REVISION OF CRATAEGUS SECT. CRATAEGUS AND NOTHOSECT. CRATAEGUINEAE (ROSACEAE-MALOIDEAE) IN THE OLD WORLD

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ABSTRACT. This revision of the Old World taxa of *Crataegus* sect. *Crataegus* and of the newly described nothosect. *Crataeguineae*, subfam. Maloideae, is based on field work and herbarium study. The taxonomic history is reviewed, and morphology and infrageneric relationships as well as the role of hybridization are discussed. The taxonomic categories employed are defined. All available chromosome counts are listed in an appendix. Data concerning phenology, dispersal, habitats, and distribution are summarized. All taxa are illustrated and their ranges mapped. *Crataegus* sect. *Crataegus* consists of 26 species and 16 nothospecies (hybrid species), distributed among 5 series, 3 subseries, and 5 nothoseries: ser. *Apiifoliae* (1 species, *C. marshallii*, in the U.S.A.), ser. *Tanacetifoliae*, ser. *Orientales*, ser. *Pentagynae*, and ser. *Crataegus*; the last is divided into subser. *Crataegus*, subser. *Erianthae* and subser. *Dzhairenses*, nothoser. *Tanacetitales* (ser. *Orientales* × ser. *Tanacetifoliae*), nothoser. *Crataegifoliae* (ser. *Crataegus* × ser. *Tanacetifoliae*), nothoser. *Orientaegus* (ser. *Crataegus* × ser. *Orientales*) and nothoser. *Crataegynae* (ser. *Crataegus* × ser. *Pentagynae*). *Crataegus* nothosect. *Crataeguineae* (sect. *Crataegus* × sect. *Sanguineae*) comprises 4 nothospecies. Eight new taxa are described (*C. orientalis* subsp. *presliana*, *C. heterophylloides*, *C. nevadensis*, *C.* ×*yosgatica*, *C.* ×*sinaïca* subsp. *rossii*, *C.* ×*killinica*, *C.* ×*hafniensis*, and *C.* ×*browicziana*), and 13 new combinations are proposed (*C. azarolus* var. *chlorocarpa*, *C. azarolus* var. *pontica*, *C. orientalis* subsp. *szovitsii*, *C. pentagyna* subsp. *pseudomelanocarpa*, *C. ambigua* subsp. *transcaspica*, *C. rhipidophylla* var. *lindmanii*, *C. pseudoheterophylla* subsp. *turcomanica*, *C. pseudoheterophylla* subsp. *turkestanica*, *C. monogyna* var. *lasiocarpa*, *C.* ×*zangezura* nothosubsp. *pseudoambigua*, *C.* ×*macrocarpa* nothovar. *hadensis*, *C.* ×*media* nothovar. *sicula*, and *C.* ×*kyrtostyla* nothovar. *domicensis*).

INTRODUCTION

Crataegus L. is a well-defined genus traditionally referred to tribe Crataegeae, subfam. Maloideae, of the Rosaceae, and has been considered closely related to *Pyracantha* Roemer, *Mespilus* L., and *Hesperomeles* Lindley, and more distantly to *Cotoneaster* Medikus and *Osteomeles* Lindley (Phipps 1983a, 1988). Recently, Phipps et al. (1991) published a new classification of the Maloideae in which they consider *Crataegus* most closely allied with *Osteomeles* and less closely with *Mespilus*, *Hesperomeles*, and *Pyrus* L. and its satellite genera, but only very distantly related to *Cotoneaster* and *Pyracantha*.

Crataegus, a genus of about 150 to 1200 species (depending on species concept employed), is distributed mainly in temperate regions of the Northern Hemisphere. Among the 50–100 Old World species of *Crataegus*, the taxa of sect. *Crataegus* (=sect. *Oxyacanthae* Loudon) occurring in Europe, northern Africa, and western Asia (Fig. 1) stand out immediately, because they have small leaves with 1–4 pairs of lobes, usually extending 0.5 times or more the width of the lamina to the midrib,

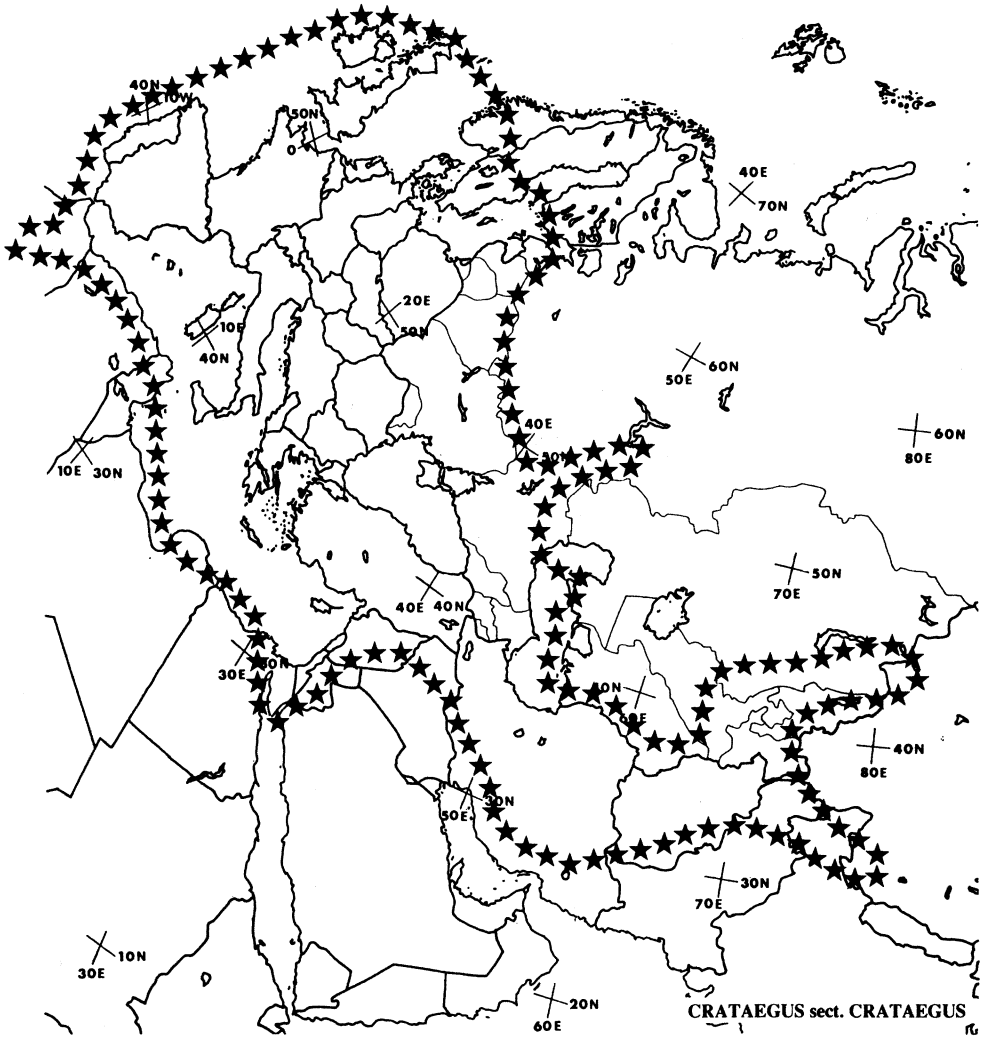


FIG. 1. Distribution of *Crataegus* sect. *Crataegus* in the Old World.

and ventro-laterally sulcate or smooth pyrenes. *Crataegus* sect. *Crataegus* is a well-defined section, which apparently is most closely related to the primarily East Asiatic sect. *Sanguineae*. Especially *C. pinnatifida* Bunge, *C. necopinnata* Pojarkova, and *C. remotilobata* Popov of sect. *Sanguineae* have a leaf morphology fairly similar to that of species of sect. *Crataegus*, but the leaves of these species are typically much larger with a larger number of lobes. A few spontanous hybrids between species of sect. *Crataegus* and sect. *Sanguineae* are known; these hybrids are in this revision referred to nothosect. *Crataeguineae*.

Crataegus sect. *Crataegus* is divisible into five series, three subseries, and five nothoseries.

CRATAEGUS ser. APIIFOLIAE (Loudon) Rehder (=sect. *Apiifoliae* Loudon): 1 species, *C. marshallii*, in the southeastern U.S.A. The relationship of this series to

other series of sect. *Crataegus* needs further study. *Crataegus* ser. *Apiifoliae* is not treated in this revision.

CRATAEGUS ser. TANACETIFOLIAE Christensen: 2 species, 1 in southern Greece, 1 in Asian Turkey. The species of this series have traditionally been referred to ser. *Orientales*, but differ from species of that (and other) series in having persistent, elliptical, serrate bracts.

CRATAEGUS ser. ORIENTALES (Schneider) Pojarkova [=sect. *Orientales* Schneider; ser. *Azaroli* (Loudon) Rehder]: 3 species from the Mediterranean region to central Asia.

CRATAEGUS ser. PENTAGYNAE (Schneider) Russanov (=sect. *Pentagynae* Schneider): 1 species from central Europe and the Balkans to Iran and Kopet-Dagh.

CRATAEGUS ser. CRATAEGUS [=ser. *Oxyacanthae* (Loudon) Rehder]: 18 species and 7 nothospecies from Europe and northern Africa to central Asia. This series is divisible into three subseries:

Crataegus subser. *Dzhairenses* Christensen, 1 species in central Asia (Hissar Mts);

Crataegus subser. *Erianthae* (Pojarkova) Christensen (=ser. *Erianthae* Pojarkova), 7 species from Europe, Caucasia, and Turkey to central Asia;

Crataegus subser. *Crataegus*, 10 species from Europe and northern Africa to central Asia.

Crataegus nothoser. *Tanacetitales* Christensen (=*Crataegus* ser. *Orientales* × *Crataegus* ser. *Tanacetifoliae*), 2 nothospecies.

Crataegus nothoser. *Crataegifoliae* Christensen (=*Crataegus* ser. *Crataegus* × *Crataegus* ser. *Tanacetifoliae*), 1 nothospecies.

Crataegus nothoser. *Orientagynae* Christensen (=*Crataegus* ser. *Orientales* × *Crataegus* ser. *Pentagynae*), 1 nothospecies.

Crataegus nothoser. *Orientaegus* Christensen (*Crataegus* ser. *Crataegus* × *Crataegus* ser. *Orientales*), 3 nothospecies.

Crataegus nothoser. *Crataegynae* Christensen (*Crataegus* ser. *Crataegus* × *Crataegus* ser. *Pentagynae*), 2 nothospecies.

The aims of this study are to revise the taxonomy of the species and nothospecies (hybrid species) of sect. *Crataegus* and the nothospecies of nothosect. *Crataeguineae*, to elucidate the degree of hybridization among the species, to document the phytogeography of the species and nothospecies, and to make the identification of specimens comprehensible to the non-specialist. To this end, I studied herbarium material from numerous herbaria (see Acknowledgments) and conducted about 25 weeks of field study during nine field seasons. The ranges of all taxa are mapped in detail, many for the first time. Keys are written to aid in the identification of species in the flowering and fruiting stages of development. Because the keys will not permit the identification of all specimens, I prepared detailed descriptions and illustrations. Many taxa are illustrated for the first time. Nomenclatural problems were resolved, and types of most names and much original material were examined. I attempted to solve the taxonomic problems presented by these taxa with both herbarium and field studies, some involving the biometrical analysis of population samples; the results of the biometrical analyses are published elsewhere (Christensen 1982a, 1984, 1985, 1992).

Problems in *Crataegus* are the result of a number of factors. First, the species

are inherently variable. For example, in *C. meyeri* and *C. monogyna* different types of leaf blades, which in other taxa may be of taxonomic significance, occur at random in many populations. Second, hybridization, introgression, and subsequent polyploidy or apomixis may occur and blur the lines between species. Third, it is often difficult to obtain all the taxonomically important structures at any one time. It may be necessary to revisit the same populations or individuals at both flowering time and fruiting time; much of my field work yielded specimens in only one or another stage of development and emphasized the advantage of "living with the species" to come to understand them. Fourth, Old World botanists have described a large number of new species and nothospecies, especially within the last fifty years, often based on very slight differences. These species and nothospecies were usually delimited without suffient field and herbarium studies to determine the constancy of their distinctive character states or without sufficiently careful comparison with previously described species or nothospecies to which the material might have been referred within a broader concept of species and nothospecies.

For practical reasons, I believe that a treatment with a broad species concept is most desirable when dealing with a large and taxonomically difficult genus, such as *Crataegus*, and I have pursued both field and herbarium studies with this in view for some time. This revision of sect. *Crataegus and* nothosect. *Crataeguineae* in the Old World is a result of these investigations.

MATERIALS AND METHODS

This study was based on more than 5000 herbarium specimens borrowed from or studied at 54 herbaria (see Acknowledgments). All specimens were critically examined and label data were used for mapping. A large number of the specimens were used to compose species descriptions.

Field studies in Denmark, Sweden, Yugoslavia, and Greece conducted in 1979–1982, 1985–1987, 1989, and 1990, supplemented the herbarium work.

The descriptions of taxa are based on mature, well-developed organs. Leaf descriptions are based on the subterminal leaves of flowering and short shoots and on the leaves from the central portion of elongate shoots (see Fig. 2). In flowering specimens, the number of stamens was counted in up to 5 flowers and the number of styles in up to 10 flowers. In fruiting specimens, the number of pyrenes was counted in up to 5 or, in critical cases, up to 10 fruits.

Phenological data were recorded for all specimens with flowers and fruits. Flowers deemed to be in anthesis had spreading petals, stamens with well-developed, unopened anthers or loose pollen, and stigmas that appeared to be receptive. Fruits deemed to be mature had the color typical of the taxon concerned.

Attempts were made to locate as much type material (holotypes, isotypes, lectotypes, and syntypes) as possible. In some cases only paratypes, topotypes (material from locus classicus), or merotypes (material from type tree) were at my disposal. In these cases, the paratypes, topotypes, or merotypes studied are cited in Representative Specimens/Additional Specimens Studied. The term paralectotype is used in accordance with Hansen and Seberg (1984). Lectotypes and neotypes were designated for many names. A herbarium acronym (according to Holmgren et al. 1981) followed by an exclamation mark indicates a type specimen seen.

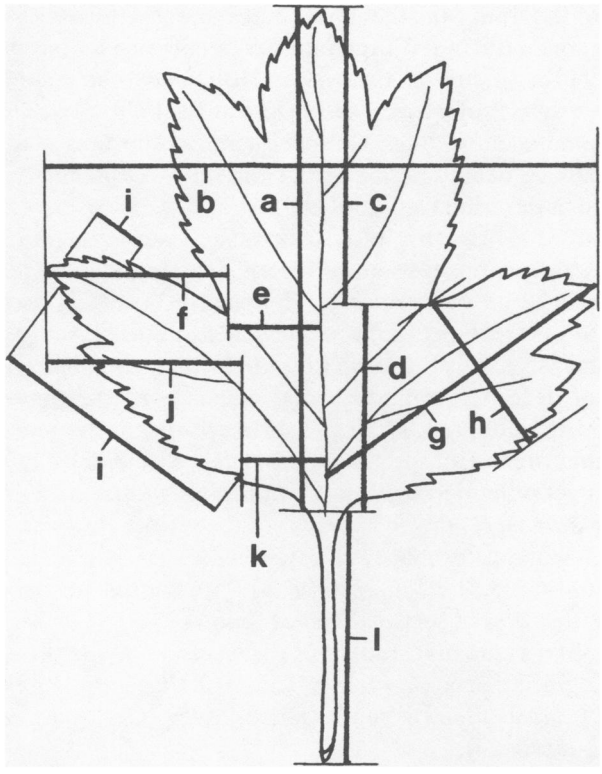


FIG. 2. Quantitative characters scored on leaves from flowering shoots, short shoots, and elongate shoots. a: length of leaf blade; b: width of leaf blade; c/c+d = c/a: location of basal sinus; f/e+f: depth of basal sinus = extension of basal lobe to midrib; g: length of basal lobe; h: width of basal lobe; i+i: number of teeth on basal lobe; j/j+k: ratio of serrate part of lobe to lobe length; l: length of petiole.

TAXONOMIC HISTORY

During the 18th and 19th century attempts were made to divide *Crataegus* into two or more genera (Medikus 1789; Borkhausen 1798, 1803; Roemer 1847; Ørsted 1860; Wenzig 1874); however, none of these new genera have been generally accepted. Although *Crataegus* is a large genus, it is a well-defined one.

Linnaeus (1753) referred nine species to *Crataegus*, three of which now are considered belonging other genera: *C. aria* = *Aria nivea* Host, *C. torminalis* = *Torminalis clusii* (Roemer) Robertson & Phipps, and *C. indica* = *Rhaphiolepis indica* (L.) Lindley (see Robertson & al. 1991). Two of the remaining six Linnaean species occur in the Old World, *C. oxyacantha* (=*C. rhipidophylla)* and *C. azarolus*, and four occur in the New World, *C. coccinea* L., *C. crus-galli* L., *C. tomentosa* L., *C. viridis* L.

Since the time of Linnaeus, the number of new species described in *Crataegus* has increased considerably. In North America, new species were described primarily during the last decade of the 19th century and the first three decades of the 20th century; more than 1000 new species were recognized, especially by Ashe, Beadle, and Sargent (Brown 1910; Palmer 1932). In the Old World, many new species were

described during the 18th and the 19th century by Poiret, Koch, Gandoger, and others, but more recently a very large number of new species has been described by Pojarkova, Hrabetová-Uhrová, Cinovskis, Doll, and others, especially after the publication of volume 9 of *Flora URSS* (Komarov 1939). Within sect. *Crataegus* (=sect. *Oxyacanthae*), more than 200 species and nothospecies and more than 100 infraspecific taxa have been described since the time of Linnaeus, and about half of these taxa has been described since 1939.

The division of *Crataegus* into sections and series is much disputed; see Cinovskis (1971) and Phipps (1983a, b) for reviews. In the most recent study of the infrageneric classification of *Crataegus,* Phipps (1983a) refers species occurring in the Old World to five sections: sect. *Mexicanae* Loudon (1 species in southeastern Asia, 1 in Mexico), sect. *Oxyacanthae* Loudon (=sect. *Crataegus*) (ca. 36 species in western Asia, northern Africa, and Europe, 1 species in the southeastern U.S.A.), sect. *Sanguineae* Schneider (ca. 17 species, primarily in eastern and central Asia, 1 in central and southeastern Europe), sect. *Cuneatae* Schneider (2 species in eastern Asia), and an as yet unnamed section (*C. hupehensis* Pojarkova and *C. shensiensis* Pojarkova from China).

The present work is primarily a revision of sect. *Crataegus* (=sect. *Oxyacanthae*) as circumscribed by Phipps (1983a), and a brief historical review of the infrageneric classification of sect. *Crataegus* follows.

Loudon (1838) was the first student of *Crataegus* to divide the genus into named sections. He recognized: sect. *Apiifoliae* (*C. marshallii*), sect. *Azaroli* (*C. azarolus*, *C. orientalis*, *C. tanacetifolia*), sect. *Heterophylla* (*C. heterophylla*), and sect. *Oxyacanthae* (*C. laevigata*).

Roemer (1847) divided *Crataegus* into 6 genera (alternatively subgenera of *Crataegus*). Species of sect. *Crataegus* were referred to *Oxyacantha* (*C. pallasii*, *C. laevigata* p.p., *C. monogyna* p.p., *C. heterophylla*), *Crataegus* (*C. azarolus* p.p., *C. marshallii*, *C. laevigata* p.p., *C. monogyna* p.p.), *Azarolus* (*C. azarolus* p.p., *C. orientalis* p.p., *C. pentagyna* p.p.), and *Phaenopyrum* (*C. orientalis* p.p., *C. tanacetifolia*, *C. pentagyna* p.p.).

In Schneider's (1906) classification of *Crataegus,* 22 sections were accepted, and sect. *Crataegus* was treated as four sections: sect. *Pentagynae* (*C. pentagyna*), sect. *Oxyacanthae* (*C. microphylla*, *C. laevigata*, *C. monogyna*, *C. heterophylla*), sect. *Orientales* (*C. azarolus*, *C. orientalis*, *C. heldreichii*, *C. tanacetifolia*, *C. pycnoloba*, *C. songarica*), and sect. *Microcarpae* (*C. marshallii*).

Pojarkova (1939a, b) was the first student of Eurasian species of *Crataegus* to use a bilevel infrageneric classification. Pojarkova (1939a, b, 1963) used existing sectional names but created new, partly invalid, series names. The invalid series names (Pojarkova 1939a) were later validated by Botschantzev (1960) and Pojarkova (1960). In Pojarkova's classification, sect. *Crataegus* (Old World species) is divided as follows: sect. *Pentagynae* (*C. pentagyna*), sect. *Orientales* ser. *Orientales* (*C. orientalis* p.p.), ser. *Szovitsianae* (*C. orientalis* p.p.), ser. *Azaroli* (*C. azarolus* p.p.), ser. *Ponticae* (*C. azarolus* p.p.), sect. *Oxyacanthae* ser. *Oxyacanthae* (*C. laevigata*), ser. *Erianthae* (*C. meyeri*), ser. *Sphaenophyllae* (*C. sphaenophylla*), ser. *Ambiguae* (*C. ambigua*, *C. caucasica*, *C. songarica*), ser. *Kyrtostylae* (*C. rhipidophylla* p.p., *C. pseudoheterophylla* p.p.), ser. *Stevenianae* (*C. monogyna* p.p.), ser. *Monogynae* (*C. monogyna* p.p., *C. pseudoheterophylla* p.p.), ser. *Microphyllae* (*C. microphylla*, *C. rhipidophylla* p.p.), and ser. *Pallasianae* (*C. pallasii*, *C. karadaghensis*, *C. longipes*).

Recently Riedl (in Rechinger 1969) has simplified Pojarkova's classification. Cinovskis (1971), Browicz (in Davis 1972), and Byatt (1977) adopted Schneider's (1906) classification for *Crataegus* occurring in the Baltic region, Turkey, and in Europe, respectively.

Of the 17 species included in the Flora of the Peoples Republic of China (Yü 1974), only one species, *C. songarica*, is treated in the present revision. Yü (1974), like Schneider (1906), referred *C. songarica* to sect. *Orientales*. Phipps (1983a) divided sect. *Crataegus* (=sect. *Oxyacanthae*) into four series: ser. *Apiifoliae* (*C. marshallii*), ser. *Oxyacanthae* (=ser. *Crataegus* of this revision), ser. *Pentagynae* (*C. pentagyna*), and ser. *Azaroli* (*C. azarolus*, *C. heldreichii*, *C. meyeri* p.p., *C. orientalis*, *C. pycnoloba*, *C. tanacetifolia*).

Tkaczenko (1982) described *C. trilobata*[1] from Ferganskiy Khr., Kirgizistan, as a species new to science. From the brief description, *C. trilobata* appears fairly similar to species of ser. *Crataegus*, but differs in having 10 stamens per flower and yellow fruits with 5 pyrenes; only *C. dzhairensis* has (4–) 5 pyrenes. *Crataegus trilobata* is the only Old World species with 10 stamens; all other Old World species have about 20 stamens per flower. This species may belong to a yet undescribed section.

TAXONOMIC CATEGORIES

The morphological species concept is used in the present work, mostly in line with that of Rothmaler (1944) and Phipps & Muniyamma (1980). The taxonomic ranks used are defined as follows

SPECIES. When two entities, with more or less different ranges, differ by at least four correlated characters, they are treated as separate species. Where closely related species meet, hybridization and introgression may occur. This species concept may appear relatively narrow. However, the species recognized by many European and Russian students of *Crataegus* are equivalent to varieties or subspecies as defined here, or merely represent poorly defined regional or local populations, which by most taxonomic standards can scarcely be accepted even as formae. The species concept used here is not entirely consistent because of the range of the variety of reproductive patterns found in the genus, i.e., from ordinary sexual outbreeding species to polytypic species with various cytotypes, to polyploid species, and to hybrid complexes. Apomicts may also occur.

SUBSPECIES. When two more or less allopatric entities differ by two or three correlated characters, they are considered separate subspecies. Intergradation occurs in areas of contact.

VARIETY. When two sympatric entities differ by one or two noticeable characters and one of the entities occurs in parts of the total range only, separate varieties are held to exist. Similarly, when two more or less allopatric entities differ by one character, they are treated as separate varieties.

[1]*Crataegus trilobata* Tkaczenko, Bjull. Glavn. Bot. Sada 126: 32. 1982, is a later homonym for *C. trilobata* Poirét, Encycl. suppl. 1: 291. 1810 [=*Eriolobus trilobata* (Poiret) Roemer], and for *C. trilobata* Loddiges ex Loudon, Arbor. frutic. brit. 2: 824, fig. 587. 1838 (*C. flava* Aiton × *C.*?). Because I have not had the opportunity to study the type (holotype: *Tkaczenko & Kuznetzov 72*, FRU), I am not publishing here a nomen novum for Tkaczenko's illegimate name.

NOTHOTAXA. With the appearance of the "*International Code of Botanical Nomenclature 1983*" (Voss 1983; see also Greuter 1988), the practice of naming all kinds of hybrids has been considerably changed. Three points are especially important to the present work. 1) When hybrids between taxa are named, the nothotaxon (hybrid taxon) must have the same rank as its parents or the same rank as the parent taxon with the lower rank (Art. H.5), e.g., *C. domicensis* is here considered identical with *C. monogyna* × *C. rhipidophylla* var. *lindmanii*, and the correct name for this infraspecific hybrid is consequently *C.* ×*kyrtostyla* nothovar. *domicensis*. 2) When a nothotaxon is divided into taxa of lower rank and the parent taxa are given at higher rank only, the lower rank of the nothotaxa is indicated by f., var., subsp., etc. (Art. H.12). 3) When all the parent taxa can be postulated, a nothotaxon is circumscribed to include not only the F_1 but also subsequent filial generations as well as back-crosses and combinations of these (Art. H.4).

When only one of the parents can be postulated, a nothotaxon is here treated as a species (e.g., *C. sphaenophylla* = *C. meyeri* × *C.* ?) or an infraspecific taxon of the postulated parent (e.g., *C. orientalis* subsp. *szovitsii* = *C. orientalis* subsp. *orientalis* × *C.* ?), depending on the number of diagnostic characters separating the nothotaxon from its postulated parent. When none of the parents can be postulated, a nothotaxon (e.g., a triploid such as *C. caucasica*) is treated as a species.

MORPHOLOGY

Habit. The habit of *Crataegus* varies from small, polycormic shrubs to monocormic trees up to 10 m tall. In most species, both shrubby and treelike individuals occur, but often the typical habit is either shrubby (e.g., *C. pycnoloba*) or treelike (e.g., *C. azarolus*). The number of trunks of one individual varies partly with the degree of suckering. The mature trunk is generally covered with a platelike bark, peeling off in small, angular, greyish or brownish, rarely yellow or orange, scales.

Twigs. The color and indumentum of the twigs change during their first 1–3 years. The color of twigs of the previous year varies from ash grey and dark brown to orange or yellow, and is usually not well correlated with the species. The indumentum of twigs of the current year, and also of buds, leaves, inflorescence, hypanthium, and fruit, often varies from taxon to taxon. In this paper the terminology for indumentum types generally follows Stearn (1978). The terms are defined as follows.

A. Indumentum of long hairs.
   Villous. Straight or slightly curly, more or less perpendicular to the surface, not matted (Fig. 63T)
   Lanate (woolly). Curly, more or less pointing in all directions, more or less matted (Fig. 17T).
   Sericeous (silky). Straight, appressed, shining (Fig. 6I).
B. Indumentum of short hairs.
   Tomentose. Curly, pointing in all directions, matted (Fig. 28T).
   Appressed-pubescent. Straight, appressed, sparse (Fig. 11I).

The twigs of the current year are usually epruinose, but in *C. sphaenophylla* they are more or less pruinose.

Like the leaf-bearing twigs, the aphyllous thorns vary in color and also in length, curvature, and stoutness. The maximum length of thorns varies from ca. 10 cm (e.g., *C. macracantha* Loddiges) to less than 1.5 cm (e.g., *C. orientalis*, *C. caucasica*, *C. nevadensis*). Species occurring in North America generally have thorns longer than 4 cm (shorter in some, e.g., *C. douglasii* Lindley, *C. marshallii*). On the other hand, Old World species generally have thorns shorter than 4 cm. The thorns are straight in most Old World species and many North American species, though occasionally slightly recurved in *C.* ×*sinaïca* and strongly recurved in some North American species (e.g., *C. pringlei* Sargent, *C. macrosperma* Ashe). Fine thorns are found in *C. pallasii* and *C. longipes,* and stout thorns in the majority of species of sect. *Crataegus*.

The buds are small, subglobose to ovoid, with an obtuse or acute apex. The indumentum is similar to that of the twigs.

Leaves. The leaves are alternate with deeply lobed (e.g., sect. *Crataegus*), shallowly lobed (e.g., sect. *Sanguineae*), or unlobed blades (e.g., sect. *Mexicanae*). The number of pairs of lobes is typically 1 in *C. phaenopyrum* (L.f.) Medikus, 1–3 in species of sect. *Crataegus,* and 4–8 or more in most other species. The margin is entire, serrate, or crenate, or in some species glandular-serrate (e.g., *C. tanacetifolia*, *C. nevadensis*). The leaf blades vary in size from about 15 cm in length and width [e.g., *C. mollis* (Torrey & A. Gray) Schelle] to less than 1 cm in length and width (e.g., *C. pycnoloba*). Intercalary veins running to the sinuses are present in sect. *Crataegus* and *C. phaenopyrum*. The petioles may be long, as in ser. *Crataegus*, or short, as in ser. *Orientales* and ser. *Tanacetifoliae,* or almost absent, as in *C. uniflora* Münchhausen and *C. cuneata* Siebold & Zuccarini. The stipules of leaves of flowering shoots and elongate shoots may be caducous-deciduous or persistent, and entire, denticulate, or serrate.

Crataegus has well-developed flowering shoot and short-shoot leaf heteroblasty (Dickinson et al. 1984, 1987) and also some elongate-shoot leaf heteroblasty. The size of leaf blades, the ratio of length to width of the lamina, the number of lobes per leaf blade, the number of teeth per lobe, the length of petioles, and the length of stipules typically decrease from the subterminal leaf blades of flowering shoots and short shoots to the subbasal leaf blades. Leaf blades of the apical and basal portions of elongate shoots are usually smaller with smaller stipules than those of the central portion.

There are also distinct between-shoot differences in shape and size of leaf blades of flowering, short, and elongate shoots. The ratio of length to width of the subterminal leaf blades of short shoots is on the average larger than that of subterminal leaf blades of flowering shoots, and the petioles are usually much longer than those of subterminal leaf blades of flowering shoots. The ratio of length to width of leaf blades from the central portion of elongate shoots is typically smaller than that of subterminal leaf blades of flowering shoots. Furthermore, the basal lobes of leaf blades of elongate shoots are broader and more coarsely and densely serrate or dentate than those of subterminal leaf blades of flowering shoots, and the petioles are often shorter. The stipules of leaves of elongate shoots are larger and generally more densely serrate than those of leaves of flowering shoots. Stipules are absent on short shoots.

Inflorescence. The inflorescence is usually a corymb, rarely an umbel (e.g., *C. microphylla*), or the flowers are solitary (e.g., *C. uniflora*). The number of flowers per inflorescence varies considerably. The inflorescence is up to 50-flowered in ser. *Pentagynae*, up to 25-flowered in ser. *Crataegus,* and up to 9-flowered in ser. *Tanacetifoliae*. The inflorescence may be compact with short peduncles and pedicels (e.g., ser. *Tanacetifoliae*) or lax with long peduncles and pedicels (e.g., ser. *Crataegus*). The type of indumentum often separates groups of taxa. Species of ser. *Orientales* have lanate or tomentose inflorescences, whereas species of ser. *Crataegus* usually have villous or glabrous inflorescences. *Crataegus pentagyna* subsp. *pentagyna* has lanate or glabrescent inflorescences, but those of subsp. *pseudomelanocarpa* are tomentose.

Flowers. Each flower is subtended by 1–3 bracts at the base of the hypanthium. These bracts are usually caducous-deciduous, small, linear-lanceolate, with an entire or more or less glandular-denticulate margin, but in ser. *Tanacetifoliae* they are persistent, large, elliptical, with a densely glandular-serrate margin. The 5-merous flowers have five sepals and petals, 5–25 stamens placed in 1–4 series or rows, a single inferior ovary composed of 1–5, rarely 6, 1-ovuled carpels, which are more or less connate at the base, and 1–5, rarely 6, free, rarely more or less connate, styles, each with a more or less disklike stigma. The hypanthium is glabrous or, if hairy, with the same indumentum type as the inflorescence.

Sepals. The sepals vary from linear in many North American species to narrowly or broadly triangular in most Old World species. Their margin varies from entire (e.g., *C. monogyna* and *C. laevigata*) to densely glandular-serrate (e.g., *C. submollis* Sargent, *C. marshallii,* and *C. tanacetifolia*).

Petals. The petals are concave, broadly obovate to suborbicular, with a short claw. They are generally white, but occasionally individuals with pinkish petals may occur. In some cultivars, such as of *C. monogyna* and *C. laevigata,* the petals are dark red.

Like most other genera of the Maloideae, *Crataegus* has petals with papillose adaxial epidermis cells. According to the surface pattern of the papillae, two types of petals may be observed with the scanning electron microscope (SEM): 1) petals with striate papillae; these papillae are striate towards the base with parallel lirae running from near the apex to the base of each papilla (Fig. 3A, B); 2) petals with rugose papillae; these papillae are more or less rugose throughout (Fig. 3C, D).

Petals with striate papillae occur in, among others, *C. laevigata*, *C. pseudoheterophylla*, *C.* ×*albanica C.* ×*macrocarpa*, *C.* ×*media*, *C.* ×*kyrtostyla*, and *C. dahurica* Schneider. Examples of species whose petals have rugose papillae are *C. tanacetifolia*, *C. pycnoloba*, *C. azarolus*, *C. orientalis*, *C. heldreichii*, *C. pentagyna*, *C. meyeri*, *C. caucasica*, *C. songarica*, *C. pallasii*, *C. microphylla*, *C. rhipidophylla*, *C. pseudoheterophylla*, *C. monogyna*, *C. marshallii*, *C.* ×*bornmuelleri*, *C.* ×*peloponnesiaca*, *C.* ×*sinaïca*, *C.* ×*killinica*, *C.* ×*zangezura*, *C. maximowiczii* Schneider, *C. nigra* Waldstein & Kitaibel, *C. pinnatifida*, *C. sanguinea* Pallas, and *C.* ×*lambertiana*.

The surface pattern of petals often shows some within-taxon variation, but if both petals types occur within a species, they apparently always occur in different infraspecific taxa, as in *C. pseudoheterophylla*. *Crataegus pseudoheterophylla* subsp. *pseudoheterophylla* has petals with rugose papillae, whereas subsp. *turcomanica* and subsp. *turkestanica* have petals with striate papillae. [Christensen and

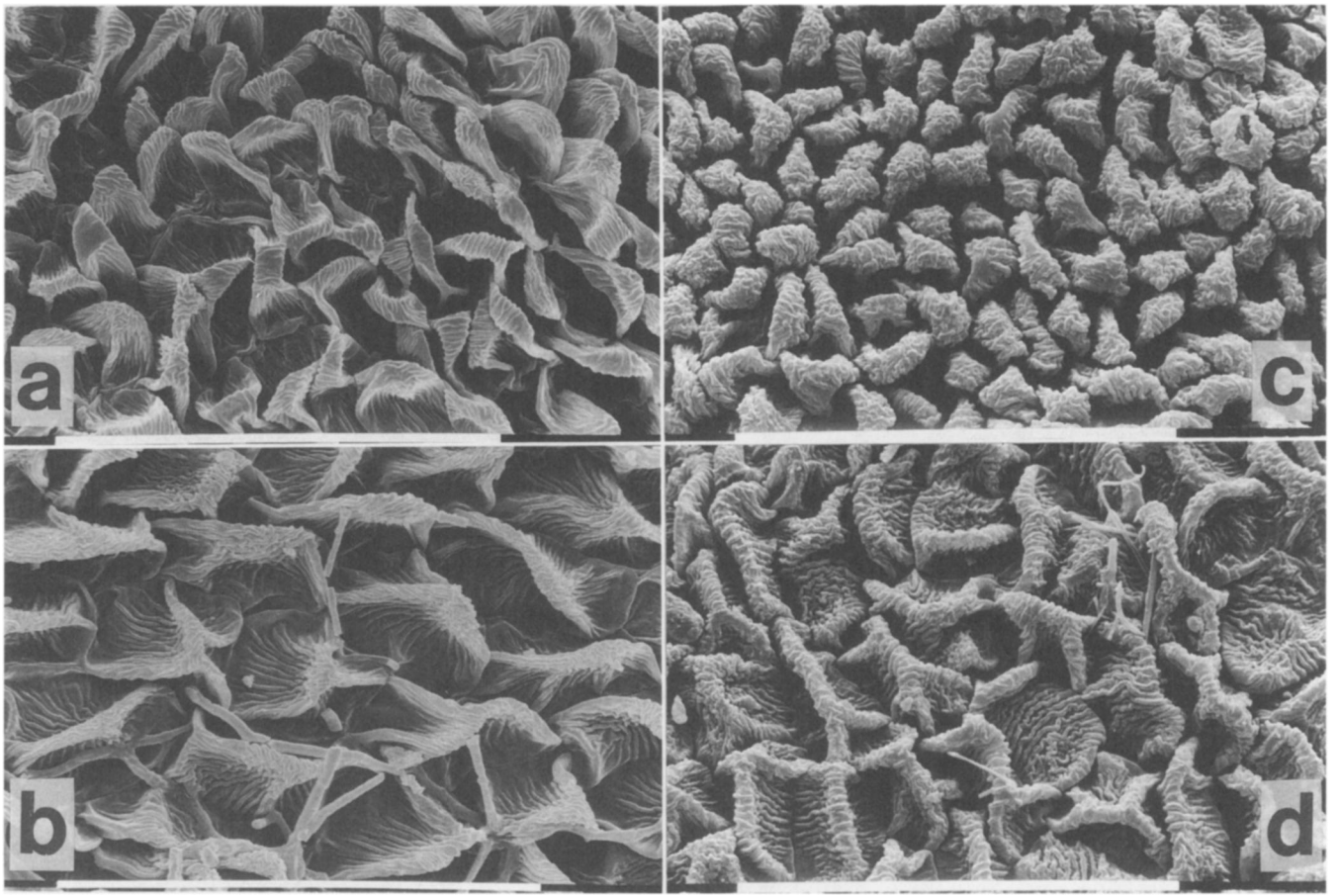


FIG. 3. SEM photographs of adaxial surfaces of petals of *Crataegus*. A, B: striate papillae. C, D: rugose papillae. A. *C. laevigata* (*Steeden s.n.*). B. *C. pseudoheterophylla* subsp. *turkestanica* (*Botschantzev 885*). C. *C. orientalis* subsp. *pojarkovae* (*Kossych s.n.*). D. *C. pallasii* (*Prima s.n.*). White bar = 100 μm.

Hansen (unpubl.) are preparing a detailed study of the surface pattern of petals in the Angiospermae and its evolutionary role.]

Stamens. The number of stamens is usually about 10 or 20, rarely as low as 5 or as high as 25. Flowers with about 10 or 20 stamens occur seldom within a species. The color of the anthers varies from purplish in some species or infraspecific taxa to pink, yellowish, or white in others. On the other hand, individuals with pink or white anthers may occur within one population, as in *C. punctata* Jacquin. Often a certain anther color is typical of a whole section or series, such as the purplish anther color of sect. *Crataegus*.

Pollen. The pollen of the genera of Rosaceae has many characters in common, and different types apparently represent variations on the same theme (Reitsma 1966). Hence, like other genera of the Maloideae, *Crataegus* has striate and tricolpate pollen with colpi 0.7–0.9 times as long as the polar axis. The pollen is 26–56 μm long, 15–47 μm in equatorial diameter. The pollen shape, i.e., the ratio of length of the polar axis to length of the equatorial axis, ranges from elliptical to almost spherical (Fig. 4A), and the equatorial view from rounded-triangular to almost circular (Fig. 4F). Two fairly well-defined types of exine pattern may be recognized with the scanning electron microscope (SEM): 1) exine strongly striate without or with few, small tectal perforations (Fig. 4A–C); 2) exine weakly striate with many, large tectal perforations (Fig. 4D–F). The orientation and width of the lirae may vary considerably within each type of exine. The orientation of lirae varies from strongly rugose (Fig. 4A) to more or less parallel (Fig. 4C), and the lirae may be coarse (Fig. 4A, B) or fine (Fig. 4C). The number of lirae per μm varies from 2 to 6. The two types of exine pattern are often found within the same species and, therefore, the interpretation and practical use of the pollen structure in both *Crataegus* and in other genera of the Maloideae is severely limited. See Byatt (1976c) and Byatt et al. (1977) (and also Christensen, in prep.) for detailed studies of pollen morphology in *Crataegus* and other genera of the Maloideae.

Fruit. The fruit is a berrylike, more or less globose or pyriform to narrowly elliptical pome. The base is often angular, e.g., *C. meyeri, C. caucasica, C. ambigua, C. rhipidophylla,* and *C. sphaenophylla*; the pedicel is often abruptly enlarged just below the fruit base in *C. pseudoheterophylla* subsp. *turkestanica*. In size the pome ranges from 6 mm long and 4 mm in diameter (*C. marshallii*) to 35 mm long and 27 mm in diameter (*C. azarolus*), and in color from yellow (e.g., *C. tanacetifolia, C. azarolus* var. *chlorocarpa, C. trilobata*), orange (e.g., *C. azarolus* var. *azarolus*), red (e.g., *C. monogyna, C. rhipidophylla*), blackish purple (e.g., *C. pallasii, C. karadaghensis*), to black (e.g., *C. pentagyna, C. nigra, C. douglasii*). The fruit is usually epruinose, but it is more or less pruinose in *C. pentagyna* subsp. *pentagyna, C. sphaenophylla,* and *C. ambigua,* and heavily pruinose in ser. *Pruinosae* (Sargent ex Eggleston) Rehder. The indumentum of the fruit is usually like that of the infructescence or absent.

The fruit is usually crowned by the persistent calyx, but sometimes, e.g., *C. phaenopyrum*, the calyx is deciduous. In ser. *Pruinosae,* the persistent calyx is elevated on a conspicuous collar or calyx tube, but usually the fruiting calyx is more or less sessile. The sepals of the persistent calyx may be erect (e.g., *C. microphylla, C. rhipidophylla* var. *lindmanii*), spreading (e.g., *C. rhipidophylla* var. *rhipidophylla*), or reflexed (most species of sect. *Crataegus*).

The flesh of the fruit may be yellowish (e.g., subser. *Crataegus*), greenish (*C. nigra, C. jozana* Schneider, *C. chlorosarca* Maximowicz), orange (subser.

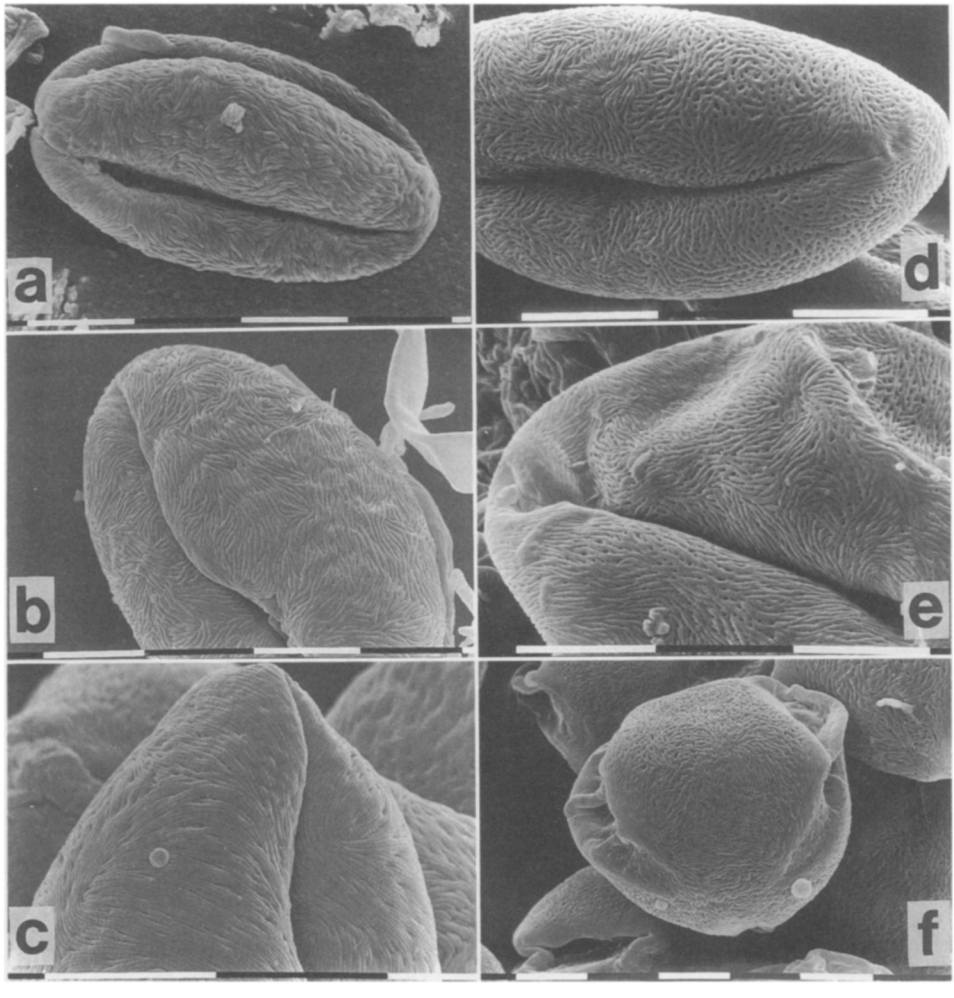


FIG. 4. SEM photographs of pollen of *Crataegus*. A–C: exine strongly striate without or with few tectal perforations. D–F: exine weakly striate with many, large perforations. A. *C. pseudoheterophylla* subsp. *turkestanica* (*Botschantzev 885*). B. *C. meyeri* (*Karelin s.n.*). C. *C. sanguinea* (*Tepevikloff s.n.*). D. *C. pallasii* (*Prima s.n.*). E. *C. ambigua* subsp. *transcaspica* (*Dubjansky 53*). F. *C.* ×*bornmuelleri* (*Davis 21490*). Bars = 10 μm.

Dzhairenses), or reddish (e.g., ser. *Pentagynae*), succulent and juicy [e.g., ser. *Coccineae* (Loudon) Rehder] or more or less dry and mealy (e.g., sect. *Crataegus*).

The number of nutlets or pyrenes varies between 1 and 5, rarely 6, depending on species or infraspecific taxon. The outer or dorsal surface of each nutlet is longitudinally sulcate (grooved) and semi-circular when seen in cross section; the inner or ventral surface is smooth (e.g., *C. tanacetifolia*, *C. azarolus*), sulcate (grooved) (e.g., *C. laevigata*, *C. monogyna*), or foveate (pitted) (e.g., *C. nigra*, *C. sanguinea*), and semi-circular (1 pyrene per fruit), flat (2 pyrenes), or more or less triangular (3–6 pyrenes) when seen in cross section. The free, apical part of the pyrene, the hypostyle, is glabrous (e.g., *C. wattiana* Hemsley & Lace, *C.* ×*tianschanica*) or pilose (e.g., sect. *Crataegus*).

INFRAGENERIC RELATIONSHIPS AND HYBRIDIZATION

It is often difficult to reconstruct the phylogeny of taxa where hybridization plays a role in their evolution (see, e.g., Phipps 1984). According to Pojarkova (1939a), Gladkova (1968), Byatt (1975a, 1976a, b), and Christensen (1982a, b, 1984, 1985, 1992), hybridization, introgression, and subsequent polyploidy play a major role in the evolution of *Crataegus* in the Old World. Furthermore, apomixis may also be a factor. Facultative apomixis in triploid taxa of *Crataegus* occurring in Poland has recently been reported by Ptak (1990); apomixis is also known to occur in North American species (Muniyamma & Phipps 1979a, b, 1984; Smith & Phipps 1988). This may, at least in part, explain why it proved impossible to construct a cladogram for Old World species of *Crataegus*.

Originally I hoped that a cladistic study based on the out-group comparison method (e.g., Watrous & Wheeler 1981) would result in a new infrageneric classification of the Old World species of *Crataegus*. Initially all hybrids where the parents could be postulated were omitted from the cladistic analysis. Subsequently an attempt was made to construct a cladogram based on 22 binary characters scored for 28 Old World species and using the HENNIG86 program version 1.5. However, more than 1400 cladograms could be constructed, and it was evident that much more information is needed before an infrageneric classification of *Crataegus* can be based on cladistic studies. In consequence, the most recent infrageneric classification of *Crataegus* (Phipps 1983a) with a few minor changes is adopted here.

In this revision, ser. *Crataegus* (=*Crataegus* ser. *Oxyacanthae* sensu Phipps 1983a) is divided into three subseries primarily on the basis of number of pyrenes per fruit: subser. *Dzhairenses* with (4–) 5 pyrenes per fruit, subser. *Erianthae* with 1–3 (–5) pyrenes per fruit, and subser. *Crataegus* with 1 (–2) pyrenes per fruit. Subseries *Crataegus* represents the most advanced subseries of ser. *Crataegus* due to the reduced number of pyrenes per fruit.

Series *Azaroli* sensu Phipps (1983a) is here divided into two series: ser. *Tanacetifoliae* (*C. tanacetifolia*, *C. pycnoloba*) and ser. *Orientales*. Series *Tanacetifoliae* is a well-defined group easily recognized by its fruits with persistent, elliptical, densely glandular-serrate bracts. In the Old World, only sect. *Cuneatae* is similar in having fruits with persistent bracts, but the bracts differ from those of ser. *Tanacetifoliae* in being linear-lanceolate and denticulate.

It is not sufficient simply to interpret a taxon that is intermediate between two others as their hybrid. It is possible, in some cases at least, that the intermediacy is a result of speciation rather than hybridization. Therefore, a check of the status of a putative hybrid includes several other criteria besides simple intermediacy. These criteria may be summarized as follows.

Generations required. The evolution of an intermediate by hybridization (hybrid) requires one cross, whereas the evolution of an intermediate by speciation (patristic intermediate) requires many generations.

Duration. Hybrids are usually not enduring but are newly generated. Patristic intermediates are persistent.

Geography. Hybrids are formed in ecotones or are sympatric with the parents, but amphiploid hybrid-derivates often have a larger range than the parents. Patristic intermediates and their "parents" are allopatric or clinal along range extremes.

Crataegus ×*albanica* and *C.* ×*peloponnesiaca* are examples of hybrids formed in ecotones (Christensen 1992). One of their parents is montane-subalpine and the other is planar-montane.

Crataegus × *sinaïca* (Fig. 75), *C.* ×*albanica* (Fig. 78), and *C.* ×*zangezura* (Fig. 82) are examples of hybrids that are sympatric with their parents, but they occur only within parts of the parents' range (respectively, Figs. 10, 12, 14, 16 and 62, 64; Figs. 18 and 62, 64, and Figs. 27, 28 and 58, 60); however, *C.* ×*kyrtostyla* (Figs. 94, 96) is occasionally found outside the range of one of its parents, *C. rhipidophylla* (Figs. 52, 54) (Christensen 1992).

Crataegus orientalis subsp. *presliana* is apparently an example of a patristic intermediate that is almost completely allopatric with at least one of its "parents," i.e., *C. orientalis* subsp. *orientalis* (Figs. 18, 21).

Populations. Hybrids are usually sporadic or discontinuous in occurrence, but occasionally they form continuous, interbreeding populations. Patristic intermediates form continuous, interbreeding populations.

Crataegus ×*peloponnesiaca* and *C.* ×*killinica* are examples of hybrids that are sporadic or discontinuous in occurrence (Figs. 70, 77) (Christensen 1992).

Crataegus ×*macrocarpa* is an example of a hybrid that occasionally forms continuous, interbreeding populations (Christensen 1982a).

Abundance. Hybrids are usually rare, whereas patristic intermediates are frequent.

Crataegus ×*peloponnesiaca*, *C.* ×*albanica,* and *C.* ×*killinica* are rare hybrids (Byatt 1976b; Christensen 1992). On the other hand, *C.* ×*macrocarpa*, *C.* ×*media,* and *C.* ×*kyrtostyla* are often as abundant or more abundant than their parents (Christensen 1982a, b, 1992).

Ecology. Hybrids usually occur in disturbed, "hybridized" habitats, but patristic intermediates are usually found in differentiated niches.

Crataegus ×*macrocarpa*, *C.* ×*media,* and *C.* ×*kyrtostyla* are examples of hybrids formed in disturbed, "hybridized" habitats (Byatt 1975b, 1976a, b; Lippert 1978; Christensen 1982a).

Reproductive system. Hybrids are usually apomictic if odd-polyploids, or sexual if amphiploid or lacking breeding barriers. Patristic intermediates are sexual.

Morphology. Hybrids are generally intermediate in character size and form; however, derivates of amphiploid hybrids are larger in size but intermediate in form, and new character states may occur. Derivates of autoploid hybrids are larger in size, but otherwise like the parents. Patristic intermediates are more or less intermediate, depending on the number of divergences from the "parents."

Crataegus ×*peloponnesiaca, C.* ×*albanica*, *C.* ×*killinica*, *C.* ×*macrocarpa*, *C.* ×*media,* and *C.* ×*kyrtostyla* are well-documented examples of hybrids that are intermediate between the parents in size and form (Byatt 1975b, 1976a, b; Christensen 1982a, 1984, 1985, 1992).

Chemical compounds. Chemical compounds are often additive in hybrids and non-additive in patristic intermediates.

Experimental synthesis. Experimental synthesis of the intermediate is usually possible in cases of hybridization, if the parents are known, but impossible in the most cases of patristic intermediacy. However, this final proof of hybridity is generally not needed, if the criteria of hybridity are well established; well-analyzed examples are usually sufficiently confirmed by non-experimental data.

CHROMOSOME NUMBERS

Crataegus is one of the many genera of Rosaceae with a large number of polyploid taxa (Grant 1981). As in other genera of the Maloideae, the base chromosome number in the genus is x = 17 (Grant 1981), and, based on this number, ploidal levels range from diploid (2x) to tetraploid (4x). Taxa with a base number of x= 8 or x = 16 have been reported by some workers (Longley 1924; El-Gazzar & Badawi 1977; El-Gazzar 1980; Ptak 1986), but these are at least in part due to inaccurate counts.

Chromosome numbers have not yet played a significant role in the taxonomy of the genus (Gladkova 1968; El-Gazzar & Badawi 1977), although theoretically they should be of fundamental importance in understanding the evolution of the genus. Chromosome numbers have been useful in recognizing the parentage of some hybrids (Gladkova 1968; Byatt & Murray 1977), but the variability in chromosome numbers that occurs within some species is still perplexing. Available counts for Old World taxa of sect. *Crataegus* are listed in the Appendix.

PHENOLOGY AND DISPERSAL

Species of *Crataegus* generally flower abundantly during late spring and early summer, and their open, unspecialized flowers are pollinated by flies, beetles, bees, and occasionally by ants (Dickinson 1985; Christensen, pers. obs.). They usually produce large numbers of fruits during late summer and autumn; often some fruits remain on the plant until the next spring (Christensen, pers. obs.). In some years, insect and fungal damage of flowers may reduce the fruit set and maturation (Gosler 1990; Christensen, pers. obs.). The pyrenes of *Crataegus* are fairly heavy and are usually dispersed by larger song birds, game birds, small rodents, ungulates, and bears, which eat the fruits (see Phipps & Muniyamma, 1980, for references). Dissemination by running water may occasionally also play a role, as noted by Palmer (1932). The pyrenes generally require from two to six years to germinate (Palmer 1932; Schopmeyer 1974; Dickinson 1985; Christensen, pers. obs.), and 10 years or more must elapse before the new individuals grow to fruiting size (Palmer 1932; Dickinson 1985).

HABITATS AND DISTRIBUTION

Species of sect. *Crataegus* generally grow in sites with high light intensity, such as mountainous tracts at and above tree-line, openings in forests, scrub, steppe, at riversides, margins of lakes, and in areas affected by man, particularly poorly managed or fallow fields, field edges, hedges, roadsides, and waste places. Only a few species, e.g., *C. laevigata* and *C. rhipidophylla* (Byatt 1977; Lippert 1978), are tolerant of shade and grow in more or less continuous forest. At early stages of succession, individuals of other species of *Crataegus*, e.g., *C. monogyna* and *C. orientalis*, may also occur in forest, but at later stages, when the shading by trees assumes greater significance, they become weak, cease flowering, and eventually die (Christensen, pers. obs.). According my field observations and information on herbarium labels, species of sect. *Crataegus* may be found on a variety of outcrops,

herbarium labels, species of sect. *Crataegus* may be found on a variety of outcrops, e.g., on calcareous rocks, serpentine, granite, schist, sandstone, and on quartzite. Some species are calcicolous, e.g., *C. tanacetifolia*, *C. pycnoloba*, *C. ambigua* subsp. *transcaspica,* and *C. nevadensis*. On the other hand, there are apparently no calcifuge species nor are any found on permanently waterlogged or much disturbed soils.

The center of diversity of sect. *Crataegus* lies in the region from Turkey to Iran, where 14 species, 6 nothospecies, and all 4 Old World series of the section occur. Secondary centers of diversity are in the Crimea and neighboring areas of the USSR (11 species and 4 nothospecies) and in Caucasia (10 species and 4 nothospecies).

Many of the widespread species of sect. *Crataegus* belong to distinct floristic elements or geo-elements, (i.e., groups of species with the same general range).

1) The subatlantic element is represented by *C. laevigata* and *C. rhipidophylla* (Figs. 35, 52, 54). The range of species of the subatlantic element extends from central and eastern Europe north to southeastern Scandinavia and the Baltic region.

2) The Mediterranean element is represented by *C. monogyna* var. *lasiocarpa* (Fig. 64). Species of this geo-element occur in the countries on both sides of the Mediterranean Sea.

The West Mediterranean element is represented by *C. azarolus* var. *azarolus*, *C. azarolus* var. *chlorocarpa,* and the montane *C. orientalis* subsp. *presliana* and *C. nevadensis* (Figs. 10, 14, 22, 52). Species of this floristic element are found from northwestern Africa and the Iberian Peninsula to Sicily and southern Italy.

The East Mediterranean element is represented by the montane *C. pycnoloba*, *C. orientalis* subsp. *orientalis,* and *C. heldreichii* (Figs. 8, 18, 25). Species of this geo-element occur primarily in the Balkan Peninsula through Turkey to the Middle East and northeastern Africa.

3) The steppe element is represented by *C. azarolus* var. *pontica*, *C. meyeri*, *C. kurdistanica*, *C. ambigua*, *C. pallasii*, *C. karadaghensis,* and the montane *C. songarica* and *C. pseudoheterophylla* (Figs. 16, 31, 33, 41, 43, 46, 58, 60). Species of the steppe element are found from central Asia to Turkey and Ukraine.

TAXONOMY

Crataegus L., Sp. pl. 1: 475. 1753.—TYPE: *Crataegus rhipidophylla* Gandoger (=*Crataegus oxyacantha* L., nom. rejic.).

Oxyacantha Medikus, Phil. Bot. 1: 15. 1789.—TYPE: *Oxyacantha vulgaris* (DC.) Roemer [=*Crataegus laevigata* (Poiret) DC.].

Lazarolus Borkhausen, Arch. Bot. Leipzig 1, 3: 88. 1798. *Azarolus* Borkhausen, Theor. Prakt. Handb. Forstbot. 2: 1224. 1803, nom. superfl.—TYPE: *Lazarolus oxyacanthoides* Borkhausen [=*Crataegus azarolus* L.].

Anthomeles Roemer, Fam. nat. syn. monogr. 3: 140. 1847.—TYPE: unknown.

Phaenopyrum Roemer, Fam. nat. syn. monogr. 3: 152. 1847. *Gymnomeles* Ørsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1859: 110. 1860, nom. superfl. *Phalacros* Wenzig, Linnaea 38: 164. 1874, nom. superfl.—TYPE: *Phaenopyrum cordatum* (Aiton) Roemer [=*Crataegus phaenopyrum* (L.f.) Medikus].

Polyomeles Ørsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1859: 111. 1860.—TYPE: *Crataegus parvifolia* Aiton [=*Crataegus uniflora* Münchhausen].

Symphyomeles Ørsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1859: 111. 1860.—TYPE: unknown.

Deciduous, rarely more or less semi-evergreen, shrubs or trees, nearly always thorny; thorns up to ca. 10 cm long, fine or stout. Buds small, with up to 16 bud scales. Leaves alternate, petiolate, rarely subsessile, blade more or less lobed, with entire, serrate, or crenate lobes, or unlobed, with serrate or crenate margin, intercalary veins running to sinuses present or absent; stipules deciduous or persistent, entire, denticulate, or serrate. Inflorescence a terminal corymb, rarely an umbel or flowers solitary, borne on a leafy short shoot of the current year. Flowers 5-merous; sepals 5, entire or more or less glandular-serrate, reflexed, spreading or more or less erect after anthesis, persistent, rarely deciduous; petals 5, white, rarely tinged with red, concave and broadly obovate to suborbicular with a short claw; stamens 5–25, anthers white, cream, yellow, pink, or purple; styles 1–5 (–6); ovary inferior with 1–5 (–6), 1-ovuled carpels more or less connate at base. Fruit a berrylike, yellow, orange, red, blackish purple, or black pome, up to 35 mm long, with yellowish, orange, or reddish, succulent and juicy or more or less dry and mealy flesh; pyrenes 1–5 (–6), bony and more or less connate at base, dorsally sulcate and ventro-laterally smooth, sulcate or foveate, hypostyle pilose or glabrous.

Crataegus is a genus of about 150 to 1200 species (depending on species concept). About 100 to 1100 species occur in temperate regions of North America and about 50 to 100 species in temperate regions of the Old World.

Crataegus section **Crataegus**.

Thorns up to ca. 4 cm long, stout or fine. Leaf blades more or less deeply lobed, lobes entire, serrate, or crenate, intercalary veins running to sinuses present; stipules more or less persistent, entire, denticulate, or serrate. Subterminal leaf blades of flowering shoots with 1–3 (–4) pairs of lobes. Inflorescence a terminal corymb, rarely an umbel, borne on a leafy short shoot of the current year. Sepals persistent, reflexed, spreading, or more or less erect after onset of anthesis, margin entire or more or less glandular-serrate; stamens 15–23, anthers purple; styles 1–5 (–6). Fruit yellow, orange, red, blackish purple, or black; flesh yellowish, orange, or reddish, more or less mealy; pyrenes 1–5 (–6), ventro-laterally smooth or sulcate, hypostyle pilose.

Section *Crataegus* comprises 26 species, 1 in the southeastern U.S.A. (*C. marshallii* Eggleston) and 25 in northern Africa, Europe, and western Asia.

KEY TO THE SERIES AND SUBSERIES OF CRATAEGUS SECT. CRATAEGUS IN THE OLD WORLD

1. Bracts persistent, glandular-serrate, 0.9–3.1 times as long as wide. I. *Crataegus* ser. *Tanacetifoliae*.
1. Bracts caducous, entire or denticulate, 2.6–26.0 times as long as wide.
   2. Fruit black; flesh reddish; pyrenes 3–5 (–6), ventro-laterally smooth. Inflorescence up to 50-flowered. III. *Crataegus* ser. *Pentagynae*.
   2. Fruit usually not black, or if black then pyrenes 1 (–2) and ventro-laterally sulcate; flesh yellowish or orange. Inflorescence up to 25-flowered.

3. Petiole of subterminal leaf blades of flowering shoots 0.1–0.4 times as long as lamina. Stipules of leaves of elongate shoots entire or more or less irregularly serrate. Inflorescence compact, rarely more or less lax, lanate or tomentose. Pyrenes (1–) 2–3 (–4), (1–) 2–5 (–6), or (2–) 3–5 (–6), ventro-laterally smooth, rarely sulcate.
II. *Crataegus* ser. *Orientales*.

3. Petiole of subterminal leaf blades of flowering shoots (0.1–) 0.2–0.7 times as long as lamina. Stipules of leaves of elongate shoots more or less regularly serrate. Inflorescence lax, rarely more or less compact, glabrous or villous, rarely villous-lanate. Pyrenes 1 (–2), 1–2 (–3), (1–) 2–3 (–5), or (4–) 5, ventro-laterally sulcate, rarely smooth.
IV. *Crataegus* ser. *Crataegus*.

4. Pyrenes (4–) 5; flesh of fruit orange. IV1. *Crataegus* subser. *Dzhairenses*.

4. Pyrenes 1 (–2), 1–2 (–3), or (1–) 2–3 (–5); flesh of fruit yellowish.

5. Pyrenes 1–2 (–3) or (1–) 2–3 (–5), ventro-laterally sulcate or smooth.
IV2. *Crataegus* subser. *Erianthae*.

5. Pyrenes 1 (–2), ventro-laterally sulcate. IV3. *Crataegus* subser. *Crataegus*.

Key to Species and Nothospecies of Crataegus sect. Crataegus and Crataegus Nothosect. Crataeguineae in the Old World

Fruiting material, preferably with all types of leaves, is generally needed for certain identification of species and nothospecies of sect. *Crataegus* and nothosect. *Crataeguineae*; however, when considered important, diagnostic characters of inflorescences and flowers are cited in the key. If possible, the number of pyrenes should be counted in more than one fruit.

1. Twigs and inflorescences/infructescences glabrous or with sparse indumentum. Leaves pubescent along major veins and in vein axils beneath, rarely glabrous or more or less pubescent throughout.

2. Pyrenes (2–) 3–4 (–5), 3–5 (–6), or (4–) 5 (–6).

3. Twigs and inflorescences glabrous. Subterminal leaf blades of flowering shoots with 3–5 pairs of lobes. Fruit yellow or brick-red; pyrenes ventro-laterally foveate, hypostyle glabrous. 44. *C.* ×*tianschanica*.

3. Twigs and inflorescences lanate-tomentose, lanate, villous, or glabrous. Subterminal leaf blades of flowering shoots with 1–3 pairs of lobes. Fruit black, blackish purple, brick- or orange-red; pyrenes smooth or sulcate, hypostyle pilose.

4. Twigs and inflorescences lanate or lanate-tomentose. Stipules entire or more or less irregularly serrate, those of leaves of flowering shoots with 0–8 teeth, those of leaves of elongate shoots with 0–15 (–25) teeth.

5. Leaf blades more or less lanate-tomentose. Fruit black, 7–11 mm long, 6–9 mm in diameter; pyrenes 3–5 (–6) or (4–) 5 (–6), ventro-laterally smooth. Inflorescences up to 50-flowered. 6. *C. pentagyna*.

5. Leaf blades more or less villous or appressed-pubescent. Fruit orange- to blackish red, 7–18 mm long, 9–22 mm in diameter; pyrenes 3–4 (–5), ventro-laterally more or less sulcate. Inflorescences up to 25-flowered. 29. *C.* ×*pseudoazarolus*.

4. Twigs and inflorescences villous or glabrous. Stipules denticulate-serrate or serrate, those of leaves of flowering shoots with 1–30 teeth, those of elongate shoots with 11–63 teeth.

6. Subterminal leaf blades of flowering shoots 3.5–4.0 cm long. Pyrenes (4–) 5. 7. *C. dzhairensis*.

6. Subterminal leaf blades of flowering shoots 4.1–7.0 cm long. Pyrenes (2–) 3–5 or 3–4.

7. Basal lobes in subterminal leaf blades of flowering shoots up to 4.5 times as long as wide, with 2–9, more or less coarse, eglandular teeth. Petiole eglandular. Fruit blackish purple. 42. *C.* ×*dsungarica*.

7. Basal lobes in subterminal leaf blades of flowering shoots up to 2.5 times as long as wide, with 7–19, more or less fine, often glandular teeth. Petiole often glandular, with 1–6 glands. Fruit brick-red. 43. *C.* ×*aberrans*.

2. Pyrenes 1 (–2), 1–2 (–3), or (1–) 2–3 (–4).
   8. Basal pair of lobes of subterminal leaf blades with 0–15 (–22) teeth. Stipules of leaves of flowering shoots entire and/or irregularly denticulate-serrate with 1–22 teeth.
      9. Pyrenes 1, 1 (–2), or 1 (–3).
         10. Fruit black or blackish purple.
            11. Subterminal leaf blades of flowering shoots 4.0–4.9 cm long, basal pair of sinuses in the apical 1/3–1/2 of lamina; stipules more or less denticulate, with 2–16 teeth. Sepals 1.2–1.9 times as long as wide, entire or glandular-serrate with 1–5 teeth. 17. *C. heterophylloides.*
            11. Subterminal leaf blades of flowering shoots 2.5–4.2 cm long, basal pair of sinuses in the apical 2/5 to basal 1/5 of lamina; stipules entire or with 1–3 teeth. Sepals 1.0–1.2 times as long as wide, entire. 18. *C. longipes.*
         10. Fruit red or orange-red.
            12. Basal pair of lobes of subterminal leaf blades of flowering shoots with 0–9 teeth. Most or all stipules of leaves of flowering shoots entire to subentire.
               13. Leaves villous along major veins beneath. Sepals usually more or less narrowly triangular, up to 1.8 times as long as wide. Pyrenes 1 or 1 (–2), ventro-laterally sulcate. 23. *C. monogyna.*
               13. Leaves usually glabrous beneath. Sepals usually more or less broadly triangular, up to 1.2 times as long as wide. Pyrenes 1 (–3), ventro-laterally smooth or more or less sulcate. 30. *C. ×sinaïca.*
            12. Basal pair of lobes of subterminal leaf blades of flowering shoots with 0–22 teeth. Most or all stipules of leaves of flowering shoots more or less irregularly denticulate-serrate or more or less denticulate.
               14. Subterminal leaf blades of flowering shoots with basal pair of sinuses in the apical 1/5–2/5 of lamina, each lobe with 0–5 teeth. Pyrene with shallow ventro-lateral grooves. 25. *C. heterophylla.*
               14. Subterminal leaf blades of flowering shoots with basal pair of sinuses usually in the apical 2/5 or lower, each lobe with 2–22 teeth. Pyrene usually with deep ventro-lateral grooves; if grooves shallow, then fruit usually crowned by erect-suberect sepals.
                  15. Stipules of leaves of flowering shoots more or less regularly denticulate. Sepals up to 3.0 mm long, up to 1.7 times as long as wide, acute or obtuse at apex. Petals up to 6 mm long and wide. Fruit crowned by reflexed sepals. 22. *C. pseudoheterophylla.*
                  15. Stipules of leaves of flowering shoots more or less irregularly serrate-denticulate to entire. Sepals up to 5.1 mm long, up to 2.2 times as long as wide, acute or acuminate at apex. Petals up to 9 mm long and 8 mm wide. Fruit crowned by reflexed, spreading, or erect sepals. 41. *C. ×kyrtostyla.*
      9. Pyrenes 1–2 (–3) or (1–) 2–3 (–4).
         16. Fruit 4–5 mm in diameter. Sepals up to 1.8 mm long. 13. *C. sakranensis.*
         16. Fruit 5–14 mm in diameter. Sepals up to 3.9 mm long.
            17. Pyrenes 1–2 (–3).
               18. Subterminal leaf blades of flowering shoot up to ca. 5.7 cm long, ca. 6.5 cm wide, lobes 2–4 pairs. Fruit 8–14 mm long, 7–13 mm in diameter, up to 1.4 times as long as wide, often pruinose; flesh yellowish. 12. *C. ambigua.*
               18. Subterminal leaf blades of flowering shoots up to ca. 4.1 cm long, ca. 4.0 cm wide, lobes 2–3 pairs. Fruit 8–9 mm long, 5–9 mm in diameter, up to 1.8 times as long as wide, epruinose; flesh more or less reddish. 33. *C. ×zangezura.*
            17. Pyrenes (1–) 2 (–3) or 2–3 (–4).
               19. Fruit orange-red to dark red, flesh yellowish.
                  20. Fruit 8–9 mm long; pyrenes 2–3 (–4), ventro-laterally smooth or more or less sulcate. Sepals 1.2–2.6 mm long, 1.5–2.6 mm wide, 0.8–1.0 times as long as wide. 9. *C. kurdistanica.*

20. Fruit 9–12 mm long; pyrenes (1–) 2 (–3), ventro-laterally sulcate. Sepals 2.8–3.9 mm long, 2.3–3.5 mm wide, 1.1–1.6 times as long as wide. 30. *C.* ×*sinaïca.*

19. Fruit blackish purple or black, or if dark red, then flesh more or less reddish.

21. Fruit 8–9 mm in diameter, dark red to blackish purple. Lobes of leaf blades with more or less fine teeth. 33. *C.* ×*zangezura.*

21. Fruit 8–14 mm in diameter; blackish purple. Lobes of leaf blades with more or less coarse to very coarse teeth.

22. Lobes in subterminal leaf blades of flowering shoots 3–4 pairs, with coarse to very coarse teeth. Fruit more or less villous-lanate; sepals 2.1–3.5 mm long. 14. *C. songarica.*

22. Lobes in subterminal leaf blades of flowering shoots 1–3 pairs, with more or less coarse teeth. Fruit glabrous or more or less villous; sepals 1.2–2.5 mm long. 34. *C.* ×*rubrinervis.*

8. Basal pair of lobes of subterminal leaf blades of flowering shoots with 4–30 teeth. Stipules of leaves of flowering shoots regularly denticulate or serrate with 5–49 teeth.

23. Pyrenes 1 (–2), rarely 1 (–3).

24. Fruit purplish black or blackish purple.

25. Subterminal leaf blades of flowering shoots 1.8–3.3 cm long; petiole 7–14 mm long. Fruit 1.3–1.5 times as long as wide. 15. *C. pallasii.*

25. Subterminal leaf blades of flowering shoots 4.3–5.0 cm long; petiole 23–30 mm long. Fruit 1.0–1.4 times as long as wide. 16. *C. karadaghensis.*

24. Fruit red.

26. Fruit crowned by erect-suberect sepals.

27. Subterminal leaf blades of flowering shoots 1.3–4.3 cm long, lobes obtuse or more or less acute, crenate-serrate. Inflorescence umbellate or corymbose, 3–5(–9)-flowered. Petals 4–7 mm wide. Pyrenes with shallow ventro-lateral grooves. 19. *C. microphylla.*

27. Subterminal leaf blades of flowering shoots 2.0–6.5 cm long, lobes acute or subacuminate, serrate. Inflorescence corymbose, 5–15-flowered. Petals 6–10 mm wide. Pyrenes usually with deep ventro-lateral grooves. 20. *C. rhipidophylla.*

26. Fruit crowned by reflexed or spreading sepals.

28. Lobes of leaf blades more or less glandular-serrate, glands ca. 0.15 mm in diameter. Sepals glandular-serrate, with 1–6 teeth, or entire. Fruit 6–10 mm long. 21. *C. nevadensis.*

28. Lobes of leaf blades eglandular-serrate. Sepals entire, rarely with 1–2 glands. Fruit 7–15 mm long.

29. Stipules of leaves of flowering shoots denticulate. Leaf blades glaucous- or greyish green beneath. 22. *C. pseudoheterophylla.*

29. Stipules of leaves of flowering shoots serrate or denticulate-serrate. Leaf blades more or less greyish green or pale green beneath.

30. Subterminal leaf blades of flowering shoots up to 6.5 cm long, usually pale green beneath, basal pair of lobes acute or subacuminate, tapering towards apex or more or less parallel-sided; stipules up to 22 mm long. Fruit up to 15 mm long, 11 mm wide; pyrene usually with deep ventro-lateral grooves. 20. *C. rhipidophylla.*

30. Subterminal leaf blades of flowering shoots up to 3.1 cm long, more or less greyish green beneath, basal pair of lobes subacute, more or less tapering towards base; stipules up to 8 mm long. Fruit up to 9 mm long, 7 mm wide; pyrene with shallow ventro-lateral grooves. 40. *C.* ×*browicziana.*

23. Pyrenes 1–2 (–3) or (1–) 2–3 (–5).

31. Fruit crowned by erect-suberect sepals.

32. Lobes of leaf blades obtuse, with more or less coarse teeth. Sepals up to 1.4 times as long as wide. Fruit about as long as wide. 37. *C.* ×*hafniensis.*
32. Lobes of leaf blades subacuminate or acute, with more or less fine teeth. Sepals up to 2.2 times as long as wide. Fruit up to 1.8 times as long as wide. 38. *C.* ×*macrocarpa.*

31. Fruit crowned by reflexed or spreading sepals.
33. Pyrenes (1–) 2–3 (–5).
34. Leaf blades with crenate-serrate lobes, basal pair of veins convergent, rarely more or less straight. Subterminal leaf blades of flowering shoots with 1–2 pairs of lobes, basal pair extending up to 0.7 times the width of lamina to midrib, basal pair of sinuses in the apical 1/5–2/5 of lamina. Fruit bright red. 10. *C. laevigata.*
34. Leaf blades with serrate lobes, basal pair of veins straight or more or less divergent. Subterminal leaf blades of flowering shoots with 2–3 pairs of lobes, basal pair extending at least 0.7 times the width of lamina to midrib, basal pair of sinuses in basal 1/2–3/10 of lamina. Fruit blackish purple. 11. *C. caucasica.*
33. Pyrenes 1–2 (–3).
35. Lobes of leaf blades subacuminate or acute, with more or less fine teeth. Sepals 1.0–2.2 times as long as wide. Fruit up to 1.8 times as long as wide. 38. *C.* ×*macrocarpa.*
35. Lobes of leaf blades obtuse or acute, with more or less coarse teeth. Sepals 0.6–1.1 (–1.9) times as long as wide. Fruit up to 1.3 (–1.6) times as long as wide. 39. *C.* ×*media.*

1. Twigs and inflorescences/infructescences with dense, rarely moderate, indumentum. Leaves pubescent throughout beneath, rarely more or less glabrous.
36. Pyrenes 1 or 1 (–2), rarely 1 (–3). Twigs villous.
37. Basal pair of lobes of subterminal leaf blades of flowering shoots serrate or glandular-serrate, with 4–25 teeth; stipules serrate or denticulate with 8–29 teeth.
38. Subterminal leaf blades of flowering shoots up to 5 cm long, each of the basal lobes with 6–25 eglandular teeth. Fruit 8–15 mm long; sepals entire. 20. *C. rhipidophylla.*
38. Subterminal leaf blades of flowering shoots up to 3 cm long, each of the basal lobes with 4–17 glandular teeth, glands ca. 0.15 mm in diameter. Fruit 6–10 mm long; sepals glandular-serrate, with 1–6 teeth, or entire. 21. *C. nevadensis.*
37. Basal pair of lobes of subterminal leaf blades of flowering shoots entire or eglandular-serrate, with 1–9 teeth; stipules entire or more or less denticulate with 1–8 teeth.
39. Twigs more or less pruinose when young. Subterminal leaf blades of flowering shoots 4.2–5.0 cm long. Fruit more or less pruinose; pyrene with shallow ventro-lateral grooves. Inflorescence more or less compact. 24. *C. sphaenophylla.*
39. Twigs epruinose. Subterminal leaf blades of flowering shoots 11–41 mm long. Fruit epruinose; pyrene with deep ventro-lateral grooves. Inflorescence more or less lax.
40. Leaves greyish green or glaucous-green beneath. Fruit 6–11 mm long, not angular at base; sepals up to 1.8 times as long as wide. 23. *C. monogyna.*
40. Leaves pale green beneath. Fruit 10–12 mm long, often angular at base; sepals up to 1.3 times as long as wide. 36. *C.* ×*armena.*

36. Pyrenes 1–2, 1–2 (–3), 1–3 (–5), (1–) 2–3 (–4), (1–) 2–4 (–5), or (2–) 3–5 (–6). Twigs villous, lanate, tomentose, or subsericeous.
41. Pyrenes 1–2, 1–2 (–3), 1–3 (–5), or (1–) 2–3 (–4).
42. Leaves appressed-pubescent on both surfaces, or appressed-pubescent above and glabrous beneath. Fruit yellow or orange. 3. *C. azarolus.*
42. Leaves villous or lanate on both surfaces. Fruit red or blackish purple.
43. Twigs and inflorescences moderately villous or villous-lanate.
44. Fruit blackish purple. Subterminal leaf blades of flowering shoots with 3–5 pairs of lobes. Anthers yellow. 45. *C.* ×*lambertiana.*
44. Fruit red. Subterminal leaf blades of flowering shoots with 1–3 pairs of lobes. Anthers purple.

45. Lobes of leaf blades more or less glandular-serrate, glands ca. 0.1 mm in diameter. Petiole of subterminal leaf blades of flowering shoots up to 0.2 times as long as lamina. 28. *C.* ×*yosgatica.*
45. Lobes of leaf blades eglandular-serrate. Petiole of subterminal leaf blades of flowering shoots at least 0.2 times as long as lamina.
46. Subterminal leaf blades of flowering shoots 0.9–3.1 cm long; stipules more or less regularly serrate. Sepals up to 3.3 mm long, entire. 39. *C.* ×*media.*
46. Subterminal leaf blades of flowering shoots 1.8–5.7 cm long; stipules entire or more or less irregularly serrate-denticulate. Sepals up to 5.5 mm long, entire or glandular-serrate, with 1–2 teeth.
47. Pyrenes 2–3 (–4). Leaves more or less coarsely serrate. Indumentum villous-lanate. 9. *C. kurdistanica.*
47. Pyrenes 1–2 or 1–2 (–3). Leaves more or less finely serrate. Indumentum villous.
48. Basal pair of lobes of subterminal leaf blades of flowering shoots extending 0.5–0.9 times the width of lamina to midrib. Inflorescence 9–20-flowered; pedicels up to 26 mm long. 8. *C. meyeri.*
48. Basal pair of lobes of subterminal leaf blades of flowering shoots extending 0.4–0.7 times the width of lamina to midrib. Inflorescence 4–14-flowered; pedicels up to 36 mm long. 35. *C.* ×*chersonensis.*

43. Twigs and inflorescences densely lanate or villous-lanate.
49. Petioles of subterminal leaf blades of flowering shoots 0.1–0.3 times as long as lamina. Petioles of subterminal leaf blades of short shoots 0.1–0.5 times as long as lamina. Pyrenes (1–) 2–3 (–4). 4. *C. orientalis.*
49. Petioles of subterminal leaf blades of flowering shoots 0.2–0.5 times as long as lamina. Petioles of subterminal leaf blades of short shoots 0.4–0.9 times as long as lamina. Pyrenes 1–3 (–5).
50. Basal pair of lobes of subterminal leaf blades of flowering shoots up to 4.2 times as long as wide, each lobe with 0–3 teeth. Leaf blades of elongate shoots up to 6.2 cm long, 6.1 cm wide, often very deeply incised-serrate; stipules up to 30 mm long, with up to 30 teeth. Sepals up to 1.6 times as long as wide. Fruit 8–13 mm long. 31. *C.* ×*albanica.*
50. Basal pair of lobes of subterminal leaf blades of flowering shoots up to 2.4 times as long as wide, each lobe with 1–5 teeth. Leaf blades of elongate shoots up to 4 cm long, 3.5 cm wide, not deeply incised-serrate; stipules up to 12 mm long, with up to 9 teeth. Sepals up to 1.1 times as long as wide. Fruit 8–10 mm long. 32. *C.* ×*killinica.*

41. Pyrenes (1–) 2–4 (–5), (2–) 3–5 (–6), or 4–5 (–6).
51. Bracts persistent on fruit. Usually some sepals glandular-serrate, with 1–24 teeth.
52. Leaf blades more or less lustrous, dark or bright green, and villous above, lobes densely glandular-serrate, glands ca. 0.25 mm in diameter. Stipules of leaves of elongate shoots serrate, with 35–90 teeth. Fruit yellowish, rarely tinged with red. 1. *C. tanacetifolia.*
52. Leaf blades dull, greyish green, and densely sericeous above, lobes entire or with 1–3 eglandular teeth. Stipules of leaves of elongate shoots entire or with 1–13 teeth. Fruit red. 2. *C. pycnoloba.*
51. Bracts caducous-deciduous. Sepals entire, rarely with a few glandular teeth.
53. Fruit black. Inflorescence up to 50-flowered. 6. *C. pentagyna.*
53. Fruit yellowish, orange, or orange- to blackish red. Inflorescence up to 25-flowered.
54. Stipules more or less serrate, those of leaves of flowering shoots with (2–) 15–20 teeth, those of leaves of elongate shoots with 17–27 teeth. Lobes of leaf blades more or less glandular-serrate, glands ca. 0.1 mm in diameter. Bracts 1.4–3.7 times as long as wide, with 8–36 teeth. 26. *C.* ×*bornmuelleri.*

54. Stipules entire or some more or less serrate, those of leaves of flowering shoots with 0–8 teeth, those of leaves of elongate shoots with 0–22 teeth. Lobes of leaf blades entire or eglandular-serrate. Bracts 2.7–24.0 times as long as wide, entire or with 1–17 teeth.
    55. Leaves densely sericeous. Twigs and inflorescences subsericeous. 27. *C.* ×*peloponnesiaca.*
    55. Leaves lanate, villous, or appressed-pubescent. Twigs and inflorescences lanate or lanate-tomentose.
        56. Leaves villous or more or less appressed-pubescent throughout or only in vein axils beneath. Sepals 0.5–0.8 times as long as wide. Fruit orange- to blackish red. 29. *C.* ×*pseudoazarolus.*
        56. Leaves densely lanate beneath. Sepals 0.6–2.2 times as long as wide. Fruit yellowish orange or brick- to dark red.
            57. Subterminal leaf blades of flowering shoots attenuate or more or less cuneate at base, basal pair of lobes 2.4–5.0 times as long as wide; petiole 0.1–0.3 times as long as lamina. Fruit 8–15 mm long. 4. *C. orientalis.*
            57. Subterminal leaf blades of flowering shoots broadly cuneate or truncate at base, basal pair of lobes 1.6–3.3 times as long as wide; petiole 0.3–0.4 times as long as lamina. Fruit 6–8 mm long. 5. *C. heldreichii.*

I. Crataegus series **Tanacetifoliae** Christensen, ser. nov.—TYPE: *Crataegus tanacetifolia* (Poiret) Persoon.

Folia profunde tri-septempartita, rarius novem-partita. Inflorescentiae compactae, 2–9-florae; bracteae ad maturitatem fructus persistentes, dense glanduloso-serratae, ellipticae. Sepala glanduloso-serrata, rarius integra. Pyrenae 4–5, rarius 2 vel 6, dorsaliter sulcatae, ventraliter laeves.

Twigs with dense indumentum; aphyllous thorns up to ca. 2.2 cm long. Petioles of subterminal leaf blades of flowering shoots 0.04–0.3 times as long as lamina. Stipules entire or serrate, those of leaves of flowering shoots 1–6 mm long, those of leaves of elongate shoots 3–17 mm long. Inflorescence 2–9-flowered, compact, with dense indumentum; bracts persistent, densely glandular-serrate, 0.9–3.1 times as long as wide. Sepals glandular-serrate, rarely entire. Fruit yellow or red; flesh yellowish; pyrenes (2–) 4–5 (–6), dorsally sulcate, ventro-laterally smooth.

1. **Crataegus tanacetifolia** (Poiret) Persoon, Syn. pl. 2: 38. 1807. *Mespilus tanacetifolia* Poiret, Encycl. 4: 440. 1798. *Phaenopyrum tanacetifolium* (Poiret) Roemer, Fam. nat. syn. monogr. 3: 158. 1847.—TYPE: Mespilus orientalis tanaceti folio villoso magno fructu pentagono e viridi flavescente, *Tournefort s.n.* (holotype: P; isotype: BM!).

Crataegus callidens Haussknecht & Bornmüller, Mitth. Thüring. Bot. Vereins 1890: 11. 1890.—TYPE: *Bornmüller 301c* (holotype: JE!).

Shrub or tree up to ca. 10 m tall. Twigs densely villous; thorns up to ca. 2 cm long, stout. Buds 2.6–3.2 mm long, 2.8–3.2 mm in diameter. Leaf blades villous, more or less lustrous dark or bright green above, pale or greyish green beneath, attenuate or narrowly cuneate at base, lobes subacuminate or acute, rarely obtuse, margin glandular-serrate with more or less spherical glands, these ca. 0.25 mm in diameter, basal pair of lateral veins straight or divergent. Subterminal leaf blades of

flowering shoots 1.4–4.2 cm long, 1.4–4.7 cm wide, lobes 2–3 pairs, basal pair 2.7–6.0 times as long as wide, extending 0.8–0.9 of the width of lamina to midrib, each lobe with 10–41 teeth in the distal 9/10–1/3, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 1–6 mm long, 0.04–0.14 times as long as lamina; stipules 3–6 mm long, serrate, with 9–63 teeth. Subterminal leaf blades of short shoots 2.1–3.9 cm long, 1.5–2.6 cm wide, lobes 2–4 pairs, basal pair 2.7–5.5 times as long as wide, extending 0.6–0.8 times the width of lamina to midrib, each lobe with 3–52 teeth throughout or only in the distal 9/10–1/4, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 1–10 mm long, 0.05–0.3 times as long as lamina. Leaf blades of elongate shoots 2.0–4.9 cm long, 2.3–4.8 mm wide, lobes 2–4 pairs, basal pair 1.7–3.8 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 15–54 teeth throughout or only in the distal 9/10–7/10, basal pair of sinuses in the basal 3/10–1/10 of lamina; petiole 2–6 mm long, 0.05–0.13 times as long as lamina; stipules 7–17 mm long, serrate, with 35–90 teeth. Inflorescence 1–3 cm long, corymbose, 2–9-flowered, compact, densely villous; pedicels 3–6 mm long, densely villous; bracts 6.0–12.7 mm long, 1.9–7.9 mm wide, 1.6–3.1 times as long as wide, persistent, margin glandular-serrate, with 24–70 teeth. Hypanthium 4–7 mm long, densely villous; sepals 3.7–9.0 mm long, 2.1–4.4 mm wide, narrowly triangular, 1.4–2.5 times as long as wide, some or all with the margin glandular-serrate, with 1–24 teeth, apex acute; petals 6–11 mm long and wide; stamens 18–23, anthers purple; styles 4–5 (–6). Fruit 11–14 mm long, 10–14 mm in diameter, 0.9–1.1 times as long as wide, depressed-globose, globose, or broadly pyriform, yellowish, rarely tinged with red, orange when dried, more or less villous; the immature fruit crowned by the persistent, erect or spreading sepals, at maturity the sepals spreading or reflexed; flesh yellowish; pyrenes 4–5 (–6), dorsally sulcate, ventro-laterally smooth, hypostyle pilose. Chromosome number unknown. Fig. 5. Additional illustrations: Fig. 40 in Cinovskis (1971); Fig. 1 in Browicz (1978).

Phenology. Flowering in May to July, fruiting in July to October.

Distribution (Fig. 6). Asian Turkey; usually on calcareous rocks; in rocky places, steppe, and in openings in forests with *Abies, Pinus, Fagus*; 800–1800 m.

Representative Specimens. **Turkey.** Suchehir to Refahiye, *Balls 1482* (BM); Gümüsane, *Balls 1482a* (BM); Galatien, Eskisehir, Mihaliccik dagi, Kici-Alan, *Bernhard s.n.* (JE); Ponti-Galatici, Mt Lagman pr. Amasya, *Bornmüller 1022* (JE); Amasya, Mt Ak-Dagh, *Bornmüller 1023* (JE); Amasya, Mt Abadsihi-, Sana-, Ak-Dagh, *Bornmüller 1023b* (BM, G, W); Pontus, Amasya, Mt Sanadagh, *Bornmüller 2711* (BM, C, FI, G, JE, M); Kastamonu, hills above town, *Davis 21767* (BM); Gümüsane, Alt-G. felsige Hänge, *Görz 555* (BM, G); Amasya und Umgebung, *Manissadjian 940* (M); Paphlagonia, Wilajet Kastambuli, Tosya, Kaiseridere, *Sintenis 4465b* (FI, JE, W); Vilajet Bolu, place called Abant, 32 km WSW of Bolu, *Strid 14508* (C).

Crataegus tanacetifolia hybridizes with *C. orientalis* (26. *C.* ×*bornmuelleri*) and with *C. monogyna* (28. *C.* ×*yosgatica*). The hybrid produced in cultivation by crossing *C. punctata* and *C. tanacetifolia* is known as *C.* ×*dippeliana* Lange (1897).

2. Crataegus pycnoloba Boissier & Heldreich in Boissier, Diagn. pl. orient. ser. 2, 2: 146. 1856. *Mespilus tanacetifolia* var. *pycnoloba* (Heldreich & Boissier) Wenzig, Linnaea 38: 146. 1874.—Type: Greece. Korinthia: in reg. media Mt Kyllenes [Killini], 3000–5000', *Orphanides Fl. Gr. Exs. 254* (lectotype, here designated: JE!; isolectotypes: BM! E, FI! JE! LD! P! W! Z).

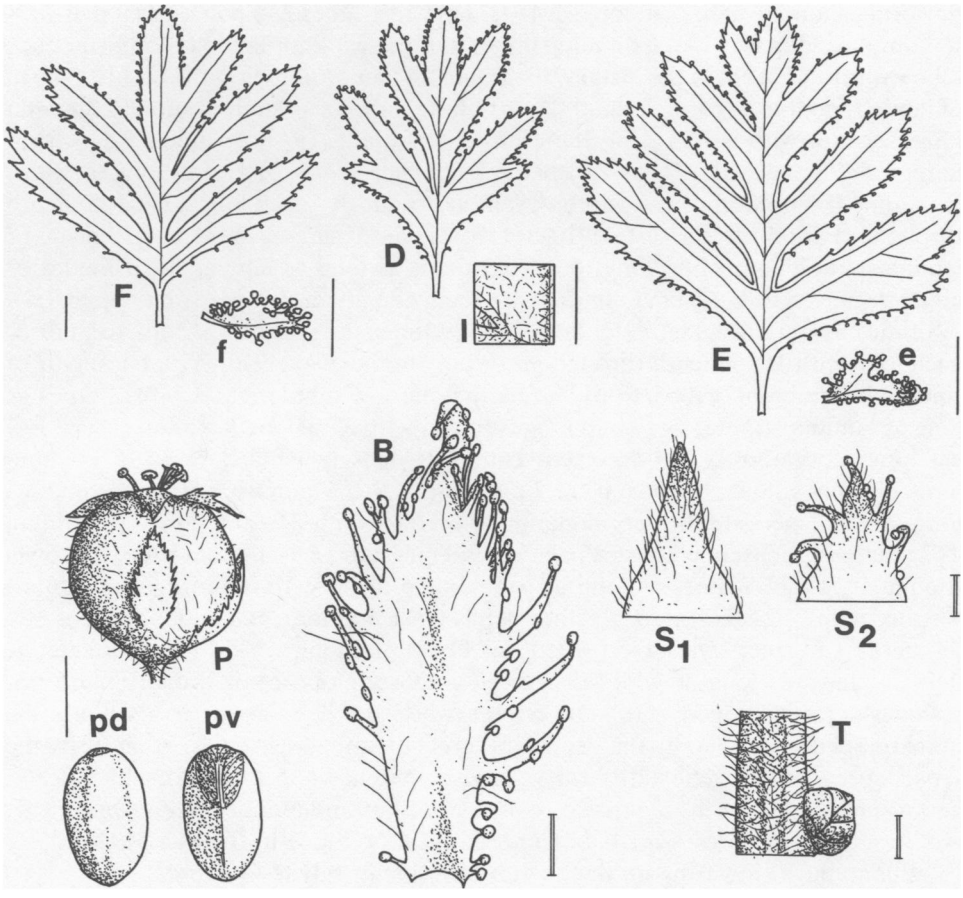


FIG. 5. *Crataegus tanacetifolia*. B: bract; D: subterminal leaf of short shoot; E: leaf of central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (P, pd, pv, T: *Balls 1482a*; B, D, E, e, F, f, I, S_1, S_2: *Bornmüller 1023b*.)

Shrub, rarely a tree, up to ca. 4 m tall, intricately branched and usually very thorny. Twigs densely subsericeous; thorns up to ca. 2.2 cm long, stout. Buds 1.1–1.9 mm long, 1.1–2.5 mm in diameter. Leaves densely sericeous and more or less concolorous greyish green above and beneath, narrowly cuneate or attenuate at base, lobes more or less acute, parallel-sided, margin entire or more or less coarsely eglandular-serrate; basal pair of lateral veins straight or more or less divergent. Subterminal leaf blades of flowering shoots 0.7–2.5 cm long, 0.6–2.0 cm wide, lobes 1–4 pairs, basal pair 2.5–6.0 times as long as wide, extending (0.4–) 0.8–1.0 times the width of lamina to midrib, each lobe entire or with 1–3 teeth in the distal 2/7–1/9, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 1–4 mm, 0.05–0.3 times as long as lamina; stipules 1–4 mm long, entire or irregularly serrate with 1–10 teeth. Subterminal leaf blades of short shoots 1.1–2.5 cm long, 0.7–1.9 cm wide, lobes 2–3 pairs, basal pair 2.5–5.6 times as long as wide, extending 0.8–1.0

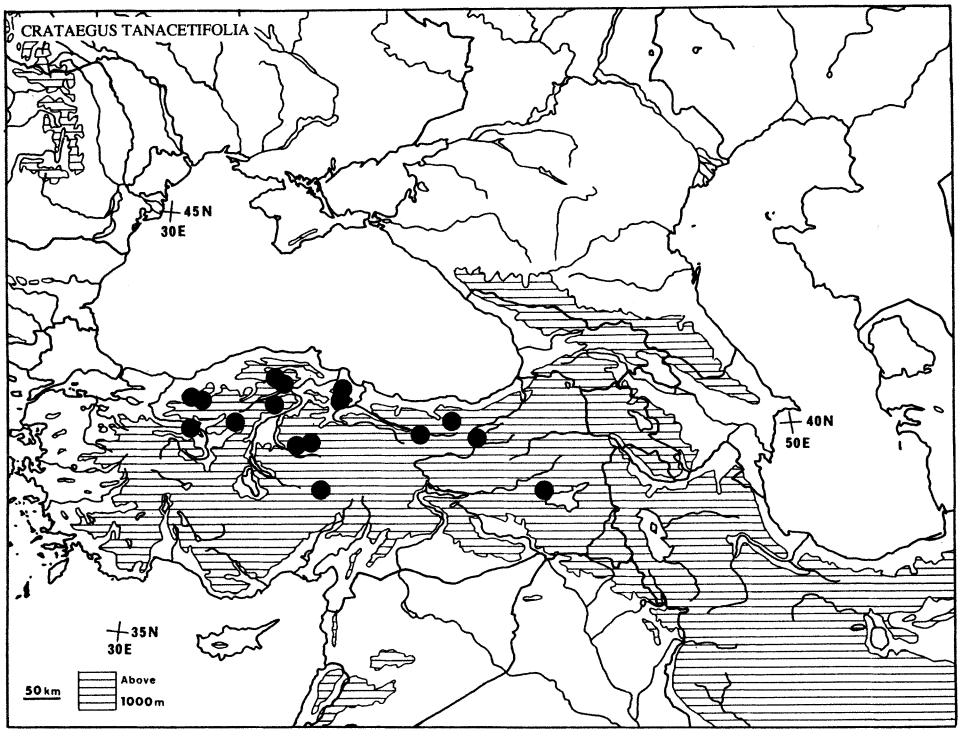


FIG. 6. Distribution of *Crataegus tanacetifolia,* based on specimens seen and literature records cited by Browicz and Zielinski (1982).

times the width of lamina to midrib, each lobe entire or with 1 tooth in the distal 1/5–1/12, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 1–7 mm long, 0.08–0.33 times as long as lamina. Leaf blades of elongate shoots 1.3–2.7 mm long, 1.2–2.9 cm wide; lobes 2–4 pairs, basal pair 2.5–4.0 times as long as wide, extending 0.9–1.0 times the width of lamina to midrib, each lobe entire or with 1–3 teeth in the distal 1/3–1/14, basal pair of sinuses in the basal 3/10–1/10 of lamina; petiole 2–6 mm long, 0.12–0.25 times as long as lamina; stipules 3–6 mm long, entire or with 1–13 teeth. Inflorescence 1.0–1.5 cm long, corymbose, 3–7-flowered, compact, densely subsericeous; pedicels 1–6 mm long, densely subsericeous; bracts 3.5–7.9 mm long, 1.9–6.5 mm wide, 0.9–2.4 times as long as wide, persistent, margin glandular-serrate with 5–46 teeth. Hypanthium 4–5 mm long, densely subsericeous; sepals 2.5–5.3 mm long, 2.1–3.9 mm wide, usually narrowly triangular, 1.1–2.1 times as long as wide, usually some with the margin glandular-serrate, with 1–15 teeth, apex acute; petals 4–6 mm long and wide; stamens 19–21, anthers purple; styles (2–) 4–5 (–6). Fruit 8–10 mm long, 8–12 mm in diameter, 0.8–1.0 time as long as wide, depressed-globose to globose, dark red, more or less subsericeous; the immature fruit crowned by the persistent, erect or spreading sepals, at maturity sepals reflexed; flesh yellowish; pyrenes (2–) 4–5 (–6), dorsally sulcate, ventrolaterally smooth, hypostyle pilose. Chromosome number unknown. Fig. 7.

Additional illustrations: Figs. 3E–H, 4 D in Christensen (1984).

Phenology. Flowering in June and July, fruiting in August to November.

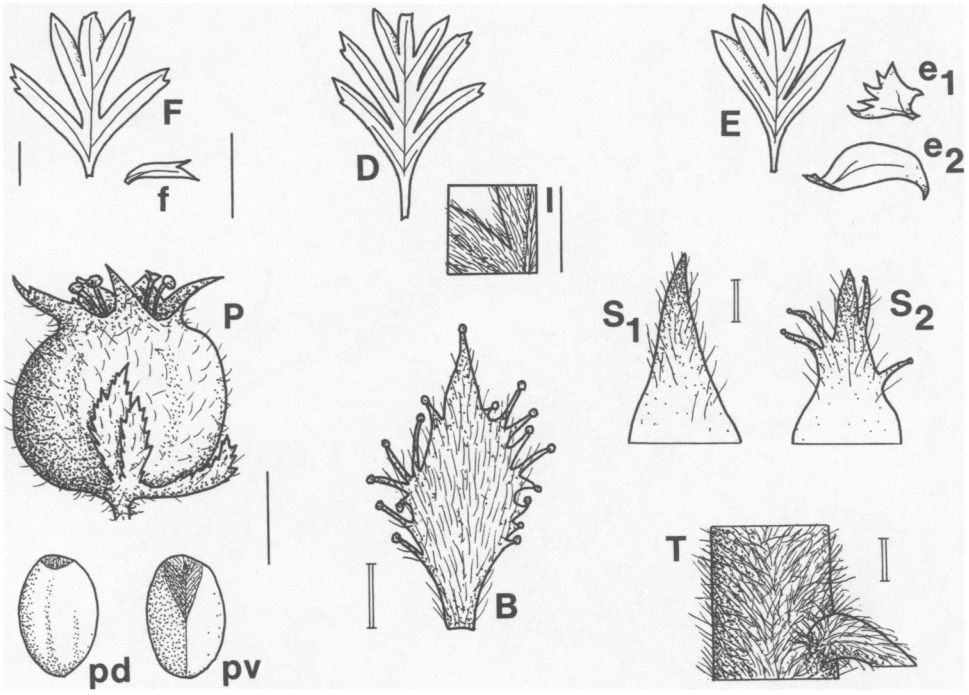


FIG. 7. *Crataegus pycnoloba*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, I, S_1, S_2: *Christensen 1319*; D, E, F, P: *Christensen 1546*; pd, pv: *Christensen 1560*; e_2, f: *Christensen 1566*; e_1, T: *Christensen 1721*.)

Distribution (Fig. 8). Endemic to the mountains of northern and central Peloponnesus (Killini, Chelmos, Menalon, and Glinitsa above Zatouna); on calcareous rocks; in scrub with *Juniperus*, *Pyrus*, *Amygdalus, Prunus, Rosa, Quercus*, in open forest with *Abies, Pinus*, on rocky mountain slopes, and in dry meadows, in degraded forest between 1500 and 1800 m often forming a "*Crataegus pycnoloba* zone" (see Quézel 1964: 329); 800–2100 m.

REPRESENTATIVE SPECIMENS. **Greece.** ACHAIA: Mt Chelmos: sine loc., *Bornmüller 612* (JE); 5 km ENE of Kalavrita, between Vrachnion and Souvardon, *Christensen 1406* (C); 8 km SW of Zarouchla, *Christensen 1572* (C); 6 km ENE of Kalavrita, new settlement just before Souvardon, *Christensen* 1595 (C); along rd from Kalavrita to ski center, *Christensen 1625* (C); inter pag. Vrachni et Souvardho, *Tzanoudakis 2930* (UPA).—KORINTHIA: Mt Killini: between EOS refuge A' "Ziria" and monastery of Ag. Vlasios above Ano Sinikia Trikalon, *Christensen 1336* (C); plateau between refuge "Ziria" and the top area, *Christensen 1486* (C); along rd from Mesi Sinikia Trikalon to Dervenion, 5–6 km before Karia, *Christensen 1489* (C); along rd from Dervenion to Goura, 1 km after southern turn-off to Sarandapichon, *Christensen 1563* (C); pr. pag. Trikalon, *Heldreich Herb. Gr. Norm. 926* (JE); above Bouzion, *Strid 15346* (C, UPA); pr. refugii (A) EOS, *Tzanoudakis 3944* (UPA).—ARKADIA: Mt Menalon: at ski center above Kardaras, *Christensen 1720* (C); along rd from ski center to Kardaras, 4–7 km beyond the center, *Christensen 1739* (C); distr. Mandinia, in reg. superiore verticis Tzelati, *Greuter 9400* (ATH).

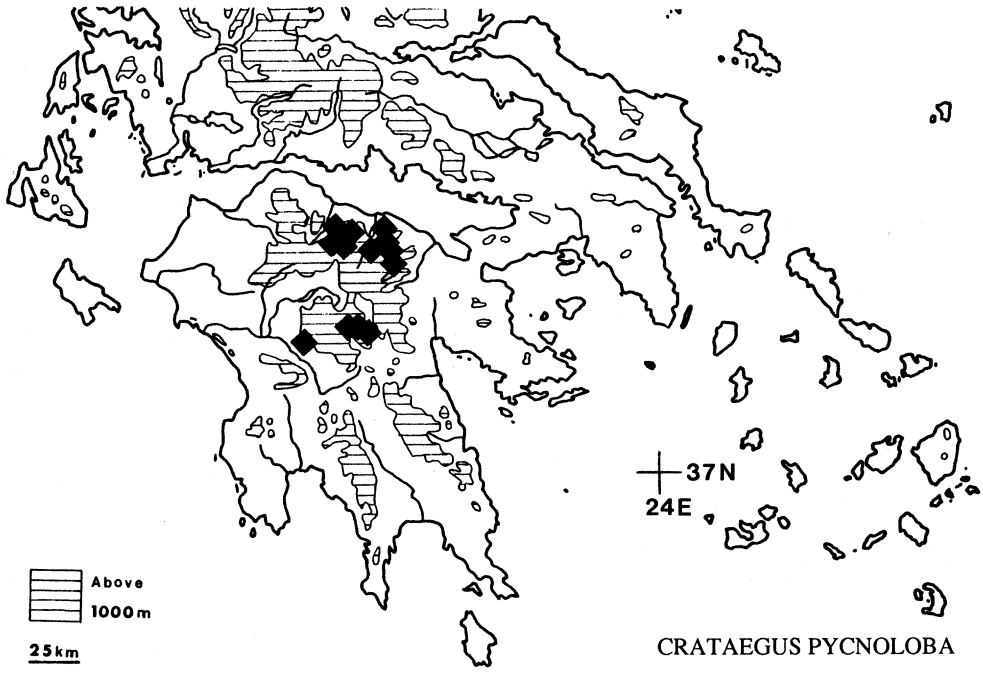


FIG. 8. Distribution of *Crataegus pycnoloba,* based on specimens seen and literature records cited by Diapulis (1934).

Crataegus pycnoloba hybridizes with *C. heldreichii* (27. *C.* ×*peloponnesiaca*). The record of the putative hybrid *C. orientalis* × *C. pycnoloba* from Mt Chelmos, ca. 5 km SW of Zarouchla (*Hartvig 10340* p.p., C!) has not been confirmed (Christensen 1984). I revisited the area in 1986 and 1987, but found no further evidence of hybridization.

II. Crataegus series **Orientales** (Schneider) Pojarkova in Komarov, Fl. URSS 9: 433. 1939. *Crataegus* sect. *Orientales* Schneider, Ill. Handb. Laubholzk. 1: 768. 1906.—TYPE: *Crataegus orientalis* Bieberstein.

Lazarolus Borkhausen, Arch. Bot. Leipzig 1(3): 88. 1798. *Azarolus* Borkhausen, Theor. prakt. Handb. Forstbot. 2: 1253. 1803, nom. superfl. *Crataegus* subgen. *Azarolus* (Borkhausen) Roemer, Fam. nat. syn. monogr. 3: 132. 1847.—TYPE: L*azarolus oxyacanthoides* Borkhausen [=*Crataegus azarolus* L.]

Crataegus sect. *Azaroli* Loudon, Arbor. frutic. brit. 2: 826. 1838. *Crataegus* ser. *Azaroli* (Loudon) Rehder, Man. cult. trees, ed. 2: 371. 1940.—TYPE: *Crataegus azarolus* L.

Crataegus sect. *Aroniae* Gordon in Loudon, Arbor. frutic. brit. 2: 846. 1838.—TYPE: *Crataegus aronia* (L.) DC.

Crataegus ser. *Ponticae* Pojarkova, Bot. Zurn. (Moscow & Leningrad) 24 (5–6): 444. 1939.—TYPE: *Crataegus pontica* Koch.

Crataegus ser. *Szovitsianae* Pojarkova ex Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 506. 1960.—TYPE: *Crataegus szovitsii* Pojarkova.

Twigs more or less densely lanate or tomentose; aphyllous thorns up to ca. 3.5 cm long. Petioles of subterminal leaf blades of flowering shoots 0.1–0.4 times as long as lamina. Stipules entire or more or less irregularly serrate, those of leaves of flowering shoots 3–15 mm long, those of leaves of elongate shoots 4–25 mm long. Inflorescence 4–25-flowered, compact, rarely lax, more or less densely lanate or tomentose; bracts 2.6–24.0 times as long as wide, entire or denticulate, caducous. Sepals entire, rarely with 1–2 glandular or eglandular teeth. Fruit yellow, orange or red; flesh yellowish; pyrenes (1–) 2–5 (–6), dorsally sulcate, ventro-laterally smooth, rarely sulcate.

3. Crataegus azarolus L., Sp. pl. 477. 1753. *Mespilus azarolus* (L.) Duhamel, Traité arbr. arbust. 1: 323. 1768. *Pyrus azarolus* (L.) Scopoli, Fl. Carniol. 1: 347. 1772. *Crataegus oxyacantha* var. *azarolus* (L.) Lamarck, Fl. Franc. 3: 484. 1798. *Lazarolus oxyacanthoides* Borkhausen, Arch. Bot. Leipzig 1(3): 88. 1798, nom. superfl. *Azarolus crataegoides* Borkhausen, Theor. prakt. Handb. Forstbot. 2: 1253. 1803, nom. superfl.—TYPE: FRANCE. Herault, Montpellier, cathedrale of Maguelonne, *Moullefarine s.n.* (neotype, here designated: CGE!). *Crataegus azarolus* was originally recorded from Florence in northern Italy and Montpellier in southern France; because there is no suitable type material at LINN (see Pojarkova 1939b), a neotype is designated here.

Azarolus crataegoides var. *macrocarpa* Roemer, Fam. nat. syn. monogr. 3: 133. 1847.—TYPE: unknown.

Azarolus crataegoides var. *dulcis* Roemer, Fam. nat. syn. monogr. 3: 133. 1847.—TYPE: unknown.

Azarolus crataegoides var. *malus* Roemer, Fam. nat. syn. monogr. 3: 133. 1847.—TYPE: unknown.

Azarolus crataegoides var. *intermedia* Roemer, Fam. nat. syn. monogr. 3: 133. 1847.—TYPE: unknown.

Azarolus crataegoides var. *torulosa* Roemer, Fam. nat. syn. monogr. 3: 133. 1847.—TYPE: unknown.

Azarolus crataegoides var. *pyriformis* Roemer, Fam. nat. syn. monogr. 3: 133. 1847.—TYPE: unknown.

Azarolus crataegoides var. *florifera* Roemer, Fam. nat. syn. monogr. 3: 133. 1847.—TYPE: unknown.

Shrub or tree up to ca. 10 m tall. Twigs more or less lanate or lanate-tomentose; thorns up to ca. 3.5 cm long, more or less stout. Buds 1.8–4.2 mm long, 1.9–4.8 mm in diameter. Leaf blades more or less coriaceous, more or less lustrous dark green and appressed-pubescent above, pale or greyish green and glabrous or appressed-pubescent beneath, attenuate, cuneate, or rounded at base, lobes obtuse, acute or cuspidate, margin entire or serrate with more or less coarse teeth; basal pair of veins divergent, straight or convergent. Subterminal leaf blades of flowering shoots

1.1–8.5 cm long, 1.0–7.9 cm wide, lobes 1–3 pairs, rarely absent, basal pair 2.0–4.8 times as long as wide, extending (0.1–) 0.4–0.9 times the width of lamina to midrib, each lobe entire or with 1–6 teeth in the distal 4/7–1/19, basal pair of sinuses in the apical 1/5 to basal 1/5 of lamina; petiole 2–17 mm long, 0.1–0.3 times as long as lamina; stipules 5–15 mm long, entire or with 1–3 teeth. Subterminal leaf blades of short shoots 1.2–7.1 cm long, 0.9–5.7 cm wide, lobes 1–4 pairs, basal pair 1.9–4.4 times as long as wide, extending (0.3–) 0.5–0.9 times the width of lamina to midrib, each lobe entire or with 1–6 teeth in the distal 1/2–1/16, basal pair of sinuses in the apical 3/10 to basal 1/5 of lamina; petiole 2–28 mm long, 0.1–0.4 times as long as lamina. Leaf blades of elongate shoots 2.7–7.0 cm long, 2.2–6.3 cm wide, lobes 1–4 pairs, basal pair 1.2–3.6 times as long as wide, extending 0.7–1.0 times the width of lamina to midrib, each lobe entire or with 1–8 teeth in the distal 2/5–1/14, basal pair of sinuses in the basal 1/2–1/10 of lamina; petiole 2–14 mm long, 0.1–0.3 times as long as lamina; stipules 4–25 mm long, with 1–16 teeth. Inflorescence 1.5–4.5 mm long, corymbose, 5–25-flowered, more or less compact, more or less lanate or lanate-tomentose; pedicels 1–20 mm long, lanate or lanate-tomentose; bracts 1.4–6.9 mm long, 0.2–0.9 mm wide, 4.0–29.0 times as long as wide, caducous, margin entire or denticulate with 1–6 teeth. Hypanthium 3–6 mm long, more or less lanate or lanate-tomentose; sepals 1.2–3.5 mm long, 1.6–3.9 mm wide, usually broadly triangular, 0.6–1.4 (–1.8) times as long as wide, margin entire, apex more or less acute; petals 3–7 mm long, 4–7 mm wide; stamens 16–22, anthers purple; styles (1–) 2–3 (–4). Fruit 8–35 mm long, 8–27 mm in diameter, 0.8–1.2 (–1.4) times as long as wide, depressed-globose, globose, or slightly pyriform, yellowish or orange, often tinged with red, when dried often becoming dark red; the immature fruit crowned by the persistent erect or spreading sepals, at maturity sepals recurved; pyrenes (1–) 2–3 (–4), dorsally sulcate, ventrally smooth, hypostyle pilose. Figs. 9, 11, 13, 15.

Phenology. Flowering in March to June, fruiting in April to October.

Distribution (Figs. 10, 12, 14, 16). From the Mediterranean region through Iraq, Iran, and Turkmenia to southern Kazakhstan, Uzbekistan, Tadzhikistan, and Kirgizistan; commonly cultivated within its natural range for its large, edible fruits, which taste of dried apples, and its wood, which is used for making small articles; on limestone, sandstone, volcanic rocks; in macchie, garrigue, rocky places, wastelands, at roadsides, in olive groves, vineyards, and hedges; 0–2000 m.

In a revision of the *C. azarolus* complex, Pojarkova (1939b) recognized five species in two series. She placed the orange-fruited *C. azarolus* s.str. in one series and the yellow-fruited *C. aronia*, *C. linnaeana*, *C. pontica,* and *C. triloba* sensu Pojarkova in her new ser. *Ponticae*; however, Pojarkova's species concept is that of a splitter. In this revision, *C. azarolus* is divided only into four varieties.

Hammer and Perrino (1985) divided *C. azarolus* into two subspecies, *C. azarolus* subsp. *azarolus* and *C. azarolus* subsp. *aronia* (incl. *C. azarolus* var. *pontica*). According to these authors, *C. azarolus* var. *pontica* may have arisen as a result of selection by man from forms of *C. azarolus* var. *aronia* with larger fruits and without thorns.

Crataegus azarolus hybridizes with *C. pentagyna* (29. *C.* ×*pseudoazarolus*) and *C. monogyna* (30. *C.* ×*sinaïca*). According to Pojarkova (1939a: 427), *C. azarolus* var. *pontica* hybridizes with *C. wattiana* [=*C. altaica* (Loudon) Lange] in western Tian Shan, but I have not seen any specimens from that area.

KEY TO THE VARIETIES OF CRATAEGUS AZAROLUS

1. Leaves glabrous (-subglabrous) beneath. Fruit orange. 3a. *C. azarolus* var. *azarolus*.
1. Leaves sparsely appressed-pubescent throughout beneath. Fruit yellowish or orange.
   2. Subterminal leaf blades of flowering shoots 1.1–4.1 (–4.8) cm long. Thorns usually present. Twigs more or less densely lanate-tomentose. 3b. *C. azarolus* var. *aronia*.
   2. Subterminal leaf of flowering shoots (3.5–) 4.5–8.5 cm long. Thorns rare. Twigs densely lanate-tomentose or more or less lanate.
      3. Twigs densely lanate-tomentose. Subterminal leaf blades of flowering shoots with 1–2 pairs of lobes, each lobe of basal pair entire or with 1–2 (–4) teeth; basal pair of sinuses in the apical 3/10 to basal 2/5 of lamina. Fruit yellowish. 3c. *C. azarolus* var. *chlorocarpa*.
      3. Twigs more or less lanate. Subterminal leaf blades of flowering shoots with 2–3 pairs of lobes, each lobe of basal pair with 1–6 teeth; basal pair of sinuses in the basal 2/5–1/5 of lamina. Fruit yellowish or orange. 3d. *C. azarolus* var. *pontica*.

3a. Crataegus azarolus var. **azarolus.**

Mespilus azarolus var. *erythrocarpa* Moris, Fl. Sardoa 2: 44. 1840–1843.—TYPE: Fig. in Gallesio, Pomona Ital. 24. 1817–1834 (lectotype, here designated).

Azarolus maroccana Roemer, Fam. nat. syn. monogr. 3: 133. 1847.—TYPE: Tab. 1855 in Lindley, Bot. Reg. 9(22). 1836 (lectotype, here designated).

Crataegus ruscinonensis Grenier & Blanc in Grenier, Billotia 1: 71. 1866. *Crataegus azarolus* var. *ruscinonensis* (Grenier & Blanc) Fiori, Nuov. Fl. Italia 1: 785. 1924.—TYPE: *Blanc s.n.* (lectotype, here designated: P!).

Twigs more or less lanate; thorns usually present. Leaf blades appressed-pubescent above, glabrous (-subglabrous) beneath, attenuate or narrowly cuneate at base, lobes acute or cuspidate, parallel-sided or tapering towards apex; basal pair of veins more or less divergent. Subterminal leaf blades of flowering shoots 3.1–4.8 cm long, 1.9–4.6 cm wide, lobes 1–2 pairs, each lobe of basal pair entire or with 1 tooth; basal pair of sinuses in the apical 3/10 to basal 3/10 of lamina. Subterminal leaf blades of short shoots 2.3–5.5 cm long, 1.3–4.9 cm wide, lobes 1–2 pairs, each lobe of basal pair entire or with 1–3 teeth; basal pair of sinuses in the apical 3/10 to basal 1/5 of lamina. Leaf blades of elongate shoots 2.9–4.6 cm long, 3.2–4.2 cm wide, lobes 2 pairs, each lobe of basal pair with 1 tooth; basal pair of sinuses in the apical 2/5 to basal 3/10 of lamina. Inflorescence, pedicels, and hypanthium more or less lanate. Fruit orange. Chromosome number unknown. Fig. 9.

Additional illustration: Fig. 1 in Pojarkova (1939b).

Distribution (Fig. 10). Southeastern France, Sardinia, and Italy (native, or cultivated and more or less naturalized); 0–800 m.

ADDITIONAL SPECIMENS EXAMINED. **France.** Dep. d'Herault, Lunel Viel, *Diemont s.n.* (WAG); Narbonne et au Pech de l'Agniel, *Endrefs s.n.* (JE, W); Montpellier, La Colombiere, *Kümmel 116* (WAG); Aude, Narbonne, *Le Jolis s.n.* (C); Aude, La Clappe, a Combe-Malle, *Magnier Fl. Sel. Exs. 1683* (G, JE, W); Montpellier, ruines de la Cathedrale de Maguelonne, *Perrier s.n.* (G); Herault, Beziers, *Sennen s.n.* (JE, W); Beziers, *Thevenau s.n.* (LD). **Italy.** Napoli, *Liebmann s.n.* (C); Emilia, Montefiorino, *Lunardi s.n.* (FI).—SARDINIA: sine loc., *Ekart & Irmisch s.n.* (JE).

3b. Crataegus azarolus var. **aronia** L., Sp. pl. 477. 1753. *Mespilus aronia* (L.) Willdenow, Enum. pl. suppl. 35. 1814. *Crataegus aronia* (L.) Bosc ex DC., Prodr. 2: 629. 1825. *Crataegus orientalis* var. *aronia* (L.) Lange, Revis. Crataeg. 53. 1897. *Crataegus azarolus* subsp. *aronia* (L.) Rouy & Camus,

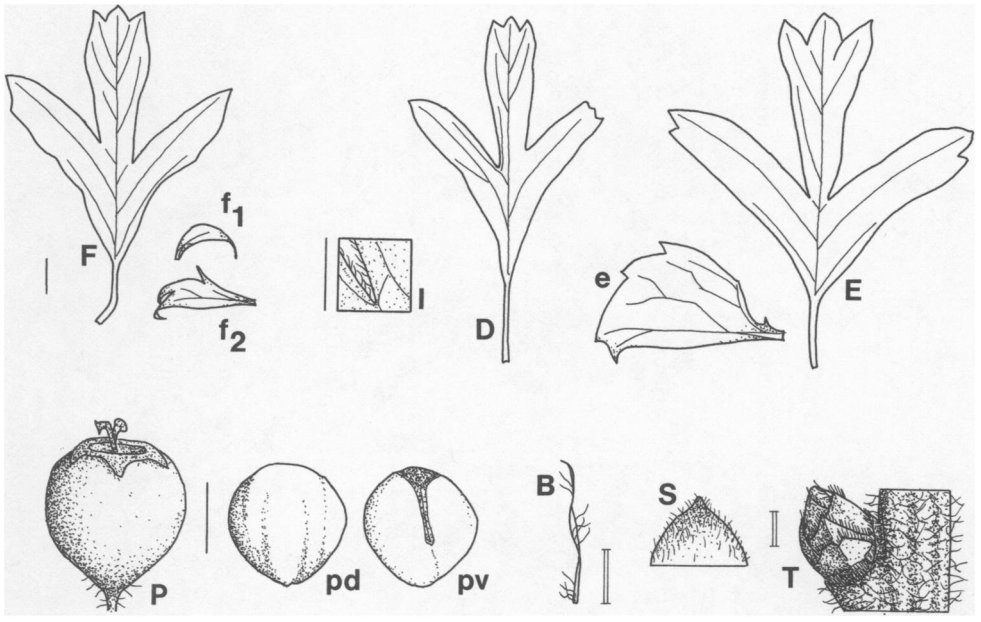


FIG. 9. *Crataegus azarolus* var. *azarolus*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, f_1, f_2, S: *Magnier 1683*; pd, pv: *Sennen 511*; D, E, e, F, I, P, T: *Moullefarine s.n.*)

Fl. France 7: 6. 1901 [also Riedl in Rechinger, Fl. Iran. 66 Rosaceae 1: 56. 1969].—TYPE: Tab. 85 in Pococke, Descr. orient. 189. 1745 (lectotype, here designated). Recorded from Palestine.

Crataegus chrysoclada Gandoger, Fl. cret. 35. 1916; Bull. Soc. Bot. France 63: 231. 1916. *Crataegus azarolus* var. *chrysoclada* (errore *chrysolepis*) (Gandoger) Hayek, Repert. Spec. Nov. Regni Veg. Beihefte 30: 754. 1926.—TYPE: *Gandoger 9524* (holotype: not located; not at LY).

Crataegus azarolus var. *hastata* Diapulis, Repert. Spec. Nov. Regni Veg. 34: 59. 1934.—TYPE: *Barbey s.n.* (holotype: B).

Crataegus azarolus var. *kurdistanica* Diapulis, Repert. Spec. Nov. Regni Veg. 34: 59. 1934.—TYPE: *Bornmüller 1026* (holotype: B, destroyed; isotypes: JE! LD! W!).

Crataegus azarolus var. *rotundiloba* Diapulis, Repert. Spec. Nov. Regni Veg. 34: 59. 1934.—TYPE: *Kersten s.n.* (holotype: B!).

Crataegus aronia var. *dentata* Browicz, Notes Roy. Bot. Gard. Edinburgh 31: 324. 1972.—TYPE: *Davis 41136* (holotype: E!; isotype: K!).

Crataegus aronia var. *minuta* Browicz, Notes Roy. Bot. Gard. Edinburgh 31: 324. 1972.—TYPE: *Coode & Jones 521* (holotype: E!).

Crataegus ×*ruscinonensis* var. *aronioides* Browicz, Willdenowia 21: 114. 1991.—TYPE: *Browicz Lemnos 56* (holotype: ATH; isotype: KOR).

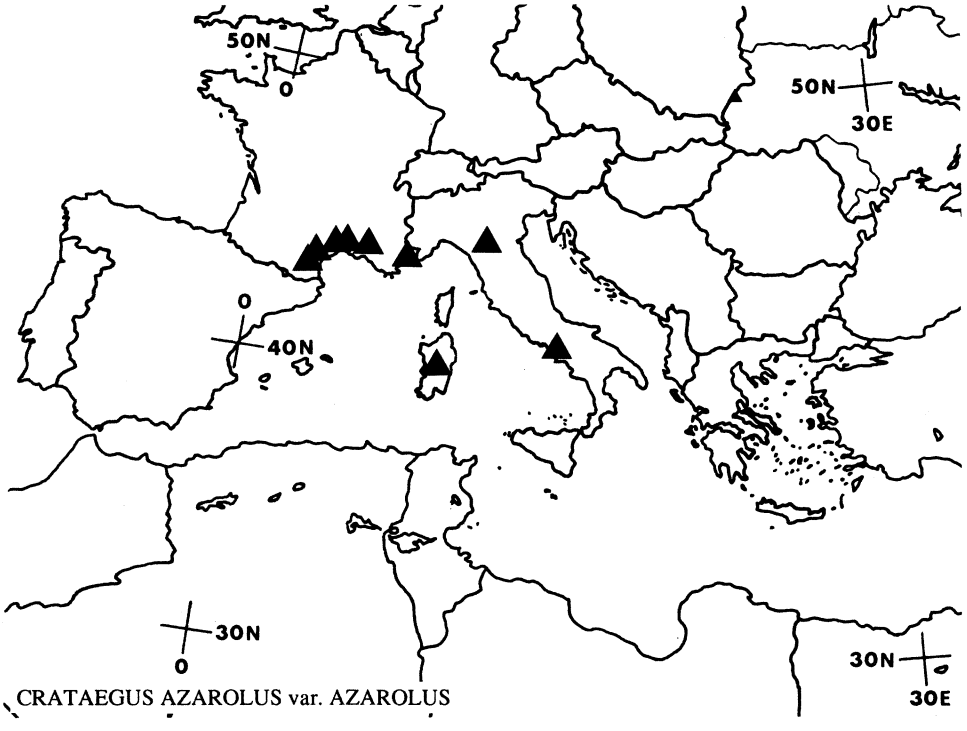


FIG. 10. Distribution of *Crataegus azarolus* var. *azarolus*.

Twigs more or less densely lanate-tomentose, thorns usually present. Leaf blades appressed-pubescent above and beneath, attenuate or cuneate or rarely rounded at base, lobes acute or obtuse, parallel-sided or tapering towards apex; basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 1.1–4.8 cm long, 1.0–4.0 cm wide, lobes 1–2 pairs, rarely absent, each lobe of basal pair entire or with 1–5 (–11) teeth; basal pair of sinuses in the apical 1/5 to basal 1/5 of lamina. Subterminal leaf blades of short shoots 1.2–5.7 cm long, 0.9–5.4 cm wide, lobes 1–3 pairs, each lobe of basal pair entire or with 1–3 teeth; basal pair of sinuses in the apical 2/5 to basal 3/10 of lamina. Leaf blades of elongate shoots 2.7–5.1 cm long, 2.2–5.0 cm wide, lobes 1–3 pairs, each lobe of basal pair entire or with 2–3 teeth; basal pair of sinuses in the basal 1/2–1/10 of lamina. Inflorescence, pedicels, and hypanthium lanate-tomentose. Fruit yellowish, often tinged with red. Chromosome number: 2n (2x) = 34. Fig. 11.

Additional illustrations: Figs. 4, 5 in Pojarkova (1939b).

Distribution (Fig. 12). Algeria, Tunisia, Libya, Malta, Sicily, Italy, Crete, Aegean Islands, Turkey, Cyprus, Israel, Jordan, Lebanon, Syria, Iraq, Iran, and Turkmenia (Kopet Dagh); 50–2000 m. The reports of *C. azarolus* var. *aronia* from Turkmenia (Pojarkova 1939b) have not been confirmed.

REPRESENTATIVE SPECIMENS. **Tunisia.** Nabeul, *Gandoger 78* (C, W); Nabeul, *Gandoger 102* (LE, W); Zaghouan, *Kralik s.n.* (LE), Sousse, *Murbeck s.n.* (LD). **Libya.** Cyrenaica, N of Aj Marj, *Guichard CYR153* (BM). **Malta.** E end of Victoria lines between Wied il-Faram and Wied Anglu,

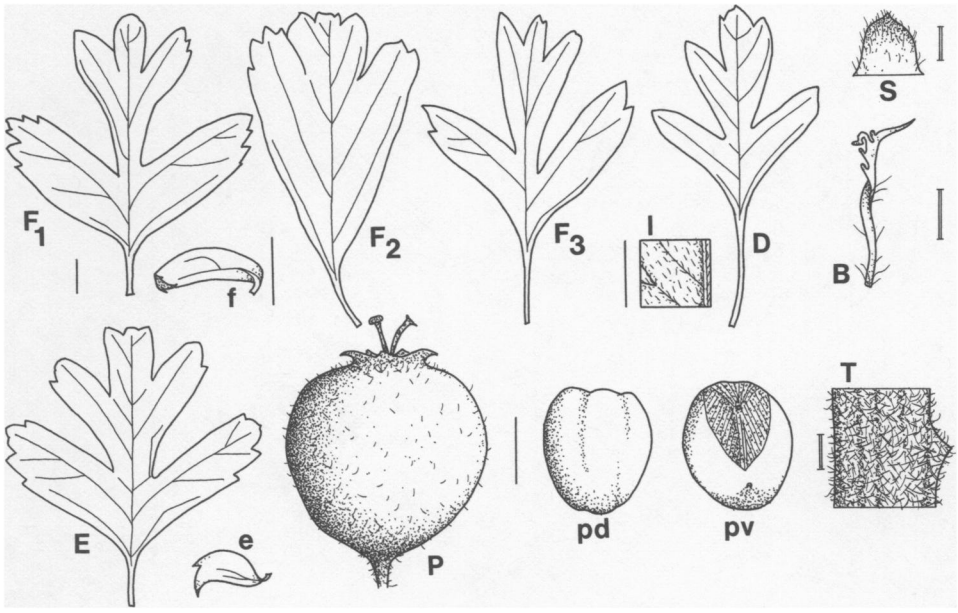


FIG. 11. *Crataegus azarolus* var. *aronia*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2, F_3: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (pd, pv: *Bourgeau 50*; f: *Christensen 1654*; F_3: *Christensen 1655*; F_2, P, T: *Gandoger 102*; D, F_1: *Kotschy 854*; E, e, I: *Murbeck s.n.*; B, S: *Strauss s.n.*)

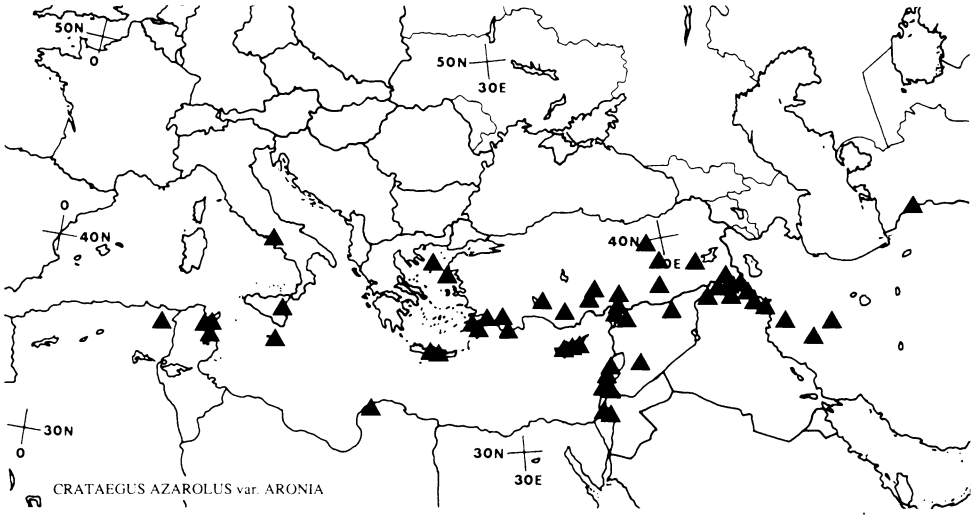


FIG. 12. Distribution of *Crataegus azarolus* var. *aronia,* based on specimens seen and literature records cited by Pojarkova (1939b), Rechinger (1969), Davis (1972), and Hadac and Chrtek (1980). See also Browicz and Zielinski (1982).

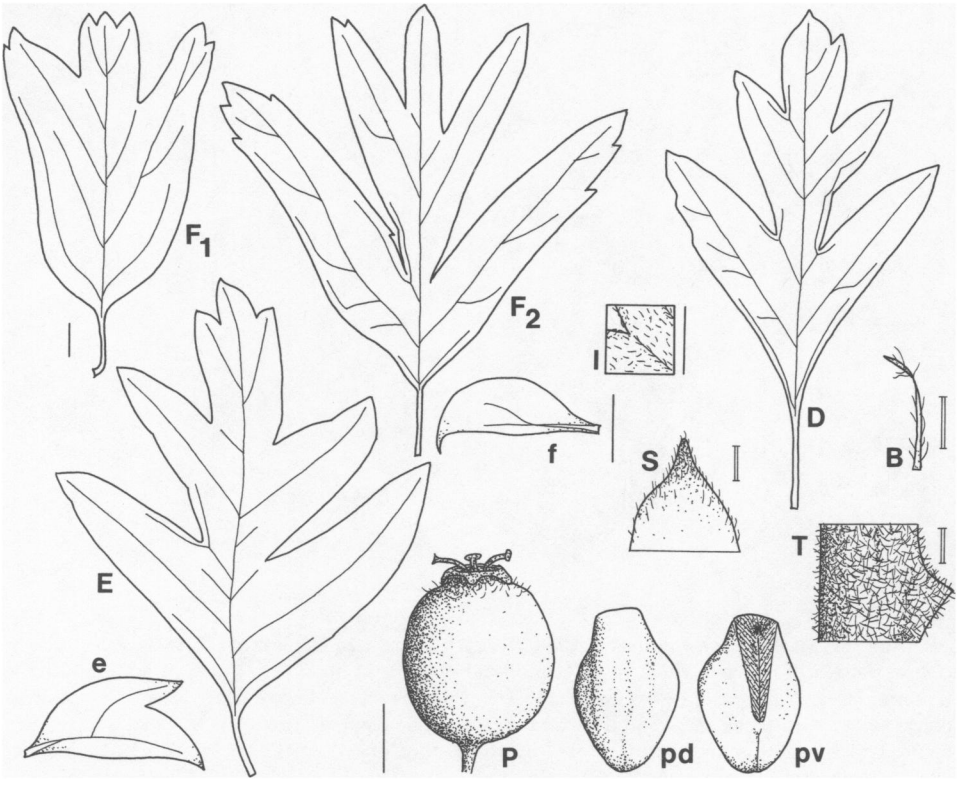


FIG. 13. *Crataegus azarolus* var. *chlorocarpa*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (pd, pv: *Billot 3607*; E, e, S: *Bornmüller s.n.*; F_2, f, I: *Rigo s.n.*; B, D, F_1, P, T: *Ross 231*.)

Sjöblom 140 (H). **Greece.** RHODOS: vallée entre Salakos et Dimilia, *Bourgeau 50* (LD, W); inter Kalitea et Asguru, *Rechinger 8587* (LD, W).—CRETE: prov. Iraklion, above monastery of Moni Gorgolaïni, above Kato Asites, *Christensen 1634* (C); prov. Rethimno, along rd from Ag. Varvara to Rethimno, Nithavris, *Christensen 1654* (C); S of Fortetsa, near Knossos, *Kaae s.n.* (C).—KASTELLORIZO: polje of Ajios Ioannis, *Stamatiadou 16593* (ATH). **Turkey.** Kurdistania media, Taurus Armenius, in valle Sassun, distr. Bitlis, inter vic. Deled et Rabat, *Handel-Mazzetti 2678* (W); Armenia turcica, Egin, Attikioei, *Sintenis 2342* (W). **Cyprus.** Distr. Nicosia, 6 km N Nisou, W Dhali, *Bauer 108* (W); ad Prodromo, in campis Wlachiae pro Larnaca, *Kotschy 730* (JE, W); near Ayios Mamas, Livadhi near Stavros tis Psokas, *Meikle 2261* (C). **Israel.** Mt Abu Ghosh, *Kotschy 854* (W). **Lebanon.** A l'est de Saïda, *Blanche 17* (C, JE, W); Beirut, *Gaillardot s.n.* (JE). **Syria.** Aleppo, *Kotschy 195* (BR, W). **Iraq.** Distr. Sulaimaniya, Kurdistan, Mt Kuh e Owraman, ad confines Persiae, in ditione Tawilla, *Rechinger 10230* (LD). **Iran.** Keshvar, *Køie s.n.* (C); Mt Kuh Delu, *Kotschy 550* (C, W); in fauce Girdu, supra Arak, *Strauss s.n.* (JE).

3c. Crataegus azarolus var. **chlorocarpa** (Moris) Christensen, comb. nov. *Mespilus azarolus* var. *chlorocarpa* Moris, Fl. Sardoa 2: 44. 1840–1843.—TYPE: Fig. in Gallesio, Pomona Ital. 20. 1817–1834 (lectotype, here designated). Recorded from Sardinia.

Crataegus linnaeana Pojarkova, Bot. Zurn. (Moscow & Leningrad) 24(5–6): 444. 1939.—TYPE: *Ross 231* (holotype: LE!; isotypes: B! FI! JE! LD!).

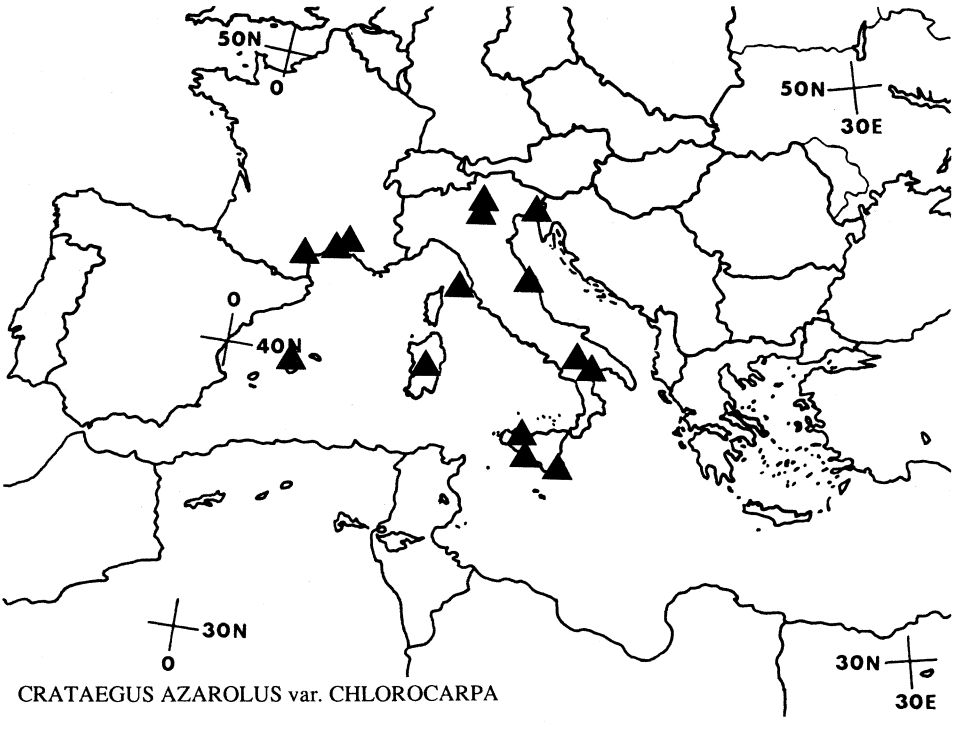


FIG. 14. Distribution of *Crataegus azarolus* var. *chlorocarpa*.

Twigs densely lanate-tomentose; thorns rare. Leaf blades appressed-pubescent above and beneath, usually widest above the middle, rounded or cuneate at base; lobes cuspidate, acute or obtuse, tapering towards apex or more or less parallel-sided; basal pair of veins divergent to convergent. Subterminal leaf blades of flowering shoots 3.5–8.5 cm long, 2.4–7.9 cm wide, lobes 1–2 pairs, each lobe of basal pair entire or with 1–2 (–4) teeth; basal pair of sinuses in the apical 3/10 to basal 2/5 of lamina. Subterminal leaf blades of short shoots 5.2–6.0 cm long, 3.3–5.0 cm wide, lobes 2–3 pairs, each lobe of basal pair entire or with 1–2 teeth; basal pair of sinuses in the basal 1/2–3/10 of lamina. Leaf blades of elongate shoots 5.9–7.0 cm long, 4.1–6.3 cm wide, lobes 2 pairs, each lobe of basal pair with 1 tooth; basal pair of sinuses in the basal 1/2–2/5 of lamina. Inflorescence, pedicels, and hypanthium densely lanate-tomentose. Fruit yellowish, often tinged with red. Chromosome number unknown. Fig. 13.

Additional illustration: Fig. 3 in Pojarkova (1939b).

Distribution (Fig. 14). Southeastern France, Mallorca, Sardinia, Sicily, and Italy (native, or cultivated and more or less naturalized); 0–200 m.

REPRESENTATIVE SPECIMENS. **France.** Herault, Balaruc-les-Bains, *Billot Fl. Exs. 3607* (JE, LE); Montpellier, *Vitou s.n.* (LE, W). **Mallorca.** Pass S of Soller, E of Biniforani, *Nordborg 77* (LD); Coll de Soller, *Willkomm 498* (C, LE). **Italy.** Marche, Roncitelli, *Bettini s.n.* (FI); Süd-Tirol, Gardaseegebiet, Riva, bei S. Magdalena, *Bornmüller s.n.* (JE); Basilicata, Potenza, *Gavlioli 13725* (FI); Venezia, Garda, ca. Torri del Benaco, l.d. le Camille, *Rigo 7534* (B, FI, LD); Toscana, ins. Capraja, Nella Calonia,

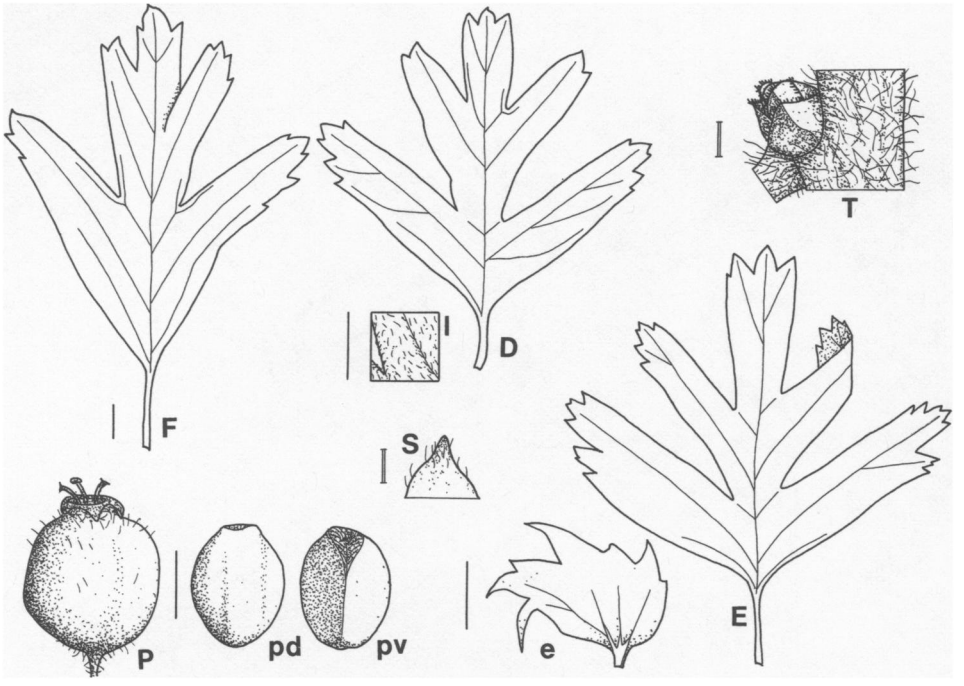


FIG. 15. *Crataegus azarolus* var. *pontica*. D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (*Jilenko s.n.*)

Sommier s.n. (FI); Lazio, Roma, Mt Mario, *Webb s.n.* (FI).—SARDINIA: sine loc., *Thomas s.n.* (JE).—SICILY: Agrigento, *Citarda 824* (LE); Prov. Syracus, *Davis 40237* (LD); Palermo, *Ross s.n.* (LD, W).

3d. Crataegus azarolus var. **pontica** (Koch) Christensen, comb. nov. *Crataegus pontica* Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 269. 1853. *Crataegus aronia* var. *pontica* (Koch) Zohary & Danin in Zohary, Fl. pal. 2: 20. 1972.—TYPE: TURKEY. Prov. Coruh, in der Nähe von Ardanuc, *Koch 187* (holotype: B, destroyed).—Neotype, here designated: drawing of holotype, Fig. 6b in Pojarkova, 1939b.

Crataegus pontica f. *aurantiaca* Cinovskis, Crat. balt. 164. 1971.—TYPE: *Skujeniece s.n.* (holotype: LATV!; isotypes: LATV!).

Twigs more or less lanate; thorns rare. Leaf blades appressed-pubescent above and beneath, usually widest below the middle, more or less broadly cuneate-attenuate at base, lobes more or less obtuse, more or less parallel-sided or slightly tapering towards base; basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 3.9–6.6 mm long, 3.8–6.2 mm wide, lobes 2–3 pairs, each lobe of basal pair with 1–6 teeth; basal pair of sinuses in the basal 2/5–1/5 of lamina. Subterminal leaf blades of short shoots 3.1–7.1 cm long, 2.1–5.7 cm wide, lobes 2–4 pairs, each lobe of basal pair with 4–6 teeth; basal pair of sinuses in the

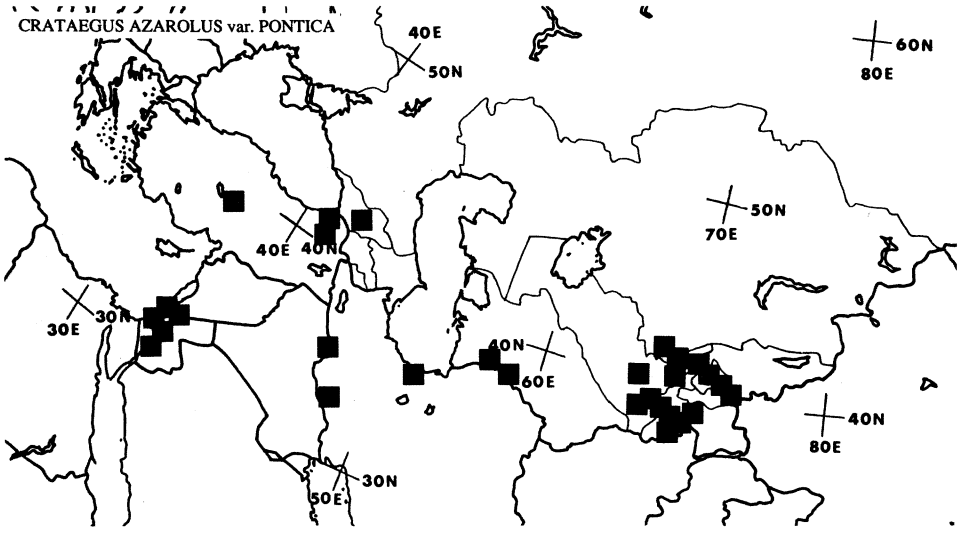


FIG. 16. Distribution of *Crataegus azarolus* var. *pontica*, based on specimens seen and literature records cited by Pojarkova (1939b), Gladkova (1968), Rechinger (1969), Davis (1972), and Zohary (1972).

basal 2/5–1/10 of lamina. Leaf blades of elongate shoots 3.1–5.9 cm long, 3.4–6.1 cm wide, lobes 2–4 pairs, each lobe of basal pair with 4–8 teeth; basal pair of sinuses in the basal 1/2–1/10 of lamina. Inflorescence, pedicels, and hypanthium more or less lanate. Fruit yellowish or orange. Chromosome number: 2n (4x) = 68. Fig. 15.

Additional illustrations: Fig. 98 in Popov (1929); Fig. 6 in Pojarkova (1939b); Fig. LXXXIII in Ovchinnikov (1973).

Distribution (Fig. 16). Israel, Jordan, Turkey, Georgia, Iraq, Iran, Turkmenia (Kopet-Dagh), southern Kazakhstan, Uzbekistan, Tadzhikistan, and Kirgizistan; 800–2000 m. The reports of *C. azarolus* var. *pontica* from Israel and Jordan (Zohary 1972) have not been confirmed.

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** TURKMENIA: Kopet-Dagh, cultivated in the Botanical Garden, Ashkhabad, *Jilenko s.n.* (JE, LD); Regio transcaspica, Ashkhabad, supra pag. Nephton, *Sintenis 434* (JE, W).—UZBEKISTAN: Tashkent obl., village of Aktash, 70–80 km NE of Tashkent, Karzhantau Ridge, Tian-Shan, *Elias 9790* (C).—TADZHIKISTAN: Pamir, Hissarski khrebet, distr. Dushanbe, in vicinitate pag. Chorbet, in valle fl. Varzob, *Vasák s.n.* (B). **Cultivated** (without provenance): the Botanical Garden, Vienna, collector unknown *s.n.* (W); sine loc., *Déséglise s.n.* (BR); the Botanical Garden, Paris, *Roos s.n.* (W); the arboretum, Schönbrunn, *Roos s.n.* (W).

4. Crataegus orientalis Bieberstein, Fl. taur.-caucas. 1: 387. 1808, non *Crataegus orientalis* (Poiret) Bosc ex DC., 1825. *Crataegus tanacetifolia* var. *taurica* DC., Prodr. 2: 629. 1825. *Crataegus tanacetifolia* var. *orientalis* (Bieberstein) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 114. 1871.—TYPE: U.S.S.R., the Crimea, *Marshall von Bieberstein s.n.* (lectotype, here designated: B-W 9271–2, photo: C!; isolectotypes: B-W 9271-1, B-W 9271–3, photos: C! HAL!).

Shrub or tree up to ca. 6 m tall. Twigs densely lanate; thorns up to ca. 13 mm long, stout. Buds 1.4–2.1 mm long, 1.8–2.6 mm in diameter. Leaf blades coriaceous or not, more or less lustrous dark or greyish green and lanate above, paler green and densely lanate beneath, cuneate to attenuate at base, lobes acute, rarely obtuse, margin serrate, incised-serrate or more or less irregularly serrate-crenate; basal pair of veins straight or divergent. Subterminal leaf blades of flowering shoots 2.0–4.7 cm long, 1.6–4.2 cm wide, lobes 1–3 pairs, basal pair 2.4–5.0 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 1–8 teeth in the distal 2/3–1/10, rarely entire; basal pair of sinuses in the apical 2/5 to basal 1/5 of lamina; petiole 2–11 mm long, 0.1–0.3 times as long as lamina; stipules 3–10 mm long, entire or irregularly serrate with 1–8 teeth. Subterminal leaf blades of short shoots 1.6–5.3 cm long, 1.1–4.5 cm wide, lobes 1–4 pairs, basal pair 2.1–5.0 times as long as wide, extending (0.4–) 0.7–0.9 times the width of lamina to midrib, each lobe with 1–9 teeth in the distal 3/4–1/5, rarely entire; basal pair of sinuses in the apical 2/5 to basal 1/5 of lamina; petiole 1–21 mm long, 0.1–0.5 times as long as lamina. Leaf blades of elongate shoots 2.3–4.8 cm long, 2.3–5.0 cm wide, lobes 1–4 pairs, basal pair 1.7–3.7 times as long as wide, extending 0.6–1.0 times the width of lamina to midrib, each lobe with 1–7 teeth in the distal 1/2–1/9, basal pair of sinuses in the apical 2/5 to basal 1/10 of lamina; petiole 2–14 mm, 0.1–0.5 times as long as lamina; stipules 4–17 mm long, irregularly serrate with 2–13 teeth. Inflorescence 1–4 cm long, corymbose, 4–18-flowered, compact or more or less lax, densely lanate; pedicels 1–23 mm long, densely lanate; bracts caducous, 1.9–10.6 mm long, 0.1–2.1 mm wide, 2.8–24.0 times as long as wide, caducous, margin entire or denticulate with 1–17 teeth. Hypanthium 3–7 mm long, densely lanate; sepals 1.8–4.9 mm long, 1.8–3.5 mm wide, broadly to narrowly triangular, 0.7–2.2 times as long as wide, margin entire, rarely with 1–2 glandular or eglandular teeth, apex acute or acuminate; petals 4–9 mm long, 5–8 mm wide; stamens (15–) 17–22, anthers purple; styles (1–) 2–5 (–6). Fruit 8–15 mm long, 7–15 mm in diameter, 0.9–1.4 times as long as wide, subglobose, pyriform, or broadly ovoid-cylindrical, yellowish orange to dark red, more or less lanate; the immature fruit often crowned by the persistent erect or spreading sepals, at maturity sepals more or less spreading or reflexed; flesh yellowish; pyrenes (1–) 2–5 (–6), dorsally sulcate, ventro-laterally smooth or sulcate, hypostyle pilose. Chromosome number: 2n (3x) = 51; 2n (4x) = 68. Figs. 17, 19, 21, 23.

Phenology. Flowering in May to July, fruiting in July to October.

Distribution (Figs. 18, 20, 22). The Mediterranean region, Turkey, Caucasia, the Crimea, and western Iran; on calcareous rocks, quartzite and other siliceous rocks; in rocky places, steppe, meadows, along rivers, and in open forest with *Quercus, Fagus, Pyrus, Carpinus, Cornus, Abies, Pinus, Cedrus, Juniperus*; 0–2150 m.

Crataegus orientalis hybridizes with *C. tanacetifolia* (26. *C.* ×*bornmuelleri*) and *C. monogyna* (31. *C.* ×*albanica*). Concerning the putative hybrid *C. orientalis* × *C. pycnoloba,* see 2. *C. pycnoloba.*

In Caucasia, the fruits of *C. orientalis* are collected in the field and sold in markets. They are usually eaten raw, but occasionally they are ground and mixed with flour for the preparation of a sweet bread. The wood is used for tool handles.

KEY TO THE SUBSPECIES OF CRATAEGUS ORIENTALIS

1. Styles and pyrenes (3–) 4–5 (–6).
   2. Fruit dark, brick-, or orange-red, globose or depressed-globose, rarely slightly pyriform. 4a. *C. orientalis* subsp. *orientalis*.
   2. Fruit yellowish orange, distinctly pyriform. 4b. *C. orientalis* subsp. *pojarkovae*.
1. Styles and pyrenes (1–) 2–3 (–4) or (1–) 2–4 (–5).
   3. Leaf blades not coriaceous, lobes serrate or incised-serrate. Subterminal leaf blades of flowering shoots 2.0–3.5 cm long. Inflorescence relatively lax; pedicels up to ca. 23 mm long. Fruit up to ca. 1.4 times as long as wide; pyrenes ventro-laterally sulcate or smooth. 4c. *C. orientalis* subsp. *presliana*.
   3. Leaf blades more or less coriaceous, lobes more or less irregularly serrate-crenate. Subterminal leaf blades of flowering shoots 2.9–4.7 cm long. Inflorescence more or less compact; pedicels up to ca. 7 mm long. Fruit up to ca. 1.1 times as long as wide; pyrenes ventro-laterally smooth. 4d. *C. orientalis* subsp. *szovitsii*.

4a. Crataegus orientalis subsp. **orientalis.**

Mespilus odoratissima Andrews, Bot. Repos. 10, 121–126: tab. 590. 1810. *Crataegus odoratissima* (Andrews) Don, Gen. hist. 2: 601. 1832, non *Crataegus odoratissima* Hornemann, 1819. *Phaenopyrum odoratissimum* (Andrews) Roemer, Fam. nat. syn. monogr. 3: 158. 1847.—TYPE: Tab. 590 in Andrews, Bot. Repos. 10. 1810 (lectotype, here designated).

Crataegus odoratissima Hornemann, Hort. bot. hafn. suppl. 52. 1819, non *Crataegus odoratissima* (Andrews) Don, 1832.—TYPE: *Hornemann s.n.* (holotype: C!).

Crataegus sanguinea Schrader, Ann. Sci. Nat., Sér. 2, 6: 99. 1836, non *Crataegus sanguinea* Pallas, 1784. *Crataegus orientalis* var. *sanguinea* (Schrader) Loudon, Arbor. frutic. brit. 2: 828, fig. 596. 1838. *Crataegus schraderiana* Ledebour, Fl. ross. 2(1): 91. 1844. *Phaenopyrum schraderianum* (Ledebour) Roemer, Fam. nat. syn. monogr. 3: 158. 1847.—TYPE: *Schrader s.n.* (not located, not at GOET). Recorded from "Tauria orientali, unde semina cum horto Göttingensi communicata sunt."

Crataegus tournefortii Grisebach, Spic fl. rumel. 1: 90. 1843. *Phaenopyrum tournefortii* (Grisebach) Roemer, Fam. nat. syn. monogr. 3: 158. 1847. *Crataegus orientalis* var. *tournefortii* (Grisebach) Schneider, Ill. Handb. Laubholzk. 1: 787. 1906.—TYPE: Tab. 1852 in Lindley, Bot. Reg. 22. 1836 (lectotype, here designated).

Crataegus orientalis var. *flabellata* Heldreich ex Boissier, Fl. orient. 2: 661. 1872.—TYPE: *Heldreich Herb. Gr. Norm. 632* (lectotype, here designated: W!; isolectotypes: C! JE!).

Crataegus pycnoloba var. *parnassica* Diapulis, Repert. Nov. Spec. Regni Veg. 34: 57. 1934.—TYPE: *Orphanides 2720* (lectotype, here designated: B!).

Crataegus orientalis var. *obtusata* Browicz, Notes Roy. Bot. Gard. Edinburgh 31: 324. 1972.—TYPE: *Tobey 1910* (holotype: E, photo: W!).

Leaf blades not coriaceous, lobes serrate or incised-serrate. Subterminal leaf blades of of flowering shoots 2.2–4.0 cm long, 1.9–4.0 cm wide, each of the basal lobes with 1–6 teeth. Subterminal leaf of short shoots 1.6–4.2 cm long, 1.1–3.3 cm wide, each of the basal lobes with 1–6 teeth. Leaf blades of elongate shoots 2.5–4.1

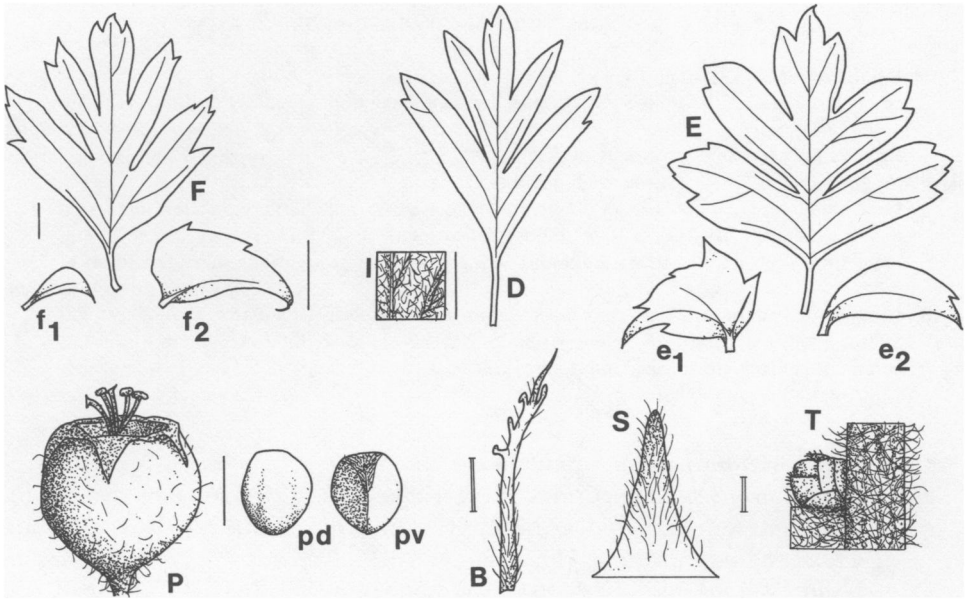


FIG. 17. *Crataegus orientalis* subsp. *orientalis*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, D, I: *Christensen 1395*; f_2, T: *Christensen 1884*; P, F, f_1, E, e_1, e_2, S: *Christensen 1942*; pd, pv: *Christensen 1970*.)

cm long, 2.3–5.0 cm wide, each of the basal lobes with 1–6 teeth. Inflorescence more or less compact; pedicels 2–11 mm. Sepals usually narrowly triangular, (0.9–) 1.2–1.6 times as long as wide, apex acuminate. Styles (3–) 4–5 (–6). Fruit 0.9–1.1 times as long as wide, globose or depressed-globose, rarely slightly pyriform, dark red, brick- or orange red, crowned by reflexed, rarely more or less spreading sepals; pyrenes (3–) 4–5 (–6), ventro-laterally smooth. Chromosome number: 2n (4x) = 68. Fig. 17.

Additional illustrations: Fig. 39 in Cinovskis (1971); Fig. LXXX.3 in Jordanov (1973); Figs. 3A–D, 4A, B in Christensen (1984).

Distribution (Fig. 18). Sicily (Nebrodi Mts), Albania, southern Yugoslavia, Greece, Bulgaria, Turkey, Georgia, Armenia, Azerbaijan, Ukraine (near Odessa), and the Crimea; 0–2150 m.

REPRESENTATIVE SPECIMENS. **Italy.** SICILY: montibus nebrodensibus, *Gasparini s.n.* (CGE). **Albania.** Mt Jablanitza, *Dimonie s.n.* (W). **Yugoslavia.** Mt Peristeri Bitol., supra Capari, *Bornmüller 907* (JE); Macedonija, at first pass from Izvor on rd between Gari and Izvor, between Bistra pl. and Strogovo pl., *Frost-Olsen 2410* (C); Makedonija, NE von Debar, ob der Radika, ob von Grn. Kosovrasti, *Krendl s.n.* (W). **Greece.** Prov. Trikala, along rd from Kalambaka to Chalikion, 1–2 km before Kastanea, *Christensen 1823* (C); prov. Larissa, Mt Ossa, 0–6 km along rd from Spilia to Anatoli, *Christensen 1970* (C); ins. Thasos, Theologos, *Sintenis 591* (BR, G, JE, LD, W); Mt Olympus, SE part, along rd Leptokarya-Karya, 19 km from the national rd, *Strid 11624* (ATH, C); Nom. Messinias, Ep. Kalamon, Mt Taygetos, S part, NE of Mavrovouna, above place called Ag. Dimitrios, *Strid 15274* (ATH, C). **Bulgaria.** Pirin, Gebiet des Zusammenflusses von Bnderica und Demjanica südl. Bansko, *Manitz s.n.* (JE). **Turkey.** Erciyas-Dagh, au sud de Kayseri, *Balansa 578* (G); Amasya, Ak-dagh,

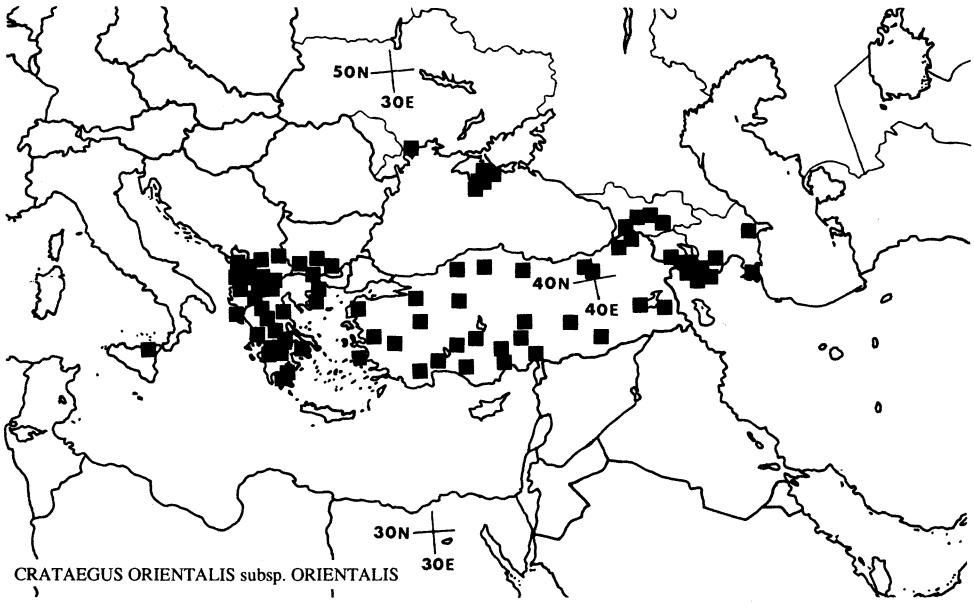


FIG. 18. Distribution of *Crataegus orientalis* subsp. *orientalis*, based on specimens seen and literature records cited by Davis (1972) and Browicz and Zielinski (1984).

Bornmüller s.n. (JE); prov. Malatya, Darende-Akcadag, *Davis 21903* (BM); Gümüsane, *Görz 554* (BM, G); Armenia, Szandschak, Gümüsane, Taltaban et prope pag. Kisilkoei, *Sintenis 5852* (BR, JE, LD, M); Erciyas-Dagh, *Zederbauer s.n.* (W). **U.S.S.R.** GEORGIA: Tbilisi, Berge über den Schildkrötensee, *Marstaller s.n.* (JE).—ARMENIA: pone et supra coenobium Gehart ad orientem pagi Garni, *Greuter 12913* (G).—UKRAINE: Odessa, *Lang 35* (H, HAL, MO, REG).—THE CRIMEA: Abhänge der Charabi-Jaila bei Iskut, *Callier 307* (FI, LD, MANCH, W); distr. Alushta, in vicinitate pag. Kirapisovoie, *Vasák s.n.* (W).

Crataegus tournefortii Grisebach (=*C. schraderiana* Ledebour) is often treated as the hybrid between *C. orientalis* and *C. pentagyna* (Pojarkova 1939a, 1950), but the type of *C. tournefortii* (Tab. 1852 in Lindley 1836) shows a specimen of *C. orientalis* subsp. *orientalis,* as circumscribed here. It has more or less compact inflorescences; large, dark red, depressed-globose fruits; subterminal leaves of flowering shoots with petioles ca. 0.2 times as long as the laminas; etc. Furthermore, material referred to *C. tournefortii* by Pojarkova (e.g., material at W!) belongs to *C. orientalis* subsp. *orientalis* and not to *C. orientalis* × *C. pentagyna*.

4b. Crataegus orientalis subsp. **pojarkovae** (Kossych) Byatt, Contrib. Crataeg. Eur. 89. 1977. *Crataegus pojarkovae* Kossych, Novit. Syst. Plant. Vasc. 1964: 147, fig. [1]. 1964. *Crataegus laciniata* subsp. *pojarkovae* (Kossych) Franco, Feddes Repert. 79: 37. 1968.—TYPE: U.S.S.R., the Crimea, Karadag, in parte inferiore declitatis australis jugi Sjurju-Kaja, 14 Jun and 22 Sep 1960, *Kossych s.n.* (holotype: YALT; isotype: LE!).

Leaf blades not coriaceous, lobes serrate or incised-serrate. Subterminal leaf blades of flowering shoots 3.1–3.5 cm long, 1.8–3.3 cm wide, each of the basal

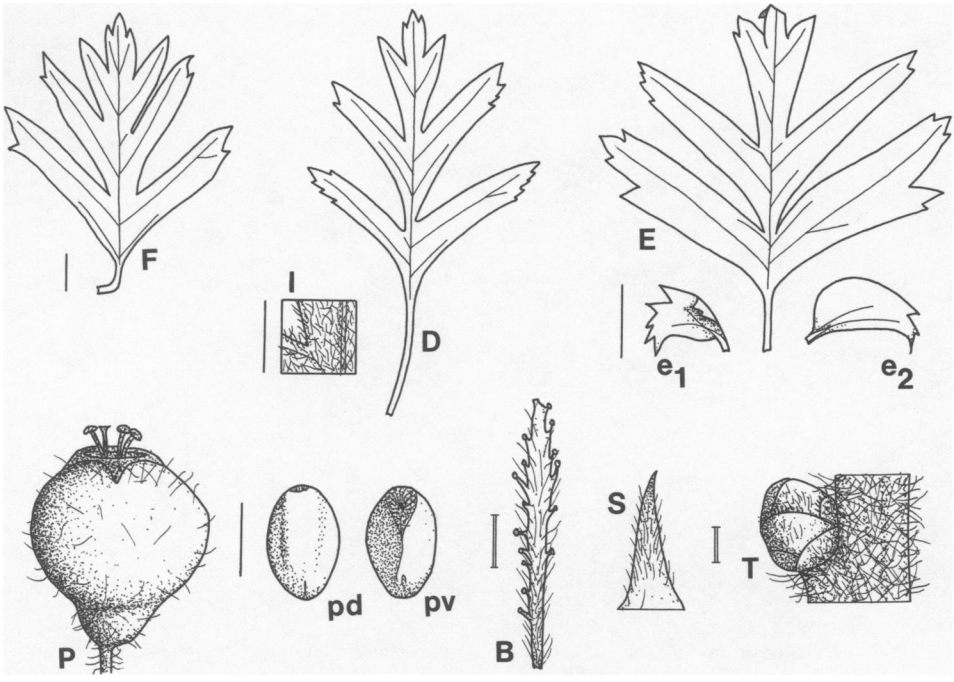


FIG. 19. *Crataegus orientalis* subsp. *pojarkovae*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, D, E, e_1, e_2, F, f, I, pd, pv, S: *Kossych s.n.;* P, T: *Kossych Gerb. Fl. SSSR 5026.*)

lobes with 0–2 teeth. Subterminal leaf blades of short shoots 4.0–5.3 cm long, 2.5–4.2 cm wide, each of the basal lobes with 2–3 teeth. Leaf blades of elongate shoots 3.8–4.5 cm long, 3.0–4.8 cm wide, each of the basal lobes with 2–4 teeth. Inflorescence more or less compact; pedicels up to ca. 7 mm long. Sepals usually narrowly triangular, 1.0–2.2 times as long as wide; apex acuminate. Styles (3–) 4–5. Fruit 1.0–1.2 times as long as wide, distinctly pyriform, yellowish orange, when dried becoming orange, crowned by reflexed sepals; pyrenes (3–) 4–5, ventrolaterally smooth. Chromosome number: 2n (3x) = 51. Figs. 3C, 19.

Additional illustration: Fig. 38 in Cinovskis (1971).

Distribution (Fig. 20). Endemic to the southeastern Crimea; 0–300 m.

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** THE CRIMEA: Karadag, declivitas australis jugi Cjurju-Kaja, ad pedem jugi, *Kossych Gerb. Fl. SSSR 5026* (C, JE, W).

The triploid *C. orientalis* subsp. *pojarkovae* apparently resulted from unidirectional introgression between the tetraploid *C. orientalis* subsp. *orientalis* and an unknown diploid species with yellowish, pyriform fruits.

4c. Crataegus orientalis subsp. **presliana** Christensen, subsp. nov. *Mespilus pubescens* K. Presl in J. Presl & K. Presl, Delic. prag. 1: 53. 1822, non *Mespilus*

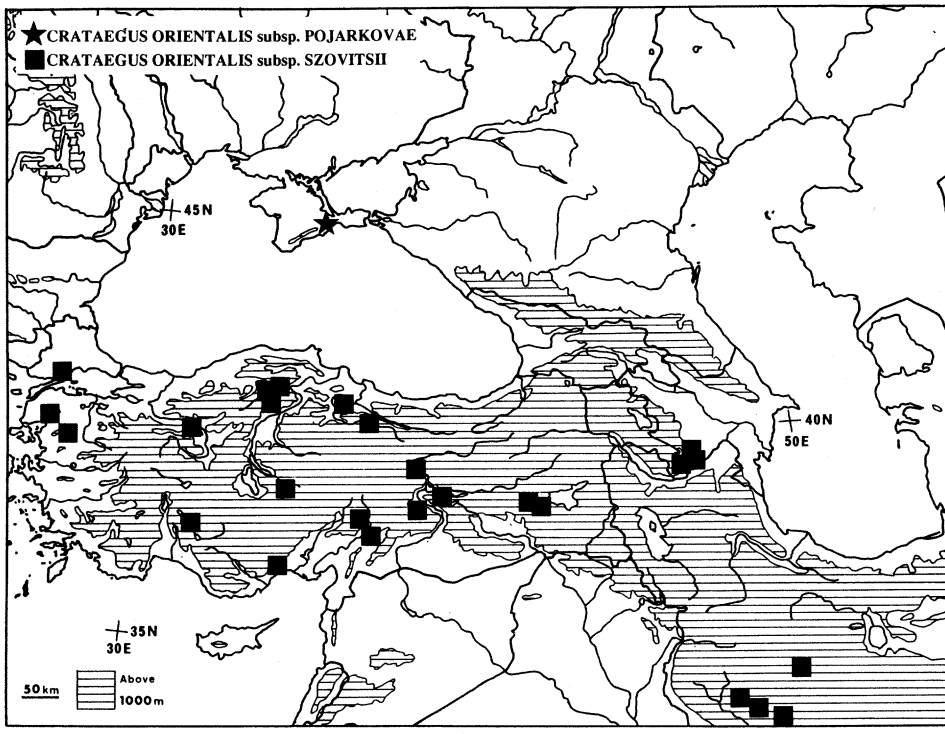


FIG. 20. Distribution of *Crataegus orientalis* subsp. *pojarkovae* and *C. orientalis* subsp. *szovitsii*, based on specimens seen and literature records cited by Pojarkova (1939a), Rechinger (1969), and Davis (1972).

pubescens Pohl, 1815, nec Wendland, 1823, nec Humboldt, Bonpland & Kunth, 1824. *Crataegus pubescens* (K. Presl) K. Presl, Fl. sicul. 1: 24. 1826, non *Crataegus pubescens* (H. B. K.) Steudel, 1840. *Azarolus pubescens* (K. Presl) Roemer, Fam. nat. syn. monogr. 3: 131. 1847.—TYPE: ITALY. Sicily, *Presl s.n.* (lectotype, here designated: PRC!; isolectotype: PR!).

Crataegus eriocarpa Pomel, Nouv. mat. fl. atl. 1: 157. 1874.—TYPE: unknown.

Crataegus ×*destefani* Lojacono-Pojero, Fl. sicul. 1(2): 209. 1891.—TYPE: collector unknown *s.n.* (holotype: PAL).

Crataegus boissieri Willkomm, Suppl. prodr. fl. hispan. 221. 1893.—TYPE: *Porta & Rigo 172* (lectotype, here designated: W!; isolectotype: JE!).

Leaf blades not coriaceous, lobes serrate or incised-serrate. Subterminal leaf blades of flowering shoots 2.0–3.5 cm long, 1.6–3.5 cm wide, each of the basal lobes with 1–5 teeth. Subterminal leaf blades of short shoots 1.9–4.5 cm long, 1.3–3.1 cm wide, each of the basal lobes with 1–5 teeth. Leaf blades of elongate shoots 2.3–4.3 cm long, 2.8–4.3 cm wide, each of the basal lobes with 3–7 teeth. Inflorescence relatively lax; pedicels 1–23 mm long. Sepals usually narrowly triangular, (0.7–) 1.0–1.7 times as long as wide, apex acuminate. Styles (1–) 2–3 (–4). Fruit 0.9–1.4 times as long as wide, broadly ovoid-cylindrical to subglobose, brick-

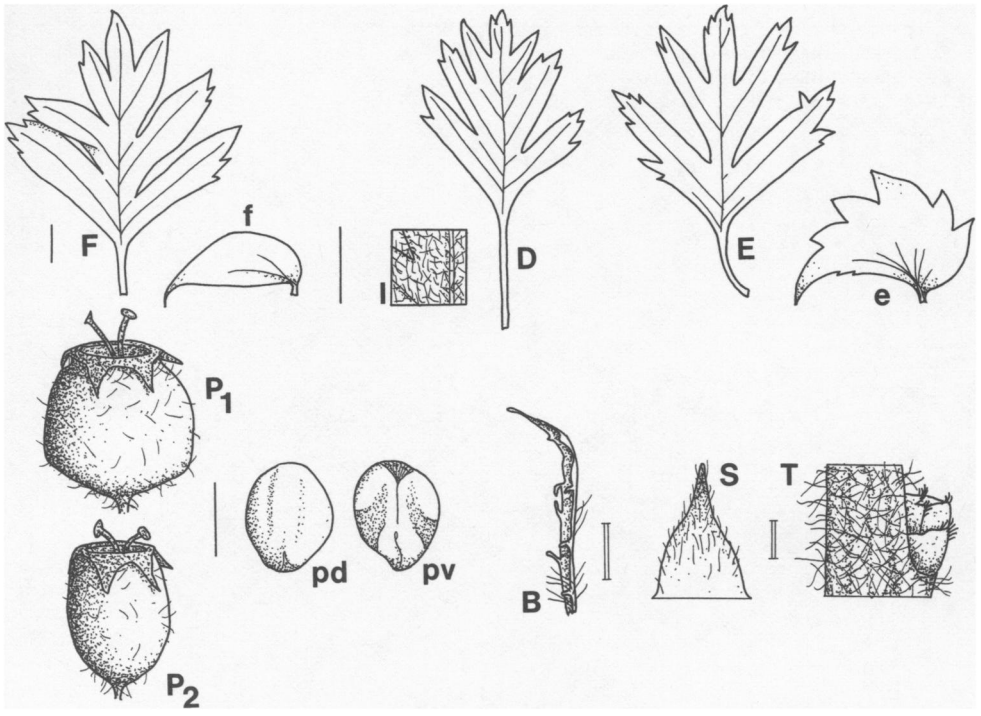


FIG. 21. *Crataegus orientalis* subsp. *presliana*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (P_2, T: *Bourgeau 650*; B, I, S: *Charpin 18091*; F, f: *Lojacono-Pojero 241*; P_1, pd, pv: *Nerobouti 499*; D: *Sennen 8406;* E, e: *Strobl s.n.*)

red; pyrenes (1–) 2–3 (–4), ventro-laterally smooth or sulcate. Chromosome number unknown. Fig. 21.

Additional illustration: Fig. 80 in Maire (1980).

Distribution (Fig. 22). Morocco, northern Algeria, southeastern Spain, and Sicily; 700–1950 m.

Representative Specimens. **Morocco.** Afra, 4 km SW of Taddert, Marrakesh-Ourazazat rd, High Atlas, *Chaworth-Musters 122* (BM); Dj. Tidiquin, above Ketema, *Davis 50717* (BM); Mt Iguermalez, juxta Tizzi Iffri, *Font Quer 259* (BM); Daïet Achlef, Moien Atlas, *Jahandiez 543* (BM); Moien Atlas, Foret d'Aïn Kahla, *Jahandiez 835* (BM); Great Atlas Mts, top of Tizi n'tichka, *Polunin 2282S58* (BM); Atlas Rifain, Tizi-Ifri, *Sennen 8406* (BM, W). **Algeria.** Dj. Djurdjura, near Tikjda, *Davis 53136* (BM); Djurdjura, below Tala Quilef, above Boghni, *Davis 59302* (BM). **Spain.** Sommet de la Sierra de Segura, *Bourgeau 650* (G, W); Albacete, Sierra de Alcarez, *Porta 388* (BM, JE, W). **Italy.** Sicily: prov. Palermo, entre Portella Manadrini et Feraci en parsant a la base de Punta Argentina, *Charpin 18091* (G); in sylv. elatis Nebrodum supra Castellobuono, *Huet de Pavillon s.n.* (CGE, P, UPS, W); prov. de Palermo, Monts Madonie, Monte Quacella, au N de Polizzi Generosa, Vallone Madonna degli Angli, *Lambinon 83Si154* (BR); Boschi di Valdemone, *Todaro 1360* (BM, CGE, FI, JE, MANCH).

Crataegus orientalis subsp. *presliana* may have resulted from unidirectional introgression between *C. orientalis* subsp. *orientalis* and an unknown species of ser.

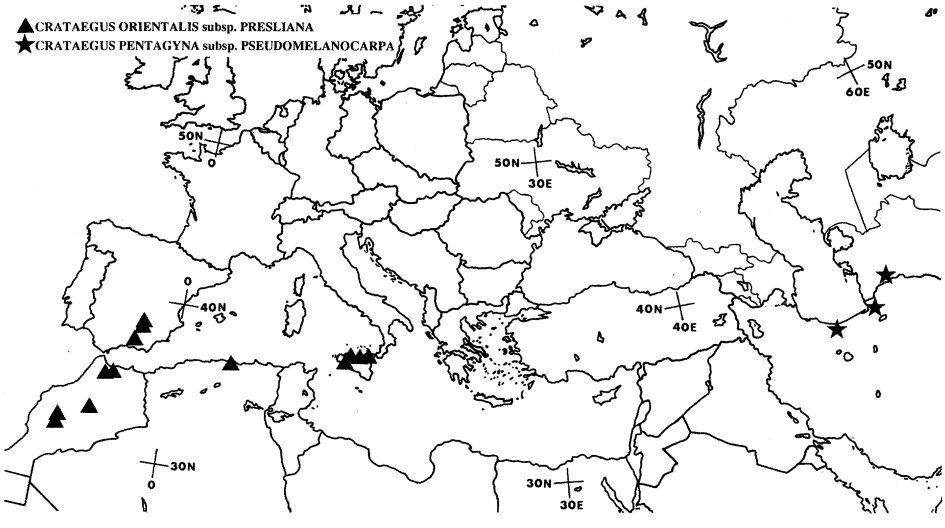


FIG. 22. Distribution of *Crataegus orientalis* subsp. *presliana* and *C. pentagyna* subsp. *pseudomelanocarpa*, based on specimens seen and literature records cited by Rechinger (1969).

Crataegus. Like some species of ser. *Crataegus*, *C. orientalis* subsp. *presliana* has more or less lax inflorescences and often ventro-laterally sulcate pyrenes. Furthermore, the number of styles per flower in *C. orientalis* subsp. *presliana* is more or less intermediate between the number of styles per flower in *C. orientalis* subsp. *orientalis* and the number in some species of ser. *Crataegus*. On the other hand, *C. orientalis* subsp. *presliana* may represent a patristic intermediate that evolved as a result of partial divergence. This hypothesis is supported by the fact that *C. orientalis* subsp. *presliana* and *C. orientalis* subsp. *orientalis* are almost completely allopatric.

Lojacono-Pojero (1891) originally considered *C.* ×*destefani* a hybrid between *C. monogyna* and *C. pubescens* (=*C. orientalis* subsp. *presliana*), but later (Lojacono-Pojero 1906) reduced *C.* ×*destefani* to a synonym of *C. pubescens* (=*C. orientalis* subsp. *presliana*), and this interpretation of *C.* ×*destefani* is accepted here.

4d. Crataegus orientalis subsp. **szovitsii** (Pojarkova) Christensen, comb. et stat. nov. *Crataegus szovitsii* Pojarkova in Komarov, Fl. URSS 9: 499. 1939.—TYPE: U.S.S.R., Azerbaijan: Nagorno-Karabagh, in collibus prope Shusha, *Hohenacker 3423* (holotype: LE, photo: C!; isotypes: BM! G! W!).

Mespilus monogyna var. *armeniaca* Wenzig, Linnaea 38: 157. 1874.—TYPE: *Haussknecht s.n.* (lectotype, here designated: W!; isolectotypes: LE! W!).

Crataegus orientalis var. *connecta* Diapulis, Repert. Spec. Nov. Regni Veg. 34: 56. 1934.—TYPE: *Szovitz s.n.* (lectotype, here designated: M!; isolectotypes: UPS! W!).

Crataegus sericella Pojarkova, Novit. Syst. Pl. Vasc. 1964: 152, Fig. 1. 1964.—TYPE: *Davis, Dodds & Cetik 19318* (holotype: E!; isotype: BM!).

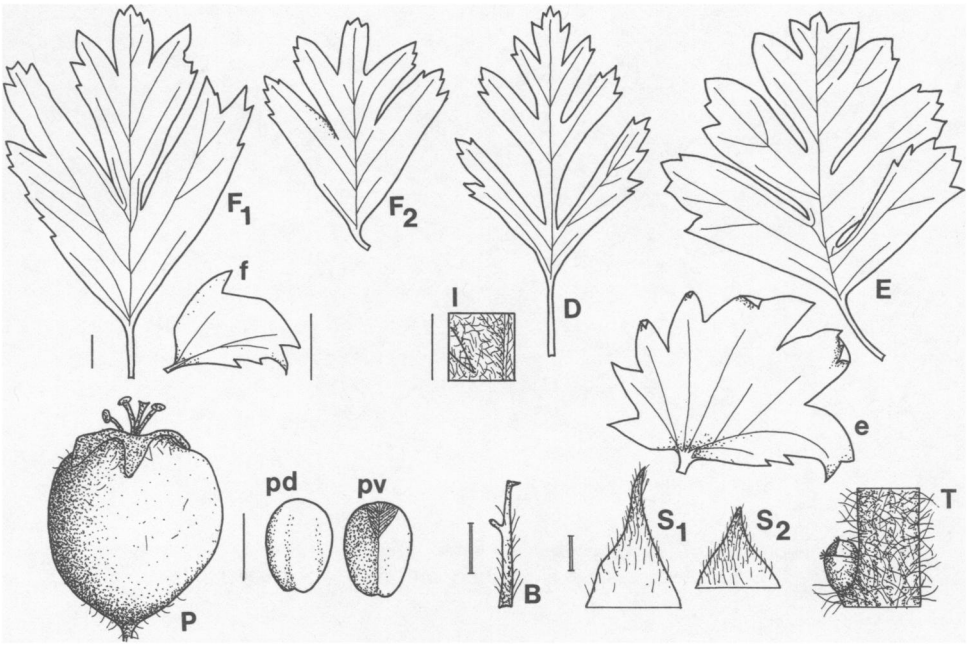


FIG. 23. *Crataegus orientalis* subsp. *szovitsii*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (S_1: *Ern 143*; D, E, e, F_1, f: *Handel-Mazzetti 2259*; P, pd, pv, T: *Haussknecht s.n.*; B, S_2: *Hohenacker s.n.*; F_2, I: *Sintenis 4231*.)

Leaves more or less coriaceous, lobes more or less irregularly serrate-crenate, teeth more or less coarse. Subterminal leaf blades of flowering shoots 2.9–4.7 cm long, 2.6–4.2 cm wide, each of the basal lobes with 1–8 teeth. Subterminal leaf blades of short shoots 3.1–5.0 cm long, 2.0–4.5 cm wide, each of the basal lobes with 3–9 teeth. Leaf blades of elongate shoots 2.8–4.8 cm long, 3.0–4.8 cm wide, each of the basal lobes with 4–7 teeth. Inflorescence more or less compact; pedicels 1–7 mm long. Sepals broadly to narrowly triangular, 0.7–1.3 (–1.5) times as long as wide, apex acute to acuminate. Styles (1–) 2–4 (–5). Fruit 0.9–1.1 times as long as wide, subglobose, brick-red; immature fruit crowned by erect-suberect sepals, at maturity sepals spreading or reflexed; pyrenes (1–) 2–4 (–5), ventro-laterally smooth. Chromosome number unknown. Fig. 23.

Distribution (Fig. 20). European and Asian Turkey, Armenia, Azerbaijan (Nagorno-Karabakh), and western Iran; 600–2150 m.

REPRESENTATIVE SPECIMENS. **Turkey.** Pandik Han to Marash, *Balls 1111* (BM); Galatien, Mihaliccik dagi, östl. bei Kidji Allan, zw. Porsuk u. Sakarya, *Bornmüller s.n.* (JE); Paphlagonia austr., Mt Ilkas-dagh supra Karakol trajectus inter Cankiri et Tosya, *Bornmüller 13414* (BM, W); Konya, Beysehir, *Ern 143* (B); Kurdistania centralis, Taurus Cataonicus, inter urbem Malatya et vicum Kjachta, supra Karatschor versus Kumik, *Handel-Mazzetti 2259* (W); Kurdistania media, Taurus Armenius, Meretug Dagh, distr. Bitlis, Natopa, *Handel-Mazzetti 2699* (W); Pont. Galat., Amasya, Sanadagh, *Haussknecht 1024* (JE); Beyrut Dagh, Cataonia, *Haussknecht 1058* (JE); Manisa Vil., Soma, *Pesmen 1241* (G);

Harput, Adeti, *Sintenis 422* (JE, LD); Harput, Schuschnas, *Sintenis 514* (JE), Armenia turcica, Egin, Attikioei, *Sintenis 2342* (JE, LD); Paphlagonia, Vilajet Kastambuli, Tosya, Giuardagh, *Sintenis 4231* (JE, LD); Tokat, Kischkischdagh, *Wiedemann 15* (LE).

C. orientalis subsp. *szovitsii* is probably of hybrid origin. It may have resulted from unidirectional introgression between *C. orientalis* subsp. *orientalis* and an unknown species with more or less coriaceous leaf blades and 2–3 styles per flower. See also Browicz in Davis (1972: 142) and notes to 8. *C. meyeri*.

5. Crataegus heldreichii Boissier, Diagn. pl. orient. ser. 2(2): 47. 1856. *Crataegus tanacetifolia* var. *heldreichii* (Boissier) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 114. 1871. *Crataegus polyacantha* subsp. *heldreichii* (Boissier) Lange, Revis. Crataeg. 49. 1897. *Mespilus heldreichii* (Boissier) Ascherson & Graebner, Syn. Mitteleur. Fl. 6 (2): 40. 1906.—TYPE: GREECE. Attika: in regione abietina Mt Parnethis [Parnis], 3500–4000', *Heldreich Herb. Gr. Norm. 113* (lectotype, here designated: W!; isolectotypes: BM! JE! P!).

Shrub or tree up to ca. 6 m tall. Twigs densely lanate; thorns up to ca. 1.3 cm long, stout. Buds 1.6–1.8 mm long, 1.4–2.1 mm in diameter. Leaf blades dark green and lanate above, yellowish green or greyish green and densely lanate beneath, broadly cuneate to truncate at base, lobes tapering towards base, rarely parallel-sided, margin serrate; basal pair of lateral veins divergent or straight. Subterminal leaf blades of flowering shoots 2.0–3.7 cm long, 1.7–3.8 cm wide, lobes 2–4 pairs, basal pair 1.6–3.3 times as long as wide, extending 0.7–1.0 times the width of lamina to midrib, each lobe with 1–7 teeth in the distal 2/5–1/12, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 6–12 mm long, 0.3–0.4 times as long as lamina; stipules 3–6 mm long, with 0–1 tooth. Subterminal leaf blades of short shoots 1.9–3.8 cm long, 1.5–3.3 cm wide, lobes 2–4 pairs, basal pair 1.6–3.4 times as long as wide, extending 0.7–1.0 times the width of lamina to midrib, each lobe with 2–6 teeth in the distal 3/7–1/8, basal pair of sinuses in the basal 3/10–1/10 of lamina; petiole 8–20 mm long, 0.3–0.7 times as long as lamina. Leaf blades of elongate shoots 2.2–4.1 cm long, 1.9–4.2 cm wide, lobes 2–4 pairs, basal pair 1.5–2.9 times as long as wide, extending 0.8–1.0 times the width of lamina to midrib, each lobe with 3–8 teeth in the distal 2/5–1/6, basal pair of sinuses in the basal 3/10–1/10 of lamina; petiole 9–18 mm long, 0.3–0.5 times as long as lamina; stipules 5–17 mm long, entire or irregularly serrate with 1–9 teeth. Inflorescence 1.5–3.0 cm long, corymbose, 5–19-flowered, more or less compact, densely lanate; pedicels 1–13 mm, densely lanate; bracts 1.1–2.8 mm long, 0.2–0.4 mm wide, 4.5–14.0 times as long as wide, caducous, margin with 0–3 glandular teeth. Hypanthium 2–5 mm long, densely lanate; sepals 1.1–2.3 mm long, 1.6–2.1 mm wide, broadly triangular, 0.6–1.0 (–1.3) times as long as wide, margin entire, apex acute; petals 4–6 mm long and wide; stamens 17–22, anthers purple; styles (2–) 3–5 (–6). Fruit 6–8 mm long, 6–9 mm in diameter, 0.9–1.2 times as long as wide, subglobose, bright red, more or less lanate; the immature fruit crowned by the persistent, erect or spreading sepals with more or less recurved apices, at maturity sepals recurved; flesh yellowish; pyrenes (2–) 3–5 (–6), dorsally sulcate, ventrolaterally smooth, hypostyle pilose. Chromosome number: 2n (2x) = 34. Fig. 24.

Additional illustrations: Figs. 3J–L, 4C in Christensen (1984); Fig. 1 in Browicz and Zielinski (1986).

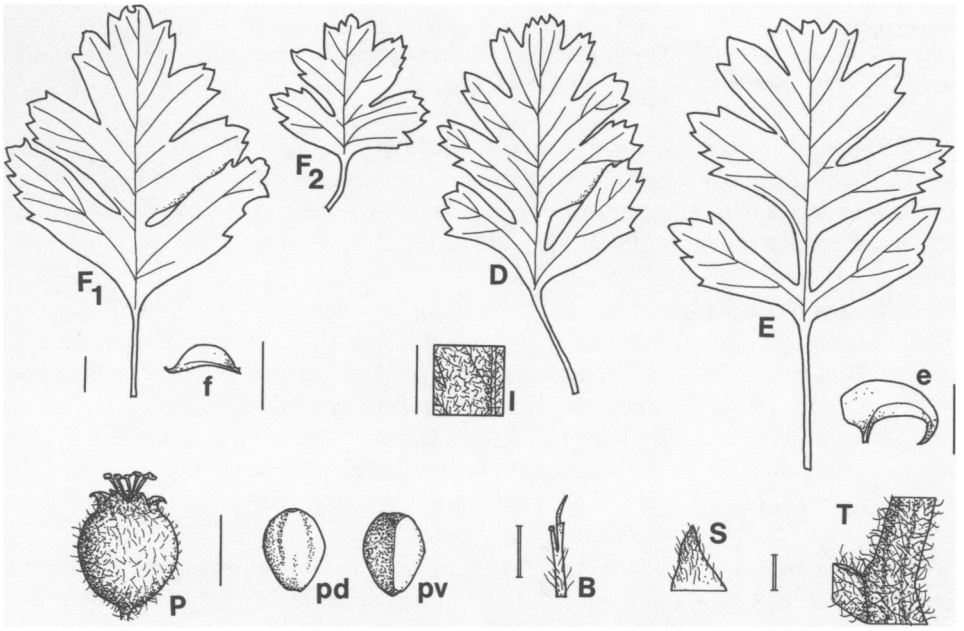


FIG. 24. *Crataegus heldreichii*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, F_2, I, S: *Christensen 1289*; D, E, e, F_1, f: *Christensen 1744*; pd, pv: *Christensen 1975*; P, T: *Christensen 1976.*)

Phenology. Flowering in May and June, fruiting in August and September.

Distribution (Fig. 25). Greece, southwestern Bulgaria, Yugoslavia, and Albania; on calcareous rocks, schist, and sandstone; in open forest with *Abies, Pinus*, in scrub with *Juniperus, Quercus, Rosa, Pyrus, Amygdalus, Acer, Juglans*, in rocky places, dry meadows, at field edges and roadsides; 20–1550 m.

REPRESENTATIVE SPECIMENS. **Greece.** LAKONIA: Mt Parnon along rd from EOS refuge to Vamvakou, 11–13 km before Vamvakou, *Christensen 1715* (C); Mt Taygetos, inter pag. Bolianas et refugium EOS, *Tzanoudakis 4423* (UPA).—ACHAIA: Mt Erimanthos, above Kalentzi, *Boratynski 1309* (C), *Tzanoudakis 3194* (UPA); prope Kalavrita, ad coenobium Agia Lavra, *Bornmüller 619* (JE); Mt Chelmos, Vrachnion, *Christensen 1315* (C); Mt Erimanthos, supra Kalousion, *Phitos 7010* (UPA); prope pag. Aroania inter Mt Erimanthos et Mt Chelmos, *Phitos 11158* (UPA).—KORINTHIA: Mt Killini, between the monastery of Ag. Vlasios above Ano Sinikia Trikalon and refuge Ziria, *Christensen 1289* (C); Mt Killini, above Bouzion, *Strid 15336* (C, UPA).—ETOLIA-AKARNANIA: Thyrion, Vustrion and Trypho, *Boratynski 1625* (C).—ARTA: Mt Mavrovouni, supra Strongili, *Christodoulakis 531b* (UPA).—PIERIA: Mt Olympos, N of Litochoron, *Strid 11466* (C).—LARISSA: Mt Ossa, 0–6 km along rd from Spilia to Anatoli, *Christensen 1975* (C).—TRIKALA: inter Chaliki et Karnia, *Haussknecht s.n.* (JE); supra Chaliki, in valle super. fl. Aspropotamos, *Haussknecht s.n.* (JE).—VIOTIA: Mt Parnassos, bifurcation of rd towards refuge and Eptalofos, *Stamatiadou 16416* (ATH).—ATTIKI: Mt Parnis, pr. Ag. Triada, *Heldreich 2112* (UPS, W); Mt Parnis, *Heldreich s.n.* (BR, C, W). **Yugoslavia.** MACEDONIA: Mt Ostri, supra pag. Morani, *Bornmüller 908* (JE); ad Morani, in decliv. Mt Kitka et Mt Ostri, *Bornmüller 909* (JE). **Albania.** Kula Ljums, *Zerny s.n.* (W).

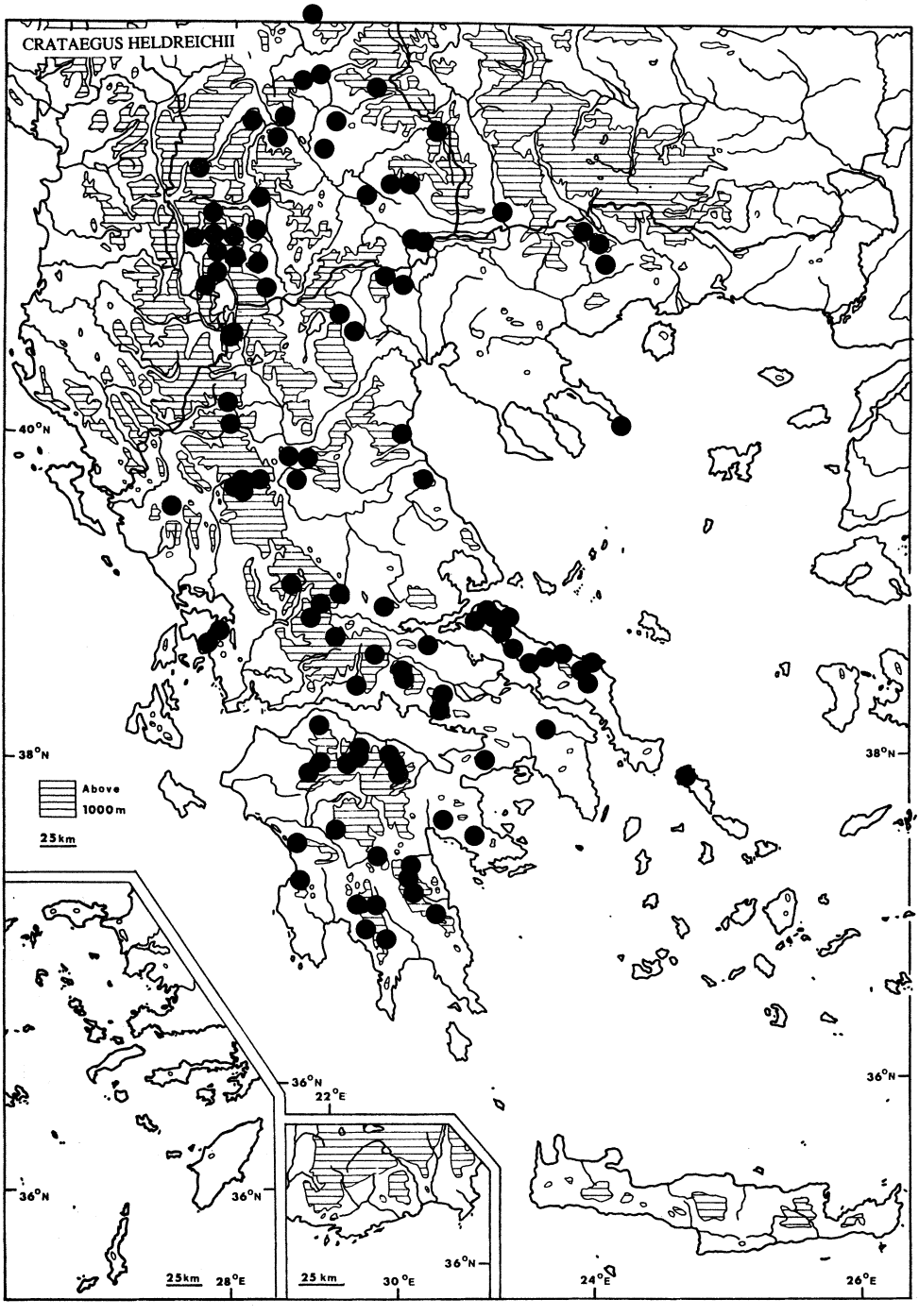


FIG. 25. Distribution of *Crataegus heldreichii*, based on specimens seen and literature records cited by Zielinski (1984) and Boratynski et al. (1990); according to Tutin et al. (1968), also occurring in Albania.

Crataegus heldreichii hybridizes with *C. pycnoloba* (27. *C.* ×*peloponnesiaca*) and with *C. monogyna* (32. *C.* ×*killinica*).

III. Crataegus series **Pentagynae** (Schneider) Russanov, Dendrol. Uzbek. 1: 81. 1965. *Crataegus* sect. *Pentagynae* Schneider, Ill. Handb. Laubholzk. 1: 768. 1906.—TYPE: *Crataegus pentagyna* Willdenow.

Symphyomeles Ørsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1859: 111. 1860.—TYPE: unknown.

Twigs subglabrous, lanate or tomentose; aphyllous thorns up to ca. 1.7 cm long. Petioles of subterminal leaf blades of flowering shoots 0.3–0.6 times as long as lamina. Stipules entire or more or less irregularly serrate, those of leaves of flowering shoots 3–15 mm long, those of leaves of elongate shoots 5–17 mm. Inflorescence 9–50-flowered, lax, glabrous, lanate, or tomentose; bracts 5–21 times as long as wide, usually entire, caducous. Sepals entire. Fruit black; flesh reddish; pyrenes 3–5 (–6), dorsally sulcate, ventro-laterally smooth.

6. Crataegus pentagyna Waldstein & Kitaibel ex Willdenow, Sp. pl. 2 (2): 1006. 1800. *Mespilus pentagyna* (Willdenow) Sprengel, Syst. veg. 2: 507. 1825. *Phaenopyrum pentagynum* (Willdenow) Roemer, Fam. nat. syn. monogr. 3: 155. 1847. *Crataegus oxyacantha* var. *pentagyna* (Willdenow) Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 87. 1891.—TYPE: HUNGARY/YUGOSLAVIA. In Dunato et Syrmio, [Danube and Serbia], *Kitaibel s.n.* (holotype: B-W 9718, photos: C!).

Shrub or tree up to ca. 8 m tall. Twigs subglabrous, lanate or tomentose; thorns up to ca. 1.7 cm long, more or less stout, rare. Buds 1.2–2.6 mm long, 1.1–3.0 mm in diameter. Leaves more or less dark green and more or less lanate-tomentose above, pale green and lanate-tomentose at least in vein axils beneath, cuneate, truncate, or rounded at base, lobes acute or obtuse, margin more or less irregularly crenate-serrate, with more or less coarse teeth. Subterminal leaf blades of flowering shoots 2.2–6.0 cm long, 2.4–6.0 cm wide; lobes 1–3 pairs, basal pair 1.9–3.4 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 2–11 teeth in the distal 1/2–1/14, basal pair of sinuses in the apical 2/5 to basal 2/5 of lamina; petiole 10–30 mm long, 0.2–0.6 times as long as lamina; stipules 3–15 mm long, entire or more or less irregularly serrate with 1–12 teeth. Subterminal leaf blades of short shoots 2.3–6.8 cm long, 2.1–5.3 cm wide, lobes 1–3 (–5) pairs, basal pair 1.9–3.0 times as long as wide, extending 0.6–1.0 times the width of lamina to midrib, each lobe with 1–16 teeth in the distal 2/3–1/7, basal sinuses in the apical 2/5 to basal 2/5 of lamina; petiole 10–44 mm long, 0.4–0.9 times the length of lamina. Leaf blades of elongate shoots 3.2–6.0 cm long, 3.5–6.2 cm wide, lobes 2–4 pairs, basal pair 1.4–2.7 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 3–15 teeth in the distal 3/5–2/15, basal pair of sinuses in the apical 2/5 to basal 1/10 of lamina; petiole 15–35 mm long, 0.3–0.7 times as long as lamina; stipules 5–17 mm long, entire or more or less irregularly serrate with 1–15 (–25) teeth. Inflorescence 2.5–4.5 cm long, corymbose, 9–50-flowered, lax, subglabrous, lanate or tomentose; pedicels 4–35 mm long, subglabrous, lanate or tomentose; bracts 1.1–

3.7 mm long, 0.1–1.4 mm wide, 5.0–21.0 times as long as wide, caducous, margin with 0 (–1) tooth. Hypanthium 2–4 mm long; sepals 1.1–1.9 mm long, 1.4–2.6 mm wide, usually broadly triangular, 0.5–1.0 times as long as wide, margin entire, apex acute; petals 4–6 mm long and wide; stamens 19–22, anthers purple; styles 3–5 (–6). Fruit 7–11 mm long, 6–9 mm in diameter, 1.0–1.3 times as long as wide, subglobose or broadly cylindrical, black, pruinose or epruinose, crowned by suberect sepals with recurved apices; flesh reddish; pyrenes 3–5 (–6), dorsally sulcate, ventro-laterally smooth, hypostyle pilose. Chromosome number: 2n (2x) = 34. Figs. 26, 28.

Phenology. Flowering in April to June, fruiting in July to October.

Distribution (Figs. 22, 27). From Hungary and Yugoslavia through Romania and Bulgaria to Ukraine, northeastern Greece, Turkey, Caucasia, Iran, Kopet Dagh, and northeastern Iraq; on limestone, serpentine, on rocky mountain slopes, in scrub with *Rosa, Quercus*, etc., along rivers; 0–1600 m.

Crataegus pentagyna hybridizes with *C. azarolus* (29. *C.* ×*pseudoazarolus*), *C. pseudoheterophylla* (33. *C.* ×*zangezura*), and with *C. monogyna* (34. *C.* ×*rubrinervis*). Hybrids originating in cultivation between *C. pentagyna* and *C. rivularis* Nuttall and between *C. crus-galli* and *C. pentagyna* have been described as *C.* ×*berolinensis* Cinovskis (1971) and *C.* ×*hiemalis* Lange (1882–1883).

Key to the Subspecies of Crataegus pentagyna

1. Twigs and inflorescences lanate or subglabrous. Fruit 7–11 mm long, more or less pruinose; pyrenes 3–5 (–6). 6a. *C. pentagyna* subsp. *pentagyna*.
1. Twigs and inflorescences tomentose. Fruit 7–8 mm long, epruinose; pyrenes (4–) 5 (–6). 6b. *C. pentagyna* subsp. *pseudomelanocarpa*.

6a. Crataegus pentagyna subsp. **pentagyna.**

Crataegus melanocarpa Bieberstein, Fl. taur.-caucas. 1: 386. 1808. *Mespilus melanocarpa* (Bieberstein) Poiret, Encycl. suppl. 4: 68. 1816. *Crataegus oxyacantha* var. *melanocarpa* (Bieberstein) Loudon, Arbor. frutic. brit. 2: 831, fig. 605. 1838. *Phaenopyrum melanocarpum* (Bieberstein) Roemer, Fam. nat. syn. monogr. 3: 155. 1847.—Type: *Bieberstein s.n.* (lectotype, here designated: LE, photo: C!).

Mespilus oliveriana Dumont de Courset, Bot. cult. ed.2, 5: 454. 1811, non *Mespilus oliveriana* Poiret, 1816. *Crataegus oliveriana* (Dumont de Courset) Bosc, Nouv. cours. compl. agric. ed. 2, 2: 222. 1821. *Crataegus oxyacantha* var. *oliveriana* (Dumont de Courset) Lindley, Bot. Reg. 23: Tab. 1933. 1837. *Azarolus oliveriana* (Dumont de Courset) Roemer, Fam. nat. syn. monogr. 3: 133. 1847. *Crataegus pentagyna* var. *oliveriana* (Dumont de Courset) Rehder, J. Arnold Arbor. 1: 263. 1920.—Type: unknown.

Crataegus platyphylla Lindley, Bot. Reg. 22: Tab. 1874. 1836. *Azarolus platyphylla* (Lindley) Roemer, Fam. nat. syn. monogr. 3: 133.1847.—Type: Tab. 1874 in Lindley, Bot. Reg. 22. 1836 (lectotype, here designated).

Mespilus atrofusca Steven ex Koch, Wochenschr. Vereines Beförd. Gartenbaues Königl. Preuss. Staaten 5: 400. 1862. *Crataegus melanocarpa* var. *atrofusca* (Koch) Boissier, Fl. orient. 2: 662. 1872.—Type: *Steven s.n.* (not located).

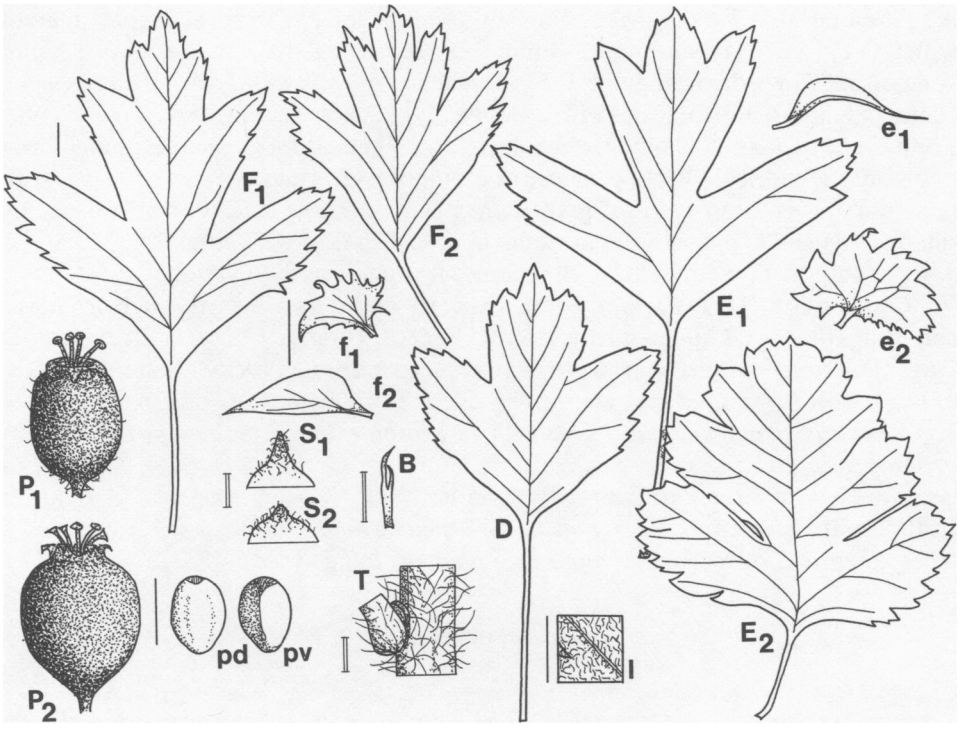


FIG. 26. *Crataegus pentagyna* subsp. *pentagyna*. B: bract; D: subterminal leaf of short shoot; E_1, E_2: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (E_2, f_1: *Callier 588*; pd, pv: *Danciu s.n.*; I, P_1: *Rechinger 2007*; D, E_1, e_1, F_1, S_2: *Schultz Herb. Norm. s.n.* I.*53*; B, F_2, f_2, S_1, T: *Strauss s.n.*; P_2: *Woronow s.n.*)

Crataegus melanocarpa var. *heterophylla* Boissier, Fl. orient. 2: 662. 1872.—TYPE: *Hohenacker s.n.* (lectotype, here designated: H-Herb. Steven!).

Crataegus colchica Grossheim, Fl. Kavk. 4: 290. 1934.—TYPE: *Grossheim s.n.* (not located).

Crataegus elbursensis Rechinger, Ann. Naturhist. Mus. Wien 53: 343. 1943. *Crataegus melanocarpa* subsp. *elbursensis* (Rechinger) Riedl in Rechinger, Fl. Iran. 66(1): 55. 1969.—TYPE: *Rechinger 2007* (holotype: W!).

Crataegus klokovii Ivaschin, Ukrains'k Bot. Zurn. 21: 61, figs. 1–3. 1964.—TYPE: *Ivaschin s.n.* (holotype: KW).

Crataegus davisii Browicz, Notes Roy. Bot. Gard. Edinburgh 31: 323. 1972, non *Crataegus davisii* Sargent, 1911.—TYPE: *Davis 45168* (holotype: E!, photo: W!).

Twigs lanate or subglabrous. Inflorescence lanate or subglabrous. Fruit 7–11 mm long, 6–9 mm in diameter, 1.0–1.3 times as long as wide, more or less pruinose; pyrenes 3–5 (–6). Chromosome number: 2n (2x) = 34. Fig. 26.

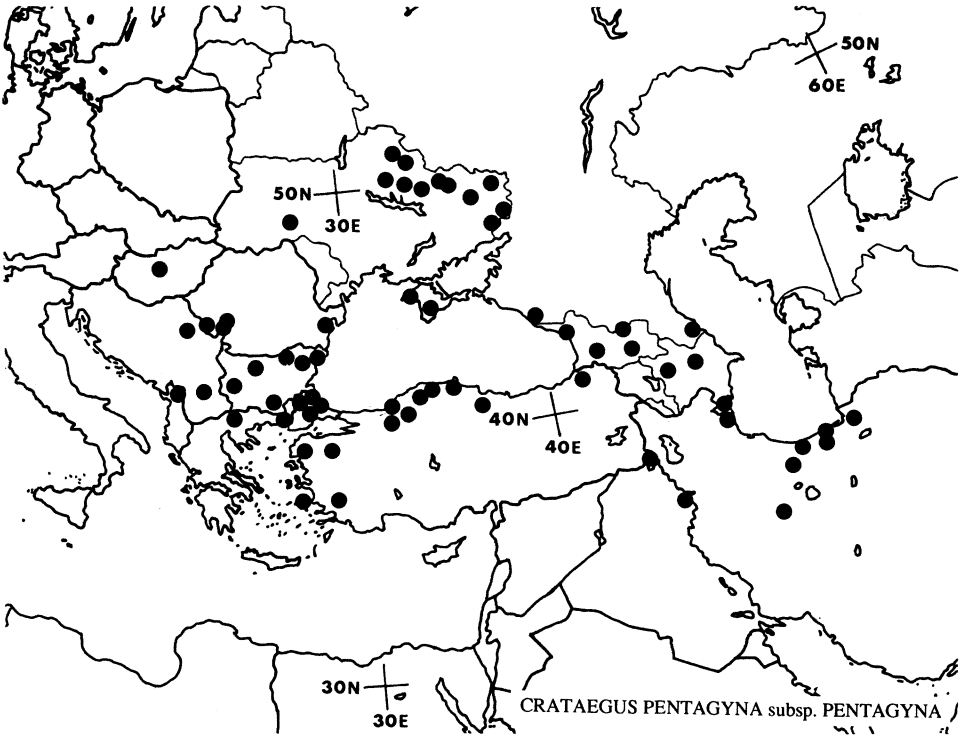


FIG. 27. Distribution of *Crataegus pentagyna* subsp. *pentagyna*, based on specimens seen and literature records cited by Klokov (1954), Ivaschin (1964), Townsend and Guest (1968), Davis (1972), Browicz (1986), and Boratynski et al. (1990).

Additional illustrations: Fig. 36 in Cinovskis (1971); Fig. LXXX.2 in Jordanov (1973).

Distribution (Fig. 27). Hungary, Yugoslavia, Romania, Bulgaria, Greece (Thrace and Samos), Turkey, the Crimea, Ukraine, Dagestan, Caucasia, Iran, and northeastern Iraq.

REPRESENTATIVE SPECIMENS. **Hungary.** Comté de Pest, pres de Schillenz, Ile de Danube Csepel, *Schultz Herb. Norm. Nov. Ser. I.53* (JE, W). **Yugoslavia.** Serbia bor., Belgrad, Mt Avala, *Bornmüller* s.n. (JE, W). **Romania.** Banatus, Baile Herculane, *Borbas s.n.* (W); distr. Caras-Severin, pr. pag. Plavisevita ad Danubium, *Danciu s.n.* (DS, LD); inter pag. Plavisevita et vallem Cazane ad Danubium inferiorem Banatus, *Janka s.n.* (JE, W); pr. Svinita, *Richter s.n.* (JE). **Bulgaria.** Planities Danubii, pr. l.d. Kajlaka, distr. urb. Pleven, *Cerneva Inst. Bot. Acad. Sci. Bulg. pl. Exs. XI.1027* (JE); Sumen, *Hruby 1431* (LD); Obrazow-Tschiflik bei Ruse, *Ronniger s.n.* (W); pr. Varna, *Schneider 313* (W); Dobrogea, Babadag, Wald von Cukarova, *Sintenis 683* (LD); Banat, Oravita, *Wierzbicki 1572* (JE, W). **Turkey.** Edirne, Kuru Dag, "Roadside Park" SE der Passhöhe, *Bauer 2614* (W); Pontus Galatici, Amasya, pr. Ladik, ad septemtr. Mt Ak-dagh, *Bornmüller 1026* (JE); Paphlagonia, Küre Nahas, Erzisler-Kajasi, *Sintenis 5028* (JE). **U.S.S.R.** THE CRIMEA: pr. pag. Janksala, *Callier 786* (JE, W).— UKRAINE: Poltavaskaya obl., Dikanski r-n, Stasi, *Ivaschin s.n.* (KW; paratype of *C. klokovii*).— DAGESTAN: Kasumkentski r-n, Baku-Makhachkala, 2.5 km za s. Ashaga-Makha, *Kuvaev 189.4* (LE).— CAUCASIA: in fruticosis montosis ditionis Kirovabad, *Hohenacker s.n.* (W); Catalinia, inter opp. Borghomi et pag. Likani, ad fl. Kura, *Juzepczuk 136* (LE); Mleti pr. Mt Kazbek, *Saalas s.n.* (H); versus meridiem ab urb. Tblisi, l.d. Tus tba/Cherepashye ozero, *Vasák s.n.* (H, W); distr. Sochi, in vicinitate pag. Masesta, ad ripam dextram fl. Masesta, *Vasák s.n.* (W). **Iran.** W side of Hasi Amir Pass, 28 km

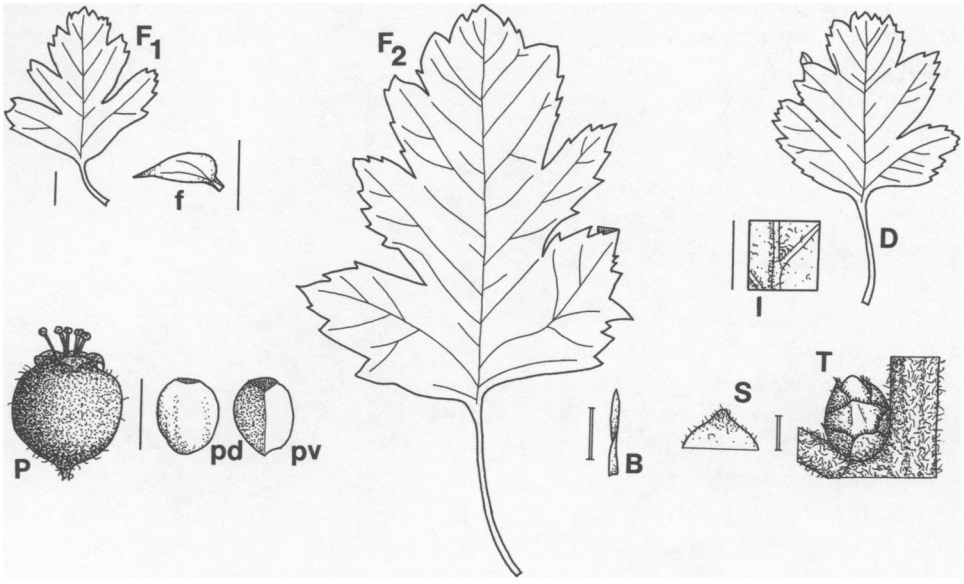


FIG. 28. *Crataegus pentagyna* subsp. *pseudomelanocarpa*. B: bract; D: subterminal leaf of short shoot; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_2, P, pd, pv, T: *Borisova 326*; D, F_1, f, S: *Lipsky 2958*; B, I: *Tschernjakovskaja 1141*.)

NE of Ardabil, *Grant 16304* p.p. (MO); 4 km après Babolsar, *Jacquemart 95.1* (BR); Prov. Gorgan, Bender Ges, *Sintenis 1495* (LD, MANCH, MO, UPS, W).

Crataegus pentagyna subsp. *pentagyna* is a variable taxon, which often is divided into two to three species or subspecies (e.g., Grossheim 1934; Rechinger 1943, 1969; Ivaschin 1964; Browicz 1972). However, it is not possible to provide a consistent formal treatment for the variants, because much of the variation follows clinal patterns (e.g., number of styles per flower) or is not correlated with geography (e.g., indumentum of twigs, leaves, and inflorescences, leaf shape, and size of teeth on the lobes).

Crataegus pentagyna subsp. *pentagyna* from east-central and southeastern Europe is often confused with *C. nigra* Waldstein & Kitaibel, Descr. icon. pl. Hung. 62, Tab. 61. 1801 (syntypes: *Kitaibel s.n.*, BP, B-W 9717, photos: C!) (sect. *Sanguineae* ser. *Nigrae*). Even Waldstein and Kitaibel often confused these species (Herb. Kitaibel BP, photos: C!). Yet, *C. nigra* is easily recognized by the following suite of characters: twigs densely villous; subterminal leaf blades of flowering shoots up ca. 8.5 cm long and ca. 8.0 cm wide, lobes 5–7 pairs; intercalary veins running to sinuses often absent (always present in *C. pentagyna*); stipules densely serrate, with 24–47 teeth; inflorescence 6–29-flowered, densely villous; anthers white; flesh of fruit greenish; pyrenes ventro-laterally foveate.

6b. Crataegus pentagyna subsp. **pseudomelanocarpa** (Pojarkova) Christensen, comb. et stat. nov. *Crataegus pseudomelanocarpa* Pojarkova in Komarov, Fl. URSS 9: 498. 1939.—TYPE: U.S.S.R.,Turkmenia, Kopet-Dagh, Kara-Kala distr., in angustiis Joldere, 8 May 1912, *Lipsky 2958* (holotype: LE!).

Twigs tomentose. Inflorescence more or less tomentose. Fruit 7–8 mm long and in diameter, epruinose, about as long as wide; pyrenes (4–) 5 (–6). Chromosome number: 2n (2x) = 34. Fig. 28.

Distribution (Fig. 22). Northeastern Iran and Turkmenia (Kopet Dagh).

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** TURKMENIA: Kopet-Dagh, Borisova 326 (LE); Kara-Kala District, Joldere, *Lipsky 3010* (LE), *Samokishi 1610* (LE), *Tschernjakovskaja 1141* (LE).

IV. Crataegus series **Crataegus.**

Twigs glabrous or more or less villous; aphyllous spines up to ca. 2.4 cm long. Petioles of subterminal leaf blades of flowering shoots (0.1–) 0.2–0.7 times as long as lamina. Stipules of leaves of flowering shoots 2–22 mm long, entire, denticulate or serrate, those of leaves of elongate shoots 4–25 mm long, more or less serrate. Inflorescence 3–20-flowered, lax, rarely more or less compact, glabrous or more or less villous, rarely villous-lanate; bracts 3.5–26.0 times as long as wide, caducous, margin entire or denticulate. Sepals entire, rarely more or less glandular-serrate. Fruit red or purplish black, rarely black; flesh yellowish, rarely orange; pyrenes 1–3, rarely (4–) 5, dorsally sulcate, ventro-laterally sulcate, rarely smooth.

IV1. Crataegus subseries **Dzhairenses** Christensen, subser. nov.—TYPE: *Crataegus dzhairensis* Vassilczenko.

Folia distalia ramorum fertilium profunde quinque-septempartita. Inflorescentiae laxae; bracteae caducae. Sepala integra. Pulpa fructus aurantiaca; pyrenae 5, rarius 4, dorsaliter et ventraliter plus minusve sulcatae.

Subterminal leaf blades of flowering shoots with 2–3 pairs of lobes. Inflorescence more or less lax; bracts caducous. Sepals entire. Flesh of fruit orange; pyrenes (4–) 5, dorsally and ventro-laterally more or less sulcate.

7. Crataegus dzhairensis Vassilczenko, Bot. Mat. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 18: 14. 1957.—TYPE: U.S.S.R., jugi Hissarici [Gissar] pars occidentalis, in systemate fl. Tupalang in valle fl. Kschtut, prope vicum Sintschob, 6 Aug 1955, *Vassilczenko & Sabitov 199* (holotype: LE, photo: C!).

Shrub up to ca. 5 m tall. Twigs sparsely villous; thorns up to ca. 1.5 cm long. Buds ca. 2.1 mm long, 2.3–2.6 mm in diameter. Leaf blades bright green and glabrous or sparsely villous along major veins above, greyish green and sparsely villous along major veins and in vein axils beneath, broadly cuneate, truncate, or subcordate at base, lobes acute, margin more or less irregularly serrate, with more or less coarse teeth; basal pair of veins divergent. Subterminal leaf blades of flowering shoots 3.5–4.0 cm long, 3.5–4.6 cm wide; lobes 2–3 pairs, basal pair 1.9–2.2 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 5–8 teeth in the distal 1/2–1/6, basal pair of sinuses in the basal 3/10 of lamina; petiole 14–18 mm long, 0.4–0.5 times as long as lamina; stipules 7–8 mm long, serrate with 10–15 teeth. Leaf blades of elongate shoots 5.8–9.0 cm, 5.0–7.6 cm wide, lobes 3 pairs, basal pair 1.7–2.2 times as long as wide, extending 0.8–0.9

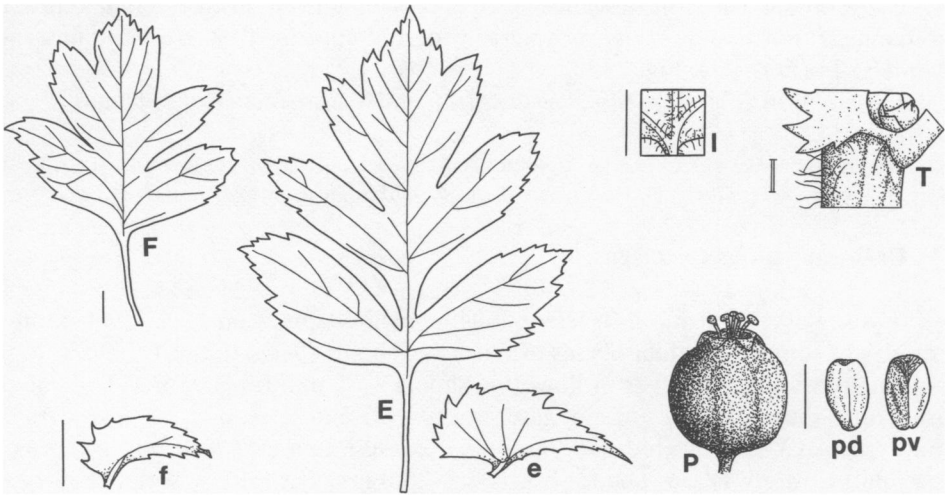


FIG. 29. *Crataegus dzhairensis*. E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (*Dshanguranov 13*.)

times the width of lamina to midrib, each lobe with 16–19 teeth in the distal 5/6–1/2, basal pair of sinuses in the basal 3/10–1/5 of lamina; petiole 14–18 mm long, 0.2–0.3 times as long as lamina; stipules 12–14 mm long, serrate with 15–21 teeth. Inflorescence glabrous or sparsely villous; pedicels ca. 11 mm long, glabrous; bracts caducous; sepals entire; styles (4–) 5. Flowers not seen. Fruit 8–9 mm long, 9–12 mm in diameter, ca. 0.9 times as long as wide, depressed-globose, blackish purple, glabrous or sparsely villous, crowned by reflexed sepals; flesh orange; pyrenes (4–) 5, dorsally sulcate, ventro-laterally slightly sulcate, hypostyle pilose. Chromosome number unknown. Fig. 29.

Phenology. Fruiting in July and August.

Distribution (Fig. 31). Endemic to the western parts of the Hissar Mts; 900–1200 m.

ADDITIONAL SPECIMEN EXAMINED. **U.S.S.R.** W Hissar [Gissar] Mts, the Tupalang river system, valley of Kschtut river, near the village of Sintschob, *Dshanguranov 13* (LE).

IV2. Crataegus subseries **Erianthae** (Pojarkova) Christensen, stat. nov. *Crataegus* ser. *Erianthae* Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 192. 1960.—TYPE: *Crataegus eriantha* Pojarkova [=*Crataegus meyeri* Pojarkova].

Oxyacantha Medikus, Phil. bot. 1: 15. 1789. *Crataegus* subgen. *Oxyacantha* (Medikus) Roemer, Fam. nat. syn. monogr. 3: 115. 1847.—LECTOTYPE, here designated: *Oxyacantha vulgaris* (DC.) Roemer [=*Crataegus laevigata* (Poiret) DC.].

Crataegus ser. *Ambiguae* Pojarkova ex Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 506. 1960.—TYPE: *Crataegus ambigua* Becker.

Subterminal leaves of flowering shoots with 1–3 (–4) pairs of lobes. Inflorescence lax, rarely more or less compact; bracts caducous, margin entire or denticulate. Sepals entire, rarely with 1–2 glandular teeth. Flesh of fruit yellowish; pyrenes 1–2 (–3) or (1–) 2–3 (–5), dorsally sulcate, ventro-laterally sulcate or smooth.

8. Crataegus meyeri Pojarkova in Komarov, Fl. URSS 9: 500, Fig. XXIX.3. 1939.—TYPE: U.S.S.R., Armenia, in vicinitate urbis Jerevan, in faucibus fl. Gjarni-czai, prope monasterium Gehart, 11 Oct 1936, *Pojarkova 792* (holotype: LE, photo: C!).

Crataegus monogyna var. *hirsutior* Boissier, Fl. orient. 2: 664. 1872.—TYPE: *Kotschy 189* (holotype: G; isotypes: BM! FI! REG! UPS! W!).

Crataegus ambigua var. *hohenackeri* Schneider, Ill. Handb. Laubholzk. 1: 785. 1906.—TYPE: *Hohenacker s.n.* (lectotype, here designated: W!; isolectotype: W!).

Crataegus eriantha Pojarkova in Komarov, Fl. URSS 9: 500. 1939.—TYPE: *Kolenati 1399* (holotype: LE; isotype: LE!).

Crataegus taurica Pojarkova in Komarov, Fl. URSS 9: 501. 1939.—TYPE: *Wulff & Dzevanovsky s.n.* (holotype: LE).

Crataegus ucrainica Pojarkova in Komarov, Fl. URSS 9: 502. 1939.—TYPE: *Rogovicz s.n.* (holotype: LE; isotype: LE, photos: C!).

Crataegus persica Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 12: 190, Fig. 3. 1960.—TYPE: *Alexeenko 836* (holotype: LE).

Crataegus dikmensis Pojarkova, Novit. Syst. Pl. Vasc. 1964: 167, fig. 5. 1964.—TYPE: *Davis 13201* (holotype: E!).

Crataegus stankovii Kossych, Bjull. Glavn. Bot. Sada AN SSSR 57: 78. 1965.—TYPE: *Kossych s.n.* (holotype: YALT).

Shrub or tree up to ca. 5 m tall. Twigs more or less villous; thorns up to ca. 2.0 cm long, stout. Buds 1.4–3.7 mm long, 2.1–3.0 mm in diameter. Leaf blades more or less dark green and villous above, greyish green and more or less densely villous beneath, cuneate or attenuate at base, lobes acute, margin serrate with more or less fine teeth, basal pair of veins divergent or straight. Subterminal leaf blade of flowering shoots 1.8–5.0 cm long, 1.6–4.5 cm wide, lobes 1–3 pairs, basal pair 2.0–4.2 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 2–15 teeth in the distal 3/10–7/10, basal pair of sinuses in the apical 3/10 to basal 3/10 of lamina; petiole 2–21 mm long, 0.2–0.6 times as long as lamina; stipules 4–15 mm long, entire or more or less irregularly serrate with 1–20 teeth. Subterminal leaf blades of short shoots 2.2–4.9 cm long, 1.9–5.0 mm wide, lobes 2–3 pairs, basal pair 2.2–3.4 times as long as wide, extending 0.6–1.0 times the width of lamina to the midrib, each lobe with 3–15 teeth in the distal 1/2–1/14, basal pair of sinuses in the apical 2/5 to basal 1/5 of lamina; petiole 7–34 mm, 0.2–0.9 times as long as lamina. Leaf blades of elongate shoots 2.7–5.0 cm long, 2.6–5.2 cm wide, lobes 2–4 pairs, basal pair 1.3–2.6 times as long as wide, extending 0.6–1.0 times the width of lamina to midrib, each lobe with 6–19 teeth in the distal 7/10–2/5, basal pair of sinuses in the apical 2/5 to basal 1/10 of lamina; petiole 10–20 mm long, 0.2–0.5 times as long as lamina; stipules 8–20 mm long, more or less regularly serrate, with 8–45 teeth. Inflorescence 3–5 cm long, corymbose, 9–20-flowered, more or less lax, villous; pedicels 3–26 mm long, villous; bracts 1.8–2.8 mm long, 0.2–0.9

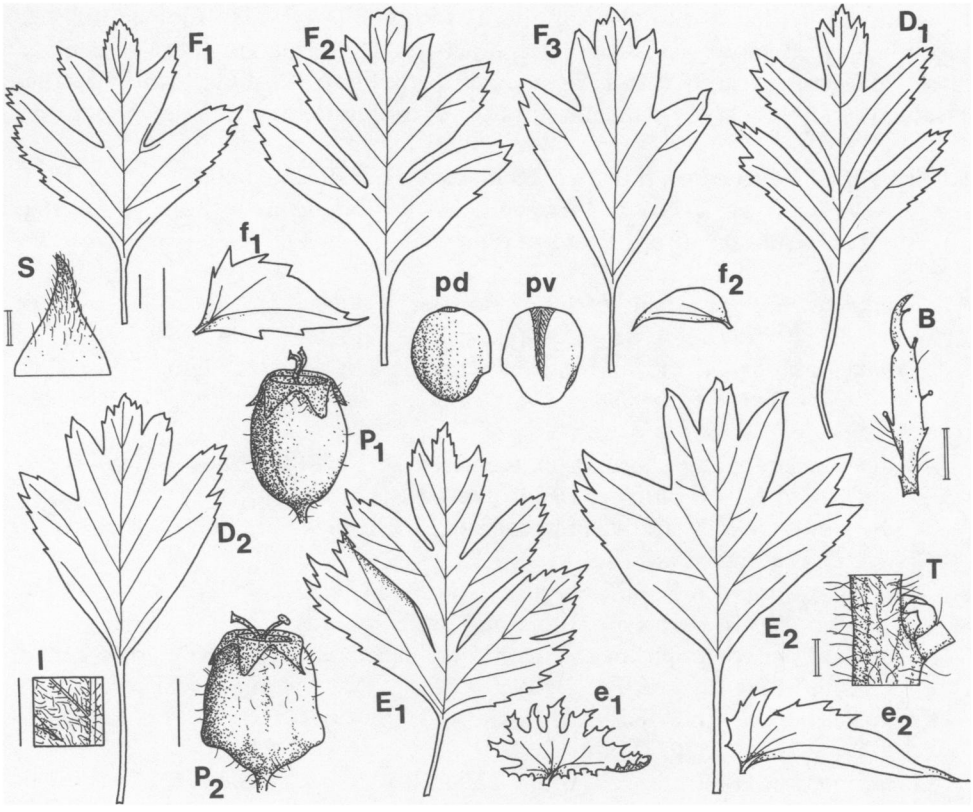


FIG. 30. *Crataegus meyeri*. B: bract; D_1, D_2: subterminal leaf of short shoot; E_1, E_2: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F_1, F_2, F_3: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (E_2, e_2: unknown collector *3332*; D_1, E_1, e_1, F_1, I, P_2, T: *Callier 589*; B, F_2, f_1, S: *Grossheim s.n.*; D_2, F_3, f_2: *Kolenati 1399*.)

mm wide, 2.6–15.0 times as long as wide, caducous, margin entire or denticulate with 1–6 glandular teeth. Hypanthium 3–5 mm long, villous; sepals 1.4–5.5 mm long, 1.6–3.2 mm wide, broadly to narrowly triangular, 0.7–1.7 times as long as wide, margin entire or glandular-serrate with 1–2 teeth, apex acuminate to obtuse; petals 4–8 mm long, 5–7 mm wide; stamens 18–20, anthers purple; styles 1–2 (–3). Fruit 7–12 mm long, 6–10 mm in diameter, 1.1–1.7 times as long as wide, subglobose to cylindrical, red, more or less villous, crowned by the persistent, reflexed sepals, often angular at base; flesh yellowish; pyrenes 1–2 (–3), dorsally sulcate, ventro-laterally more or less sulcate, hypostyle pilose. Chromosome number: 2n (4x) = 68; 2n (3x) = 51. Figs. 4B, 30.

Additional illustration: Fig. 8 in Klokov (1954).

Phenology. Flowering in May and June, fruiting in June to October.

Distribution (Fig. 31). Ukraine, the Crimea, Asian Turkey, northern Iraq, Armenia, Azerbaijan, and Iran; dry meadows and woodlands; 1200–2800 m.

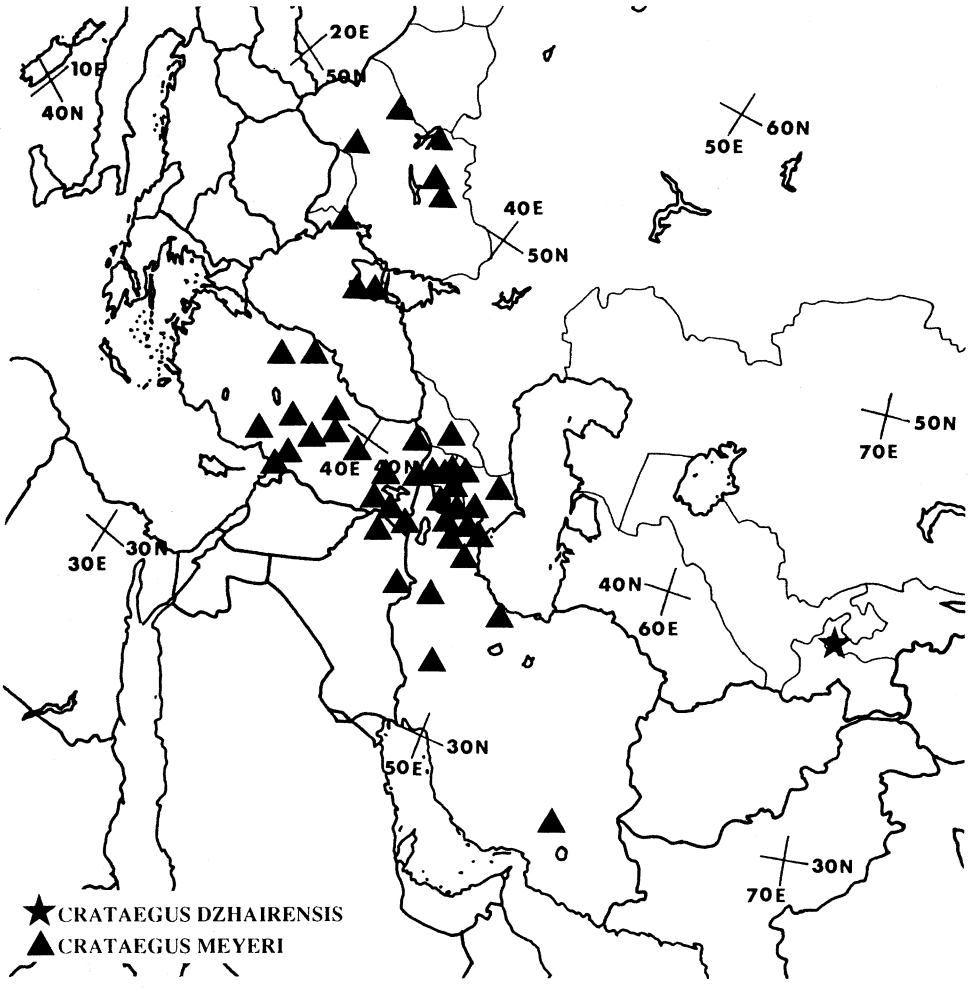


FIG. 31. Distribution of *Crataegus dzhairensis* and *C. meyeri*, based on specimens seen and literature records cited by Klokov (1954) and Browicz and Zielinski (1982).

REPRESENTATIVE SPECIMENS. **U.S.S.R.** CAUCASUS: Talysch, Gab. Baku, inter Orant et Dshangamiran, *Alexeenko s.n.* (LE); lac. Goktscha (Gökcha, Sevan), *Chociatowski s.n.* (LE); Armenia, ab urbe Jerevan, in vicinitate lacus Sevan, urbe Shorzha, *Cuba 351* (G); Azerbaijan, distr. Zuvant, pr. Kaljaban, *Grossheim s.n.* (LE); Karduschia, Shirvan, *Kotschy 801* (W); Armenia, Daralaghes, inter Kuschi et Terger, *Pojarkova 455* (LE); Azerbaijan, prov. Baku, steppe Shirvan, pr. Alchasava, *Sachokia s.n.* (LE); distr. Krasnoselskoie, Mt Aregumi, pag. Tokludza, *Vasák s.n.* (W); Armenia, ad fl. Gjarni-czai, *Wermischian s.n.* (LE).—THE CRIMEA: Simferopol pr. Neusatz, *Callier 589* (B, C, G, JE, LD, W; paratype of *C. taurica*); Neusatz pr. Simferopol, *Dörfler Herb. Norm. 4663* (C, G, JE, LD, MANCH, W; paratype of *C. taurica*); distr. Bjelogorsk, in vicinitate pag. Rodniki, in declivitate Monastyrskaja, *Kossych Herb. Fl. SSSR 5025* (C, JE; paratype of *C. stankovii*).—UKRAINE: prope Lubny, *Rogovitch s.n.* (W; topotype of *C. ucrainica*). **Turkey.** Paphlagonia, Ilgas dag, *Bornmüller 2378* (JE); Erciyas dagi, n-lich von Saisaly, *Zederbauer s.n.* (W). **Iran.** Prov. Kerman, montes Kuh-e Jebal Barez, inter Bam et Jiroft, supra Deh Bakri, *Rechinger 3742* (LD); prov. Mazanderan, in valle fl. Chalus, Pol-e Zanguleh, *Rechinger 6364* (LD).

Crataegus meyeri is a variable species, which has been divided into several species by Russian students (Pojarkova 1939a, 1960, 1964; Kossych 1965). Much of the variation follows clinal patterns, e.g., indumentum of twigs and leaves, or is not well correlated with geography, e.g., number of styles per flower, leaf shape, and number of teeth on basal leaf lobes; consequently, it is not possible to give a consistent formal treatment for the variants.

According to Browicz in Davis (1972: 142), *C. meyeri* is probably conspecific with *C. orientalis* subsp. *szovitsii,* and perhaps these taxa should be treated as one more or less stabilized species, derived from the results of possibly ancient hybridization of *C. azarolus* var. *aronia* and *C. orientalis* subsp. *orientalis*. However, *C. meyeri*, like other species of ser. *Crataegus*, differs from *C. orientalis* subsp. *szovitsii* in its villous indumentum, lax inflorescences, and ventro-laterally more or less sulcate pyrenes. More likely, *C. meyeri* is a triploid/tetraploid resulting from perhaps ancient hybridization between two unknown species of ser. *Crataegus*.

Crataegus meyeri hybridizes with *C. microphylla* (39. *C.* ×*chersonensis*) and *C. monogyna* (36. *C.* ×*armena*).

9. Crataegus kurdistanica Hadac & Chrtek, Candollea 35: 317. 1980.—TYPE: IRAQ, distr. Rowanduz, Hassar-i-Sakran, 2400–2800 m, 7 Jun 1961, *Hadac & Kader 5620* (holotype: PR!).

Crataegus melanocarpa var. *kotschyana* Boissier, Diagn. pl. orient. ser. 2, 2: 47. 1856.—TYPE: *Kotschy 670* (lectotype, here designated: W!).

Shrub or tree up to ca. 3 m tall. Twigs more or less villous-lanate, occasionally glabrescent; thorns up to ca. 1 cm long, stout, rare. Buds 1.1–2.8 mm long, 1.6–2.2 mm in diameter. Leaf blades bright green and villous-lanate above, greyish green and villous-lanate throughout or glabrescent towards margin beneath, cuneate, attenuate, or more or less rounded at base, lobes more or less acute, margin serrate, with more or less coarse teeth, basal pair of veins divergent or straight. Subterminal leaf blade of flowering shoots 2.6–4.5 cm long, 2.4–4.9 cm wide, lobes 2–3 pairs, basal pair 2.0–2.9 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 4–9 teeth in the distal 2/3–3/10, basal pair of sinuses in the basal 1/2–1/3 of lamina; petiole 5–19 mm long, 0.2–0.5 times as long as lamina; stipules 6–15 mm long, entire or irregularly denticulate-serrate with 1–6 teeth. Leaf blades of short shoots 3.3–6.7 cm long, 2.9–5.0 cm wide, lobes 2–4 pairs, basal pair 2.1–2.6 times as long as wide, extending 0.6–1.0 times the width of lamina to midrib, each lobe with 5–9 teeth in the distal 2/5–1/4, basal pair of sinuses in the apical 2/5 to the basal 1/5 of lamina; petiole 12–33 mm long, 0.4–0.7 times as long as lamina. Leaf blades of elongate shoots 4.6–5.5 cm long, 4.6–6.0 cm wide, lobes 3–4 pairs, basal pair 1.8–2.2 times as long as wide, extending 0.6–1.0 times the width of lamina to midrib, each lobe with 7–14 teeth in the distal 3/5–1/4, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 15–28 mm long, 0.3–0.8 times as long as lamina; stipules 8–17 mm long, serrate, rarely irregularly denticulate-serrate, with 4–17 teeth. Inflorescence 3–4 cm long, corymbose, 10–20-flowered, lax, villous-lanate; pedicels 4–20 mm long, villous-lanate; bracts ca. 1.2 mm long, ca. 0.1 mm wide, ca. 12 times as long as wide, caducous, margin entire. Hypanthium 3–4 mm long, villous-lanate; sepals 1.2–2.6 mm long, 1.5–2.6 mm wide, triangular, 0.8–1.0 times as long as wide, margin entire, apex acute; petals 6–7 mm

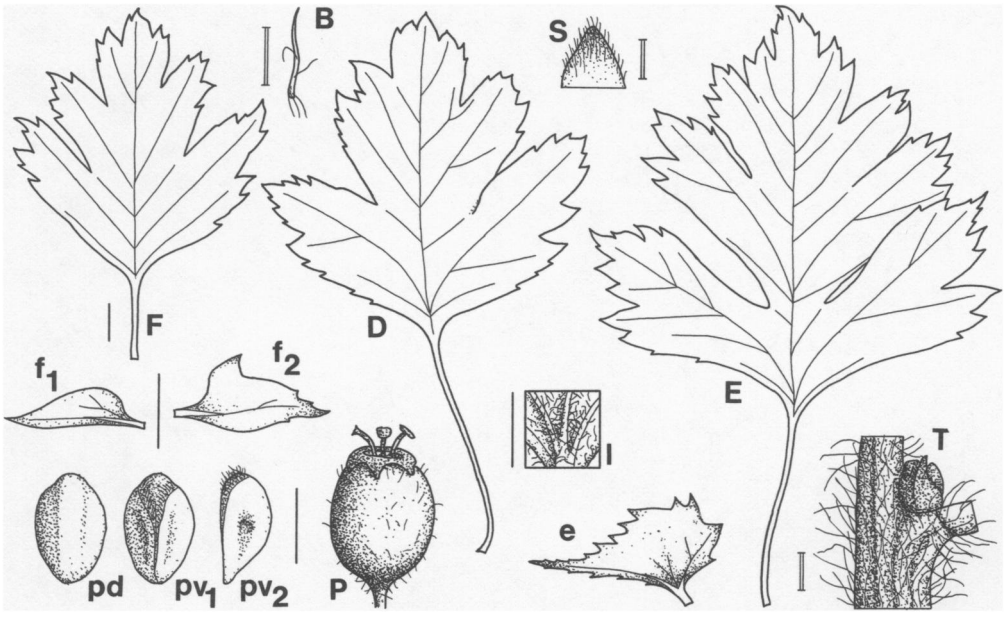


FIG. 32. *Crataegus kurdistanica*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv_1, pv_2: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (T: *Hadac 5620*; B, S: *Kotschy 268*; D: *Kotschy 648*; F, f_1, f_2, P, pd, pv_1: *Kotschy 670*; E, e, I, pv_2: *Strauss 146*.)

long, ca. 6 mm wide; stamens 16–20, anthers purple; styles 2–3 (–4). Fruit 8–9 mm long, ca. 8 mm in diameter, 1.0–1.1 times as long as wide, subglobose, brick-red, more or less villous-lanate, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 2–3 (–4), dorsally sulcate, ventro-laterally more or less sulcate or smooth, hypostyle pilose. Chromosome number unknown. Fig. 32.

Phenology. Flowering in May and June, fruiting in August.

Distribution (Fig. 33). Iraq, Iran, and Afghanistan; mountainous tracts; 2400–2800 m.

ADDITIONAL SPECIMENS EXAMINED. **Afghanistan.** Kabul, *Honigberger s.n.* (W). **Iran.** Mt Totschal pr. Teheran, *Kotschy 188* p.p. (UPS); Dudera prope Derbent, supra Teheran, in montibus Elburs, *Kotschy 268* (UPS, W; paralectotypes of *C. melanocarpa* var. *kotschyana*); Kuh-e Dinar, *Kotschy 648* (G, UPS, W); Arak, Gürtsch, Dorf Girdu, See Kekire Göll, *Strauss 146* (JE).

Crataegus kurdistanica is closely related to *C. meyeri*, but differs in type of indumentum, type of leaf lobe serration, length of sepals, and number of pyrenes.

Kotschy 648 was referred to *C.* ×*sinaïca* by Schneider (1906) and Riedl in Rechinger (1969), and *Kotschy 268* was referred to *C. melanocarpa* subsp. *melanocarpa* (=*C. pentagyna* subsp. *pentagyna*) and to *C. meyeri* by Riedl in Rechinger (1969).

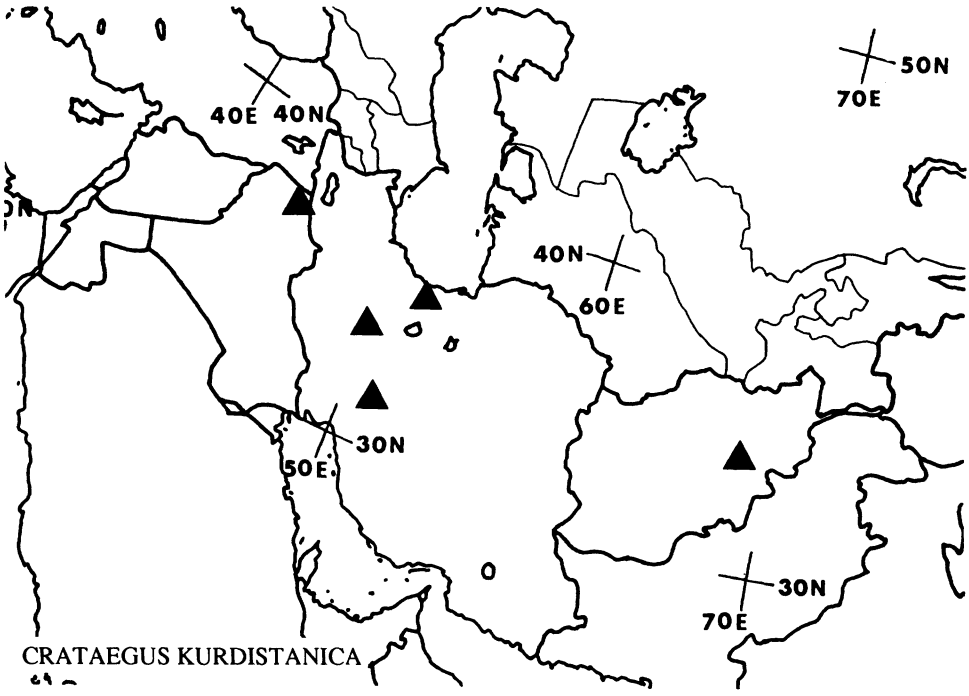


FIG. 33. Distribution of *Crataegus kurdistanica*.

10. Crataegus laevigata (Poiret) DC., Prodr. 2: 630. 1825. *Mespilus laevigata* Poiret, Encycl. 4: 439. 1798. *Crataegus oxyacantha* f. *laevigata* (Poiret) Beck, Fl. Nieder-Österreich 2(1): 706. 1892. *Crataegus oxyacantha* var. *laevigata* (Poiret) Rouy & Camus, Fl. France 7: 4. 1901. *Crataegus oxyacantha* subsp. *polygyna* var. *laevigata* (Poiret) Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown locality, *Poiret s.n.* (lectotype, here designated: P-Herb. Moquin-Tandon!).

Crataegus oxyacanthoides Thuillier, Fl. env. Paris: 245. 1799, non *Crataegus* ×*oxyacanthoides* Doll, 1976. *Mespilus oxyacanthoides* (Thuillier) DC. in Lamarck & DC., Fl. France ed. 3, 4: 433. 1805. *Mespilus oxyacantha* var. *obovata* Mérat, Nouv. fl. env. Paris ed. 2, 2: 298. 1821. *Crataegus oxyacantha* var. *oxyacanthoides* (Thuillier) Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 284. 1853. *Crataegus oxyacantha* subsp. *polygyna* var. *oxyacanthoides* (Thuillier) Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912. *Crataegus oxyacantha* subsp. *oxyacanthoides* (Thuillier) Maire, Fl. Afr. Nord 15: 135. 1980, nom. superfl.—TYPE: unknown; recorded from France, "les bois de Montmorency, de la ci-devant Abbaye de Haute-Bruyere, de la-Queue en Brie, d'Ozour, d'Armainvillers."

Mespilus intermedia Poiret, Encycl. suppl. 4: 68. 1816.—TYPE: *Poiret & Defoucault s.n.* (holotype: P?).

Mespilus digyna Gray, Nat. arr. brit. pl. 2: 565. 1821.—TYPE: unknown.

Mespilus oxyacantha var. *integrifolia* Wallroth, Sched. crit. 1: 219. 1822. *Crataegus oxyacantha* var. *obtusata* DC., Prodr. 2: 628. 1825, nom. superfl. *Oxyacantha obtusata* (DC.) Roemer, Fam. nat. syn. monogr. 3: 107. 1847.

Mespilus oxyacantha var. *obtusata* (DC.) Wenzig, Linnaea 38: 162. 1874. *Crataegus oxyacantha* var. *integrifolia* (Wallroth) Rouy & Camus, Fl. France 7: 5. 1901. *Crataegus oxyacantha* subsp. *polygyna* var. *integrifolia* (Wallroth) Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912. *Crataegus laevigata* subsp. *laevigata* var. *integrifolia* (Wallroth) Christensen, Dansk Dendrol. Årsskr. 5(5): 134. 1982, nom. superfl.—TYPE: *Wallroth s.n.* (neotype, here designated: G!).

Crataegus oxyacantha var. *vulgaris* DC., Prodr. 2: 628. 1825. *Oxyacantha vulgaris* (DC.) Roemer, Fam. nat. syn. monogr. 3: 109. 1847. *Crataegus laevigata* var. *vulgaris* (DC.) Schmidt, Mitt. Florist. Kart. Halle 7: 87. 1981. *Crataegus laevigata* subsp. *vulgaris* (DC.) Baranec, Acta Dendrobiol. 1986: 17. 1986.—TYPE: unknown.

Crataegus oxyacantha var. *obtusiloba* Schur, Enum. pl. Transsilv.: 205. 1866.—TYPE: *Schur 971* (not located).

Crataegus coriacea Gandoger, Bull. Soc. Bot. France 18: 445. 1871, non *Crataegus coriacea* Solander, 1822.—TYPE: *Gandoger 1*, 18 Jul 1869 (holotype: LY!).

Crataegus subinermis Gandoger, Bull. Soc. Bot. France 18: 445. 1871.—TYPE: *Gandoger s.n.* (holotype: LY!).

Crataegus oxyacantha var. *eriocarpa* Gillot, Bull. Soc. Bot. France 29: LXXXIII. 1882, non *Crataegus oxyacantha* var. *eriocarpa* Loudon, 1838. *Crataegus oxyacantha* var. *genuina* subvar. *eriocarpa* (Gillot) Rouy & Camus, Fl. France 7: 4. 1901. *Crataegus oxyacantha* subsp. *polygyna* var. *eriocarpa* (Gillot) Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; recorded from France, Nolay, Bligny-sur-Ouche.

Crataegus oxyacantha var. *integrifolia* f. *glabrata* Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 90. 1891.—TYPES: *Körnicke s.n.* (syntype: not located); *Sauter s.n.* (syntype: not located).

Crataegus oxyacantha var. *auriculata* Lange ex Dippel, Handb. Laubholzk. 3: 457. 1893. *Crataegus oxyacantha* var. *vulgaris* f. *auriculata* (Dippel) Schneider, Ill. Handb. Laubholzk. 1: 780. 1906.—TYPE: *Lange s.n.* (not located, no material at C; the type tree is still present in the Botanical Garden of the University of Copenhagen, Denmark).

Crataegus oxyacantha var. *microphylla* Lange, Revis. Crataeg. 71, fig. M1. 1897. *Crataegus laevigata* var. *microphylla* (Lange) Hrabetová-Uhrová, Preslia 50: 210. 1978.—TYPE: *Mortensen s.n.* (lectotype, here designated: C!).

Crataegus oxyacantha subsp. *vernicosa* Lange, Revis. Crataeg.: 71, fig. M2. 1897. *Crataegus oxyacantha* var. *vulgaris* f. *vernicosa* (Lange) Schneider, Ill. Handb. Laubholzk. 1: 780. 1906.—TYPE: *Lange s.n.* (lectotype, here designated: C!).

?Crataegus cuneato-trifida Lojacono-Pojero, Malpighia 20: 215. 1906.—TYPES: *Citarda s.n.* (syntype: not located); *Todaro s.n.* (syntype: not located); *Lojacono-Pojero s.n.* (syntype: not located, PAL?).

Crataegus oxyacantha subsp. *polygyna* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown (no material at E).

Crataegus oxyacantha subsp. *polygyna* var. *microcarpa* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown (no material at E).

Crataegus palmstruchii Lindman, Sv. fanerogamfl. 307, fig. 189.2. 1918. *Crataegus oxyacantha* var. *palmstruchii* (Lindman) Hegi, Ill. Fl. Mitt.-Eur.

4(2): 733. 1923. *Crataegus oxyacantha* subsp. *palmstruchii* (Lindman) Hrabetová-Uhrová, Index Sem. Arbor. Novy Dvur 1964: 7, f4. 1964. *Crataegus laevigata* subsp. *palmstruchii* (Lindman) Franco, Feddes Repert. 78: 25. 1967.—TYPE: *Lindman s.n.* (lectotype, here designated: S!; isolectotype: S!).

Crataegus oxyacantha var. *microxyacantha* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 112, tabs. II.7, VII.36–38. 1956.—TYPE: *Pénzes 16* (holotype: BP).

Crataegus oxyacantha var. *ovoxyacantha* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 112, tabs. I.3, VII.30–35. 1956.—TYPE: *Pénzes 78* (holotype: BP).

Crataegus oxyacantha var. *mathei* Pénzes, Kert. Szölesz. Föisk. Évk. 18(2): 114, tab. VI.25. 1956.—TYPE: *Máthé s.n.* (holotype: BP).

Crataegus oxyacantha subsp. *walokochiana* Hrabetová-Uhrová, Preslia 40: 198, fig. 1. 1968. *Crataegus laevigata* subsp. *walokochiana* (Hrabetová-Uhrová) Holub, Preslia 42: 94. 1970. *Crataegus* ×*calycina* var. *walokochiana* (Hrabetová-Uhrová) Cinovskis, Crat. balt. 87. 1971. *Crataegus walokochiana* (Hrabetová-Uhrová) Soó, Feddes Repert. 85: 440. 1974.—TYPE: *Koch 49.551* (holotype: ZT!; isotype: ZT!).

Crataegus oxyacantha subsp. *palmstruchii* var. *globosa* Hrabetová-Uhrová, Biologia (Bratislava) 24: 549, fig. 1. 1969.—TYPE: *Hrabetová s.n.* (holotype: BRNU 429075).

Crataegus oxyacantha var. *laevigata* f. *ellipticifolia* Cinovskis, Crat. balt. 65. 1971.—TYPE: *Cinovskis N-K* (holotype: LATV!).

Crataegus oxyacantha subsp. *carnoviensis* Hrabetová-Uhrová, Preslia 48: 81, tab. III. 1976. *Crataegus laevigata* var. *carnoviensis* (Hrabetová-Uhrová) Hrabetová-Uhrová, Preslia 50: 210. 1978. *Crataegus laevigata* subsp. *carnoviensis* (Hrabetová-Uhrová) Dostál, Folia Mus. Rerum Nat. Bohem. Occid. Bot. 21: 8. 1984.—TYPE: *Hrabetová s.n.* (holotype: BRNU).

Crataegus palmstruchii subsp. *rhenana* Knapp, Oberhessische Naturwiss. Zeitschr. 44: 121. 1978.—TYPE: *Knapp s.n.* (holotype: Herb. Knapp).

Shrub, rarely a tree, up to ca. 8 m tall. Twigs sparsely villous or glabrous; thorns up to ca. 1 cm long, stout, rare. Buds 1.1–2.1 mm long, 1.2–1.9 mm in diameter. Leaf blades often more or less coriaceous, more or less lustrous dark green and more or less villous along major veins above, pale green and more or less villous along major veins and in vein axils beneath, cuneate or rounded at base, lobes obtuse or more or less acute, margin crenate-serrate, with more or less fine teeth, basal pair of veins convergent, rarely more or less straight. Subterminal leaf blades of flowering shoots 1.3–5.7 cm long, 0.9–5.0 cm wide, lobes 1–2 pairs, rarely absent, basal pair 1.6–2.8 times as long as wide, extending 0.4–0.7 times the width of lamina to midrib, each lobe with 6–23 teeth in the distal 3/4–1/8, basal pair of sinuses in the apical 1/5–2/5 of lamina; petiole 4–25 mm long, 0.2–0.6 times as long as lamina; stipules 3–16 mm long, serrate with 11–41 teeth. Subterminal leaf blades of short shoots 2.0–6.0 cm long, 1.5–3.2 cm wide, lobes 1–3 pairs, basal pair 1.7–3.8 times as long as wide, extending 0.3–0.7 times the width of lamina to midrib, each lobe with 10–21 teeth in the distal 2/3–2/9, basal pair of sinuses in the apical 1/5 to basal 2/5 of lamina; petiole 9–29 mm long, 0.4–0.6 times as long as lamina. Leaf blades of elongate shoots 1.9–7.2 cm long, 1.8–5.1 cm wide, lobes 1–3 pairs, basal pair 1.5–2.9 times as long as wide, extending 0.4–0.8 times the width of lamina to midrib, each lobe with 13–26 teeth in the distal 6/7–3/11, basal pair of sinuses in the

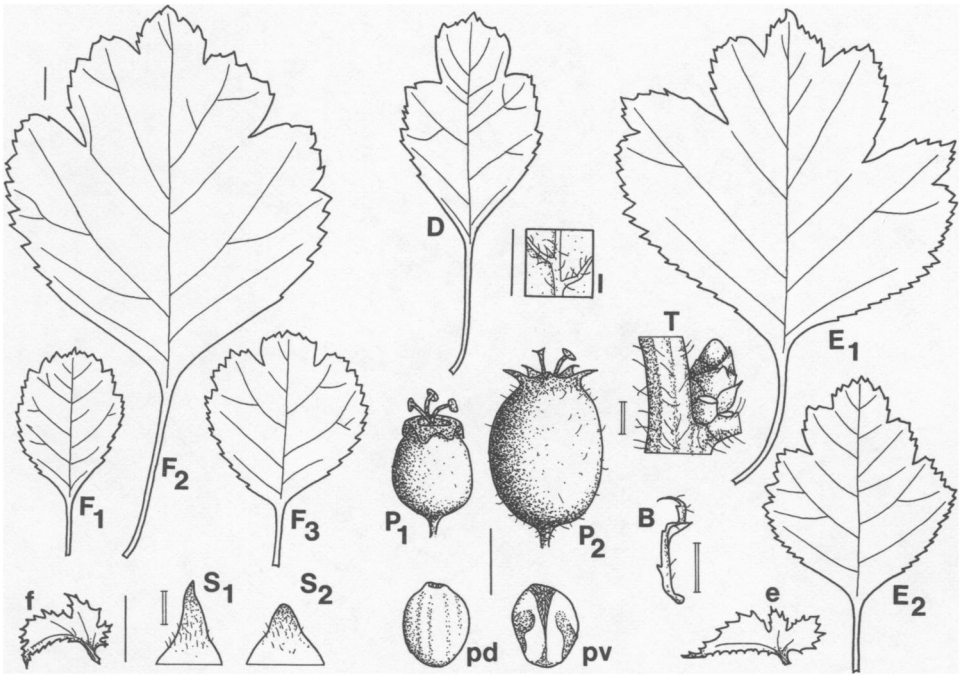


FIG. 34. *Crataegus laevigata*. B: bract; D: subterminal leaf of short shoot; E_1, E_2: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2, F_3: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D, F_1, F_3: *Christensen A5;* P_2: *Christensen A34*; E_2, e, f, P_1, T: *Christensen D13*; pd, pv: *Christensen s.n.*; E_1, F_2, S_1: *Lindman s.n.*; B, I, S_2: *Steeden s.n.*)

apical (1/10–) 3/10 to basal 3/10 of lamina; petiole 8–20 mm long, 0.2–0.5 times as long as lamina; stipules 5–24 mm long, serrate with 15–47 teeth. Inflorescence 2.5–5.0 cm long, corymbose, 3–11-flowered, lax, glabrous, rarely sparsely villous; pedicels 6–30 mm, glabrous, rarely sparsely villous; bracts 1.1–5.3 mm long, 0.2–0.5 mm wide, 6–13 times as long as wide, caducous, margin denticulate with 3–16 teeth. Hypanthium 3–4 mm long, glabrous, rarely villous; sepals 0.9–2.8 mm long, 1.4–2.6 mm wide, usually broadly triangular, 0.7–1.3 (–1.5) times as long as wide, margin entire, apex acute; petals 5–10 mm long, 5–9 mm wide; stamens 17–22, anthers purple; styles (1–) 2–3 (–5). Fruit 6–14 mm long, 6–12 mm in diameter, 1.0–1.4 (–1.8) times as long as wide, subglobose to more or less ellipsoidal, bright red, glabrous, rarely more or less villous, crowned by the persistent, recurved or spreading sepals; flesh yellowish; pyrenes (1–) 2–3 (–5), dorsally and ventrolaterally sulcate, hypostyle pilose. Chromosome number: 2n = 32, 2n (2x) = 34, 2n = 48. Figs. 3A, 34.

Additional illustrations: Fig XXX.2 in Pojarkova (1939a); Fig. 1b in Bakker (1964); Fig. 6 in Cinovskis (1971); Figs. 15a, 16a in Christensen (1982a).

Phenology. Flowering in April to June, fruiting in June to November.

Distribution (Fig. 35). From England, France, and southern Scandinavia to Estonia, Latvia, Lithuania, Poland, Romania, Yugoslavia, and Italy; commonly planted as an ornamental within its natural range; on calcareous rocks, flysch,

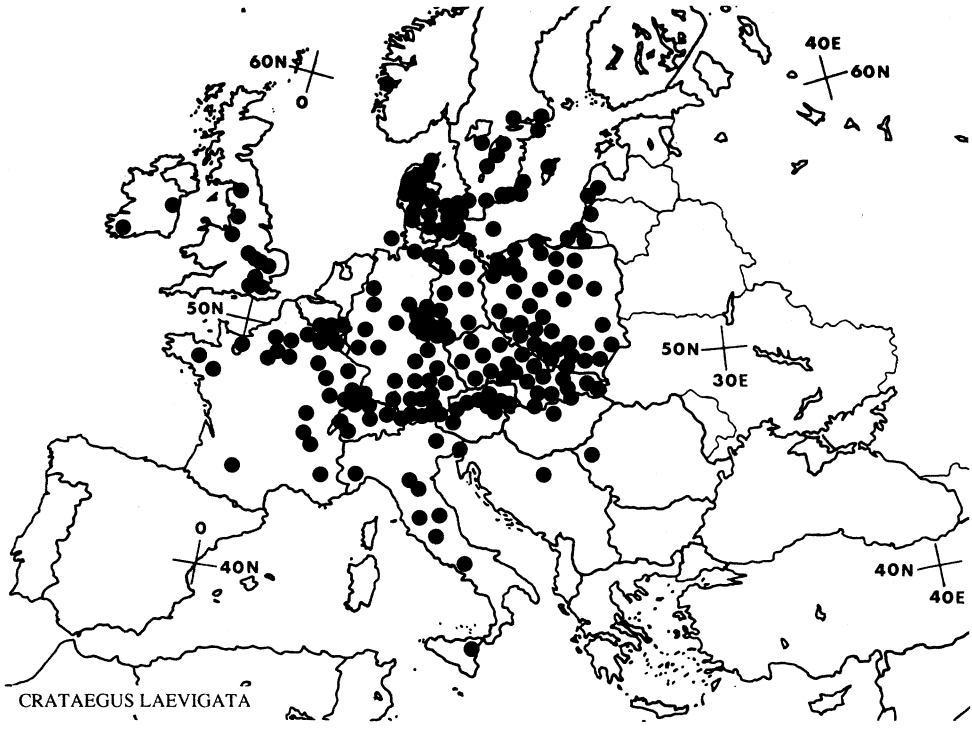


FIG. 35. Distribution of *Crataegus laevigata*, based on specimens seen and literature records cited by Cinovskis (1971), Lippert (1978), Synnott (1978), and Gostynska-Jakuszewska and Hrabetová-Uhrová (1983). The record from Sicily has not been confirmed. *Crataegus laevigata* is adventive in Norway.

andesite, as well as gneiss and other siliceous rocks; in forest with *Fagus, Quercus, Carpinus, Fraxinus, Picea, Pinus*, in scrub with *Cornus, Viburnum, Rosa, Salix, Corylus*, in grasslands, on sand dunes, at riversides, and in hedges; 0–1150 m.

REPRESENTATIVE SPECIMENS. **England.** Middlesex, Ruislip, *Batko s.n.* (GB). **France.** Dep. Moselle, Moyenvic, en bordure de la vallée de la Seille, *Duvigneau 64F1136* (BR); Pont de Claixe, Isère, near Grenoble, *Rothkegel 1424* (BR). **Belgium.** Val de Poix, route de Saint Hubert, *Lawalrée 12892* (BR). **Denmark.** Sjælland, Asnæs, *Christensen A5* (C); Jylland, Tjele Langsø, *Ostenfeld s.n.* (C). **Norway.** Hordaland, Strandebarm, Barsnes, *Lillefosse s.n.* (H). **Sweden.** Blekinge, Sölvesborg, Valje, *Holmgren s.n.* (C); Stockholm, Danviksbergen, *Lindman s.n.* (S). **Latvia.** Distr. Liepaja, Matra, ad litora glaciali Baltici, *Cinovskis 18.3* (LATV); Kurland, Kreis Grobin, Matern, nördlich von Grobin, *Kupffer 23440* (GB). **Germany.** Hessen, Starkenburg b. Darmstadt, *Hirth s.n.* (W); Kellerberg b. Schmölln, *Bauch s.n.* (JE); Mecklenburg, Kr. Parchim, Neu-Klokow, *Doll s.n.* (JE). **Poland.** Koszalinskie, pow. Szczecinek, zarosla nad Jeziorem Brody kolo Ragoeskiego Mlyna, *Boratynska s.n.* (C); Krepsko pow. Walcz, Cieple zbocza nad Gwda, *Zielinski s.n.* (C). **Czechoslovakia.** Slovenia, Lipt. Sv. Mikulás, ad ripam fl. Váh, supra pag. Uh. Nová Ves, ad pedem Mt Tatra, *Hrabetová s.n.* (BR); Moravia centr.-merid., Brno, inter fl. Svratka et suburb. Brno-Novy Liskovec, *Smejkal Fl. Exs. Cech. 1637* (C, GB, H, JE, UPS, W). **Romania.** Banatus, distr. Timis-Torontal, in silva Casa Verde ad opp. Timisoara, *Pascovschi Fl. Rom. Exs. 2776* (C, LIV, MEL). **Yugoslavia.** Slavonia, fl. Sava pr. Zupanje, 50 km E Brod, *Rechinger 21715* (B). **Austria.** Niederösterreich, am Wege vom Baytal bei Gumpoldskvecken zum Richardshof, *Hayek s.n.* (GB); Voralberg, Klostertal, Dalaas-Mutten bis Innerbraz, *Polatschek s.n.* (W). **Switzerland.** Kt. St. Gallen, Fürstenland, bei Winkeln, *Koch 45.464* (BR); Kt. Schaffhausen, Griesbach Schaffhausen, *Kummer s.n.* (BR). **Italy.** Prov. di Firenze, Firenzuola alla Mazzetta, *Fiori s.n.* (FI); Lazio, Roma, Monterotondo, *Steinberg s.n.* (FI).

A proposal by Lambinon (1981) to reject *C. oxyacantha* L. (1753: 477) as a name that has been widely and persistently used for a taxon not including the type has been approved by the Spermatophyta Committee (Anon. 1986; Greuter 1988); see also Byatt (1974) and Hrabetová-Uhrová (1974). Material of *C. laevigata* with combinations of the following characters: leaves larger than typical for *C. laevigata* and more or less villous in vein axils beneath, fruits ellipsoidal, more or less villous, 10–12 mm long, crowned by spreading sepals up to 2 times as long as wide, is often referred to as *C. palmstruchii* Lindman (Cinovskis 1971; Gostynska-Jakuszewska 1975) or *C. laevigata* subsp. *palmstruchii* (Lindman) Franco (Franco 1967; Franco in Tutin et al. 1968). However, according to Byatt (1975a) and Christensen (1982a), *C. palmstruchii* cannot be recognized by a constant set of correlated characters and material referred to this taxon apparently represents introgressants of *C. laevigata* × *C. rhipidophylla* or *C. laevigata* × *C. monogyna* with *C. laevigata*.

Crataegus laevigata with small, unlobed leaves is often referred to var. *microphylla* (Hrabetová-Uhrová 1978) or var. *integrifolia* (Rouy & Camus 1901; Christensen 1982b). However, material of *Mespilus oxyacantha* var. *integrifolia* Wallroth determined by Wallroth, and designated as neotype here, is typical of *C. laevigata* with lobed leaves; therefore, if *C. laevigata* with unlobed leaves is recognized at the level of variety, the correct name is *C. laevigata* var. *microphylla* (Lange) Hrabetová-Uhrová. *Crataegus laevigata* var. *microphylla* is not recognized here, because unlobed and lobed leaves often occur on the same individual, and because individuals with more or less unlobed leaves occur throughout the range of the species.

Crataegus laevigata hybridizes with *C. microphylla* (37. *C.* ×*hafniensis*), *C. rhipidophylla* (38. *C.* ×*macrocarpa*), and *C. monogyna* (39. *C.* ×*media*). A hybrid, originating in cultivation, between *C. laevigata* and an unknown species is known as *C.* ×*ariifolia* (errore *ariaefolia*) Cinovskis (1971) (=*C.* ×*sorbifolia* Lange, non Desfontaines).

11. Crataegus caucasica Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 286. 1853. *Crataegus oxyacantha* var. *caucasica* (Koch) Boissier, Fl. orient. 664. 1872.—TYPE: U.S.S.R., Caucasus, *Wilhelms s.n.* (holotype: B, destroyed).—Neotype, here designated, following suggestion by Riedl in Rechinger, 1969: U.S.S.R., Azerbaijan, Kirovabad, *Pojarkova 288* (LE).

Shrub or tree up to ca. 7 m tall. Twigs glabrous, rarely sparsely villous; thorns up to ca. 7 mm long. Buds 1.8–3.7 mm long, 1.6–3.5 mm in diameter. Leaf blades more or less lustrous dark green and sparsely villous above, pale to greyish green and more or less villous along major veins and in vein axils beneath, truncate or more or less broadly cuneate at base, lobes acute, margin serrate or incised-serrate, with fine to more or less coarse teeth, basal pair of veins straight or more or less divergent. Subterminal leaf blades of flowering shoots 2.7–4.5 cm long, 2.4–6.0 cm wide, lobes 2–3 pairs, basal pair 1.7–2.4 times as long as wide, extending 0.7–0.8 times the width of lamina to midrib, each lobe with 5–20 teeth in the distal 3/4–1/5, basal pair of sinuses in the basal 1/2–3/10 of lamina; petiole 15–27 mm long, 0.4–0.6 times as long as lamina; stipules 7–13 mm long, regularly or rarely more or less irregularly serrate with 3–18 teeth. Subterminal leaf blades of short shoots 2.5–4.3

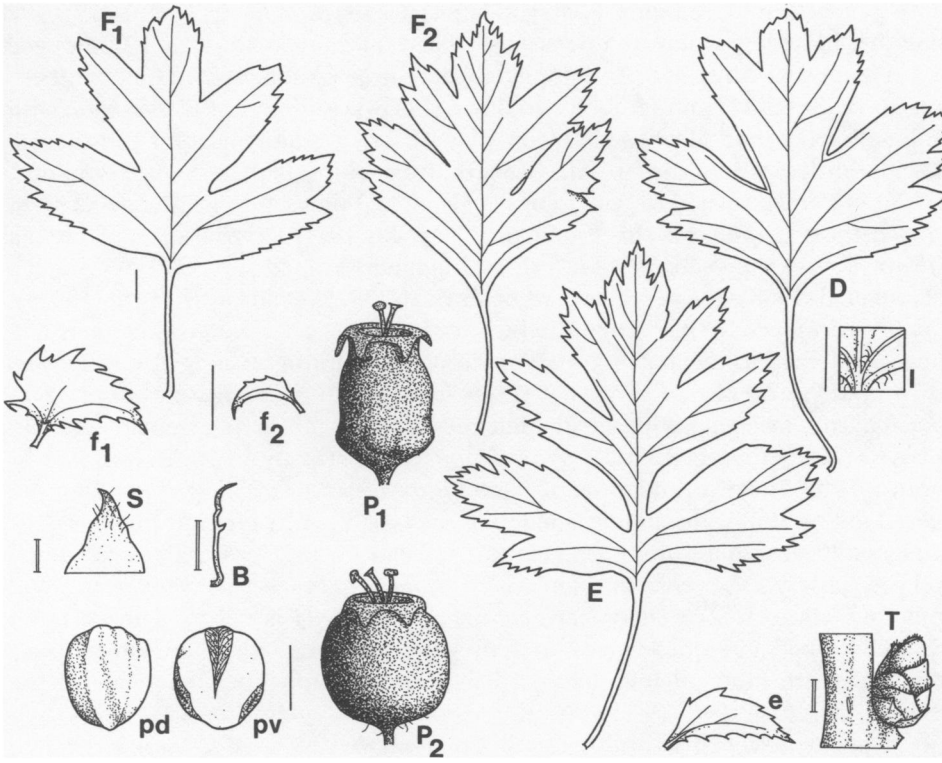


FIG. 36. *Crataegus caucasica*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, f_1, S: unknown collector *s.n.*; D, F_2, E: *Lancaster s.n.*; P_1: *Pojarkova 76*; e, F_1, f_2, P_2, pd, pv, T: *Pojarkova s.n.*)

cm long, 2.1–4.9 cm wide, lobes 2 pairs, basal pair 1.8–2.3 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 11–20 teeth in the distal 6/11–5/11, basal pair of sinuses in the basal 1/2–2/5 of lamina; petiole 11–26 mm long, 0.4–0.6 times as long as lamina. Leaf blades of elongate shoots 3.3–5.4 cm long, 3.9–5.9 cm wide, lobes 3–4 pairs, basal pair 1.7–1.9 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 13–20 teeth in the distal 6/11–1/2, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 15–28 mm long, ca. 0.5 times as long as lamina; stipules 6–10 mm long, regularly serrate with 8–15 teeth. Inflorescence 4–5 cm long, corymbose, (5–) 9–10 (–15)-flowered, more or less lax, glabrous, rarely sparsely villous; pedicels 6–24 mm long, glabrous, rarely sparsely villous; bracts ca. 2.3 mm long, ca. 0.1 mm wide, ca. 26 times as long as wide, caducous, margin denticulate with ca. 1 tooth. Hypanthium 2–3 mm long, glabrous, rarely sparsely villous; sepals 2.3–3.0 mm long, 2.1–2.8 mm wide, triangular, 1.0–1.4 times as long as wide, margin entire, apex acute; petals ca. 4 mm long and wide; stamens 17–20, anthers purple; styles (1–) 2–3. Fruit 9–11 mm long, 6–9 mm in diameter, 1.0–1.8 times as long as wide,

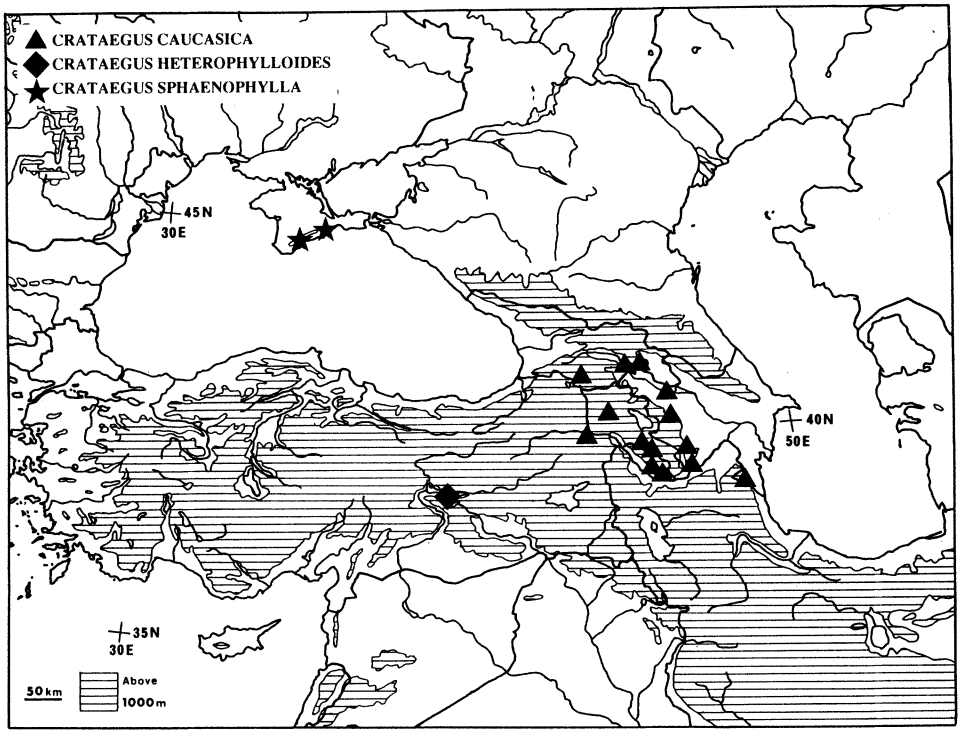


FIG. 37. Distribution of *Crataegus caucasica*, *C. heterophylloides*, and *C. sphaenophylla*, based on specimens seen and literature records cited by Pojarkova (1939a) and Grossheim (1952).

ovoid or more or less cylindrical, blackish purple, crowned by the persistent, reflexed sepals, often angular at base; flesh yellowish; pyrenes (1–) 2–3, dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number: 2n (3x) = 51. Fig. 36.

Phenology. Flowering in May, fruiting in July to October.

Distribution (Fig. 37). Easternmost Turkey, Georgia, Nakhichevan, Armenia, and Azerbaijan; on rocky mountain slopes and at roadsides.

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** Caucasus, unknown collector *s.n.* (W).—GEORGIA: Tevali-Tbilisi, *Lancaster s.n.* (BM); Tbilisi, Mgheth, *Scharrer s.n.* (JE).—ARMENIA: Daralaghes, *Pojarkova 76* (LE); Daralaghes, Gaikent, *Pojarkova 249* (LE).—AZERBAIJAN: Karabagh, Shusha, unknown collector *s.n.* (LE); Kirovabad, *Pojarkova s.n.* (LE).

12. Crataegus ambigua Meyer ex Becker, Bull. Soc. Imp. Naturalistes Moscou 31: 12, 34. 1858.—TYPE: U.S.S.R., Sarepta [Krasnoarmeiski Gorod], 24 May 1851, *Becker s.n.* (holotype: LE; isotype: LE, photos: C!).

Shrub or tree up to ca. 12 m tall. Twigs glabrous or sparsely villous; thorns up to ca. 1.4 cm long, more or less stout. Buds 1.4–4.8 mm long, 1.8–4.1 mm in diameter. Leaf blades often more or less coriaceous, dark or bright green and glabrous or more or less villous above, greyish green and more or less villous along major veins

and in vein axils beneath, more or less broadly cuneate-attenuate at base, lobes acute, subacute or obtuse, margin more or less irregularly or regularly serrate or incised-serrate, with coarse teeth, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 3.0–5.7 cm long, 2.9–6.5 mm wide, lobes 2–4 pairs, basal pair 1.9–3.4 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 3–12 teeth in the distal 1/2–1/9, basal pair of sinuses in the apical 2/5 to basal 3/10 of lamina; petiole 12–28 mm long, 0.3–0.5 times as long as lamina; stipules 4–11 mm long, entire or irregularly serrate with 1–16 teeth. Subterminal leaf blades of short shoots 2.3–5.8 mm long, 1.9–6.6 mm wide, lobes 2–4 pairs, basal pair 1.7–3.0 times as long as wide, extending 0.6–0.9 the width of lamina to midrib, each lobe with 6–14 teeth in the distal 6/11–2/11, basal pair of sinuses in the basal 1/2–1/10 of lamina; petiole 6–35 mm long, 0.4–0.7 times as long as lamina. Leaf blades of elongate shoots 3.3–5.4 cm long, 3.8–6.5 cm wide, lobes 3–4 pairs, basal pair 1.7–2.2 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 11–19 teeth in the distal 3/5–1/4, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 13–28 mm long, 0.3–0.5 times as long as lamina; stipules 12–18 mm long, regularly serrate with 14–29 teeth. Inflorescence 3–5 cm long, corymbose, 10–20-flowered, more or less compact or lax, glabrous or sparsely villous; pedicels 2–30 mm long, glabrous or sparsely villous; bracts 1.6–3.2 mm long, 0.2–0.4 mm wide, 6.0–12.0 times as long as wide, caducous, margin entire or denticulate with 1–4 teeth. Hypanthium 2–4 mm long, glabrous or sparsely villous; sepals 1.6–3.5 mm long, 1.6–3.0 mm wide, usually more or less narrowly triangular, 0.8–2.0 times as long as wide, margin entire, apex acute or obtuse; petals 4–7 mm long, 5–7 mm wide; stamens 18–20, anthers purple; styles 1–2 (–3). Fruit 8–14 mm long, 7–13 mm in diameter, 1.0–1.4 times as long as wide, subglobose to ellipsoidal, dark red to blackish purple, often more or less pruinose, glabrous or sparsely villous, crowned by the persistent, reflexed sepals, often angular at base; flesh yellowish; pyrenes 1–2 (–3), dorsally and ventrolaterally sulcate, hypostyle pilose. Chromosome number: 2n (3x) = 51. Figs. 38, 40.

Phenology. Flowering in May and June, fruiting in July to October.

Distribution (Fig. 39). Turkey, the Crimea, the Volgograd area, Saratov and Kuybyshev districts of the European U.S.S.R., Dagestan, Armenia, Iran, and the Mangyschlak Peninsula in the Caspian Sea; often on calcareous rocks, in woodlands, on rocky mountain slopes, at riversides, in gullies and steppe; 0–2700 m.

Pojarkova (1939a) recognized four species within the *C. ambigua* complex: *C. ambigua* Becker s.str., *C. volgensis* Pojarkova, *C. atrosanguinea* Pojarkova, and *C. transcaspica* Pojarkova; however, by following the broader species concept adopted here, *C. volgensis* and *C. atrosanguinea* are included in *C. ambigua* s.str., and *C. transcaspica* is reduced to a subspecies of *C. ambigua*.

Crataegus ambigua hybridizes with *C. wattiana* (43. *C.* ×*aberrans*).

Key to the Subspecies of Crataegus ambigua

1. Leaf lobes acute. Inflorescence 4–5 cm long, 12–20-flowered, more or less lax; pedicels up to ca. 30 mm long. Sepals 1.9–3.5 mm long; petals 5–7 mm long. 12a. *C. ambigua* subsp. *ambigua*.
1. Leaf lobes obtuse or subacute. Inflorescence ca. 3 cm long, 10–11-flowered, more or less compact; pedicels up to ca. 11 mm long. Sepals 1.6–2.5 mm long; petals 4–5 mm long. 12b. *C. ambigua* subsp. *transcaspica*.

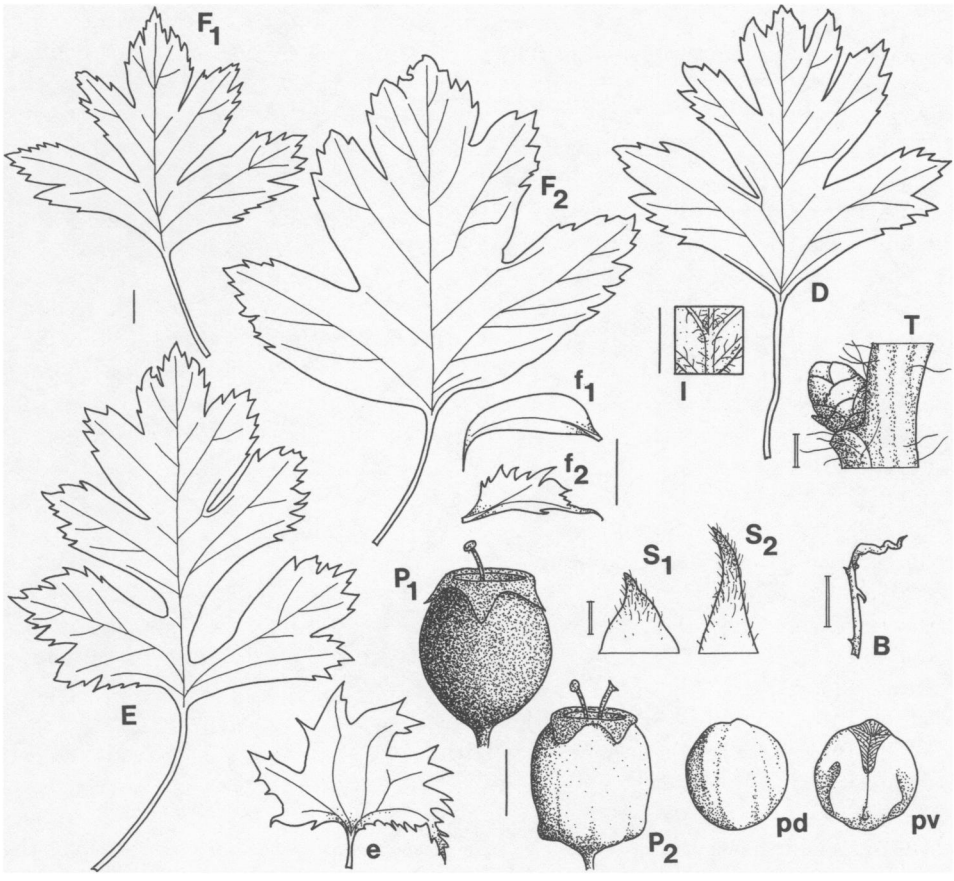


FIG. 38. *Crataegus ambigua* subsp. *ambigua*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_1, S_2: *Becker s.n.*; D, E, e, T: *Bornmüller 3520*; f_1, f_2, I, S_1: *Callier 48*; P_1, pd, pv: *Haussknecht s.n.*; B, F_2, P_2: *Pojarkova 23*.)

12a. Crataegus ambigua subsp. **ambigua.**

Crataegus volgensis Pojarkova in Komarov, Fl. URSS 9: 502. 1939.—TYPE: *Fedtschenko & Bobrov 2* (holotype: LE; isotype: LE, photos: C!).

Crataegus atrosanguinea Pojarkova in Komarov, Fl. URSS 9: 504. 1939.—TYPE: *Pojarkova 380* (holotype: LE; isotype: LE, photos: C!).

Crataegus helenae Grynj & Klokov, Bot. Zurn. (Kiev) 9(2): 57, fig. 1. 1952, non *Crataegus helenae* Sargent, 1905. *Crataegus helenolae* Grynj & Klokov in Zerov, Fl. URSR 6: 60, fig. 9. 1954.—TYPE: *Grynj s.n.* (holotype: KW).

Leaf lobes acute, margin more or less regularly serrate. Inflorescence 4–5 cm long, 12–20-flowered, more or less lax; pedicels 2–30 mm. Sepals 1.9–3.5 mm long, 1.8–3.0 mm wide, usually more or less narrowly triangular, 0.8–2.0 times as long as wide; petals 5–7 mm long and wide. Chromosome number: 2n (3x) = 51. Fig. 38.

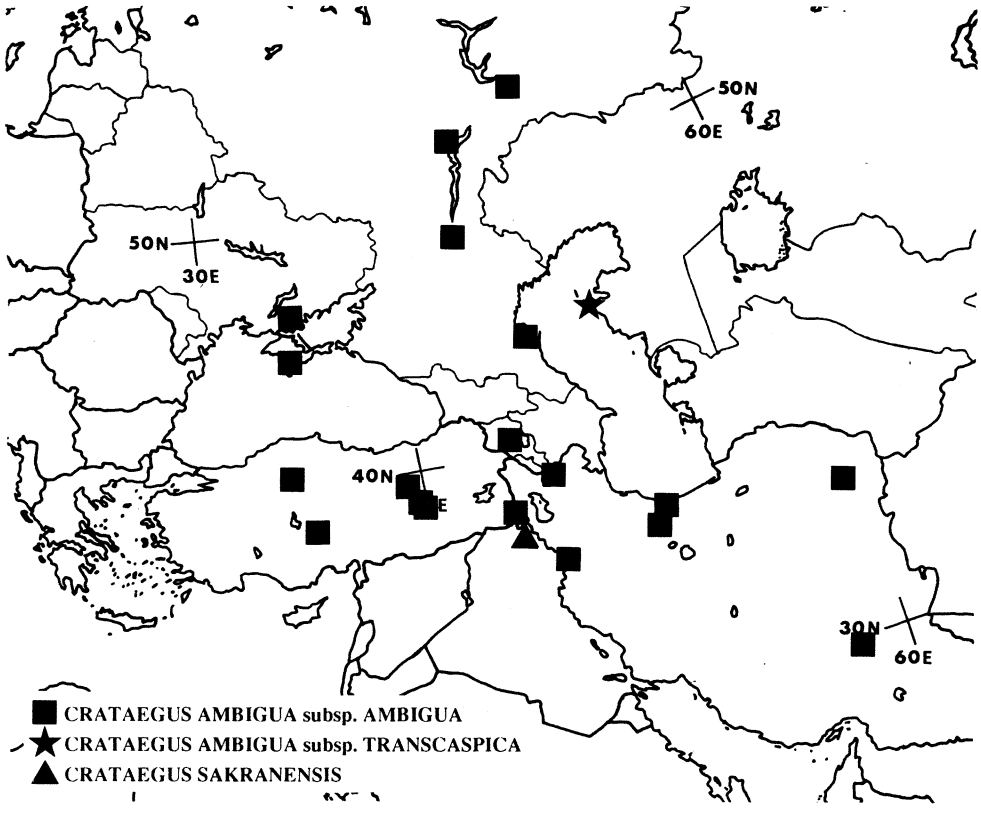


FIG. 39. Distribution of *Crataegus ambigua* subsp. *ambigua*, *C. ambigua* subsp. *transcaspica*, and *C. sakranensis*, based on specimens seen and literature records cited by Pojarkova (1939a), Klokov (1954), Rechinger (1969), and Davis (1972).

Additional illustrations: Fig. XXIX.4 in Pojarkova (1939a); Fig. 9 in Klokov (1954).

Distribution (Fig. 39). Turkey, the Crimea, the Volgograd area, Saratov and Kuybyshev districts of the European U.S.S.R., Dagestan, Armenia, and Iran, rarely planted as an ornamental in Armenia; 1200–2700 m.

REPRESENTATIVE SPECIMENS. **Turkey.** Prov. Ankara, Kalecik, *Davis 25079* (BM); Taurus Armenius, pr. vic. Gölcük ad lacum eodem nomine, fontes Tigridis occid., *Handel-Mazzetti 2622* (W); Armenia austr., supra Harput, *Haussknecht s.n.* (JE); in dumetis ca. Harput, *Haussknecht s.n.* (JE); Cappadocien, Aksaray, *Wannemacher s.n.* (W). **U.S.S.R.** THE CRIMEA: Simferopol, bei Neusats, *Callier 48* (JE, LD, W).—THE VOLGOGRAD AREA: Krasnoarmeiski Gorod, *Becker 2526* (LD), *Becker s.n.* (JE, LD).—DAGESTAN: Ak-Terek, *Kugerovskaja 355* (W).—ARMENIA: distr. Jerevan, Nork, *Pojarkova 821* (LE). **Iran.** Prov. Kerman, Rabor, inter Kerman et Bandar-Abbas, *Bornmüller 3520* (BM, JE, LD, W).

12b. Crataegus ambigua subsp. **transcaspica** (Pojarkova) Christensen, comb. et stat. nov. *Crataegus transcaspica* Pojarkova in Komarov, Fl. URSS 9: 503, Fig. XXIX.6. 1939.—TYPE: U.S.S.R., Kazakhstan, peninsula Mangyschlak, in fundo fossae Chanka-baba, 28 Jun 1906, *Dubjansky 41* (holotype: LE; isotype: LE, photo: C!).

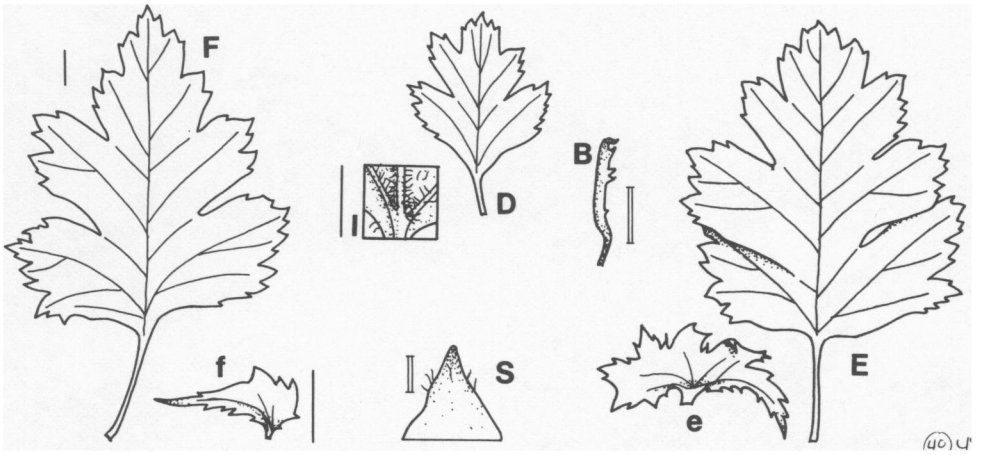


FIG. 40. *Crataegus ambigua* subsp. *transcaspica*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; S: sepal. Solid bar = 5 mm; double bar = 1 mm. (*Dubjansky 53*.)

Leaf lobes obtuse or subacute, margin more or less irregularly serrate. Inflorescence ca. 3 cm long, 10–11-flowered, more or less compact; pedicels 6–11 mm long. Sepals 1.6–2.5 mm long, 1.6–1.9 mm wide, 0.8–1.4 times as long as wide, apex acute or obtuse; petals 4–5 mm long, 5–6 mm wide. Chromosome number unknown. Figs. 4E, 40.

Distribution (Fig. 39). Endemic to the Mangyschlak Peninsula in the Caspian Sea; near sea level.

ADDITIONAL SPECIMEN EXAMINED. **U.S.S.R.** KAZAKHSTAN: Peninsula Mangyschlak, Chanka-baba, *Dubjansky 53* (LE).

13. Crataegus sakranensis Hadac & Chrtek, Candollea 35: 318, fig. 2. 1980.—TYPE: IRAQ, distr. Rowanduz, ad vicum Sakri Sakran, 1900 m, 6 Jun 1961, *Hadac & Kader 5607* (holotype: PR!).

Shrub up to ca. 3 m tall. Twigs glabrous; thorns rare. Buds ca. 1.9 mm long, ca. 2.1 mm in diameter. Leaf blades dark green and sparsely villous along major veins above, greyish green and villous in vein axils beneath, more or less rounded or truncate at base, lobes more or less obtuse, margin more or less irregularly serrate with more or less coarse teeth, basal pair of veins straight or more or less divergent. Subterminal leaf blades of flowering shoots 3.1–3.5 cm long, 3.9–4.0 cm wide, lobes 2 pairs, basal pair 1.6–1.9 times as long as wide, extending ca. 0.8 times the width of lamina to midrib, each lobe with 3–9 teeth in the distal 3/5–1/4, basal pair of sinuses in the basal 2/5 of lamina; petiole 14–15 mm long, 0.4–0.5 times as long as lamina; stipules ca. 5 mm long, entire. Inflorescence ca. 3 cm long, corymbose, up to ca. 5-flowered, more or less lax, glabrous or sparsely villous; pedicels ca. 20 mm long, glabrous or sparsely villous; bracts caducous. Flowers not seen; sepals 1.6–1.8 mm long, 1.8–1.9 mm wide, broadly triangular, ca. 0.9 times as long as

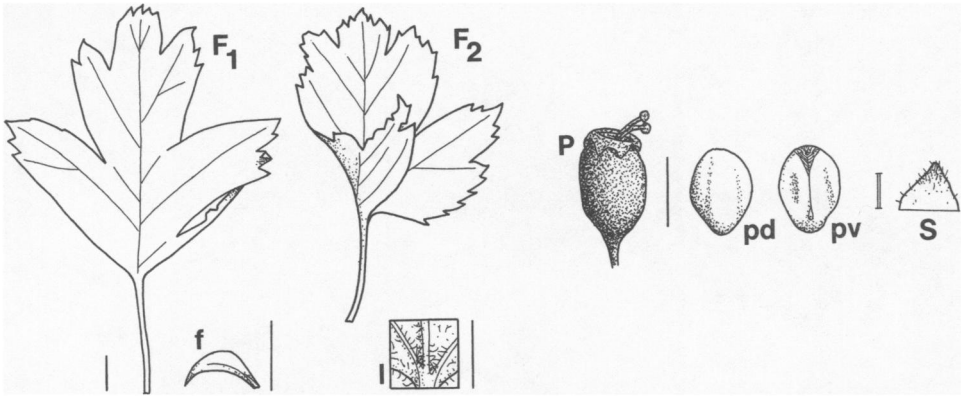


FIG. 41. *Crataegus sakranensis*. F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal. Solid bar = 5 mm; double bar = 1 mm. (*Hadac 5607.*)

wide, margin entire, apex subacute. Fruit 7–8 mm long, 4–5 mm in diameter, 1.6–1.8 times as long as wide, broadly obovoid, blackish purple, glabrous or sparsely villous, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 2–3, dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number unknown. Fig. 41.

Phenology. Fruiting in June.

Distribution (Fig. 39). Northern Iraq; along rivers; ca. 1900 m.

Crataegus sakranensis is known only from the type. It is closely related to *C. ambigua* subsp. *ambigua*, but differs in leaf shape, and size of inflorescences, sepals, and fruits, as well as in number of pyrenes per fruit.

14. Crataegus songarica Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 187. 1853. *Crataegus oxyacantha* var. *incisa* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 1: 117. 1874, non *Crataegus oxyacantha* var. *incisa* Mérat, 1821. *Crataegus pinnatifida* var. *songarica* (Koch) Dippel, Handb. Laubholzk. 3: 447. 1893.—TYPE: U.S.S.R., Kazakhstan, Dzungarskiy Alatau, ad fl. Lepsa, 1841, *Karelin & Kiriloff 1462* (holotype: LE!; isotypes: BM! BR! LE!).

Mespilus oxyacantha var. *intermixta* Wenzig, Linnaea 38: 163. 1874. *Crataegus* ×*intermixta* (Wenzig) Beck, Fl. Niederösterreich 2(1): 706. 1892, non *Crataegus* ×*intermixta* Sargent, 1922.—TYPE: *Hooker f. & Thomson s.n.* (lectotype, here designated: W!; isolectotype: C!).

Crataegus pinnatifida var. *garanica* Paulsen, Bot. Tidsskr. 27: 141, fig. 1. 1906.—TYPE: *Paulsen 1463* (holotype: C!).

Crataegus fischeri Schneider, Ill. Handb. Laubholzk. 1: 789, figs. 450l–n, 451l–o, z–z_1. 1906.—TYPE: *Regel s.n.* (not located).

Crataegus darvasica Pojarkova, Novit. Syst. Pl. Vasc. 6: 129, fig. 3. 1970.—TYPE: *Linczevski & Maslennikova 1556* (holotype: LE; isotypes: LE, TAD, photo: C!).

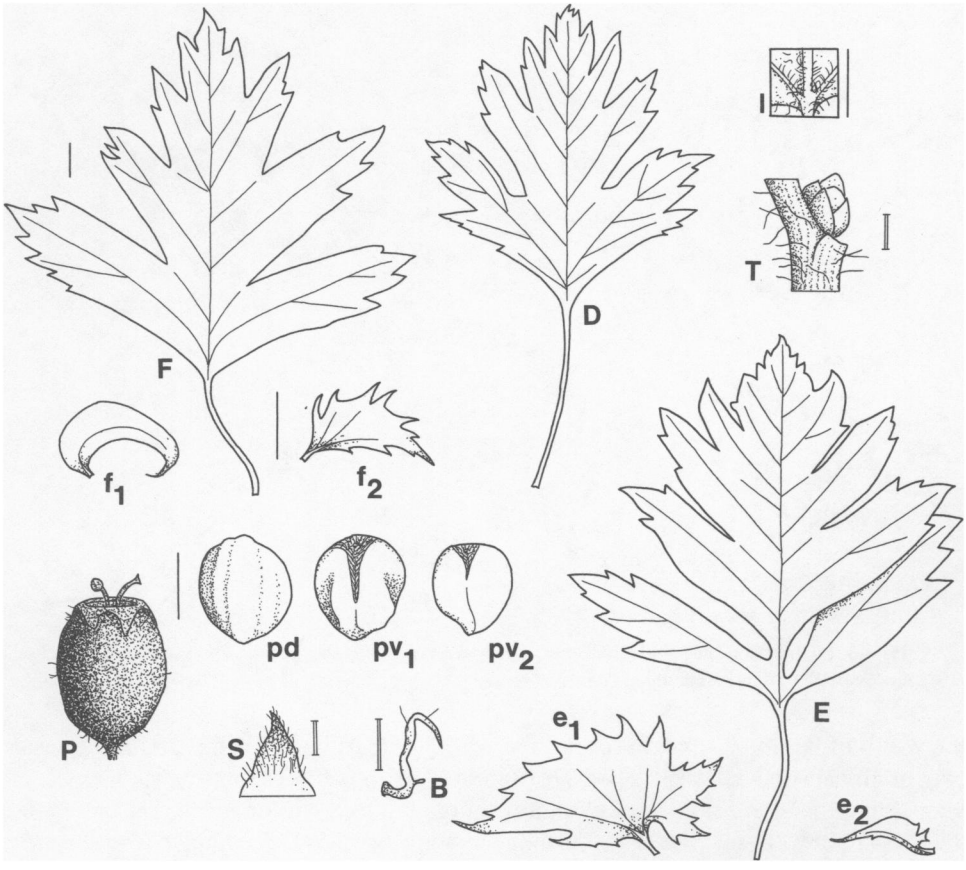


FIG. 42. *Crataegus songarica*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv_1, pv_2: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D, T: *Duthie 19424a*; f_2, S: *Karelin 1462*; F, f_1, P: *Khan s.n.*; B, E, e_1, e_2, I: *Lace 1730*; pv_2: *Makarov 858*; pd, pv_1: *Paulsen 1463*.)

Shrub or small tree. Twigs sparsely villous; thorns up to ca. 1.5 cm long, stout. Buds 1.9–2.5 mm long, 1.6–2.5 mm in diameter. Leaf blades bright green and sparsely villous above, pale green and villous-lanate along major veins beneath, cuneate to truncate at base, lobes more or less acute, margin irregularly crenate-serrate or incised-serrate, with coarse or very coarse teeth, basal pair of veins divergent. Subterminal leaf blades of flowering shoots 3.5–6.2 cm long, 2.7–7.7 cm wide, lobes 3–4 pairs, basal pair 2.6–3.9 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 3–8 teeth in the distal 11/20–1/8, basal pair of sinuses in the basal 2/5–3/10 of lamina; petiole 10–26 mm, 0.3–0.5 times as long as lamina; stipules 7–16 mm long, entire or irregularly serrate with 1–8 teeth. Subterminal leaf blades of short shoots 3.5–6.9 cm long, 3.2–6.0 cm wide, lobes 3–4 pairs, basal pair 2.5–3.6 times as long as wide, extending 0.8–0.9 times

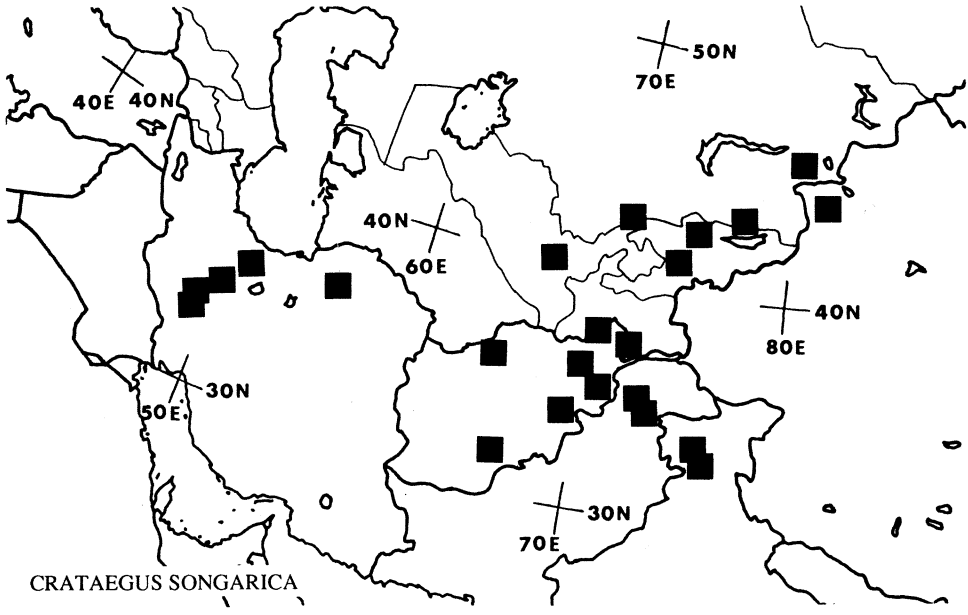


FIG. 43. Distribution of *Crataegus songarica*, based on specimens seen and literature records cited by Pojarkova (1939a) and Rechinger (1969).

the width of lamina to midrib, each lobe with 3–9 teeth in the distal 2/5–3/10, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 17–34 mm; ca. 0.5 times as long as lamina. Leaf blades of elongate shoots 3.2–6.8 cm long, 3.0–7.7 cm wide, lobes 3–5 pairs, basal pair 2.1–2.6 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 5–15 teeth in the distal 3/5–1/4, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 14–29 mm, 0.4–0.5 times as long as lamina; stipules 8–14 mm long, more or less irregularly serrate with 2–18 teeth. Inflorescence 3.0–5.5 cm long, corymbose, 10–19-flowered, lax, sparsely villous; pedicels 4–30 (–50) mm long, more or less villous-lanate; bracts 2.6–3.0 mm long, ca. 0.4 mm wide, 7.5–8.5 times as long as wide, caducous, margin with 0–1 tooth. Hypanthium 3–5 mm long, more or less densely villous-lanate, rarely more or less glabrous; sepals 2.1–3.5 mm long, 2.1–2.8 mm wide, triangular, 0.9–1.4 times as long as wide, margin entire, apex subacuminate, acute or obtuse; petals 4–7 mm long, 4–8 mm wide; stamens 18–20, anthers purple; styles (1–) 2 (–3). Fruit 8–14 mm long, 6–14 mm in diameter, 1.0–1.3 times as long as wide, subglobose or slightly pyriform, blackish purple, more or less villous-lanate, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes (1–) 2 (–3), dorsally sulcate, ventro-laterally smooth or sulcate, hypostyle pilose. Chromosome number: 2n (4x) = 68. Fig. 42.

Additional illustrations: Fig. 16 in Cinovskis (1971); Fig. 26.11–13 in Yü (1974); Figs. LXXVII, LXXVIII in Ovchinnikov (1975).

Phenology. Flowering in April and May, fruiting in July to October.

Distribution (Fig. 43). Iran, Afghanistan, northern Pakistan, northern India, Tadzhikistan, Uzbekistan, Kirgizistan, Kazakhstan, and Sinkiang (I-ning); on limestone, granite, on mountain slopes, in woodlands, and along rivers; 800–2700 m.

REPRESENTATIVE SPECIMENS. **Iran.** Keshvar, *Køie 1548* (C); prov. Luristan, Bisheh, 50 km a Khorrambad orientem versus, *Rechinger 5678* (B, LD). **Afghanistan.** Ghorband, *Køie 2790* (C). **Pakistan.** Kamalban, Kazan valley, distr. Hazara, *Hafiz Khan s.n.* (MEL); Swat, in valle Jabba E Kolalai, *Rechinger 30711* (W). **India.** W Himalaya, *Duthie 19424a* (W); Chamba State, Kilar, Pangi, *Lace s.n.* (B). **U.S.S.R.** TADZHIKISTAN: Pamir, river Pyandzh, *Pojarkova 90* (LE).—UZBEKISTAN: Samarkand obl., Nura Tau, *Spirodonow s.n.* (LE).—KAZAKHSTAN: Dzungarskiy Alatau, fl. Lepsa, *Karelin 320* (LE); Yuzhno-Kazakhstanskaya obl., Tyulkubasski r-n., Talasski Ala-Tau, Taldi-bulak, *Makarov 858* (W); Zailiyskiy Alatau, Semiryechensk prov., Vyernyi distr., *Sokalsky 32* (BM).

Crataegus songarica is closely related to *C. ambigua*, but differs in type of indumentum of leaf blades and hypanthium, type of leaf lobe serration, and number and type of pyrenes. Regel (1871) included several taxa of *Crataegus* in his new *C. oxyacantha* var. *incisa*, viz., *C. monogyna* (*Kotschy pl. Exs. Cypr.* = *Kotschy 720*), *C. pallasii* (tab. XII in Pallas, Fl. ross. 1,1. 1784), *C. pentagyna* (*C. atrofusca*, Hohenacker, *Pl. Exs. Helenendorf*), *C. songarica* (Karelin & Kiriloff, *Pl. Exs. Song.* = *?Karelin & Kiriloff 1462*), and *C. laevigata* (*Mespilus intermedia* Poiret). The holotype of *C. songarica* (*Karelin & Kiriloff 1462*, LE!) is here designated as lectotype of *C. oxyacantha* var. *incisa* Regel.

Concerning the application of the names *Mespilus oxyacantha* var. *intermixta* Wenzig (1874) and *C.* ×*intermixta* (Wenzig) Beck (1892), see 39. *C.* ×*media*.

Crataegus songarica hybridizes with *C. wattiana* (42. *C.* ×*dsungarica*).

IV3. Crataegus subseries **Crataegus.**—TYPE: *Crataegus rhipidophylla* Gandoger.

Crataegus sect. *Oxyacanthae* Loudon, Arbor. frutic. brit. 2: 829. 1838. *Crataegus* ser. *Oxyacanthae* (Loudon) Rehder, Man. cult. trees ed. 2, 370. 1940.—TYPE: *Crataegus oxyacantha* L., nom. rejic. [=*Crataegus rhipidophylla* Gandoger].

Crataegus ser. *Sphaenophyllae* Pojarkova ex Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 506. 1960.—TYPE: *Crataegus sphaenophylla* Pojarkova.

Crataegus ser. *Microphyllae* Pojarkova ex Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 507. 1960.—TYPE: *Crataegus microphylla* Koch.

Crataegus ser. *Kyrtostylae* Pojarkova ex Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 507. 1960.—TYPE: *Crataegus kyrtostyla* Fingerhuth.

Crataegus ser. *Monogynae* Pojarkova ex Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 507. 1960.—TYPE: *Crataegus monogyna* Jacquin.

Crataegus ser. *Stevenianae* Pojarkova ex Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 507. 1960.—TYPE: *Crataegus stevenii* Pojarkova [=*Crataegus monogyna* Jacquin].

Crataegus ser. *Pallasianae* Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 12: 166. 1963.—TYPE: *Crataegus pallasii* Grisebach.

Crataegus ser. *Rosiformes* (errore *Rosaeformes*) Christensen, Feddes Repert. 96: 372. 1985.—TYPE: *Crataegus rosiformis* Janka [=*Crataegus rhipidophylla* Gandoger].

Leaf blades of flowering shoots with 1–3 (–4) pairs of lobes. Inflorescence lax, rarely more or less compact; bracts caducous, margin entire or denticulate. Sepals entire or with 1–6 glandular teeth. Flesh of fruit yellowish; pyrenes 1 (–2), dorsally and ventro-laterally sulcate.

15. Crataegus pallasii Grisebach, Spic. fl. rumel. 1: 89. 1843. *Crataegus monogyna* var. *nigra* Pallas, Fl. ross. 1(1): 26, tab. XII. 1784. *Oxyacantha pallasii* (Grisebach) Roemer, Fam. nat. syn. monogr. 3: 106. 1847. *Crataegus beckeriana* Pojarkova in Komarov, Fl. URSS 9: 506. 1939, nom. superfl.—TYPE: U.S.S.R., Sarepta [Krasnoarmeiski Gorod], *Pallas s.n.* (holotype: LE!).

Shrub. Twigs sparsely villous or glabrous; thorns up to ca. 1.5 cm long, fine. Buds 1.9–2.5 mm long, 1.8–2.1 mm in diameter. Leaf blades bright green and sparsely villous above, pale or greyish green and more or less villous in vein axils beneath, cuneate to more or less truncate at base, lobes acute, margin serrate or incised-serrate, with more or less fine teeth, basal pair of veins divergent. Subterminal leaf blades of flowering shoots 1.8–3.3 cm long, 2.0–3.4 cm wide, lobes 2–3 pairs, basal pair 2.3–3.0 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 6–12 teeth in the distal 2/5–1/4, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 7–14 mm, 0.3–0.5 times as long as lamina; stipules 5–12 mm, serrate with 6–22 teeth. Subterminal leaf blades of short shoots 1.7–3.5 cm long, 1.8–3.3 cm wide, lobes 2–4 pairs, basal pair 2.6–4.0 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 11–15 teeth in the distal 2/3–2/5, basal pair of sinuses in the basal 2/5–3/10 of lamina; petiole 9–31 mm long, 0.5–0.9 times as long as lamina. Leaf blades of elongate shoots 1.7–4.3 cm long, 1.8–4.6 cm wide, lobes 3–4 pairs, basal pair 1.7–2.4 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 12–20 teeth in the distal 4/5–1/3, basal sinuses in the basal 1/5–1/10 of lamina; petiole 9–16 mm, 0.2–0.5 times as long as lamina; stipules 5–10 mm long, serrate with 13–15 teeth. Inflorescence 2–3 (–5) cm long, 9–14-flowered, more or less lax, sparsely villous or glabrous; pedicels 3–25 mm long, sparsely villous; bracts 1.6–2.3 mm long, 0.2–0.4 mm wide, 6.5–11.0 times as long as wide, caducous, margin entire or denticulate with ca. 1 tooth. Hypanthium ca. 3 mm long, sparsely villous; sepals 1.2–2.6 mm long, 1.8–2.3 mm wide, more or less broadly triangular, 0.7–1.2 times as long as wide, margin entire, apex more or less acute; petals ca. 4 mm long and wide; stamens 16–20, anthers purple; styles 1 (–2). Fruit 8–12 mm long, 6–8 mm in diameter, 1.3–1.5 times as long as wide, ovoid-ellipsoidal, purplish black or blackish purple, sparsely villous, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 1 (–2), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number unknown. Figs. 3D, 4D, 44.

Phenology. Flowering in April and May, fruiting in July and August.

Distribution (Fig. 46). Checheno-Ingushskaya ASSR, Dagestan, mouth of Kuban River, and near Volgograd (Krasnoarmeiski Gorod); on mountain slopes, along rivers, and in scrub; 0–300 m.

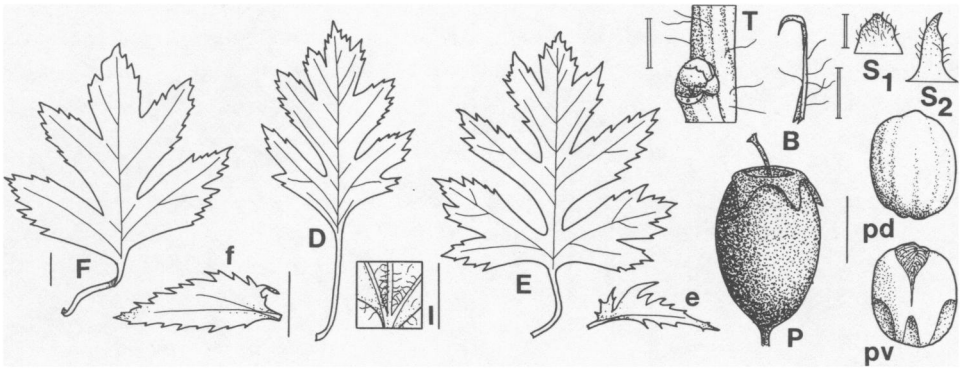


FIG. 44. *Crataegus pallasii*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (S_2: *Prima s.n.*; B, e, S_1: *Prokhanov 511*; D, E, F, f, I, P, T: *Prokhanov 1482*; pd, pv: *Schiffers 15909*.)

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** CHECHENO-INGUSHSKAYA ASSR: Lake Kissik, *Prima s.n.* (LE).—DAGESTAN: Makhachkali District, near Makhachkali, *Prokhanov 29a* (LE); Tarki-Tau, *Prokhanov 511* (LE); *Prokhanov 1482* (LE); Kuban River: sea of Azov, Taman peninsula, *Schiffers 1590a* (LE).

Concerning the application of the name *C. oxyacantha* var. *incisa* Regel (1871), see 14. *C. songarica*.

16. Crataegus karadaghensis Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 22: 167, Fig. 2. 1963.—TYPE: U.S.S.R., the Crimea, near Feodosia, Karadagh, prope stationem scientialem, 21 Sep 1958, *Pojarkova s.n.* (holotype: LE!).

Shrub up to ca. 3 m tall. Twigs glabrous-subglabrous; thorns up to ca. 1 cm long, rare. Buds ca. 1.9 mm long and in diameter. Leaf blades bright green and sparsely villous above, greyish green and villous in vein axils beneath, broadly cuneate to more or less rounded at base, lobes more or less acute, margin serrate or incised-serrate, with fine teeth, basal pair of veins divergent. Subterminal leaf blades of flowering shoots 4.1–5.0 mm long, 4.1–5.5 mm wide, lobes 2–3 pairs, basal pair ca. 2.6 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 7–11 teeth in the distal 3/7–1/4, basal pair of sinuses in the basal 2/5–3/10 of lamina; petiole 23–30 mm long, 0.6–0.7 times as long as lamina; stipules serrate. Leaf blades of elongate shoots 4.3–5.5 cm long, 4.0–5.5 cm wide, lobes 2–3 pairs, basal pair 2.5–2.6 times as long as wide, extending 0.8–0.9 of the width of lamina to midrib, each lobe with ca. 11 teeth in the distal 1/2, basal pair of sinuses in the basal 3/10 of lamina; petiole 20–24 mm long, 0.5–0.6 times as long as lamina; stipules serrate. Inflorescence 3–4 cm long, 8–16-flowered, more or less lax, glabrous; pedicels 5–26 mm long, more or less villous; bracts caducous. Hypanthium more or less villous; sepals ca. 2.3 mm long and wide, triangular,

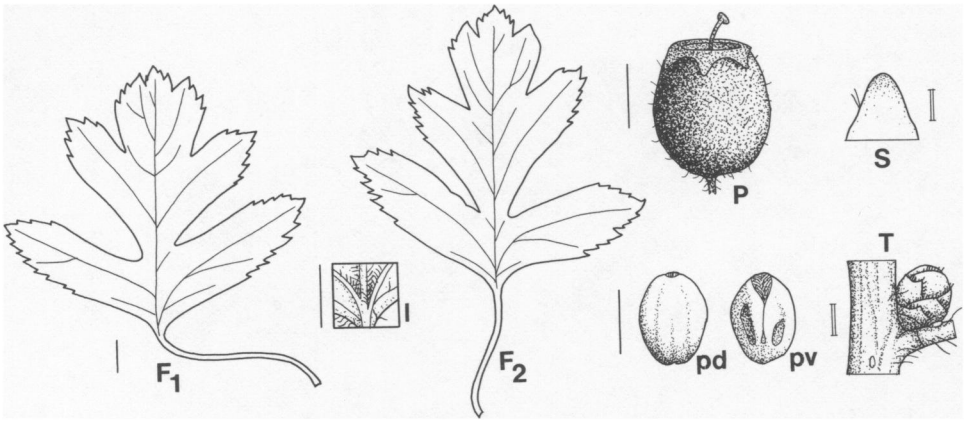


FIG. 45. *Crataegus karadaghensis*. F_1, F_2: subterminal leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig: Solid bar = 5 mm; double bar = 1 mm. (*Pojarkova s.n.*)

about as long as wide, margin entire, apex obtuse; petals ca. 5 mm long, 5–6 mm wide; stamens 17–20, anthers presumably purple; styles 1 (–2). Fruit 8–11 mm long, 8–10 mm in diameter, subglobose to ovoid, 1.0–1.4 times as long as wide, sparsely villous, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 1 (–2), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number unknown. Fig. 45.

Phenology. Flowering in May, fruiting in September.

Distribution (Fig. 46). The Crimea, Sea of Azov (Nogyask), and the lower reaches of the Don (Novocherkassk).

17. Crataegus heterophylloides Pojarkova ex Christensen, sp. nov.—TYPE: TURKEY, prov. Elazig, in collibus pr. Harput, Oct 1865, *Haussknecht s.n.* (holotype: JE!).

Ramunculi glabri vel sparsim villosi. Folia distalia ramorum fertilium 4.0–4.9 mm longa, 3.2–4.4 cm lata, distaliter tri-quinquepartita; stipulae 7–17 mm longae, denticulato-serratae. Inflorescentiae 5–10-florae, laxae, glabrae; bracteae denticulatae, caducae. Sepala integra vel glanduloso-serrata, post anthesin reflexa. Fructus ca. 9 mm longus, ca. 8 mm latus, niger; pyrena 1, rarius 2, dorsaliter et ventraliter sulcata.

Habit unknown. Twigs glabrous or sparsely villous; thorns rare. Buds 1.8–4.6 mm long, 1.6–3.5 mm in diameter. Leaf blades more or less lustrous green and villous along major veins above, pale green and glabrous or villous in vein axils beneath, more or less rounded or narrowly cuneate at base, lobes acute or obtuse, serrate with fine or coarse teeth, basal pair of veins straight or slightly divergent. Subterminal leaf blades of flowering shoots 4.0–4.9 cm long, 3.2–4.4 cm wide, lobes 1–2 pairs, basal pair 2.2–4.4 times as long as wide, extending 0.6–0.8 times the width of lamina to midrib, each lobe entire or with 4–7 teeth in the distal 3/10–1/4, basal pair of sinuses in the apical 1/3–1/2 of lamina; petiole 15–18 mm long,

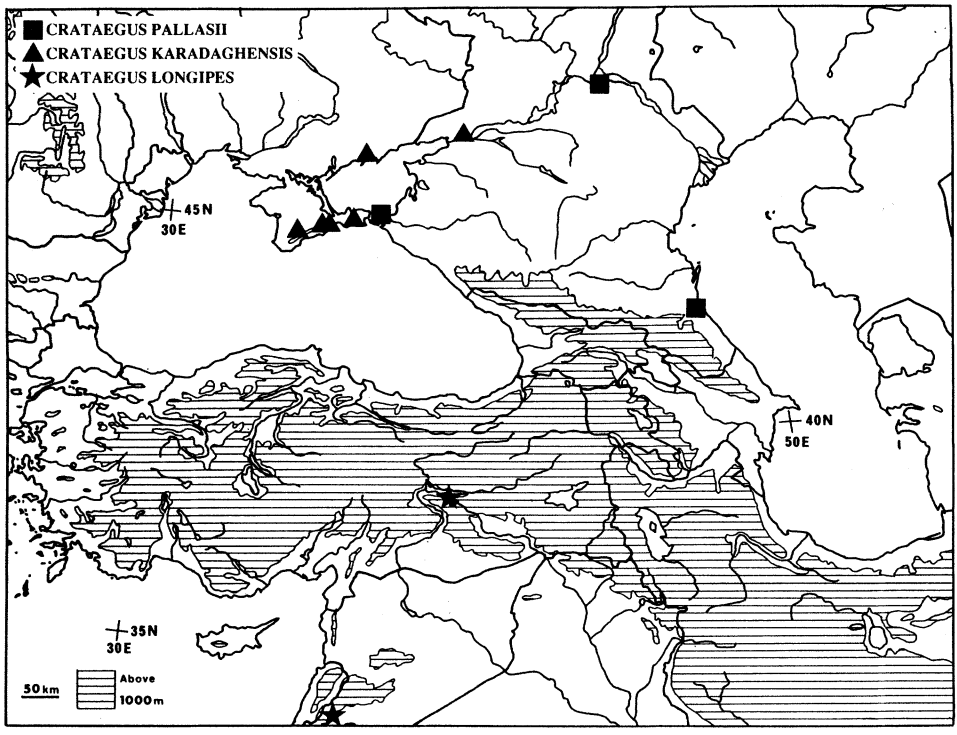


FIG. 46. Distribution of *Crataegus pallasii*, *C. karadaghensis*, and *C. longipes*, based on specimens seen and literature records cited by Pojarkova (1963).

0.3–0.4 times as long as wide; stipules 7–17 mm long, more or less irregularly denticulate-serrate with 2–16 teeth. Inflorescence 3.5–5.0 cm long, 5–10-flowered, lax, glabrous; pedicels 4–35 mm long, glabrous; bracts ca. 3.9 mm long, ca. 0.2 mm wide, ca. 22 times as long as wide, caducous, margin denticulate with ca. 2 teeth. Hypanthium 3–5 mm long, glabrous; sepals 2.6–4.4 mm long, 2.1–2.6 mm wide, more or less narrowly triangular, 1.2–1.9 times as long as wide, margin entire or glandular-serrate with 1–5 teeth, apex acute or acuminate; petals ca. 7 mm long and wide; stamens 15–16, anthers purple; styles 1 (–2). Fruit ca. 9 mm long, ca. 8 mm wide, ca. 1.1 times as long as wide, subglobose, black, crowned by the persistent, recurved sepals; flesh yellowish; pyrenes 1 (–2), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number unknown. Fig. 47.

Phenology. Flowering in May, fruiting in October.

Distribution (Fig. 37). Province of Elazig (Harput) in Asian Turkey.

ADDITIONAL SPECIMENS EXAMINED. **Turkey.** Armenia turcica, Harput, Schuschnas, *Sintenis 465* (JE, W).

Schneider (1906) referred the type of *C. heterophylloides* to *C. heterophylla*. *Sintenis 465* was assigned to *C. heterophylla* by Diapulis (1934) and to *C. atrosanguinea* (=*C. ambigua* subsp. *ambigua*) by Browicz in Davis (1972).

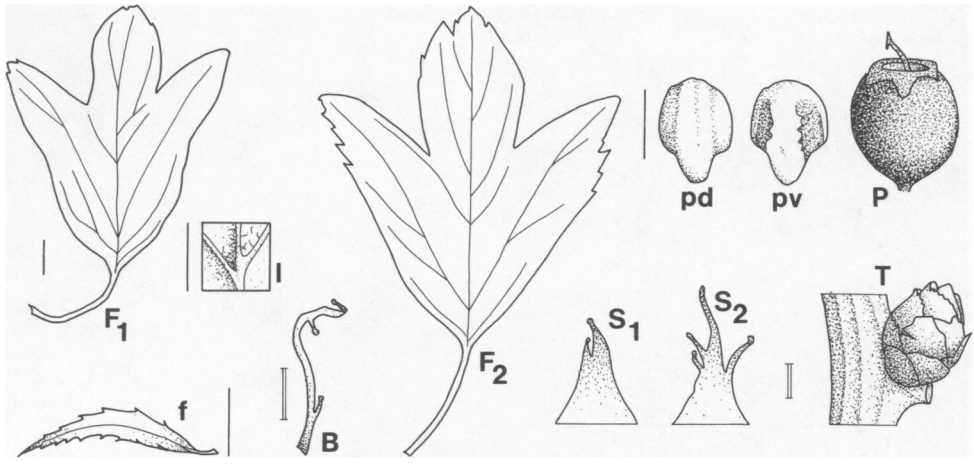


FIG. 47. *Crataegus heterophylloides*. B: bract; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_1, I, P, pd, pv, T: *Haussknecht s.n.*; B, F_2, f, S_1, S_2: *Sintenis* 465.)

18. Crataegus longipes Pojarkova, Novit. Syst. Pl. Vasc. 1964: 171, fig. 6. 1964.—TYPE: TURKEY, Anatolia orientalis, 1890, *Bornmüller s.n.* (holotype: JE!).

Habit unknown. Twigs glabrous; thorns up to ca. 1.3 cm long, fine. Buds 2.1–2.3 mm long, 1.6–2.3 mm in diameter. Leaf blades more or less lustrous dark green and glabrous or more or less villous along major veins above, greyish green and glabrous or villous in vein axils beneath, cuneate or attenuate at base, lobes more or less acute, margin serrate, with more or less coarse teeth, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 2.5–4.2 cm long, 2.0–3.2 cm wide, lobes 2–3 pairs, basal pair 2.2–3.1 times as long as wide, extending 0.5–0.8 times the width of lamina to midrib, each lobe with 1–8 teeth in the distal 1/3–1/16, basal pair of sinuses in the apical 2/5 to basal 1/5 of lamina; petiole 10–20 mm long, 0.4–0.7 times as long as lamina; stipules ca. 7 mm long, entire or denticulate with 1–3 teeth. Subterminal leaf blades 3.9–4.2 cm long, 2.5–4.4 cm wide, lobes 2–4 pairs, basal pair 2.5–3.1 times as long as wide, extending 0.5–0.6 the width of lamina to midrib, each lobe with 3–5 teeth in the distal 1/2–1/6, basal pair of sinuses in the basal 1/2 of lamina; petiole 8–30 mm, 0.2–0.7 times as long as lamina. Leaf blades of elongate shoots 3.3–4.2 cm long, 3.2–4.3 cm wide, lobes 2–3 pairs, basal pair 2.1–3.1 times as long as wide, extending 0.5–0.7 times the width of lamina to midrib, each lobe with 3–7 teeth in the distal 3/10–1/5, basal pair of sinuses in the apical 2/5 to basal 2/5 of lamina; petiole ca. 19 mm long, 0.5–0.6 times as long as lamina. Inflorescence ca. 4.5 cm long, up to 9-flowered, lax, glabrous; pedicels 12–21 mm long, glabrous; bracts caducous. Flowers not seen; sepals 1.8–2.1 mm long, 1.6–2.1 mm wide, triangular, 1.0–1.2 times as long as wide, margin entire, apex obtuse; style 1. Fruit 7–9 mm long, 6–8 mm wide, 1.0–1.3 times as long as wide, subglobose to broadly ellipsoidal, black to purplish black, crowned by the persistent, reflexed sepals; flesh yellowish; pyrene 1, dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number unknown. Fig. 48.

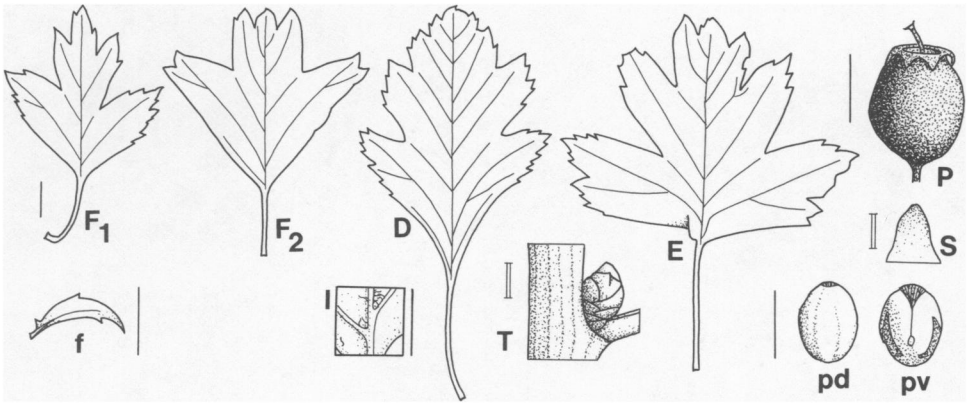


FIG. 48. *Crataegus longipes*. D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_1, f, I, P, pd, pv, S, T: *Bornmüller s.n.;* D, E, F_2: *Gaillardot 1809bis*.)

Phenology. Fruiting in July to October.

Distribution (Fig. 46). Eastern Turkey and Syria (near Damascus); in woodlands and in hedges; up to ca. 1400 m.

ADDITIONAL SPECIMENS EXAMINED. **Turkey.** Kurdistania, Kesin, pr. lacum Gölcük, fontes Tigridis occid., *Handel-Mazzetti 2625* (W). **Syria.** Ouest de Damaskus, *Gaillardot 1809bis* (G, JE).

19. Crataegus microphylla Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 288. 1853, non *Crataegus microphylla* Gandoger, 1871. *Crataegus lagenaria* Fischer & C. Meyer ex Boissier, Fl. orient. 2: 665. 1872, nom. superfl. *Mespilus monogyna* var. *lagenaria* (Boissier) Wenzig, Linnaea 38: 155. 1874. *Crataegus laevigata* subsp. *microphylla* (Koch) Dostál, Folia Mus. Rerum Nat. Bohem. Occid., Bot. 21: 7. 1984.—TYPE: U.S.S.R., Talish, ad marginem sylvarum prope Lenkoran, 1838, *Hohenacker s.n.* (holotype: W!; isotype: BM!).

Crataegus pinnatiloba Lange, Bot. Tidsskr. 13: 22, Tab. III. 1882–1883. *Crataegus monogyna* var. *pinnatiloba* (Lange) Dippel, Handb. Laubholzk. 3: 458. 1893.—TYPE: *Lange s.n.* (holotype: C!; merotypes: C!).

Crataegus pinnatiloba var. *sphaerocarpa* Lange, Bot. Tidsskr. 13: 22. 1882–1883.—TYPE: Tab. III, fig. K in Lange, Bot. Tidsskr. 13. 1882–1883 (lectotype, here designated).

Crataegus monogyna var. *dolichocarpa* Sommier & Levier, Trudy Imp. S.-Petersburgsk. Bot. Sada 16: 134. 1900. *Crataegus microphylla* var. *dolichocarpa* (Sommier & Levier) Handel-Mazzetti, Ann. K.K. Naturhist. Hofmus. 23: 167. 1909.—TYPE: *Sommier & Levier s.n.*, 14 Jun (syntype: P?); *Sommier & Levier s.n.*, 23 Jul (syntype: P?); *Sommier & Levier s.n.*, 24 Jul (syntype: P?).

Crataegus microphylla var. *orthosepala* Haussknecht & Bornmüller ex Bornmüller, Bull. Herb. Boissier, sér. 2, 6: 607. 1906. *Crataegus*

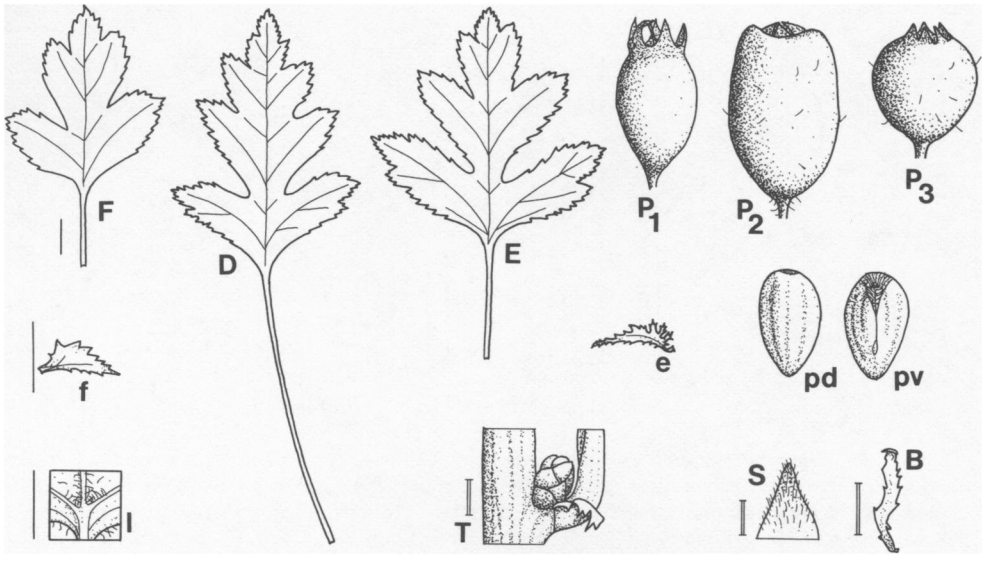


FIG. 49. *Crataegus microphylla*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2, P_3: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, S: *Kukkonen 5584*; I, P_2, pd, pv: *Kukkonen 8345*; D, E, e, F, P_1: *Sintenis 5029b*; f, P_3, T: *Wagenitz 139*.)

orthosepala (Bornmüller) Diapulis, Repert. Spec. Nov. Regni Veg. 34: 62. 1934.—TYPE: *Bornmüller 1764* (lectotype, here designated: B!; isolectotypes: BR! JE! LD! W!).

Crataegus orthosepala var. *glabra* Diapulis, Repert. Spec. Nov. Regni Veg. 34: 62. 1934.—TYPE: *Bornmüller 1765* (holotype: B, destroyed; isotypes: BR! G! JE! LD! W!).

Crataegus lagenaria var. *transcaucasica* Diapulis, Repert. Spec. Nov. Regni Veg. 34: 61, tab. CXLIX.2. 1934.—TYPE: *Weidemann s.n.* (holotype: B, destroyed).

Shrub up to ca. 4 m tall. Twigs glabrous or sparsely villous; thorns up to ca. 1.9 cm long, stout. Buds 1.1–3.2 mm long, 1.1–2.1 mm in diameter. Leaf blades sparsely villous along major veins above and beneath, bright green above, pale green beneath, broadly cuneate, truncate or more or less rounded at base, lobes obtuse or more or less acute, margin crenate-serrate with fine, rarely more or less coarse, teeth, basal pair of veins straight or divergent. Subterminal leaf blades of flowering shoots 1.3–4.3 cm long, 1.2–3.6 cm wide, lobes 1–3 pairs, basal pair 1.4–2.3 times as long as wide and extending (0.3–) 0.6–0.9 times the width of lamina to midrib, each lobe with 5–24 teeth in the distal 4/5–3/8, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 5–20 mm long, 0.4–0.6 times as long as lamina; stipules 2–8 mm long, serrate, with 3–21 teeth. Subterminal leaf blades of short shoots 1.5–4.0 cm long, 1.2–3.5 cm wide, lobes 2–4 pairs, basal pair 1.4–2.5 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe

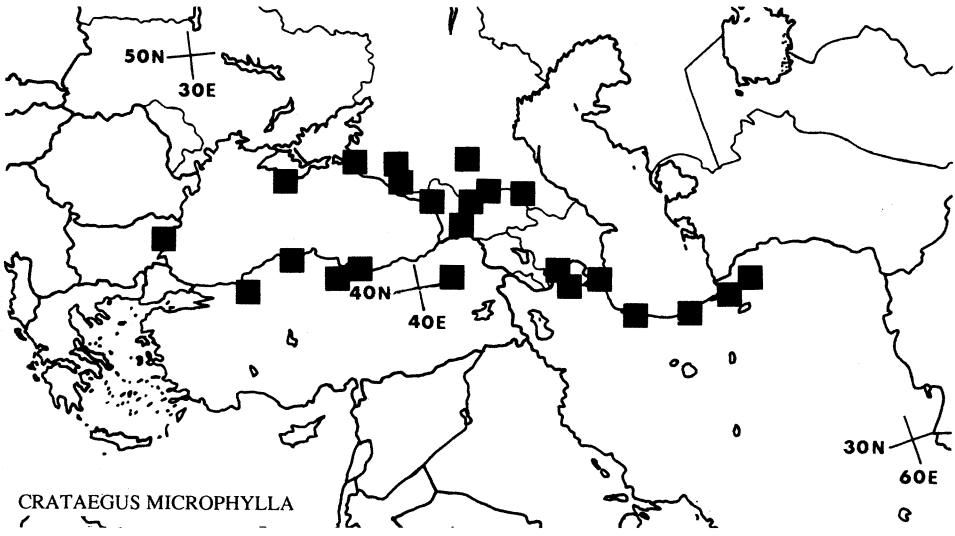


FIG. 50. Distribution of *Crataegus microphylla*, based on specimens seen and literature records cited by Zielinski (1977) and Browicz and Zielinski (1984).

with 8–28 teeth throughout or in the distal 4/5–4/9, basal pair of sinuses in the basal 1/2–4/5 of lamina; petiole 7–40 mm, 0.5–1.1 times as long as lamina. Leaf blades of elongate shoots 1.6–5.7 cm long, 1.8–4.4 cm wide, lobes 1–4 pairs, basal pair 1.6–2.1 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 11–27 teeth throughout or in the distal 9/10–3/5, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 5–22 mm long, 0.3–0.6 times as long as lamina; stipules 5–13 mm long, serrate, with 9–30 teeth. Inflorescence 2–3 cm long, umbellate or more or less corymbose, 3–5 (–9)-flowered, lax, glabrous or sparsely villous; pedicels 8–41 mm, glabrous or sparsely villous; bracts 1.2–2.6 mm long, 0.2–0.5 mm wide, 4.3–15.0 times as long as wide, margin entire or denticulate with 1–9 teeth, caducous. Hypanthium 3–4 mm long, glabrous or sparsely villous; sepals 1.6–4.6 mm long, 1.2–2.6 mm wide, usually narrowly triangular, 0.9–1.9 times as long as wide, margin entire, apex acute, rarely obtuse; petals 4–7 mm long and wide; stamens 16–20, anthers purple; styles 1 (–2). Fruit 7–14 mm long, 5–10 mm in diameter, 1.1–2.0 times as long as wide, subglobose to cylindrical, red, crowned by the persistent, erect sepals; pyrenes 1 (–2), dorsally and ventro-laterally more or less sulcate, hypostyle pilose. Chromosome number: 2n (2x) = 34; 2n = 32. Fig. 49.

Additional illustration: Fig. XXX.7 in Pojarkova (1939a).

Phenology. Flowering in March to May, fruiting in June to October.

Distribution (Fig. 50). Eastern Bulgaria, Asian Turkey, the Crimea, Caucasia, and northern Iran; in open forest with *Alnus, Pterocarya, Parrotia, Fagus, Abies*, in rocky places and along rivers; 0–1450 m. Reports of *C. microphylla* from Czechoslovakia (Dostál 1989) are based on misidentifications of *C. laevigata.*

REPRESENTATIVE SPECIMENS. **Turkey.** Pontus australis, Amasia, *Bornmüller 2375* (JE; paralectotype of *C. microphylla* var. *orthosepala*); Bolu, Koru Hotel, *Kukkonen 8345* (H), *Kukkonen 8346* (H); Vil. Kastambuli, Inebolu, pr. Kerman Chan, *Sintenis 3712* (LD); Vil. Kastambuli, Küre Nahas,

Ervzisler-Kajasi, *Sintenis 5029* (JE); Küre Nahas, pr. Erzschewit, *Sintenis 5029b* (G, JE, LD); Küre Nahas, pr. Tschucha Chan, *Sintenis 5030* (JE, LD); prov. Bolu, Bolu Da., zwischen Bolu u. Düzce, *Wagenitz 139* (B). **U.S.S.R.** The Crimea: distr. Alusha, pag. Luchistoie, Mt Demerdzhi, *Vasák s.n.* (W).—Caucasia: Georgia, Imeretia, fl. Rioni, *Brotherus s.n.* (H; topotype of *C. monogyna* var. *dolichocarpa*); Sev. Osetija, Balta, fl. Terek, *Brotherus 311* (BM, H); Grusiya, Imeretin-skaya, Kutais., Dzevri, *Meffert 19* (LE); distr. Sochi, pag. Iarkonaya scel, *Vasák s.n.* (W); distr. Gulripsh, pag. Ganakhleba, fl. Kodori, 20 km ad aestuarium, *Vasák s.n.* (G); distr. Gulripsh, fl. Amtkel haut procul a confluvio fl. Kodora, *Vasák s.n.* (W); Abchazia, Tsebelda, ca. Jurjeroskoje, *Woronow s.n.* (JE). **Iran.** Mazanderan, 10 km N of Amol, rd from Teheran to Caspian Coast, *Kukkonen 5584* (H); Prov. Gilan, inter Rasht et Rudbar, fl. Safid Rud, *Rechinger 2350* (W); prov. Gorgan, Bender Ges, pr. pag. Ges, *Sintenis 1484* (BM, JE, LD, W).

Crataegus microphylla hybridizes with *C. laevigata* (37. *C.* ×*hafniensis*), *C. meyeri* (39. *C.* ×*chersonensis*), and *C. rhipidophylla* (40. *C.* ×*browicziana*).

20. Crataegus rhipidophylla Gandoger, Bull. Soc. Bot. France 18: 447. 1871.—Type: France, Rhone, Liergues, a la Combe, 2 Oct 1870, *Gandoger 3* (holotype: LY!).

Crataegus oxyacantha L., Sp. pl.: 477. 1753, nom. rejic. *Mespilus oxyacantha* (L.) Crantz, Stirp. austr.: 82. 1769.—Type: Linn 643.12 (lectotype, designated by Dandy in Bot. Soc. Exch. Club Brit. Isles Rep. 12: 867. 1946, photo!). For comments on the typification and application of the name *Crataegus oxyacantha*, see Byatt (1974), Hrabetová-Uhrová (1974), Anonymous (1986), and Greuter (1988).

Crataegus oxyacantha subsp. *monogyna* var. *concolor* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—Type: unknown; no material at E.

Shrub or tree up to ca. 5 m tall. Twigs glabrous or sparsely villous; thorns up to ca. 1.5 cm long, stout. Buds 1.4–3.9 mm long, 1.4–3.2 mm in diameter. Leaf blades more or less lustrous dark green and subglabrous or rarely more or less villous above, pale green or rarely more or less greyish green and villous in vein axils beneath, rarely entirely villous beneath, lobes acute or subacuminate, margin serrate with more or less fine teeth; basal pair of veins divergent, rarely straight. Subterminal leaf blades of flowering shoots 2.0–6.5 cm long, 1.2–6.9 cm wide, lobes 2–4 pairs, basal pair 1.6–3.3 times as long as wide, extending (0.4–) 0.6–0.8 times the width of lamina to midrib, each lobe with 6–25 teeth in the distal 15/16–1/8, basal pair of sinuses in the apical 2/5 to basal 1/5 of lamina; petiole (3–) 9–26 mm long, (0.2–) 0.3–0.7 times as long as lamina; stipules 5–22 mm long, serrate or serrate-denticulate with 8–29 teeth. Subterminal leaf blades of short shoots 1.8–5.0 cm long and wide, lobes 2–3 pairs, basal pair 1.7–3.2 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 7–28 teeth in the distal 6/7–1/3, basal pair of sinuses in the basal 1/2–3/10 of lamina; petiole 10–45 mm long, 0.4–0.9 times as long as lamina. Leaf blades of elongate shoots 2.5–6.4 cm long, 2.4–6.2 cm wide, lobes 2–4 pairs, basal pair 1.9–2.8 times as long as wide, extending (0.4–) 0.6–0.9 times the width of lamina to midrib, with 8–29 teeth in the distal 7/8–2/7, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 10–47 mm long 0.2–0.7 times as long as lamina; stipules 5–25 mm long, serrate with 13–46 teeth. Inflorescence 3.0–4.5 cm long, corymbose, 5–15-flowered, lax, glabrous, rarely more or less villous, corymbose; pedicels 3–32 mm long, glabrous or more or

less villous; bracts 2.1–3.7 mm long, 0.2–0.5 mm wide, 6.5–13.0 times as long as wide, caducous, margin denticulate with 4–9 teeth. Hypanthium 3–5 mm long, glabrous or more or less villous; sepals 1.8–5.5 mm long, 1.2–2.6 mm wide, more or less narrowly triangular, 1.1–2.6 times as long as wide, margin entire, apex more or less acuminate; petals 6–9 mm long, 6–10 mm wide; stamens 14–20, anthers purple; styles 1 (–2). Fruit 8–15 mm long, 5–11 mm in diameter, 1.3–2.0 times as long as wide, subglobose, ellipsoidal or cylindrical, bright or dark red, often angular at base, crowned by the persistent reflexed, spreading or erect sepals; flesh yellowish; pyrenes 1 (–2), dorsally and ventro-laterally sulcate, hypostyle pilose. Figs. 51, 53.

Phenology. Flowering in May and June, fruiting in June to October.

Distribution (Figs. 52, 54). From southern Scandinavia and the Baltic region to France, the Balkan Peninsula, Asian Turkey, Caucasia, the Crimea, and Ukraine, rarely planted as an ornamental within its natural range; on limestone, granite, volcanic rocks; in open woodlands with *Platanus, Fagus, Fraxinus, Pinus, Acer, Sambucus, Salix, Sorbus*; 0–1800 m.

Considerable confusion surrounds the application of the names *C. calycina* Petermann, *C. curvisepala* Lindman, and *C. lindmanii* Hrabetová-Uhrová. Lindman (1904) recorded a new species of *Crataegus* in Sweden for which he used the name *C. calycina* Petermann emend. Lindman. Lindman's species is recognized by densely serrate leaves and fruits with 1 pyrene and erect, acuminate sepals. Franco (1968) accepted Lindman's emendation of *C. calycina* in his contribution to *Flora Europaea* (Tutin et al. 1968). However, in the original description, *C. calycina* Petermann (1846, 1849) is said to have fruits with 3–2 (–1) pyrenes and erect, acuminate sepals. Therefore, Hrabetová-Uhrová (1969c) considered *C. calycina* Petermann conspecific with *C.* ×*macrocarpa* Hegetschweiler (*C. laevigata* × *C. rhipidophylla*), which has fruits with 1–2 (–3) pyrenes and often more or less erect, more or less acuminate sepals. When Byatt (1974) located type material of *C. calycina* Petermann (LAU!, S, W!), it became evident that Hrabetová-Uhrová's contention that *C. calycina* Petermann is synonymous with *C. macrocarpa* was correct. Hrabetová-Uhrová (1969c) renamed *C. calycina* Petermann emend. Lindman as *C. lindmanii* Hrabetová-Uhrová, and Byatt (1974) treated *C. lindmanii* as *C. curvisepala* Lindman subsp. *lindmanii* (Hrabetová-Uhrová) Byatt.

According to Cinovskis (1971), Byatt (1974), Christensen (1985), and Baranec (1986), the year of publication of *C. lindmanii* Hrabetová-Uhrová is 1968; however, Hrabetová-Uhrová (1969a) states that the correct year of publication is 1969, and recently this has been confirmed by Cinovskis (pers. comm.). Therefore, *C. lindmanii* Hrabetová-Uhrová (1969c) is apparently antedated by *C.* ×*lindmanii* Cinovskis in Cinovskis & Knape (1968), but *C.* ×*lindmanii* Cinovskis was published without a Latin diagnosis and thus is an invalidly published name, which cannot displace *C. lindmanii* Hrabetová-Uhrová. *Crataegus* ×*lindmanii* Cinovskis was later renamed *C.* ×*estonica* Cinovskis (1971) (=*C.* ×*media* nothovar. *media*, *C. laevigata* × *C. monogyna* var. *monogyna*).

Holub (1991) has pointed out that *C. curvisepala* Lindman is a superfluous name, because Lindman (1918) included in the protologue of *C. curvisepala* the earlier validly published name *C. rosiformis* Janka (1874). According to Holub, *C. rosiformis* does not include the taxon to which European students of *Crataegus* have applied the name *C. curvisepala* Lindman, and he therefore described this unnamed element as *C. praemonticola* Holub. However, from Holub's detailed description it appears that *C. praemonticola* is conspecific with *C. rhipidophylla*

Gandoger (1871) (including *C. rosiformis* Janka) as circumscribed here, and it is consequently treated as a synonym.

Crataegus rhipidophylla hybridizes with *C. laevigata* (38. *C.* ×*macrocarpa*), *C. microphylla* (40. *C.* ×*browicziana*), and *C. monogyna* (41. *C.* ×*kyrtostyla*).

KEY TO THE VARIETIES OF CRATAEGUS RHIPIDOPHYLLA

1. Fruits crowned by spreading or reflexed sepals. 20a. *C. rhipidophylla* var. *rhipidophylla*.
1. Most or all fruits crowned by erect-suberect sepals. 20b. *C. rhipidophylla* var. *lindmanii*.

20a. Crataegus rhipidophylla var. **rhipidophylla.**

Crataegus monogyna var. *rubra* Pallas, Fl. ross. 1(1): 26. 1784.—TYPE: unknown.

Crataegus laciniata Steven ex Besser, Enum. pl. 58. 1822, non *Crataegus laciniata* Ucria, 1793. *Crataegus monogyna* var. *laciniata* (Besser) Ledebour, Fl. ross. 2(1): 89. 1844, non *Crataegus monogyna* var. *laciniata* Koch, 1853. *Oxyacantha laciniata* (Besser) Roemer, Fam. nat. syn. monogr. 3: 109. 1847. *Mespilus monogyna* var. *laciniata* (Besser) Wenzig, Linnaea 4: 155. 1874. *Crataegus monogyna* subsp. *laciniata* (Besser) Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 121. 1956.—TYPE: *Besser 1510* (holotype: not located). [*Besser 1512* at G!]

Crataegus microphylla Gandoger, Bull. Soc. Bot. France 18: 451. 1871, non *Crataegus microphylla* Koch, 1853. *Crataegus oxyacantha* subsp. *monogyna* var. *microphylla* (Gandoger) Rouy & Camus, Fl. France 7: 6. 1901.—TYPE: *Gandoger 14* (holotype: LY!).

Crataegus rosiformis (errore *rosaeformis*) Janka, Oesterr. Bot. Zeitschr. 20: 250. 1870 [nomen]; Math. Természettud. Közlem. 12: 166. 1874. *Crataegus monogyna* f. *rosiformis* (Janka) Reichenbach, Icon. fl. germ. helv. 25: 25. 1909–1912. *Crataegus curvisepala* Lindman, Sv. fanerogamfl. 307, fig. 189.4, 1918, nom. superfl. *Crataegus monogyna* var. *azarella* f. *rosiformis* (Janka) Hayek, Repert. Spec. Nov. Regni Veg. Beihefte 30: 756. 1926. *Crataegus calycina* subsp. *curvisepala* (Lindman) Franco, Feddes Repert. 79: 39. 1968.—TYPE: *Janka s.n.* (lectotype, designated by Christensen, 1985: BP 81730!; isolectotypes: BP! C! W!). [Baranec (Acta Dendrobiol. 1986: 39. 1986) designated *Janka s.n.* (BP 81726!) as lectotype of *Crataegus rosiformis* Janka.]

Crataegus monogyna var. *mauriannensis* Didier, Bull. Soc. Dauphin. Échange Pl. 9: 385. 1882. *Crataegus mauriannensis* (Didier) Rouy & Camus, Fl. France 7: 6. 1901. *Crataegus oxyacantha* subsp. *monogyna* var. *mauriannensis* (Didier) Léveillé, Bull. Acad. Int. Geogr. Bot. 12: 181. 1912.—TYPE: *Didier Soc. Dauphin. 3595* (lectotype, here designated: P!; isolectotypes: G! LY! MPU, photo: C!).

Crataegus monogyna var. *saxatilis* Pierrat, Bull. Soc. Rochelaise 11 (1889): 31. 1890.—TYPE: *Pierrat Soc. Rochelaise 2624* (holotype: BR!).

Crataegus pseudokyrtostyla Klokov in Zerov, Fl. URSR 6: 574, fig. 11. 1954.—TYPE: *Kotov s.n.* (holotype: KW!).

Crataegus subrotunda Klokov in Zerov, Fl. URSR 6: 575, fig. 12. 1954.—TYPE: *Osidra s.n.* (holotype: KW!).

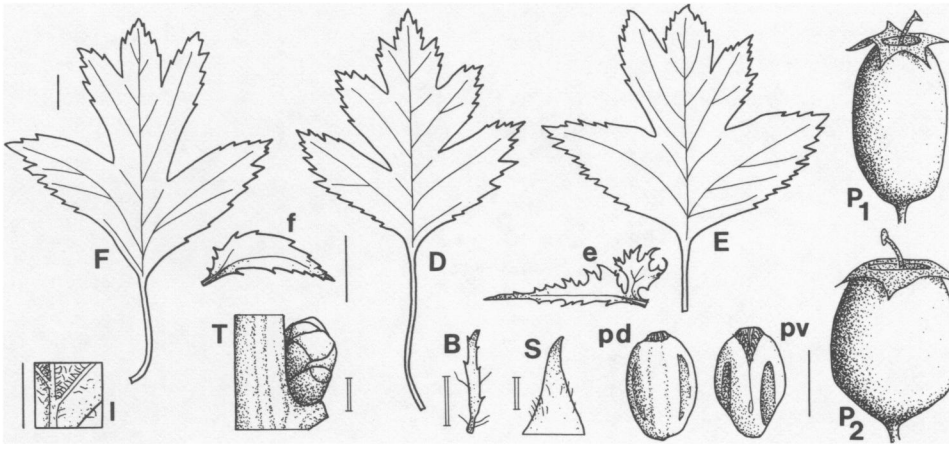


FIG. 51. *Crataegus rhipidophylla* var. *rhipidophylla*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D, E, e: *Christensen A15*; pd, pv: *Christensen s.n.*; B, F, f, I, P_1, S, T: *Gandoger 3*; P_2: *Hrabetová s.n.*)

Crataegus monogyna subsp. *intermedia* var. *hirsutointermedia* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 115. 1956.—TYPE: *Vágner s.n.* (holotype: BP).

Crataegus appressidens Pojarkova, Novit. Syst. Pl. Vasc. 6: 164, fig. 4. 1964.—TYPE: *Davis 21709* (holotype: E!).

Crataegus curvisepala subsp. *carstica* Hrabetová-Uhrová, Biologia (Bratislava) 24: 553, fig. 5. 1969.—TYPE: *Hrabetová s.n.* (holotype: BRNU 427325!).

Crataegus silesiaca Hrabetová-Uhrová, Preslia 45: 109, tab. XI. 1973.—TYPE: *Hrabetová-Uhrová s.n.* (holotype: BRNU 430300).

Crataegus curvisepala subsp. *curvisepala* var. *quadriloba* Petauer, Biol. Vestn. 28: 77. 1980.—TYPE: *Petauer s.n.* (holotype: LJU 97942!).

Crataegus praemonticola Holub, Preslia 63: 79. 1991.—TYPE: *Holub s.n.* (holotype: PR-377724; isotype: herb. Holub).

Each basal lobe of subterminal leaf blades of flowering shoots with 6–16 teeth. Fruit crowned by spreading or reflexed sepals. Chromosome number: 2n (2x) = 34; 2n (3x) = 51; 2n (4x) = 68. Fig. 51.

Additional illustrations: Fig. 30 in Cinovskis (1971); Figs. 15b, 16b in Christensen (1982a); Figs. 2A–C, 6 in Christensen (1985).

Distribution (Fig. 52). From southern Scandinavia and the Baltic region to France, the Balkan Peninsula, Turkey, Caucasia, the Crimea, and Ukraine.

REPRESENTATIVE SPECIMENS. **Poland.** Krakowskie, pow. Olkusz, przy szcsie miedzy Pilica i Smoleniem, *Boratynski s.n.* (C); powiat Nowy Targ, wies Zarabek Nizki, *Jakuszewski s.n.* (C). **Romania.** Oravita, *Borbas s.n.* (W). **Denmark.** Sjælland, Asnæs, *Christensen A17* (C). **Sweden.** Stockholm, experimentalfältets hållplats, *Lindman s.n.* (S). **Finland.** Åland, Geta, Dånö, *Hult s.n.* (H). **Czechoslovakia.** Distr. Trebisov, supra pag. Vinicky, *Chrtek s.n.* (LD); Juhoslovensky kras, supra cavam Domica, *Hrabetová s.n.* (BRNU). **Germany.** Neustrelitz, Dolgen, Dolgener See, *Doll s.n.* (JE); Schlewig-Holstein, Angeln, *Larsen Fl. Germ. Exs. 142* (JE). **The Netherlands.** Oostvorne, près

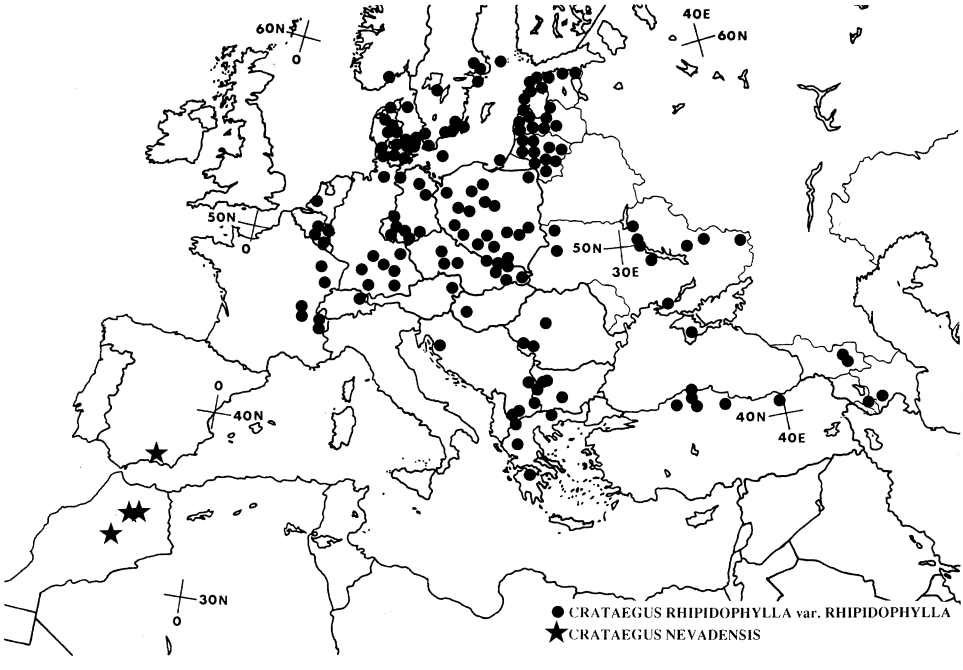


FIG. 52. Distribution of *Crataegus rhipidophylla* var. *rhipidophylla* (incl. *C. rhipidophylla* s.l.) and *C. nevadensis*, based on specimens seen and literature records cited by Cinovskis (1971), Lippert (1978), Gostynska-Jakuszewska and Hrabetová-Uhrová (1983), and Browicz (1986).

de la station biologique Weevers' Duin, *Lawalrée 11672* (BR). **Belgium.** Tintange, bifurcation des routes Strainchamps et Wilty, *Lawalrée 11074* (BR). **Switzerland.** Kt. St. Gallen, Eggersriet, östlich Egg gegen Wiesen ob Tannacker, *Koch 54.543* (BR). **Hungary.** Com. Zala, Budacsony, *Pénzes s.n.* (BP). **Yugoslavia.** Slovenia, Butorajske kosenice pri Crnomlju, *Petauer s.n.* (LJU). **Greece.** Prov. Serres, Mt Vrondous, 19 km NNE of Serres, forest of Laïlia, bwn. EOS refuge and summit of Vrondous, *Christensen 1955* (C). **Estonia.** Ins. Dagö, in der Nähe von Söru küla, *Grøntved 619* (C). **U.S.S.R.** UKRAINE: Wolhyrien, Kovel, Judenfriedhof, *Hayek s.n.* (GB).—GEORGIA: river Aragvi, N of Ananuri, *Kukkonen 12207* (H); bei Tblisi, Kadschora, *Scharrer s.n.* (JE). **Turkey.** distr. Trapezunti, vic. Fol Koei, ad austr.-occid. Trapezunti, *Handel-Mazzetti 408* (W); Samsun, Ladik, *Yildirimli 1103* (G).

20b. Crataegus rhipidophylla var. **lindmanii** (Hrabetová-Uhrová) Christensen, comb. et stat. nov. *Crataegus lindmanii* Hrabetová-Uhrová, Spisy Prír. Fak. Univ. v Brne L33 1968/3, 491: 98, figs. 2, 3. 1969. *Crataegus curvisepala* subsp. *lindmanii* (Hrabetová-Uhrová) Byatt, J. Linn. Soc., Bot. 69: 20. 1974. *Crataegus rosiformis* subsp. *lindmanii* (Hrabetová-Uhrová) Christensen, Feddes Repert. 96: 370. 1985.—TYPE: CZECHOSLOVAKIA, Slovakia, Tatra minor [Nizké Tatry], infimo monto Kamenicná in convalle Svotojanská dolina supra vicum Lipt. Jan, supra rivum Stiavnica, 690 m, 25 Aug 1960, *Hrabetová s.n.* (holotype: BRNU 430242!).

Crataegus ×*dunensis* Cinovskis, Crat. balt. 143, fig. 34. 1971.—TYPE: *Cinovskis 487* (holotype: LATV!).

Crataegus curvisepala subsp. *zlatnensis* Petauer, Biol. Vestn. 28: 77. 1980. *Crataegus rosiformis* nothosubsp. *zlatnensis* (Petauer) Kerguélen & Lambinon

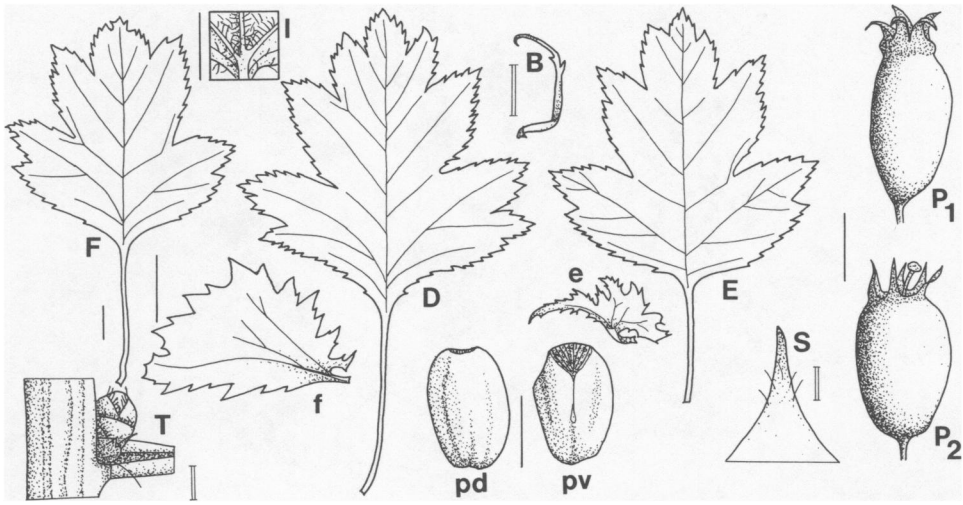


FIG. 53. *Crataegus rhipidophylla* var. *lindmanii*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, S: *Dyring s.n.*; f, P_2, pd, pv, T: *Hülphers s.n.*; E, e, P_1: *Johansson s.n.*; D, F: *Lindman s.n.*)

in Kerguélen, Lejeunia 120: 75. 1987.—TYPE: *Petauer s.n.* (holotype: LJU 98043!).

Each basal lobe of subterminal leaf blades of flowering shoots with 9–25 teeth. All or most fruits crowned by erect-suberect sepals. Chromosome numbers: 2n (2x) = 34; 2n (3x) = 51; 2n (4x) = 68. Fig. 53.

Additional illustrations: Figs. 32, 34 in Cinovskis (1971); Fig. 2E–G in Christensen (1985).

Distribution (Fig. 54). From southern Scandinavia and the Baltic region to France and the northern parts of the Balkan Peninsula.

REPRESENTATIVE SPECIMENS. **Denmark.** Fyn, Fyns Hoved, Korshavn, *Christensen KH21* (C). **Norway.** Holmestrand, *Dyring s.n.* (S, W), Asker, *Lindman s.n.* (S). **Sweden.** Uppland, Lidingö, *Håkanson s.n.* (C); Västergötland, Skövde, Billingen, *Hülphers s.n.* (W); Gotland, Visby, *Lindman Vi2* (S); Stockholm, Liljeholmsberget, hitom Årstadal, *Lindman s.n.* (S). **Germany.** Bavaria, Fränkische Schweiz, Wisent-Tal gegenüber Stempfermühle, *Bornmüller s.n.* (JE). **France.** Deux Sevres, Lezay, *Contre s.n.* (BR); Vosges, Saulxures-sur-Moselotte, *Pierrat Fl. Sel. Exs. 4030* (W). **Poland.** Okolo 3–4 km na NE od Sokolki w polizu Zadworzan, na NE od Bialogostoku, *Browicz s.n.* (C); Pawlikowice k. Wieliczki, *Bulandzianka Pl. Pol. Exs. 39* (GB). **Romania.** Brasov, Mt Cenk, *Borbas s.n.* (BR); Oravita, *Wierzbicki s.n.* (W).

21. Crataegus nevadensis Christensen, sp. nov.—TYPE: SPAIN, Sierra Nevada, S. Geronimo, 20 Jul 1883, *Nilsson s.n.* (holotype: C!).

Ramunculi sparsim villosi vel glabri. Folia distalia ramorum fertilium 1.8–3.0 cm longa, 1.6–3.5 cm lata, profunde quinque-septempartita, rarius novempartita, lobis

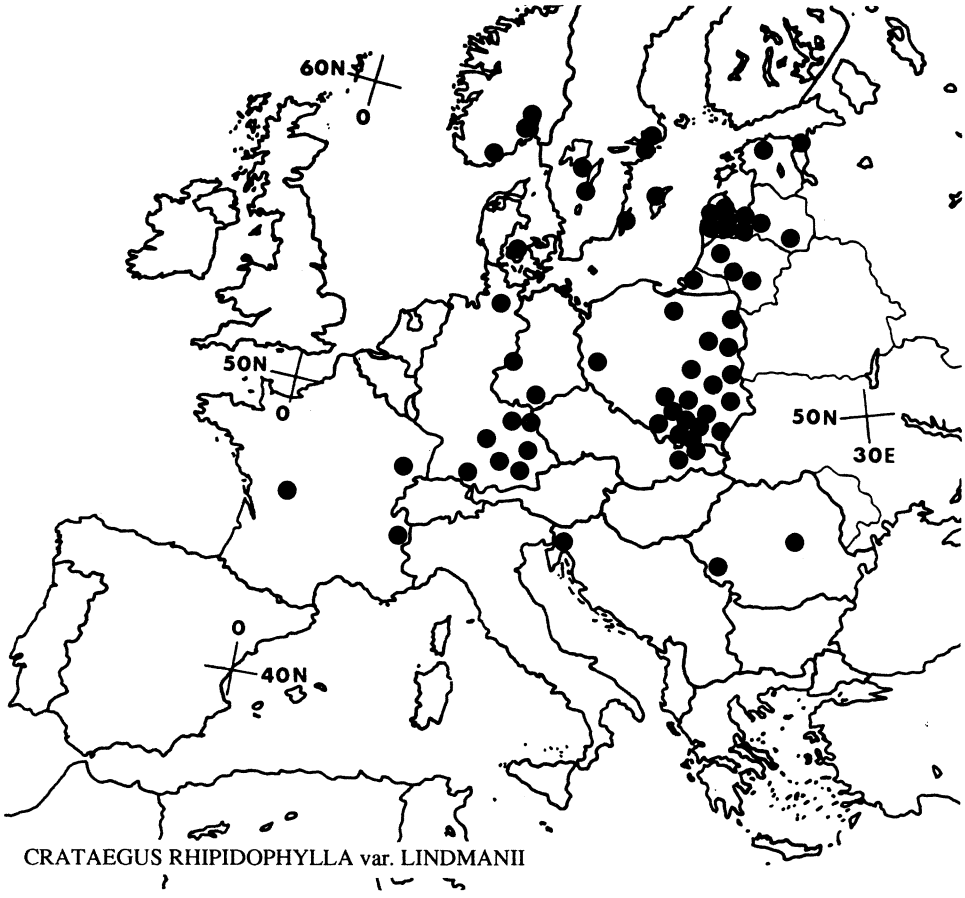


FIG. 54. Distribution of *Crataegus rhipidophylla* var. *lindmanii*, based on specimens seen and literature records cited by Cinovskis (1971), Lippert (1978), and Gostynska-Jakuszewska and Hrabetová-Uhrová (1983).

glanduloso-serratis; stipulae 2–14 mm longae, denticulatae vel serratae. Inflorescentiae 7–11-florae, laxae, villosae vel glabrae; bracteae caducae, denticulatae. Sepala glanduloso-serrata vel integra, post anthesin reflexa. Fructus 6–10 mm longus, 5–8 mm latus, lateritius; pyrena 1, rarius 2 vel 3, dorsaliter et ventraliter sulcata.

Shrub up to ca. 3 m tall. Twigs more or less villous or glabrous; thorns up to ca. 1.2 cm long, more or less stout, rare. Buds 1.2–2.0 mm long, 1.0–1.6 mm in diameter. Leaf blades more or less lustrous dark- or bright-green and sparsely villous above, pale- or greyish green and villous throughout or in vein axils only beneath, attenuate or cuneate at base, lobes acute, margin glandular-serrate with more or less spherical glands, these ca. 0.15 mm in diameter, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 1.8–3.0 cm long, 1.6–3.5 cm wide, lobes 2–3 (–4) pairs, basal pair 2.2–5.0 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 4–17 teeth in the distal 8/9–1/4, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 6–16 mm long, 0.3–0.6 times as long as lamina; stipules 2–14 mm long, denticulate or serrate, with 8–21

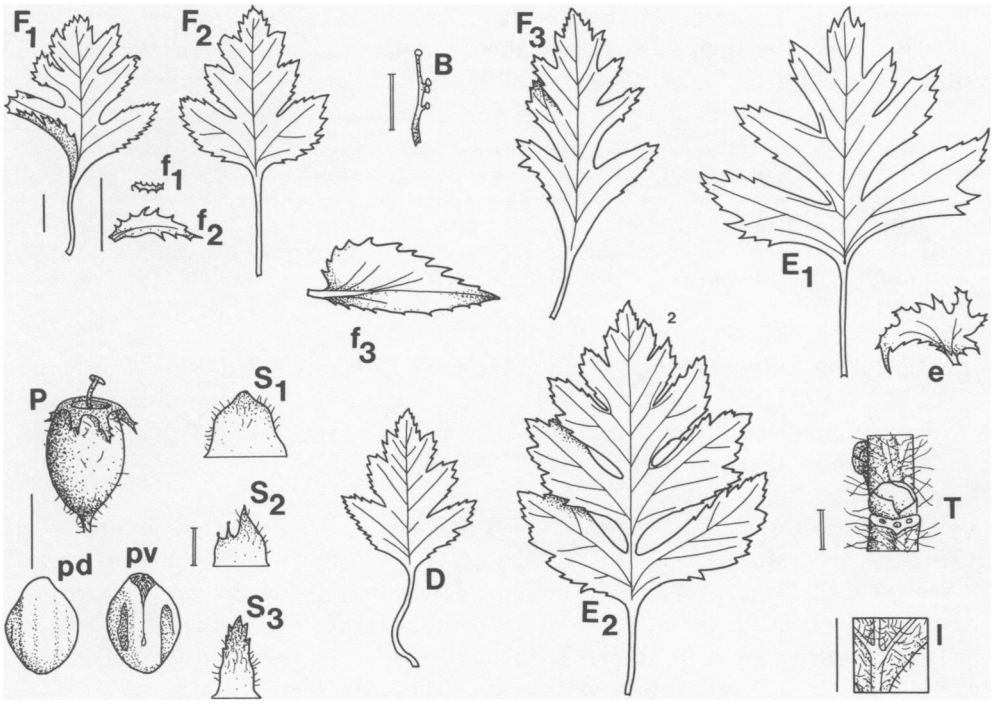


FIG. 55. *Crataegus nevadensis*. B: bract; D: subterminal leaf of short shoot; E_1, E_2: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2, F_3: subterminal leaf of flowering shoot; f_1, f_2, f_3: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2, S_3: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_1, f_1, I, P, pd, pv, S_3, T: *Nilsson s.n.*; E_1, e, f_2: *Lewalle 8933*; B, D, F_2, S_1, S_2: *Reading Univ.-BM exped. 1022*; f_3: *Søndergaard s.n.*; E_2, F_3: *Søndergaard s.n.*)

teeth. Subterminal leaf blades of short shoots 1.9–2.6 cm long, 1.2–2.4 cm wide, lobes 2–3 pairs, basal pair 2.2–3.0 times as long as wide, extending 0.8–0.9 of the width of lamina to midrib, each lobe with 5–12 teeth in the distal 3/5–3/10, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 9–17 mm, 0.5–0.7 times as long as lamina. Leaf blades of elongate shoots 3.1–4.9 cm long, 4.0–5.3 cm wide, lobes 2–4 (–5) pairs, basal pair 1.8–3.3 times as long as wide, extending 0.7–1.0 of the width of lamina to midrib, each lobe with 7–35 teeth in the distal 3/4–1/3, basal sinuses in the basal 3/10–1/10; petiole 9–25 mm, 0.3–0.6 times as long as lamina; stipules 5–16 mm long, denticulate-serrate or serrate with 20–60 teeth. Inflorescence ca. 2.5 cm long, corymbose, 7–11-flowered, more or less lax, more or less villous or glabrous; pedicels 8–24 mm long, more or less villous or glabrous; bracts 1.6–8.5 mm long, 0.2–0.4 mm wide, 9–24 times as long as wide, caducous, margin denticulate with 4–7 teeth. Hypanthium 3–4 mm long, more or less villous or glabrous; sepals 1.9–3.3 mm long, 1.5–2.1 mm wide, broadly to narrowly triangular, 0.8–1.8 times as long as wide, margin glandular-serrate with 1–6 teeth or entire; petals 4–5 mm long and wide; styles 1 (–2), rarely 1 (–3). Fruit 6–10 mm long, 5–8 mm in diameter, 1.1–1.6 times as long as wide, subglobose to ellipsoidal, brick-red, crowned by the persistent, reflexed sepals; pyrenes 1 (–2), rarely 1 (–3), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number unknown. Fig. 55.

Phenology. Flowering in May and June, fruiting in July to October.

Distribution (Fig. 52). Sierra Nevada of southern Spain and Morocco; on limestone, in forest with *Cedrus, Quercus*; 1000–2100 m.

ADDITIONAL SPECIMENS EXAMINED. **Spain.** Sierra Nevada, Cortijo de S. Geronimo, *Porta & Rigo 562 p.p.* (JE). **Morocco.** Zaïan, near Azrou, near base of Mischliffen ski lift, 33°25′N, 05°15′W, *Reading Univ. BM Exped. 1022* (ATH, BM); a 5 km de Ifrane, Menzeh-Ifrane, vers Azrou, *Bocquet 10379* (BM); near Ifrane, *Davis 55040* (BM); Ifrane, *Lewalle 8933* (BM, BR); Khenifra, *Lewalle 10702* (BM), Azrou, *Skottsberg s.n.* (GB); Taffert, 33°42′N, 04°18′W, *Søndergaard s.n.* (C); Bab Bou Idir, 34°04′N, 04°07′W, *Søndergaard s.n.* (C); Foret de Seheb, Azrou, *Søndergaard s.n.* (C), 6 mi SE of Ifrane, *Stanes 28141* (BM).

22. Crataegus pseudoheterophylla Pojarkova in Komarov, Fl. URSS 9: 507, fig. XXX.5. 1939.—TYPE: U.S.S.R., Armenia, distr. Jerevan, prope monasterium Gehart, in faucibus fl. Gjarni-czai, 11 Oct 1936, *Pojarkova 793* (holotype: LE; isotype: LE!).

Shrub or tree up to ca. 3 m tall. Twigs glabrous or sparsely villous; thorns up to ca. 1.4 cm long, stout. Buds 1.1–3.2 mm long, 1.1–2.6 mm in diameter. Leaf blades bright or dark green and sparsely villous along major veins above, pale, greyish green or glaucous green and more or less villous in vein axils beneath, broadly to narrowly cuneate or more or less rounded at base, lobes acute or subacuminate, margin serrate with more or less fine teeth, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 1.7–4.6 cm long, 1.5–4.3 cm wide, lobes 1–3 pairs, basal pair 2.2–4.5 times as long as wide, extending 0.5–0.8 times the width of lamina to midrib, each lobe with 4–14 teeth in the distal 3/4–1/11, basal pair of sinuses in the apical 2/5 to basal 3/10 of lamina; petiole 6–23 mm long, 0.4–0.7 times as long as lamina; stipules 4–11 mm long, regularly or irregularly denticulate or denticulate-serrate with 2–20 teeth, rarely some entire. Subterminal leaf blades of short shoots 2.5–4.0 cm long, 2.3–3.9 cm wide, lobes 2–3 pairs, basal pair 2.4–3.8 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 4–14 teeth in the distal 6/11–1/11, basal pair of sinuses in the apical 3/10 to basal 1/5 of lamina; petiole 14–36 mm long, 0.6–1.0 times as long as lamina. Leaf blades of elongate shoots 2.9–5.4 cm long, 3.1–5.2 cm wide, lobes 2–3 pairs, basal pair 2.1–3.1 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 5–26 teeth in the distal 2/3–2/11, basal pair of sinuses in the basal 1/2–3/10 of lamina; petiole 13–27 mm long, 0.4–0.6 times as long as lamina; stipules 6–21 mm long, regularly serrate-denticulate or serrate with 11–33 teeth. Inflorescence 2–4 cm long, 4–14-flowered, lax, glabrous; pedicels 3–30 mm, glabrous or more or less villous; bracts 1.2–5.3 mm long, 0.2–0.4 mm wide, 3.5–15.0 times as long as wide, caducous, margin denticulate with 1–6 teeth. Hypanthium 3–4 mm long; sepals 1.8–3.0 mm long, 1.2–2.6 mm wide, usually more or less narrowly triangular, 0.9–1.7 times as long as wide, margin entire, rarely with 1–2 glandular teeth, apex acute or obtuse; petals 4–6 mm long and wide; stamens 16–20, anthers purple; styles 1 (–2), very rarely 1 (–4). Fruit 7–11 mm long, 5–9 mm wide, 1.0–1.6 times as long as wide, subglobose to ellipsoidal, red, crowned by the persistent, reflexed sepals; pyrenes 1 (–2), very rarely 1 (–4), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome numbers: 2n (3x) = 51; 2n (4x) = 68. Figs. 56, 58, 59.

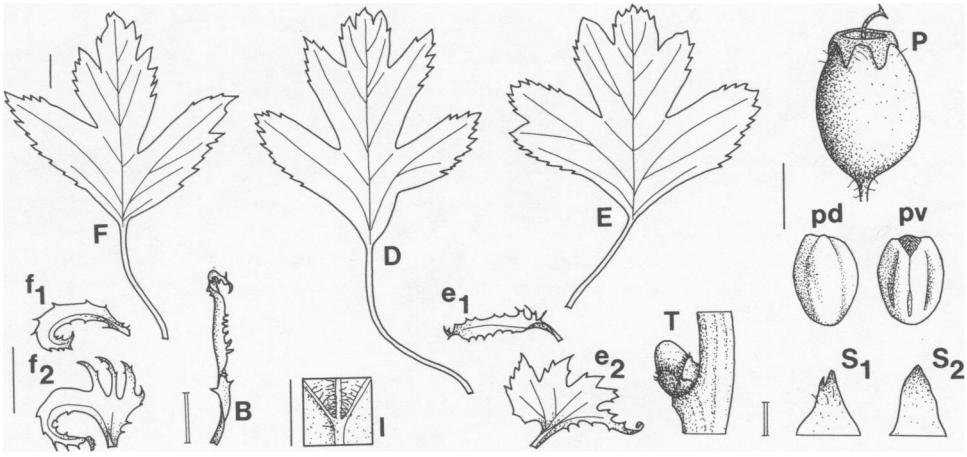


FIG. 56. *Crataegus pseudoheterophylla* subsp. *pseudoheterophylla*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (E, e_1, e_2, f_1, f_2, I, S_1, S_2: *Buhse 382*; pd, pv: *Pojarkova 793*; D, F, P, T: *Pojarkova s.n.;* B: *Strauss s.n.*)

Phenology. Flowering in April to June, fruiting in May to October.

Distribution (Figs. 57, 60). Asian Turkey, Caucasia, Iran, Turcomania, Uzbekistan, Kazakhstan, Kirgizistan, Tadzikistan, Afghanistan, Pakistan?, northern India, and Tibet; in scrub, rocky mountainous tracts, gorges, along rivers, and at field edges; 300–2700 m.

Crataegus pseudoheterophylla is divisible into three subspecies: subsp. *pseudoheterophylla*, subsp. *turcomanica,* and subsp. *turkestanica*. Subspecies *turcomanica* and subsp. *turkestanica* are triploids and apparently the result of unidirectional introgressive hybridization between the tetraploid subsp. *pseudoheterophylla* and an unknown diploid species of ser. *Crataegus* with 1 style per flower. Subspecies *turcomanica* and subsp. *turkestanica* apparently invaded areas in central Asia and/or displaced subsp. *pseudoheterophylla* from parts of its original range.

Crataegus pseudoheterophylla hybridizes with *C. pentagyna* (32. *C.* ×*zangezura*) and *C. wattiana* (42. *C.* ×*tianschanica*).

Key to the Subspecies of Crataegus pseudoheterophylla

1. Pedicels, hypanthium, and fruit more or less villous. Twigs often sparsely villous. Pedicels usually abruptly enlarged just below the fruit. 22c. *C. pseudoheterophylla* subsp. *turkestanica.*
1. Pedicels glabrous or more or less villous in upper part; hypanthium and fruit glabrous or more or less villous. Twigs glabrous. Pedicels not abruptly enlarged.
   2. Subterminal leaf blades of flowering shoots broadly or narrowly cuneate at base, basal pair of sinuses in the basal 1/2 of lamina. Upper part of pedicels, hypanthium, and fruit often more or less villous. 22a. *C. pseudoheterophylla* subsp. *pseudoheterophylla.*
   2. Subterminal leaf blades of flowering shoots more or less rounded or narrowly cuneate at base, basal pair of sinuses in the apical 1/2 of lamina. Pedicels, hypanthium, and fruit glabrous. 22b. *C. pseudoheterophylla* subsp. *turcomanica.*

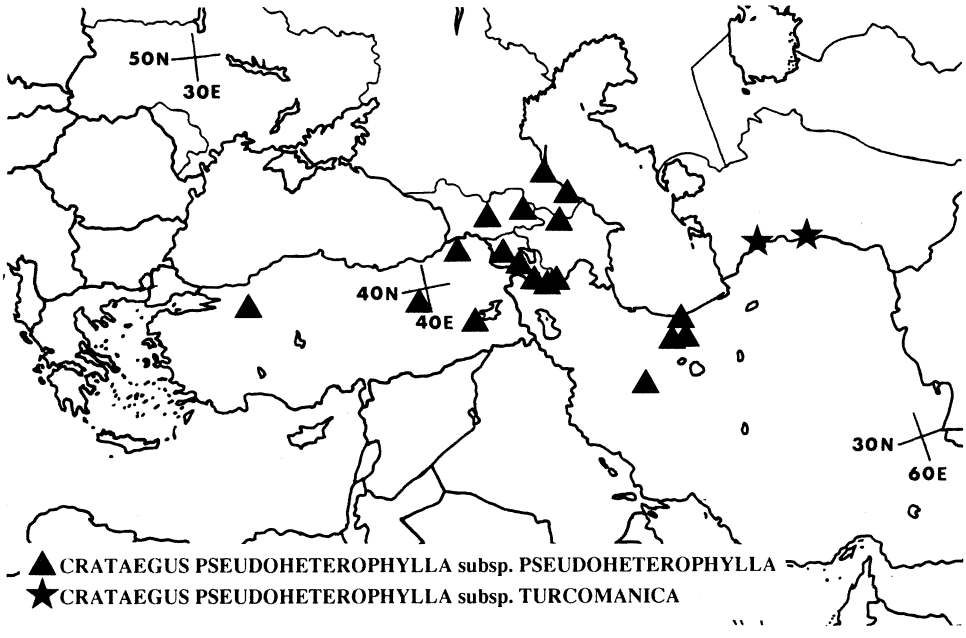


FIG. 57. Distribution of *Crataegus pseudoheterophylla* subsp. *pseudoheterophylla* and *C. pseudoheterophylla* subsp. *turcomanica*, based on specimens seen and literature records cited by Grossheim (1952) and Davis (1982).

22a. Crataegus pseudoheterophylla subsp. **pseudoheterophylla.**

Twigs glabrous. Subterminal leaf blades of flowering shoots broadly to narrowly cuneate at base, basal pair of sinuses in the basal 1/2–3/10 of lamina. Pedicels glabrous or more or less villous in upper part, not abruptly enlarged just below the fruit. Hypanthium glabrous or more or less villous. Fruit glabrous or more or less villous. Chromosome number: 2n (4x) = 68. Fig. 56.

Distribution (Fig. 57). Asian Turkey, Armenia, Georgia, Azerbaijan, Dagestan, and western Iran; 300–2000 m. Reports of this subspecies from Afghanistan (Rechinger 1969: 63) are probably based on misidentifications of *C. pseudoheterophylla* subsp. *turkestanica*.

REPRESENTATIVE SPECIMENS. **U.S.S.R.** ARMENIA: Daralaghes, Alagez, *Pojarkova 63* (LE); distr. Megri, *Pojarkova 779* (LE); distr. Jerevan, monasterium Gekhart, *Pojarkova s.n.* (LE).—GEORGIA: Grusyia, *Pojarkova 40* (LE).—AZERBAIJAN. Nakhichevan: Betschenagh b. Nakhichevan, *Buhse 382* (LE); Norashenski r-n, Akhura, Kabakhl-czai, *Grossheim s.n.* (LE); inter Ordubad et oustodiam Kartschevan, in fauce fl. Araxis, *Karjagin s.n.* (LE).—DAGESTAN: Makhachkali r-n, Tarki, *Prokhanov 1325* (LE); Derbent, *Trauttvetter 147* (LE). **Iran.** In fauce Dudera prope Teheran, *Kotschy 692* (W); prov. Mazanderan, distr. Kojur, inter Kinch et Dasht-e Nazir, *Rechinger 6655a* (LD); prov. Kazvin, in ditione opp. Karaj, *Rechinger 6715* (LD); ca. 1/2 Meile südwestlich Arak, *Strauss 147* (JE); Arak, Bürüdschird, *Strauss s.n.* (JE).

22b. Crataegus pseudoheterophylla subsp. **turcomanica** (Pojarkova) Christensen, comb. et stat. nov. *Crataegus turcomanica* Pojarkova in Komarov, Fl.

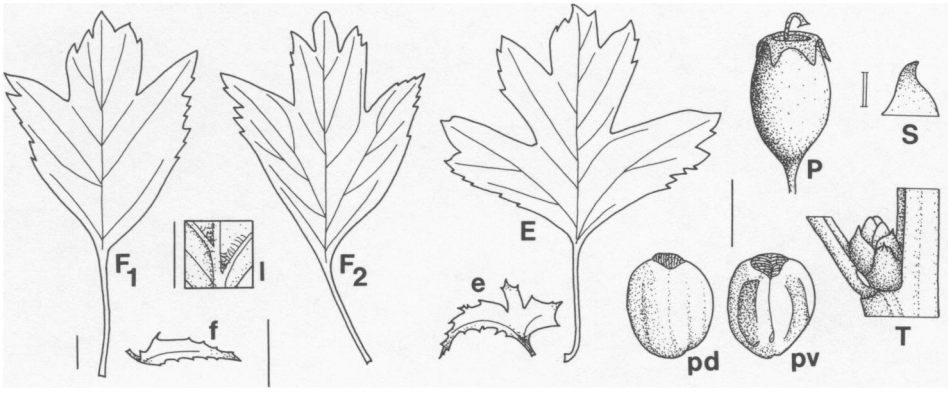


FIG. 58. *Crataegus pseudoheterophylla* subsp. *turcomanica*. E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_1, F_2, f, P, pd, pv: *Sintenis 1835a*; E, e, T: *Sintenis 1835b*; I: *Tschernjakovskaja 704*.)

URSS 9: 507, fig. XXX.4. 1939.—TYPE: U.S.S.R., Turcomania, in montibus Kopet-dagh, in angustiis Czuli, 9 May 1911, *Seidmuratov s.n.* (holotype: LE; isotype: LE!).

Twigs glabrous. Subterminal leaf blades of flowering shoots more or less rounded or narrowly cuneate at base, basal pair of sinuses in the apical 2/5–1/2 of lamina. Pedicels glabrous, not abruptly enlarged just below fruit. Hypanthium glabrous. Fruit glabrous. Chromosome number: 2n (3x) = 51. Fig. 58.

Distribution (Fig. 57). Turcomania (Kopet Dagh). Reports of this subspecies from Afghanistan (Rechinger 1969: 63) are probably based on misidentifications of *C. pseudoheterophylla* subsp. *turkestanica*.

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** TURCOMANIA: Kopet-Dagh, Zakaspiskaya Oblast: ushchele Chuli, *Lipski 1871* (LE); Kisyl Arvat, Karakala, in valle Joldere, *Sintenis 1835a* (BM, JE, LD, UPS, W; paratypes of *C. turcomanica*), *Tschernjakovskaja 706* (LE); Kisyl Arvat, in valle Joldere, *Sintenis 1835b* (JE, LD; paratypes of *C. turcomanica*).

22c. Crataegus pseudoheterophylla subsp. **turkestanica** (Pojarkova) Christensen, comb. et stat. nov. *Crataegus turkestanica* Pojarkova in Komarov, Fl. URSS 9: 507. 1939.—TYPE: U.S.S.R., Uzbekistan, distr. Samarkand, Aman-Kutan, 19 Apr 1915, *Fedtschenko 363* (holotype: LE; isotype: LE!).
Crataegus monogyna var. *lanigera* Popov, Trudy Prikl. Bot. 22: 438. 1929, non *Crataegus monogyna* var. *lanigera* Beck, 1887.—TYPE: unknown.

Twigs glabrous or sparsely villous. Subterminal leaf blades of flowering shoots more or less broadly cuneate, basal pair of sinuses in the apical 2/5 to basal 1/3 of lamina. Pedicels more or less villous, usually abruptly enlarged just below fruit. Hypanthium more or less villous. Fruit more or less villous. Chromosome number: 2n (3x) = 51. Figs. 3B, 4A, 59.

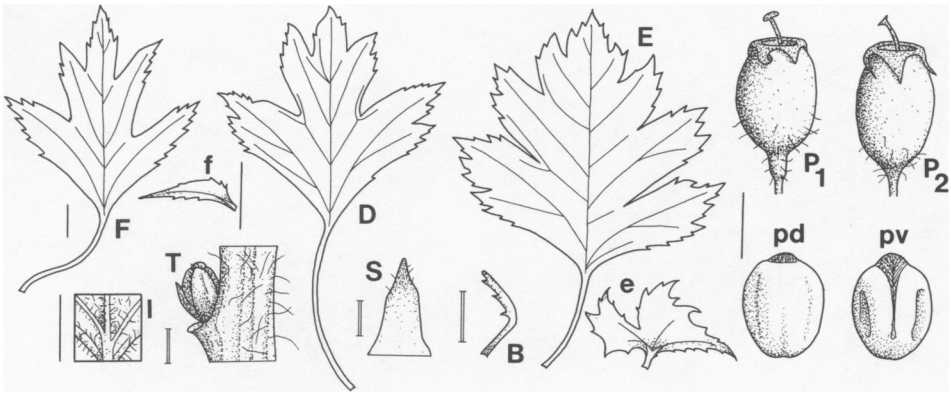


FIG. 59. *Crataegus pseudoheterophylla* subsp. *turkestanica*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, I, S: *Botschantzev 885*; pd, pv: *Czerniakowska 200*; F, f: *Hunter-Weston 10209*; E, e, P_2: *Iljin 615*; D: *Popow 291bis*; P_1, T: *Strauss s.n.*)

Additional illustration: Fig. LXXVI in Ovchinnikov (1975).

Distribution (Fig. 60). Northern Iran, Turcomania, Uzbekistan, southeastern Kazakhstan, Kirgizistan, Tadzikistan, Afghanistan, Pakistan?, northern India, and Tibet; 550–2700 m.

REPRESENTATIVE SPECIMENS. **Iran.** Inter Neyshapur et Mashhad, *Bunge s.n.* (G); prov. Khorasan, vil. Jam, ushchele Kuh-e Bezg, *Czerniakowska 200* (LE); Khorasan, inter Bojnurd et Tappeh-ye Moraveh, *Rechinger 32568* (LD); supra Arak, *Strauss s.n.* (JE). **U.S.S.R.** TURCOMANIA: Ashkhabad, Saratowka, *Sintenis 991* (JE, LD).—UZBEKISTAN: Kuhraminskogo khr., Tashkent-Kokand, unknown collector *s.n.* (W); Tashkent, *Minkwitz 99* (LE).—KAZAKHSTAN: Turkestanski r-n, gori Karatau, *Lipschitz 327* (LE); khr. Kara-Tau, *Yarmolenko 78* (LE).—KIRGIZISTAN: Chatkalski r-n, Chatkala, *Abolin 57* (LE); Maylisu, *Koschinsky 3028* (LE).—TADZIKISTAN: Yuzni Tadzikistan, gora Imam-askari k. Z. ot kishl. Darai-imam, *Botschantzev 885* (LE); Pamir, Zeravshanski khr., distr. Samarkand, situ a septem. pag. Karatepe, *Vasák s.n.* (W); W Hissar Mts, system of Tupalang river, near Sintschob, *Vassilczenko 201* (LE). **Afghanistan.** Obeh, *Køie 3754* (C). **India.** KASHMIR: Kishtwar, *Hooker f. & Thomson s.n.* (LD, MEL, W); Srinagar, *Kaul 41694* (BR), Harwan, Jhelum valley, *Keshvanand 926* (MEL). **China.** Tibet, *Hügel 2092* (W).

23. Crataegus monogyna Jacquin, Fl. austriac. 3: 50, tab. 292. 1775. *Mespilus monogyna* (Jacquin) Allioni, Fl. pedem. 2: 141. 1785. *Crataegus apiifolia* Medikus, Gesch. Bot. 83. 1793, nom. superfl., non *Crataegus apiifolia* Michaux, 1803. *Crataegus dissecta* Borkhausen, Arch. Bot. Leipzig 1(3): 86. 1798, nom. superfl. *Crataegus oxyacantha* var. *monogyna* (Jacquin) Wahlenberg, Fl. suec. 1: 307. 1826. *Oxyacantha monogyna* (Jacquin) Roemer, Fam. nat. syn. monogr. 3: 107. 1847. *Oxyacantha apiifolia* (Medikus) Roemer, Fam. nat. syn. monogr. 3: 108. 1847. *Crataegus oxyacantha* subsp. *monogyna* (Jacquin) Rouy & Camus, Fl. France 7: 5. 1901. *Crataegus monogyna* var. *typica* f. *dissecta* (Borkhausen) Buia in Savulescu, Fl. reip. pop. rom. 4: 262. 1956. *Crataegus monogyna* var. *dissecta* (Borkhausen) Gostynska-Jakuszewska, Roczn. Dendrol. 31: 12.

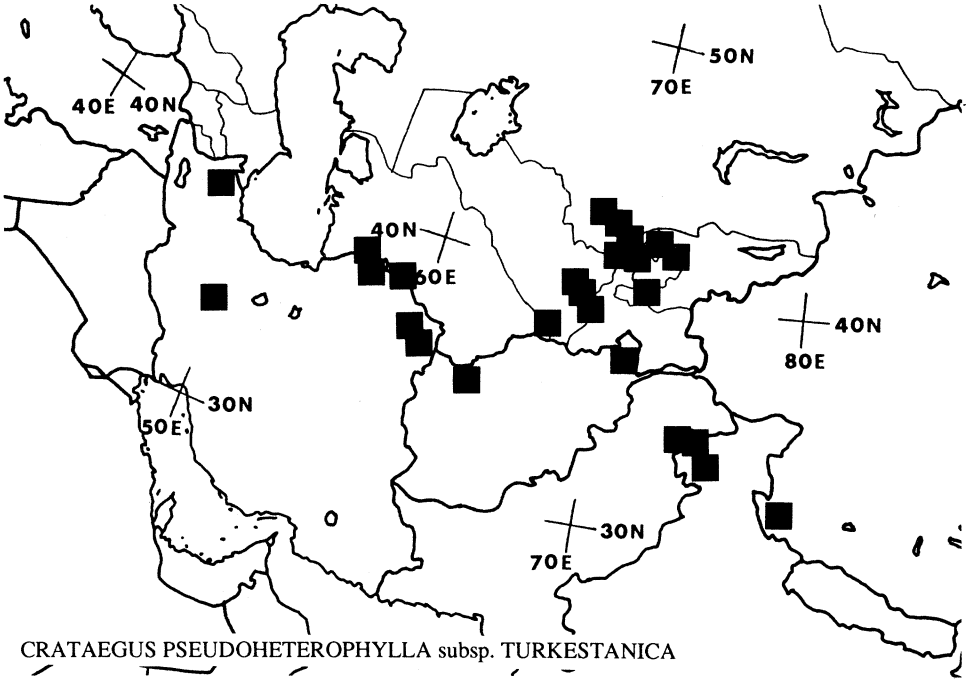


FIG. 60. Distribution of *Crataegus pseudoheterophylla* subsp. *turkestanica*.

1978.—TYPE: AUSTRIA, *Jacquin s.n.* (lectotype, here designated: BM!; isolectotype: TO, photo: C!).

Crataegus oxyacantha subsp. *monogyna* var. *discolor* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Shrub or tree up to ca. 10 m tall. Twigs glabrous or villous; thorns up to ca. 2.4 cm long, more or less stout. Buds 1.1–2.8 mm long, 1.1–2.5 mm in diameter. Leaf blades often more or less coriaceous, more or less lustrous dark or bright green and glabrous or villous above, greyish green or glaucous-green and villous throughout or only along major veins and in vein axils beneath, attenuate or cuneate or rarely more or less rounded at base, lobes acute or obtuse, margin irregularly serrate, with more or less coarse teeth, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 1.1–5.7 cm long, 0.8–6.0 cm wide, lobes 1–3 pairs or very rarely absent, basal pair 1.3–4.2 times as long as wide, extending 0.5–1.0 times the width of lamina to midrib, each lobe entire or with 1–9 teeth in the distal 1/14–2/5, basal pair of sinuses in the apical 1/5 to basal 1/5 of lamina; petiole 1–30 mm long, 0.1–0.6 times as long as lamina; stipules 3–16 mm long, entire or denticulate, with 1–8 teeth. Subterminal leaf blades of short shoots 1.1–5.7 cm long, 0.8–5.4 cm wide, lobes 1–4 pairs, basal pair 1.8–3.2 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe entire or with 1–14 teeth in the distal 1/13–1/2, basal pair of sinuses in the apical 1/10 to basal 1/10 of lamina; petiole 4–47 mm long, 0.2–0.8 times as long as lamina. Leaf blades of elongate shoots 2.2–6.2 cm long, 2.2–6.4 cm wide, lobes 2–3 pairs, basal pair 1.6–3.6 times as long as wide,

extending 0.5–0.9 times the width of lamina to midrib, each lobe with 2–16 teeth in the distal 1/11–2/3, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 7–26 mm long, 0.3–0.5 times as long as lamina; stipules 4–21 mm long, more or less regularly serrate, with 2–36 teeth. Inflorescence 1.5–5.0 cm long, corymbose, 4–15-flowered, lax, glabrous or villous; pedicels 4–32 mm long, glabrous or villous; bracts 0.5–7.9 mm long, 0.1–0.5 mm wide, 5.0–25.0 times as long as wide, caducous, margin entire or denticulate with 1–4 teeth. Hypanthium 2–4 mm long, glabrous or villous; sepals 1.2–4.4 mm long, 1.2–2.6 mm wide, usually more or less narrowly triangular, 0.7–1.8 times as long as wide, margin entire, apex acute or obtuse; petals 3–7 mm long, 4–7 mm wide; stamens 15–20, anthers purple; styles 1 (–2). Fruit 6–11 mm long, 5–10 mm in diameter, 1.0–2.0 times as long as wide, subglobose to cylindrical, bright or dark red, crowned by the persistent, reflexed, rarely erect to spreading, sepals; pyrenes 1 (–2), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome numbers: 2n = 32; 2n (2x) = 34; 2n (3x) = 51. Figs. 61, 63.

Phenology. Flowering in February to June, rarely in November to January in northern Africa and England; fruiting in June to October.

Distribution (Figs. 62, 64). From southern Scandinavia to northern Africa, Caucasia, the Crimea, Turkey, the Middle East, northern Iraq, and northwestern Iran; on calcareous rocks, micaceous schist, volcanic rocks, as well as granite and other siliceous rocks; in openings in forest with *Fagus, Quercus, Pinus, Cedrus*, in macchie, garrigue, meadows, along rivers, in rocky places, at field edges, in hedges, and at roadsides; 0–1900 m.

Crataegus monogyna is often divided into several infraspecific taxa and/or two or more species (e.g., Klokov 1954; Pénzes 1956; Pojarkova 1960, 1964; Franco 1968; Cinovskis 1971; Byatt 1977). However, much of the variation follows clinal patterns, e.g., size of leaf blades and fruits, or is not correlated with geography, e.g., petal size, form of leaf blades, texture of leaf blades, and color of lower leaf surface. In keeping with the broader species concept accepted here, only two varieties are recognized. See Christensen (1984) for a study of the variation of *C. monogyna* in the Balkan Peninsula and Byatt (1977) for an extensive discussion of the variation of *C. monogyna* in Europe.

Crataegus monogyna is known to hybridize with *C. tanacetifolia* (28. *C.* ×*yosgatica*), *C. azarolus* (30. *C.* ×*sinaïca*), *C. orientalis* (31. *C.* ×*albanica*), *C. heldreichii* (32. *C.* ×*killinica*), *C. pentagyna* (34. *C.* ×*rubrinervis*), *C. meyeri* (36. *C.* ×*armena*), *C. laevigata* (39. *C.* ×*media*), *C. rhipidophylla* (41. *C.* ×*kyrtostyla*), and *C. nigra* (44. *C.* ×*lambertiana*). It is evident that *C. monogyna* represents a good example of a so-called "compilo-species" (Harlan & De Wet 1963), i.e., a genetically agressive species that through introgressive hybridization plunders related species of their genes and invades their habitats and ranges. This may explain in part the great variability of *C. monogyna* and also its wide distribution.

Key to the Varieties of Crataegus monogyna

1. Leaf blades villous in vein axils or along major veins beneath. Twigs, inflorescence, hypanthium, and fruit glabrous or villous. 23a. *C. monogyna* var. *monogyna*.
1. Leaf blades more or less densely villous beneath. Twigs, inflorescence, hypanthium, and fruit villous. 23b. *C. monogyna* var. *lasiocarpa*.

23a. Crataegus monogyna var. **monogyna.**

Crataegus oxyacantha var. *biflora* Weston, Bot. Univ. 1: 79. 1770. *Crataegus monogyna* f. *biflora* (Weston) Rehder, J. Arnold. Arbor. 1: 263. 1920.—TYPE: unknown.

Crataegus maura L.f., Suppl. pl. 231. 1781. *Mespilus maura* (L.f.) Poiret, Encycl., suppl. 4: 73. 1816. *Mespilus monogyna* var. *maura* (L.f.) Wenzig, Linnaea 38: 159. 1874. *Crataegus oxyacantha* subsp. *maura* (L.f.) Maire in Jahandiez & Maire, Cat. pl. Maroc 2: 334. 1932.—TYPE: LINN 643.19 (holotype).

Crataegus triloba Poiret, Voy. Barbarie 2: 176. 1789; Reise Barbarey 2: 198. 1789. *Crataegus oxyacantha* var. *triloba* (Poiret) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 118. 1871. *Mespilus oxyacantha* var. *triloba* (Poiret) Wenzig, Linnaea 38: 163. 1874.—TYPE: *Poiret s.n.* (holotype: P-Herb. Moquin-Tandon!).

Crataegus monogyna var. *acutiloba* Kerner, Darstell. ausländ. Bäume. 1796. *Crataegus oxyacantha* subsp. *monogyna* var. *acutiloba* (Kerner) Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912. *Crataegus monogyna* subsp. *acutiloba* (Kerner) Baranec, Biologia (Bratislava) 38: 857. 1983.—TYPE: unknown.

Mespilus elegans Poiret, Encycl. 4: 439. 1798. *Mespilus oxyacantha* var. *incisa* Mérat, Nouv. fl. env. Paris ed. 2, 2: 298. 1821, non *Mespilus oxyacantha* var. *incisa* Regel, 1871. *Oxyacantha elegans* (Poiret) Roemer, Fam. nat. syn. monogr. 3: 108. 1847. *Mespilus monogyna* var. *elegans* (Poiret) Koch, Dendrol. 1: 160. 1869. *Crataegus oxyacantha* subsp. *monogyna* var. *incisa* (Mérat) Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 180. 1912.—TYPE: *Poiret s.n.* (lectotype, here designated: P-Herb. Moquin-Tandon!).

Crataegus monogyna var. *denudata* Schumacher, Enum. pl. 1: 155. 1801. *Crataegus monogyna* var. *typica* f. *denudata* (Schumacher) Reichenbach, Icon. fl. germ. helv. 25: 26. 1909–1912.—TYPE: unknown; no specimens at C.—Neotype, here designated: *Thaysen s.n.* (C!).

Crataegus maura var. *diversifolia* Persoon, Syn. pl. 2: 37. 1807. *Mespilus diversifolia* (Persoon) Poiret, Encycl., suppl. 4: 73. 1816.—TYPE: unknown; recorded from Africa (?).

Crataegus maroccana Persoon, Syn. pl. 2: 37. 1807. *Mespilus maroccana* (Persoon) Poiret, Encycl., suppl. 4: 73. 1816.—TYPE: unknown; described from cultivated material.

Mespilus oliveriana Poiret, Encycl., suppl. 4: 72. 1816, non *Mespilus oliveriana* Dumont de Courset, 1811. *Crataegus monogyna* var. *oliveriana* (Poiret) Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 281. 1853.—TYPE: *Poiret s.n.* (lectotype, here designated: P-Herb. Moquin-Tandon!).

Mespilus fissa Poiret, Encycl., suppl. 4: 72. 1816. *Crataegus monogyna* var. *typica* f. *fissa* (Poiret) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 737. 1926.—TYPE: unknown.

Mespilus monogyna var. *glastonburiensis* Gray, Nat. arr. brit. pl. 2: 566. 1821. *Crataegus oxyacantha* var. *praecox* Loudon, Arbor. frutic. brit. 2: 833. 1838, nom. superfl. *Crataegus monogyna* var. *typica* f. *praecox* (Loudon) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 737. 1926.—TYPE: unknown.

Mespilus monogyna var. *cuneata* Wallroth, Sched. crit. 1: 221. 1822. *Oxyacantha monogyna* var. *cuneata* (Wallroth) Roemer, Fam. nat. syn. monogr. 3: 108. 1847.—TYPE: unknown.

Mespilus monogyna var. *decussata* Wallroth, Sched. crit. 1: 221. 1822. *Crataegus monogyna* var. *splendens* f. *decussata* (Wallroth) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 738. 1923. *Crataegus laciniata* var. *decussata* (Wallroth) Diapulis, Repert. Spec. Nov. Regni Veg. 34: 64. 1934. *Crataegus monogyna* subsp. *intermedia* var. *decussata* (Wallroth) Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 115. 1956.—TYPE: unknown.

Mespilus monogyna var. *trifida* Wallroth, Sched. crit. 1: 221. 1822. *Crataegus oxyacantha* var. *monostyla* DC., Prodr. 2: 628. 1825, nom. superfl. *Oxyacantha monogyna* var. *trifida* (Wallroth) Roemer, Fam. nat. syn. monogr. 3: 108. 1847. *Crataegus monogyna* var. *typica* f. *trifida* (Wallroth) Reichenbach, Icon. fl. germ. helv. 25: 26. 1909–1912. *Crataegus monogyna* var. *splendens* f. *trifida* (Wallroth) Hegi, Ill. Fl. Mitt.-Eur. (4)2: 738. 1923.—TYPE: tab. 1162 in Fl. dan. 7(20). 1797 (lectotype, here designated).

Mespilus polyacantha Jan ex Gussone, Fl. sicul. prodr. suppl. 1: 154. 1832. *Crataegus polyacantha* (Gussone) Nyman, Consp. fl. eur.: 244. 1879. *Crataegus monogyna* var. *azarella* f. *polyacantha* (Gussone) Gandoger, Fl. cret. 35. 1916. *Crataegus monogyna* var. *calycina* f. *polyacantha* (Gussone) Buia in Savulescu, Fl. reip. pop. rom. 4: 261. 1956.—TYPE: unknown.

Crataegus azarella Grisebach, Spic. fl. rumel 88, 89. 1843. *Oxyacantha azarella* (Grisebach) Roemer, Fam. nat. syn. monogr. 3: 107. 1847. *Mespilus monogyna* var. *azarella* (Grisebach) Koch, Dendrol. 1: 160. 1869. *Crataegus oxyacantha* var. *azarella* (Grisebach) Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 93. 1891. *Crataegus monogyna* var. *azarella* (Grisebach) Koehne, Deut. Dendrol. 238. 1893. *Crataegus monogyna* var. *calycina* f. *azarella* (Grisebach) Buia in Savelescu, Fl. reip. pop. rom. 4: 260. 1956. *Crataegus monogyna* subsp. *azarella* (Grisebach) Franco in Franco & Rocha Afonso, Collect. bot. (Barcelona) 7: 471. 1968.—TYPE: *Grisebach s.n.* (holotype: GOET!).

Mespilus insegnae Gussone, Fl. sicul. syn. 2(2): 830. 1844–1845. *Crataegus insegnae* (Gussone) Bertoloni, Fl. Ital. 7: 629. 1847. *Crataegus monogyna* subsp. *insegnae* (Gussone) Lange, Revis. Crataeg. 39. 1897. *Crataegus oxyacantha* var. *insegnae* (Gussone) Fiori, Fl. Italia 1: 596. 1896–1898. *Crataegus monogyna* var. *brevispina* f. *insegnae* (Gussone) Hayek, Repert. Spec. Nov. Regni Veg. Beihefte 30: 756. 1926. *Crataegus monogyna* var. *insegnae* (Gussone) Reichenbach, Icon. fl. germ. helv. 25: 27. 1909–1912.—TYPE: unknown.

Crataegus granatensis Boissier, Elench. pl. nov. 41. 1838. *Oxyacantha granatensis* (Boissier) Roemer, Fam. nat. syn. monogr. 3: 106. 1847. *Mespilus monogyna* var. *granatensis* (Boissier) Wenzig, Linnaea 38: 160. 1874. *Crataegus monogyna* var. *granatensis* (Boissier) Dippel, Handb. Laubholzk. 3: 458. 1893.—TYPE: tab. 61 in Boissier, Voy. bot. Espagne 2. 1839–1845 (neotype, here designated).

Crataegus brevispina Kunze, Flora 29: 737. 1846. *Mespilus monogyna* var. *brevispina* (Kunze) Wenzig, Linnaea 38: 159. 1874. *Crataegus monogyna*

var. *brevispina* (Kunze) Dippel, Handb. Laubholzk. 3: 459. 1893. *Crataegus oxyacantha* subsp. *maura* var. *brevispina* (Kunze) Maire, Cat. pl. Maroc 2: 334. 1932. *Crataegus monogyna* subsp. *brevispina* (Kunze) Franco in Franco & Rocha Afonso, Collect. bot. (Barcelona) 7: 463. 1968.—TYPE: *Willkomm 592* (lectotype, here designated: W!; isolectotype: W!).

Crataegus villosa Petermann, Anal. Pfl.-Schlüss. 135. 1846, non *Crataegus villosa* Thunberg, 1784, nec Dzekov, 1973. *Crataegus monogyna* var. *typica* f. *villosa* (Petermann) Reichenbach, Icon.fl. germ. helv. 25: 26. 1909–1912.—TYPE: not located. [Parts of Petermann's herbarium are at LAU, S, and W.]

Crataegus monogyna var. *laciniata* Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 279. 1853, non *Crataegus monogyna* var. *laciniata* (Besser) Ledebour, 1844. *Mespilus monogyna* f. *laciniata* (Koch) Koch, Dendrol. 1: 160. 1869. *Crataegus oxyacantha* var. *laciniata* (Koch) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 119. 1871, non *Crataegus oxyacantha* var. *laciniata* (Ucria) Fiori, 1896–1898.—TYPE: unknown.

Crataegus intermedia Schur, Enum. pl. transsilv. 205. 1866. *Crataegus intermedia* Fuss, Fl. transsilv. 211. 1866, nom. superfl. *Crataegus oxyacantha* var. *intermedia* (Fuss) Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 92. 1891. *Crataegus monogyna* var. *intermedia* (Fuss) Hegi, Ill. Fl. Mitt.-Eur. (4)2: 737. 1923. *Crataegus monogyna* subsp. *intermedia* (Schur) Javorka ex Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 114. 1956. *Crataegus monogyna* var. *intermedia* (Schur) Buia in Savulescu, Fl. reip. pop. rom. 4: 261. 1956.—TYPE: *Schur 972* (holotype: not located).—Neotype, here designated: *Schur s.n.* (B!).

Crataegus hirsuta Schur, Enum pl. Transsilv. 206. 1866. *Crataegus monogyna* var. *azarella* f. *hirsuta* (Schur) Hegi, Ill. Fl. Mitt.-Eur. (4)2: 738. 1923. *Crataegus monogyna* var. *calycina* f. *hirsuta* (Schur) Buia in Savelescu, Fl. reip. pop. rom. 4: 260. 1956.—TYPE: *Schur 973* (holotype: not located).

Mespilus monogyna var. *splendens* Koch, Dendrol. 1: 159. 1869. *Crataegus monogyna* var. *splendens* (Koch) Dippel, Handb. Laubholzk. 3: 459. 1893.—TYPE: unknown.

Mespilus monogyna f. *horrida* Koch, Dendrol. 1: 160. 1869. *Crataegus oxyacantha* var. *horrida* (Koch) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 119. 1871. *Crataegus monogyna* var. *horrida* (Koch) Dippel, Handb. Laubholzk. 3: 459. 1893.—TYPE: unknown.—Neotype, here designated: tab. 1468 in Fl. dan. 9(25). 1813; see Regel (1871) and Dippel (1893).

Crataegus floribunda Gandoger, Bull. Soc. Bot. France 18: 447. 1871.—TYPE: *Gandoger s.n.* (holotype: not located, no material at LY).—Neotype, here designated: *Magnier Fl. sel. exsicc. 65* (LY!; isoneotype: LY!).

Crataegus sublucens Gandoger, Bull. Soc. Bot. France 18: 449. 1871.—TYPE: *Gandoger 8* (holotype: LY!).

Crataegus oligacantha Gandoger, Bull. Soc. Bot. France 18: 449. 1871.—TYPE: *Gandoger 9* (holotype: LY!).

Crataegus petiolulata Gandoger, Bull. Soc. Bot. France 18: 450. 1871.—TYPE: *Gandoger 10* (holotype: LY!).

Crataegus pulchella Gandoger, Bull. Soc. Bot. France 18: 450. 1871.—TYPE: *Gandoger 11* (holotype: LY!).

Crataegus bracteolaris Gandoger, Bull. Soc. Bot. France 18: 450. 1871.—TYPE: *Gandoger 12* (holotype: LY!).

Crataegus chlorocarpa Gandoger, Bull. Soc. Bot. France 18: 451. 1871, non *Crataegus chlorocarpa* Lenne & Koch, 1855.—TYPE: *Chabert s.n.* (holotype: not located; not at LY).

Crataegus thyrsoidea Gandoger, Bull. Soc. Bot. France 18: 451. 1871.—TYPE: *Gandoger 15* (holotype: LY!).

Crataegus monogyna var. *lanigera* Beck, Ann. K.K. Naturhist. Hofmus. 2: 96. 1887, non *Crataegus monogyna* var. *lanigera* Popov, 1929.—TYPE: *Beck s.n.* (lectotype, here designated: PRC!).

Crataegus monogyna f. *schizophylla* Beck, Fl. Nieder-Österreich 2(1): 706. 1892.—TYPE: unknown.

Crataegus monogyna var. *semperflorens* Dippel, Handb. Laubholzk. 3: 460. 1893. *Crataegus monogyna* f. *semperflorens* (Dippel) Schneider, Ill. Handb. Laubholzk. 1: 782. 1906.—TYPE: unknown.

Crataegus monogyna var. *flabellata* Lange in Willkomm, Suppl. prodr. fl. hispan. 221. 1893.—TYPE: *Dieck 855* (holotype: C!).

Crataegus monogyna var. *coriacea* Podpera, Verh. Zool.-Bot. Ges. Wien 52: 649. 1902.—TYPE: unknown.

Crataegus parvifolia Lojacono-Pojero, Malpighia 20: 216. 1906, non *Crataegus parvifolia* Aiton, 1789.—TYPE: *Lojacono-Pojero s.n.* (holotype: PAL!).

Crataegus cuneata Halácsy, Consp. fl. graec. suppl. 37. 1908, non *Crataegus cuneata* Siebold & Zuccarini, 1843. *Crataegus monogyna* var. *halácsyi* Hayek, Repert. Spec. Nov. Regni Veg. Beihefte 30: 756. 1926.—TYPE: *Heldreich Herb. Gr. Norm. 1628* (lectotype, here designated: W!; isolectotype: JE!).

Crataegus monogyna f. *macrocarpa* Szafer, Acta Soc. Bot. Poloniae 1: 238, fig. 20g. 1923. *Crataegus monogyna* f. *szaferi* Gostynska-Jakuszewska in Roczn., Dendrol. 31: 11.1978, nom. superfl.—TYPE: Fig. 20g in Szafer, Acta Soc. Bot. Poloniae 1. 1923 (lectotype, here designated).

Crataegus monogyna var. *eriocarpa* f. *microphylla* Chenev ex Hegi, Ill. Fl. Mitt.-Eur. (4)2: 737. 1923. *Crataegus monogyna* var. *microphylla* (Hegi) Diapulis, Repert. Spec. Nov. Regni Veg. 34: 63. 1934.—TYPE: unknown; recorded from "Südliches Tessin, Wallis."—Neotype, here designated: *Orphanides s.n.* (UPS!). [This specimen is cited by Diapulis (1934).]

Crataegus calycina var. *cuneata* Diapulis, Repert. Spec. Nov. Regni Veg. 34: 65. 1934.—TYPE: *Sintenis* 296 (holotype: B; isotypes: BR! LD!).

Crataegus stevenii Pojarkova in Komarov, Fl. URSS 9: 505. 1939.—TYPE: *Puring s.n.* (holotype: LE, photo: C!).

Crataegus lipskyi Klokov in Zerov, Fl. URSR 6: 577. 1954.—TYPE: *Klokov & Artemczuk s.n.* (holotype: KW!).

Crataegus leiomonogyna Klokov in Zerov, Fl. URSR 6: 578, fig. 14. 1954. *Crataegus monogyna* subsp. *leiomonogyna* (Klokov) Franco, Feddes Repert. 79: 37. 1968.—TYPE: *Kleopov s.n.* (holotype: KW!).

Crataegus praearmata Klokov in Zerov, Fl. URSR 6: 578, fig. 15. 1954.—Type: *Kleopov s.n.* (holotype: KW!).

Crataegus monogyna subsp. *jacquinii* Kerner ex Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 117, tabs. III.8, VII.42–44. 1956.—TYPE: *Pénzes 129* (holotype: BP).

Crataegus monogyna subsp. *jacquinii* var. *arborescens* Kuntze ex Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 118. 1956.—TYPES: *Györffy s.n.* (syntype: BP); *Pénzes s.n.* (syntypes: BP).

Crataegus monogyna var. *latimonogyna* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 118, tabs. III.10, VII.54–56. 1956.—TYPE: *Boros s.n.* (holotype: BP!).

Crataegus monogyna var. *mandyi* Pénzes, Kert. Szölesz. Föisk. Évk. 18(2): 119, tabs. III.9, VII.45–47. 1956.—TYPE: *Pénzes s.n.* (lectotype, here designated: BP!; isolectotype: BP!).

Crataegus monogyna subsp. *tauscheri* Gandoger ex Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 119, tabs. III.9, VII.45–47. 1956. *Crataegus monogyna* var. *tauscheri* (Pénzes) Soó, Acta Bot. Acad. Sci. Hung. 18: 175. 1973.—TYPE: *Tauscher s.n.* (holotype: BP!; isotype: LY!).

Crataegus monogyna subsp. *tauscheri* f. *karpatii* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 120, tabs. IV.17, VII.69–71. 1956.—TYPE: *Kárpáti & Pénzes s.n.* (holotype: BP).

Crataegus monogyna subsp. *laciniata* var. *szepesfalvyi* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 122, tabs. IV.15, VII.63–65. 1956.—TYPE: *Pénzes 7* (holotype: BP).

Crataegus monogyna subsp. *transalpina* var. *csatoi* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 122, tab. IV.26. 1956.—TYPE: *Csató s.n.* (holotype: BP).

Crataegus monogyna subsp. *transalpina* var. *javorkae* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 123, tabs. IV.14, VII.66–68. 1956.—TYPE: *Javorka s.n.* (holotype: BP).

Crataegus monogyna var. *typica* f. *trilobata* Nyarady ex Buia in Savulescu, Fl. reip. pop. rom. 4: 887. tab. 39.4. 1956. *Crataegus monogyna* var. *trilobata* (Buia) Gostynska-Jakuszewska, Roczn. Dendrol. 31: 12. 1978.—TYPE: tab. 39.4 in Savulescu, Fl. reip. pop. rom. 4. 1956 (lectotype, here designated).

Crataegus xeromorpha Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 186, fig. 1. 1960.—TYPE: *Bornmüller 1771* (holotype: LE; isotypes: BM! JE! W!).

Crataegus aegeica Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 188, fig. 2. 1960. *Crataegus monogyna* subsp. *aegeica* (Pojarkova) Franco, Feddes Repert. 79: 37. 1968.—TYPE: *Pichler 5264* (holotype: LE!).

Crataegus subintegriloba Pojarkova, Novit. Syst. Pl. Vasc. 1964: 156, fig. 2. 1964.—TYPE: *McNeill 841* (holotype: E!).

Crataegus septempartita Pojarkova, Novit. Syst. Pl. Vasc. 1964: 162, fig. 3. 1964.—TYPE: *Davis 14446* (holotype: E!).

Crataegus monogyna subsp. *nordica* Franco, Feddes Repert. 79: 37. 1968.—TYPE: *Lange s.n.* (holotype: COI!; isotype: C!).

Crataegus monogyna subsp. *plesivecensis* Hrabetová-Uhrová, Biologia (Bratislava) 24: 550, fig. 3. 1969. *Crataegus monogyna* var. *plesivecensis*

(Hrabetová-Uhrová) Baranec, Biologia (Bratislava) 38: 861. 1983.—TYPE: *Dvorák s.n.* (holotype: BRNU 430057).

Crataegus subborealis Cinovskis, Crat. balt. 105, fig. 19. 1971.—TYPE: *Cinovskis Medze 1* (holotype: LATV!).

Crataegus alemanniensis Cinovskis, Crat. balt. 111, fig. 22. 1971.—TYPE: *Bornkamm 1477* (holotype: LATV!).

Crataegus alemanniensis f. *microalemanniensis* Cinovskis, Crat. balt. 115. 1971.—TYPE: *Cinovskis 636* (holotype: LATV!).

Crataegus orientobaltica Cinovskis, Crat. balt. 116, fig. 23. 1971.—TYPE: *Cinovskis 666* (holotype: LATV!).

Crataegus orientobaltica f. *glabra* Cinovskis, Crat. balt. 118. 1971.—TYPE: *Cinovskis 648* (holotype: LATV!).

Crataegus orientobaltica f. *laciniata* Cinovskis, Crat. balt. 118. 1971.—TYPE: *Cinovskis 620* (holotype: LATV!).

Crataegus ×*krima* Doll, Gleditschia 2: 11, fig. 2. 1974.—TYPE: *Doll s.n.* (holotype: JE!).

Crataegus ×*borealoides* Doll, Natur Naturschutz Mecklenburg 13: 13, figs. 3, 23. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*curvisepaloides* Doll, Natur Naturschutz Mecklenburg 13: 15, figs. 5, 18, 19, 24. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus integerrima Doll, Natur Naturschutz Mecklenburg 13: 18, figs. 10, 25. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus monogyna var. *contracta* Hrabetová-Uhrová, Preslia 50: 210. 1978.—TYPE: *Skybová s.n.* (holotype: BRNU 461247).

Crataegus curvisepala subsp. *colorata* Hrabetová-Uhrová, Preslia 50: 211. 1978.—TYPE: *Skybová s.n.* (holotype: BRNU 460707!).

Crataegus monogyna subsp. *latiloba* Hrabetová-Uhrová, Preslia 52: 55, tab. III. 1980.—TYPE: *Hrabetová s.n.* (holotype: BRNU 427893).

Crataegus krumbholzii Doll, Gleditschia 11: 47, fig. 1. 1984.—TYPE: *Doll s.n.* (holotype: JE).

Twigs glabrous or sparsely villous. Leaf blades glabrous or sparsely villous above, villous along major veins and in veins axils beneath. Subterminal leaf blades of flowering shoots 1.1–5.7 cm long, 0.8–6.0 cm wide; petiole 1–30 mm long. Subterminal leaf blades of short shoots 1.1–5.7 cm long, 0.8–5.4 cm wide; petiole 4–47 mm long. Leaf blades of elongate shoots 2.2–6.2 cm long, 2.2–6.4 cm wide; petiole 7–26 mm long. Inflorescence, hypanthium, and fruit glabrous or more or less villous. Chromosome number: 2n (2x) = 34. Fig. 61.

Additional illustrations: Figs. 14, 15 in Klokov (1954); Figs. 17, 18, 19, 22, 23 in Cinovskis (1971); Figs. 15c, 16c in Christensen (1982a).

Distribution (Fig. 62). From southern Scandinavia to northern Africa, Caucasia, Turkey, the Middle East, northern Iraq, and northwestern Iran; cultivated and escaping in Argentina, the U.S.A., Canada, and New Zealand, also commonly planted as an ornamental within its natural range, especially in northwestern and central Europe.

REPRESENTATIVE SPECIMENS. **England.** S Wales, Gower peninsula, *Ostenfeld s.n.* (C). **Denmark.** Sjælland, Jægerspris Vesterstrand, *Ostenfeld s.n.* (C). **Norway.** Vestfold, Tjöme, Vasser, Sönstegård,

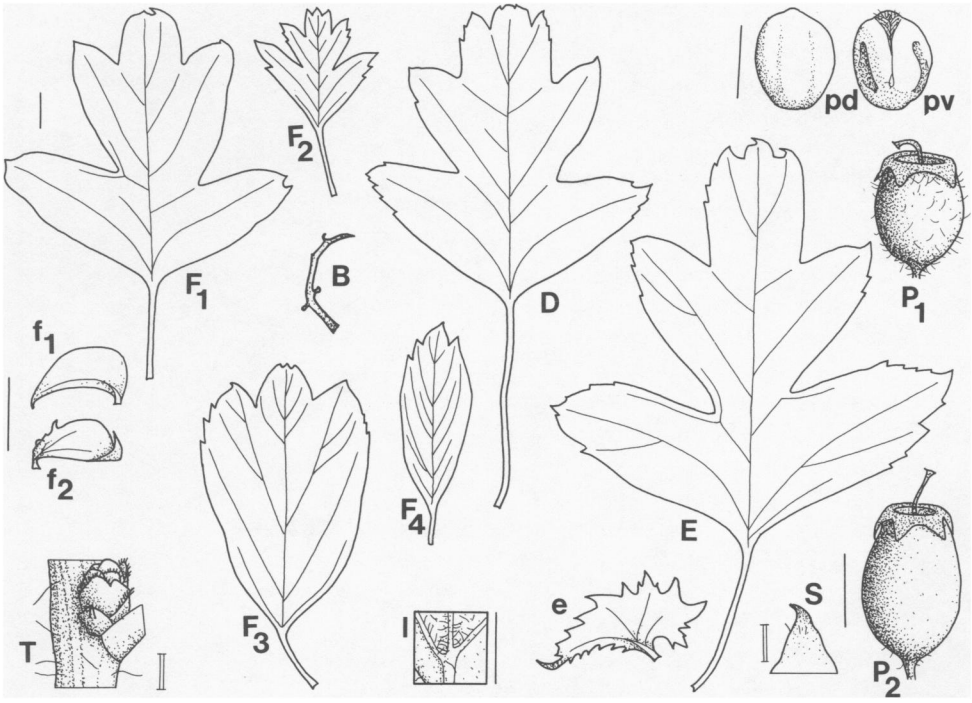


FIG. 61. *Crataegus monogyna* var. *monogyna*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2, F_3, F_4: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_3: *Bourgeau 1860*; D, E, e, F_1, f_1, f_2, P_1: *Christensen D38*; P_2, T: *Christensen D82*; F_2, I: *Christensen 1746*; pd, pv: *Christensen 1845*; B, S: *Gandoger s.n.*; F_4: *Silva 8103*.)

Kaasa s.n. (H). **Sweden.** Västergötland, Kinnekulle, *Stalin s.n.* (H). **Finland.** Al, Jomala, Ramsholmen, *Lindberg 6* (H). **Latvia.** Düna, Koknese, *Cederkreutz s.n.* (H). **Estonia.** Ins. Dagö, 3 km westlich von Emmaste, *Grøntved 1719* (C). **U.S.S.R.** UKRAINE: Dnjepropetrovsk, *Grebe s.n.* (JE).—CAUCASIA: Severnyj Kavkas, r-n Kislovodska-Podkumka, raz'ezd Podkumok, *Fedtschenko 815* (LE). **Poland.** Koszalinskie, pow. Szczecinek, Czarnkowie, zarsla Jez. Olebokim, *Boratynska s.n.* (C). **Germany.** Neu Klokow bei Parchim, *Doll s.n.* (JE); Hessen, Rheingau-Kreis, Rheingau, Öestrich, Weinberge in Pfingstbachtal, 50°1.5′N, 7°59.5′E, *Kahlheber 81.665* (GB, H, UPS). **Czechoslovakia.** Distr. Praha, prope fl. Vltava, situ austr. ab opp. Praha Smichov, *Chrtek s.n.* (LD). **The Netherlands.** Prov. Gelderland, Velp, along river IJssel, *Someren s.n.* (GB). **Belgium.** Pailhe, Saint-Fontaine, *Lawalreé 10276* (BR). **Switzerland.** Tessin, Locarno, *Boldt s.n.* (H). **France.** Haute-Savoie, Route d'Arcine au Font de l'Ecluse, pente ouest du Vuache, *Bocquet Cons. Bot. Gen. Helv. 233* (C).—CORSICA: Evisa, Porto, *Aellen 1234* (LD). **Austria.** Voralberg, Bregenzerwald, Mellau, hinter Reuthe, *Polatschek s.n.* (W). **Hungary.** Com. Pest, in nemoribus Danubii Silling prope Szigetujfalu, *Boros s.n.* (GB). **Romania.** Banatus, Baile Herculane, *Baenitz s.n.* (G, JE, W). **Bulgaria.** Strandza, l.d. Silistar, *Cerneva Inst. Bot. Acad. Sci. Bulg. pl. Exs. X.928* (C, JE, UPS, W); Stara Planina, in fauce fl. Isker pr. Lakatnik, *Rechinger 1729* (LD). **Yugoslavia.** Dubrovnik, Ombla-Tal, *Bornmüller s.n.* (JE). **Greece.** Prov. Ioannina, Mt Kourenta, above Psina, *Christensen 1798* (C). **Italy.** SICILY: Mt Etna, prope Casa di Bosco, *Bornmüller 286* (JE).—SARDINIA: Sassari a S. Anatolia, *Martelli s.n.* (FI). **San Marino.** La Degana, *Pampanini s.n.* (W). **Spain.** Prov. León, Kantabrisches Gebirge, Puerto de Somiedo, *Barnieske 4073* (B).—MALLORCA: near Es Clot, NE of Soller, 39°37 N, 2°44 E, *Christensen CUBBI.1486* (C). **Portugal.** Prov. Baixo Alentejo, Santiago de Cacém, Monte dos Alhos, *Silva 8103* (CGE, UPS, W).—MADEIRA: Funchal, Monte, *Cederkreutz s.n.* (H). **Morocco.** Dj. Zerhoun, above Moulay Idris,

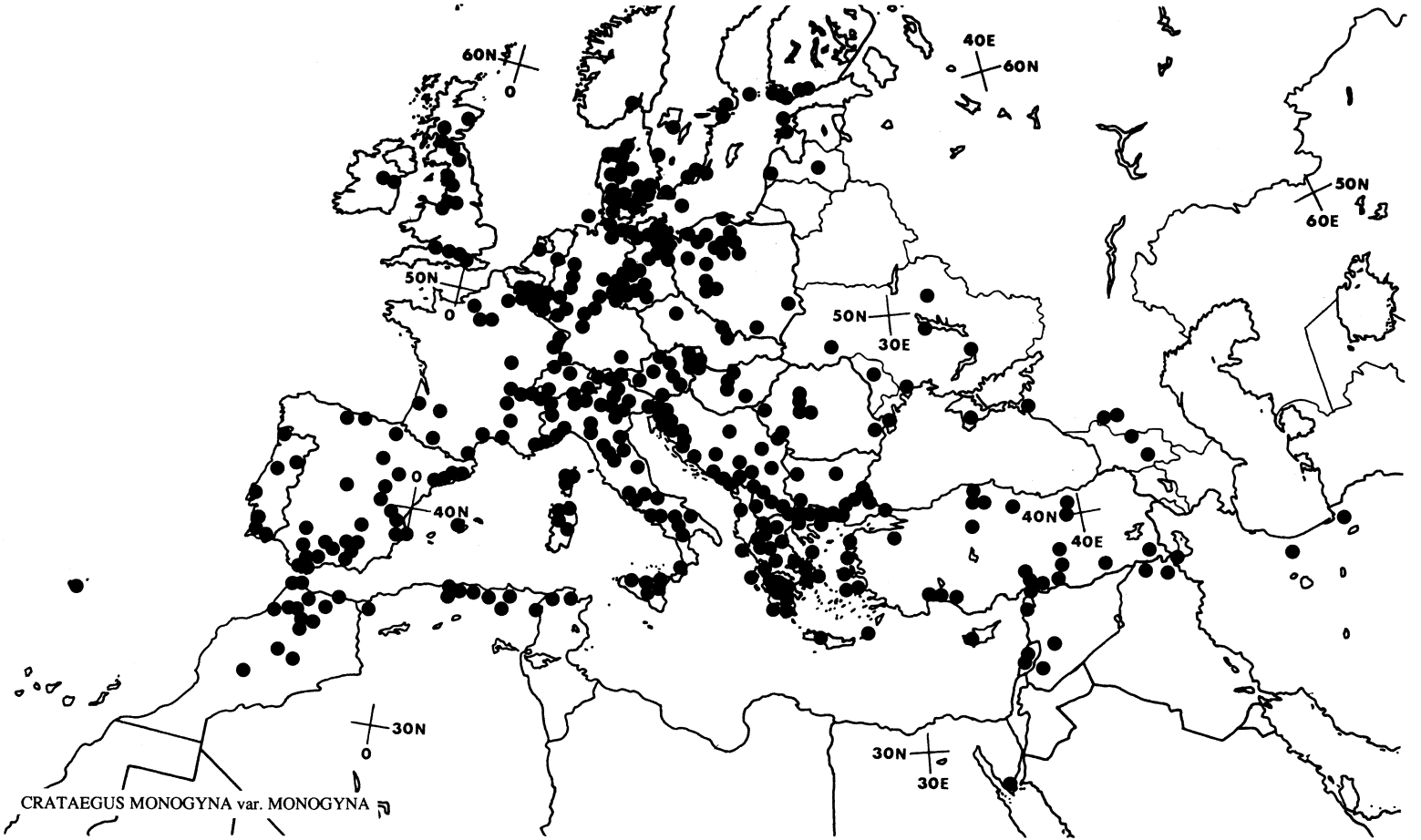


FIG. 62. Distribution of *Crataegus monogyna* var. *monogyna*, based on specimens seen and literature records cited by Synnott (1978); probably adventive in Madeira.

Davis 51231 (BM). **Algeria.** El Kseur, *Alston 37528* (BM). **Tunisia.** Ouchtata to Ain Sebae, E of Tabarka, *Davis 57813* (BM). **Egypt.** Sinai, Wadi Talaa, *Snogerup 2842* (LD). **Cyprus.** Perapedhi, by Kryos Petamos, *Meikle 2805* (C). **Turkey.** Thrakien, 2–4 km SW Demirköy, *Bauer 792* (W); Bithynia, Bursa, Mt Keschisch-dagh, ad pag. Tschekirge, *Bornmüller 4477* (W; paratype of *C. xeromorpha*). **Syria.** Djebel esh Sharqi, *Makowski s.n.* (W). **Lebanon.** Vallée de Borghoutie, environs de Saïda, *Blanche 118* (G). **Iraq.** Mt Kuh-Sefin ad Pag. Shaqlawa, ditionis Arbil, *Bornmüller 1028* (JE); Atrush, *Hossain 49* (C). **Iran.** N of Oshnoviyeh, *Cowan 1356* (LE).

Byatt (1977) recognizes *C. maura* L.f. (1781), occurring in parts of the Mediterranean region, as a species primarily differing from *C. monogyna* in having leaf blades more or less coriaceous, markedly narrower than long, with the basal pair of sinuses in the apical 1/2 of the lamina. However, material of *C. monogyna* var. *monogyna* from central and northern Europe with leaf blades similar in form and texture to those of *C. maura* has been described as *C. monogyna* var. *mandyi* Pénzes (1956), *C. monogyna* subsp. *plesivecensis* Hrabetová-Uhrová (1969b), *C. subborealis* Cinovskis (1971), and *C. integerrima* Doll (1976). Therefore, *C. maura* is treated here as a synonym of the extremely variable *C. monogyna* var. *monogyna*.

Pignatti (1982) considered *C. insegnae* (Gussone) Bertoloni (1847) conspecific with *C. monogyna* × *C. orientalis* subsp. *presliana*. This interpretation of *C. insegnae* could not be verified nor could any type specimen be located; therefore, *C. insegnae* is here treated as conspecific with *C. monogyna* var. *monogyna*. Similar interpretations of *C. insegnae* are presented by Lange (1897), Schneider (1906), Hayek (1926), and Diapulis (1934).

According to Soó (1973), *C. tauscheri* Gandoger was published by Kerner (Monatschr. Vereines Beförd. Gartenbaues Königl. Preuss. Staaten 18: 175. 1875), but according to the librarian of the Botanischer Garten und Botanisches Museum, Berlin-Dahlem, "*C. tauscheri* Gandoger ex Kerner" does not appear in volumes 16–24 of the Monatschrift (pers. comm.). Consequently, this epithet is first validly published by Pénzes (1956) as *C. monogyna* subsp. *tauscheri* Gandoger ex Pénzes.

A monographic study of the Holy Thorn of Glastonbury, *C. monogyna* f. *biflora* (Weston) Rehder (*Mespilus monogyna* var. *glastonburiensis* Gray; *C. oxyacantha* var. *praecox* Loudon), has been published by Vickery (1979). The Holy Thorn of Glastonbury has two distinct periods of flowering: November to January and early summer. In North Africa, flowering in late autumn and early winter is known also in populations of *C. monogyna* that are morphologically fairly similar to the Holy Thorn of Glastonbury.

23b. Crataegus monogyna var. **lasiocarpa** (Lange) Christensen, comb. nov. *Crataegus lasiocarpa* Lange, Diagn. pl. Iber. 103. 1882. *Crataegus laciniata* var. *lasiocarpa* (Lange) Lange, Revis. Crataeg. 51. 1897.—TYPE: SPAIN, Granada, Baranca del Rial, 22 Sep 1873, *Jimenes 18* (lectotype, here designated: C!).

Crataegus laciniata Ucria, Nuovo Racc. Opusc. Aut. Sic. 6: 251. 1793; Arch. Bot. Leipzig 1(1): 69 1796, non *Crataegus laciniata* Steven ex Besser, 1822. *Mespilus laciniata* (Ucria) Gussone, Fl. sicul. prodr. 1: 565. 1827. *Oxyacantha sicula* Roemer, Fam. nat. syn. monogr. 3: 108. 1847, nom. superfl. *Mespilus tanacetifolia* var. *laciniata* (Ucria) Wenzig, Linnaea 38: 147. 1874. *Crataegus oxyacantha* var. *laciniata* (Ucria) Fiori, Fl. Italia 1:

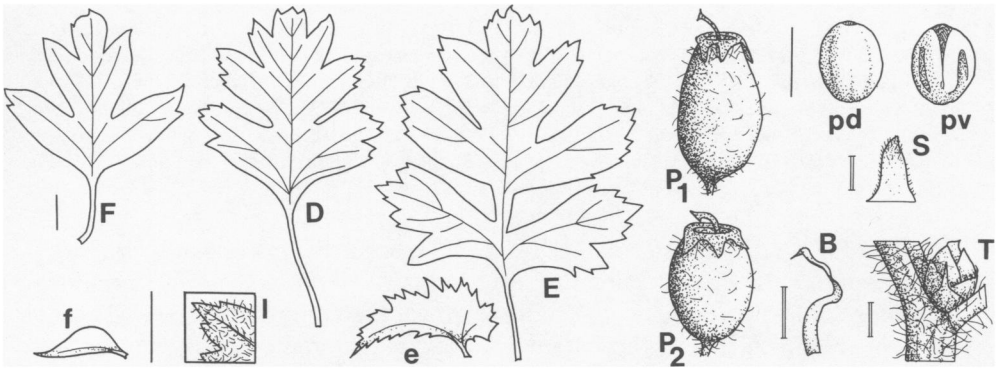


FIG. 63. *Crataegus monogyna* var. *lasiocarpa*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, S: *Christensen 1115*; D, E, e, F, f, P_2: *Christensen 1564*; P_1, T: *Christensen 1716*; pd, pv: *Christensen 1959*.)

596. 1896–1898, non *Crataegus oxyacantha* var. *laciniata* (Koch) Regel, 1871.—TYPE: *Ucria s.n.* (lectotype, here designated: C!).

Crataegus panachaica Schneider, Ill. Handb. Laubholzk. 1: 787. 1906. *Crataegus monogyna* var. *panchaica* (Schneider) Hayek, Repert. Spec. Nov. Regni Veg. Beihefte 30: 756. 1926.—TYPE: *Halácsy s.n.* (lectotype, here designated: G!).

Crataegus oxyacantha subsp. *monogyna* var. *villosa* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *erioclada* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus popovii Chrshanovski, Bot. Zurn. (Kiev) 4(1–2): 79. 1947.—TYPE: *Chrshanovski s.n.* (holotype: MW).

Crataegus alutacea Klokov, Zerov, Fl. URSR 6: 579, fig. 16. 1954.—TYPE: *Oppermann s.n.* (holotype: KW!).

Twigs villous. Leaf blades more or less densely villous above and beneath. Subterminal leaf blades of flowering shoots 1.1–3.9 cm long, 0.9–4.2 cm wide; petiole 4–17 mm long. Subterminal leaf blades of short shoots 1.4–3.6 cm long, 0.8–3.8 cm wide; petiole 3–24 mm long. Leaf blades of elongate shoots 2.4–4.0 cm long, 2.2–4.5 cm wide; petiole 8–14 mm long. Inflorescence, hypanthium, and fruit villous. Chromosome number: 2n (2x) = 34. Fig. 63.

Additional illustration: Fig. 16 in Klokov (1954).

Distribution (Fig. 64). The Mediterranean region to the Crimea and Iran.

REPRESENTATIVE SPECIMENS. **Morocco.** Asif Taffert, 80 km au sud-est de Fes, *Bocquet 10913* (BM); Meknes-Azrou, *Simpson 36225* (BM). **Tunisia.** Prope Maktar, *Murbeck s.n.* (LD); Dj. Serdj, *Murbeck s.n.* (LD). **Spain.** Regn. Granatense, Sierra Nevada, ca. Cortijo de S. Geronimo, *Porta 562* (JE); S. Nevada, *Willkomm 365* (G,W). **Italy.** Prov. l'Aquila, SE-Rand des Fucino-Beckens, Ortucchio, *Leute 1438* (W).—SICILY: in montibus Nebrodensibus, *Gussone s.n.* (G); Madonie, *Gussone s.n.* (G). **Romania.** Banat, *Janka s.n.* (JE). **Yugoslavia.** Mazedonia, NW of Vranje, Mt Ostri,

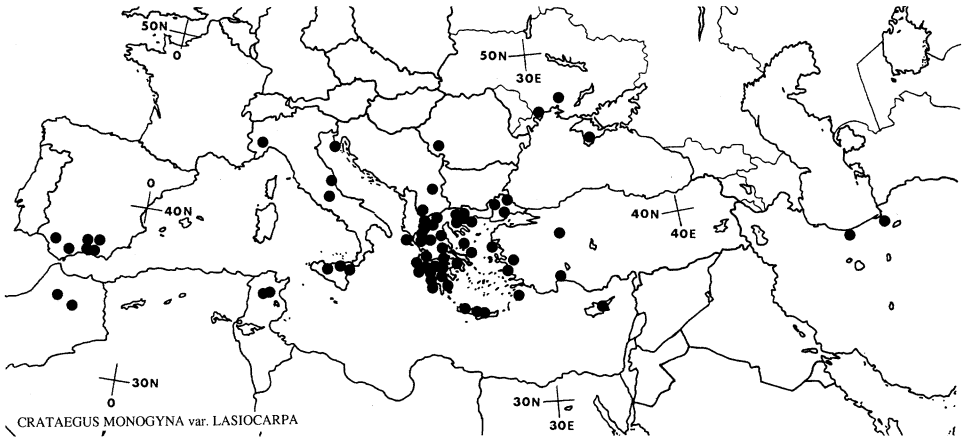


FIG. 64. Distribution of *Crataegus monogyna* var. *lasiocarpa*.

Bornmüller 4037 (JE); Istrien, Medulin, *Klaus 37* (W). **Greece.** Prov. Korinthia, along rd from Xilokastron to Trikalon, just after Kato Sinikia Trikalon, *Christensen 1116* (C); prov. Lakonia, Mt Parnon, along rd from the EOS refuge to Vamvakou, 11–13 km before Vamvakou, *Christensen 1709* (C). **Turkey.** Prov. Antalya, Kumköy, between Antalya and Serik, *Davis 25695* (BM). **U.S.S.R.** THE CRIMEA: Taur. merid., *Moricard s.n.* (G).—UKRAINE: Odessa, *Besser 1512* (G); Nikolayev, *Dobrochajeva s.n.* (KW). **Iran.** Prov. Mazanderan, distr. Kojur, inter Zanus et Kinch, *Rechinger 6595* (G); prov. Gorgan, Bender Ges, *Sintenis 1327* (JE).

Although *Crataegus laciniata* var. *lasiocarpa* (Lange) Lange (1897) is antedated by *Mespilus tanacetifolia* var. *laciniata* (Ucria) Wenzig (1874), I suggest that *C. laciniata* Ucria (1793, 1796) and all combinations based on it be rejected, because *C. laciniata* Ucria has been widely and persistently used for a taxon (4c. *C. orientalis* subsp. *presliana*) not including the type. Consequently, *C. laciniata* var. *lasiocarpa* (Lange) Lange (1897) is the first-published name at the level of variety for *C. monogyna* with villous leaf blades.

Crataegus azarella Grisebach (1843) and *C. monogyna* var. *lanigera* Beck (1887) are often considered conspecific with *C. monogyna* var. *lasiocarpa* (e.g., Franco & Rocha Alonso 1968; Byatt 1976b, 1977), but type material of these taxa differs from *C. monogyna* var. *lasiocarpa* in having leaf blades and twigs with indumentum typical of *C. monogyna* var. *monogyna*.

24. Crataegus sphaenophylla Pojarkova in Komarov, Fl. URSS 9: 502. 1939.—TYPE: U.S.S.R., the Crimea, near Feodosya, montes Karadagh, 6 Oct 1928, *Krystofovich s.n.* (holotype: LE!).

Large shrub. Twigs villous, more or less pruinose at first; thorns rare. Buds ca. 1.4 mm long and in diameter. Leaves villous above and beneath, bright green above and greyish green or glaucous-green beneath, narrowly cuneate at base; lobes more or less irregularly serrate, with more or less coarse teeth; basal pair of lateral veins straight or more or less divergent. Subterminal leaf blades of flowering shoots 4.2–5.0 cm long, 2.2–3.5 cm wide, lobes 1–2 pairs, basal pair 3.3–3.6 times as long as wide, extending 0.5–0.7 times the width of lamina to midrib, each lobe with 1–5

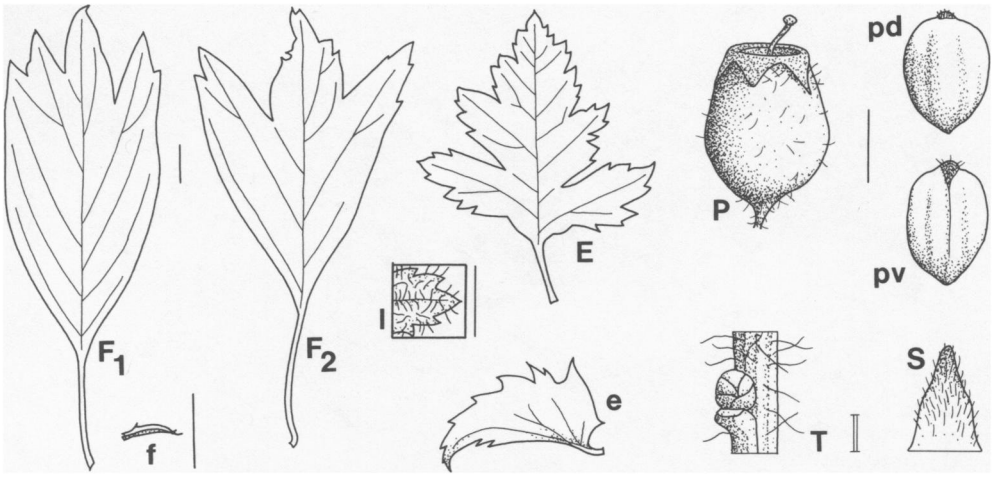


FIG. 65. *Crataegus sphaenophylla*. E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (*Kryshtofovich s.n.*)

teeth in the distal 3/20–1/12, basal pair of sinuses in the apical 3/10–2/5 of lamina; petiole 18–20 mm long, ca. 0.4 times as long as lamina; stipules ca. 4 mm long, entire or denticulate with ca. 2 teeth. Leaf blades of elongate shoots 3.5–4.5 cm long, 3.1–4.8 cm wide, lobes 2–3 pairs, basal pair 2.0–2.3 times as long as wide, extending ca. 0.8 times the width of lamina to midrib, each lobe with 6–11 teeth in the distal 2/3–2/5, basal pair of sinuses in the basal 2/5–3/10 of lamina; petiole 9–15 mm, ca. 0.3 times as long as lamina; stipules 11–13 mm long, serrate with 7–14 teeth. Inflorescence ca. 3.5 cm long (in fruit), corymbose, up to ca. 20-flowered, more or less compact, villous; pedicels 7–18 mm long, villous; bracts caducous. Flowers not seen; sepals 3.0–3.3 mm long, 2.1–2.5 mm wide, triangular, 1.0–1.4 times as long as wide, margin entire; style 1. Fruit 8–11 mm long, 8–9 mm in diameter, 1.0–1.4 times as long as wide, subglobose to cylindrical, red, more or less pruinose, more or less villous, often angular at base, crowned by the persistent, reflexed sepals; pyrene 1, dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number: 2n (3x) = 51. Fig. 65.

Phenology. Flowering in June, fruiting in October.

Distribution (Fig. 37). Endemic to the Crimea; in woodlands.

According to Pojarkova (1939a), *C. sphaenophylla* may be of hybrid origin, with *C. taurica* (=*C. meyeri*) as one of the parents. Gladkova (1968) proved *C. sphaenophylla* to be triploid. The species is probably the result of hybridization between tetraploid *C. meyeri* and an unknown diploid species of ser. *Crataegus* with pruinose twigs and one pyrene per fruit.

25. Crataegus heterophylla Flügge, Ann. Mus. Natl. Hist. Nat. 12: 423, tab. 36. 1808. *Mespilus heterophylla* (Flügge) Desfontaines, Ann. Mus. Natl. Hist. Nat. 12: 423. 1808, non *Mespilus heterophylla* Ruiz & Pavón, 1957. *Oxyacantha heterophylla* (Flügge) Roemer, Fam. nat. syn. monogr. 3: 106.

1847. *Crataegus azarolus* var. *heterophylla* (Flügge) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 111. 1871. *Mespilus monogyna* var. *heterophylla* (Flügge) Wenzig, Linnaea 38: 160. 1874. *Crataegus monogyna* var. *heterophylla* (Flügge) Dippel, Handb. Laubholzk. 3: 458. 1893. *Crataegus oxyacantha* subsp. *maura* var. *heterophylla* (Flügge) Maire, Cat. pl. Maroc 2: 335. 1932. *Crataegus monogyna* subsp. *heterophylla* (Flügge) Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 120. 1956.—TYPE: Tab. 36 in Flügge, Ann. Mus. Natl. Hist. Nat. 12. 1808 (lectotype, here designated).

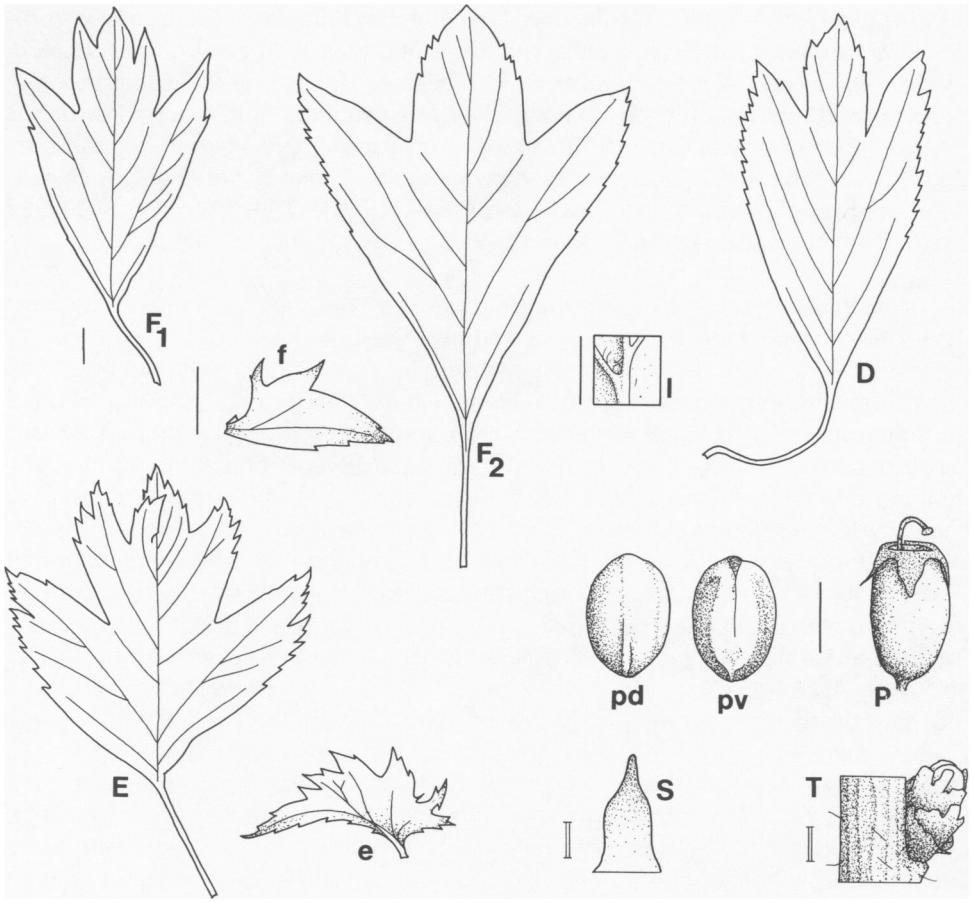
Small tree. Twigs glabrous or sparsely villous; thorns up to ca. 0.8 cm long, rare. Buds 1.9–3.0 mm long, 1.8–2.5 cm in diameter. Leaf blades lustrous dark green and glabrous or more or less villous above, pale green and glabrous or villous in vein axils beneath, narrowly cuneate or attenuate, rarely rounded, at base; lobes subacuminate or acute, serrate with more or less fine teeth, basal pair of veins divergent, straight or more or less convergent. Subterminal leaf blades of flowering shoots 4.1–6.4 cm long, 2.1–4.8 cm wide, lobes 1–2 pairs, basal pair 3.0–4.6 times as long as wide, extending 0.5–0.7 times the width of lamina to midrib, each lobe entire or with 1–5 teeth in the distal 2/5–1/11, basal pair of sinuses in the apical 1/5–2/5 of lamina; petiole 10–18 mm long, 0.2–0.3 times as long as lamina; stipules 4–14 mm long, irregularly denticulate-serrate, with 1–6 teeth. Subterminal leaf blades of short shoots ca. 5.8 cm long, ca. 3.7 mm wide, lobes 2 pairs, basal pair ca. 3.0 times as long as wide, extending ca. 0.7 times the width of lamina to midrib, each lobe with ca. 8 teeth in the distal 2/5, basal pair of sinuses in the apical 1/2 of lamina; petiole ca. 24 mm long, ca. 0.4 times as long as lamina. Leaf blades of elongate shoots 4.5–6.2 cm long, 4.5–4.8 cm wide, lobes 1–3 pairs, basal pair 2.6–2.7 times as long as wide, extending 0.6–0.7 times the width of lamina to midrib, each lobe with 7–13 teeth in the distal 3/10–1/12, basal pair of sinuses in the apical 1/3–1/2 of lamina; petiole 16–20 mm long, 0.3–0.4 times as long as lamina; stipules 15–21 mm long, serrate, with 18–44 teeth. Inflorescence 4–5 cm long, corymbose, 7–13-flowered, lax, glabrous; pedicels 2–27 mm long, glabrous or more or less villous; bracts caducous. Hypanthium 4–5 mm long, glabrous or more or less villous; sepals 3.0–4.1 mm long, 1.6–2.5 mm wide, lanceolate-triangular or triangular, 1.2–2.6 times as long as wide, margin entire, apex acuminate or acute; petals ca. 5 mm long and wide; stamens ca. 18, anthers purple; style 1. Fruit 10–11 mm long, ca. 6 mm in diameter, 1.7–1.8 times as long as wide, cylindrical, red, glabrous or more or less villous, crowned by the persistent, reflexed sepals; flesh yellowish; pyrene 1, dorsally and ventrolaterally sulcate, hypostyle pilose. Chromosome number unknown. Fig. 66.

Additional illustration: Fig. 1847 in Lindley (1836).

Phenology. Fruiting in October.

Distribution. Known only in cultivation, e.g., England, France, Switzerland. According to Pojarkova (1939a: 457), the natural range of *C. heterophylla* is Spain; however, no collections of *C. heterophylla* have been seen from Spain. Pojarkova's reports may be based on misidentifications of specimens of *C. monogyna* with leaf blades markedly narrower than long and with the basal pair of sinuses in the apical 1/2 of the lamina.

ADDITIONAL SPECIMENS EXAMINED. **England.** Tiverton, N. Devon, *Druce 196.12bis* (BR). **France.** Paris, *Roos s.n.* (W), *Wesmael s.n.* (BR). **Switzerland.** Geneva, *Meisner s.n.* (NY).



C. asiatica

FIG. 66. *Crataegus heterophylla*. D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (E, e, F_1, S: *Kunth s.n.*; P: *Poiret s.n.*; D, F_2, f: *Roos s.n.*; I, pd, pv, T: *Wesmael s.n.*)

LOCALITY UNKNOWN: *Kunth s.n.* (B); *Lange s.n.* (C); *Poiret s.n.* (P); *Reichenbach s.n.* (W-1889–109235); *Reichenbach s.n.* (W-1889–339539).

The combination *Mespilus heterophylla* (Flügge) [Ann. Mus. Natl. Hist. Nat. 12: 423. 1808] presents a bizarre nomenclatural situation. Flügge (1808) not only published his new species in *Crataegus*, but he also explained in detail why he did not place his new species in *Mespilus* (Flügge 1808: 426). However, the editor of the "Annales" states in a footnote on p. 423 that, Flügge's explanation notwithstanding, in Paris the Tournefortian interpretation of *Mespilus* is followed, and that therefore, "chez nous," the name for this new species should be *Mespilus heterophylla*. Unfortunately, there is only an indirect indication of the name(s) of the editor(s) of Ann. Mus. Natl. Hist. Nat. 12., i.e., on the title page: "Annales du Muséum d'Histoire Naturelle, par les professeurs de cet établissement," and on the

following page: "Nom des Professeurs" (=editors of Annales). Among these "professeurs" are three botanists, "Desfontaines, Botanique au Muséum," "Al. Jussieu, Botanique á la Campagne," and "A. Thouin, Culture et Naturalisation de Végétaux." Since Spach (1834: 67) cites the Latin name of "Neflier hétérophylle" as "*Mespilus heterophylla* Desf. in Hort. Par.—*Crataegus heterophylla* Flugg. Ann. du Mus. v. 12, tab. 38," Flügge's manuscript was probably edited by Desfontaines. If this interpretation is correct, Desfontaines inserted the footnote on p. 423, and made there the combination in *Mespilus*.

V. Crataegus nothoseries **Tanacetitales** Christensen, nothoser. nov. (*Crataegus* ser. *Orientales* × *Crataegus* ser. *Tanacetifoliae*.)

Twigs with dense indumentum; aphyllous thorns up to ca. 1.5 cm long. Petioles of subterminal leaf blades of flowering shoots 0.1–0.3 times as long as lamina. Stipules entire or more or less serrate, those of leaf blades of flowering shoots 2–12 mm long, those of leaf blades of elongate shoots 5–9 mm long. Inflorescence corymbose, 6–16-flowered, more or less compact, with dense indumentum; bracts 1.4–9.7 times as long as wide, caducous-deciduous, margin entire, denticulate or serrate. Sepals entire or with a few glandular teeth. Fruit yellowish, orange, or red; flesh yellowish; pyrenes (2–) 3–5, dorsally sulcate, ventro-laterally smooth, hypostyle pilose.

26. Crataegus ×bornmuelleri Zabel in Beissner, Schelle & Zabel, Handb. Laubholzben. 179. 1903. (*Crataegus orientalis* × *Crataegus tanacetifolia*.)—TYPE: GERMANY, cultivated at "Forstakademie Münden." Available material identified as *Crataegus ×bornmuelleri* by Zabel (*Zabel s.n.*, JE!, "*Crataegus* 128 *tanacetifolia*, *orientalis* × *tanacetifolia*") is *Crataegus orientalis* subsp. *orientalis*. The specimen is said to be progeny of *Crataegus* 83 *tanacetifolia* (*Zabel s.n.*, JE!), which is *Crataegus tanacetifolia*.

Shrub or tree up to ca. 10 m tall. Twigs densely villous-lanate; thorns rare. Buds 1.6–2.6 mm long, 2.1–2.6 mm in diameter. Leaf blades villous-lanate above and beneath, greyish green to dark green above, greyish green beneath, cuneate to attenuate at base, lobes acute or obtuse, margin serrate or incised-serrate, more or less glandular with more or less spherical glands, these ca. 0.1 mm in diameter, basal pair of veins divergent or straight. Subterminal leaf bladés of flowering shoots 3.0–4.7 cm long, 2.6–5.3 cm wide, lobes 2–3 pairs, basal pair 2.1–4.0 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 7–12 teeth in the distal 2/5–1/8, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 2–9 mm long, 0.1–0.2 times as long as lamina; stipules 6–12 mm long, more or less serrate with (2–) 15–20 teeth. Subterminal leaf blades of short shoots 3.3–5.6 cm long, 2.6–4.6 cm wide, lobes 2–3 pairs, basal pair 2.4–4.0 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 9–15 teeth in the distal 2/5–1/12, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 4–13 mm long, 0.1–0.3 times as long as lamina. Leaf blades of elongate shoots 2.7–4.5 cm long, 2.9–5.0 cm wide, lobes 2–3 pairs, basal pair 2.5–3.8 times as long as wide, extending ca. 0.9 times the width of lamina to midrib, each lobe with 6–12 teeth in the distal 2/7–1/12, basal pair of sinuses in the basal 3/10–1/5 of

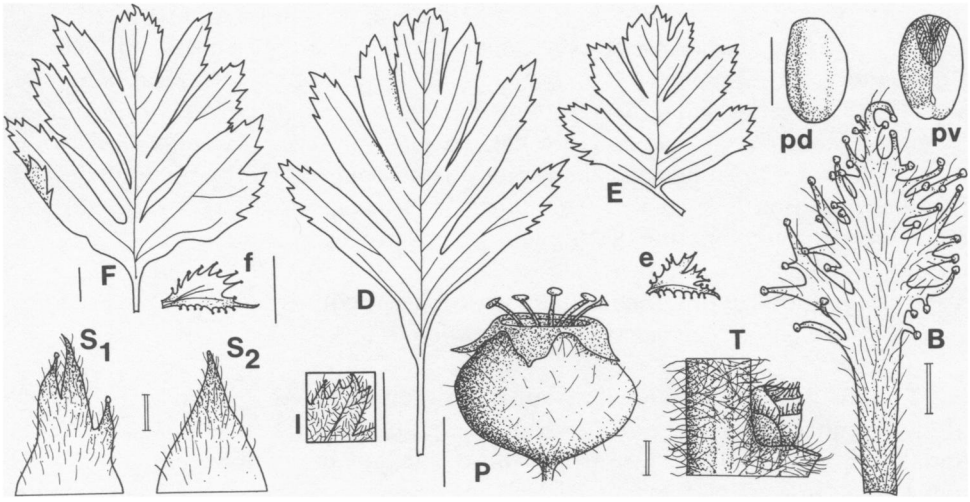


FIG. 67. *Crataegus* ×*bornmuelleri*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, E, e, I, S_1, S_2: *Davis 21490*; P, pd, pv, T: *Davis 25077*; D, F, f: *Davis 38661*.)

lamina; petiole 5–10 mm long, ca. 0.2 times as long as lamina; stipules 5–7 mm long, serrate with 17–27 teeth. Inflorescence 2.5–3.0 cm long, corymbose, 7–13-flowered, more or less compact, densely villous-lanate; pedicels 2–11 mm, densely villous-lanate; bracts 3.9–7.9 mm long, 1.1–5.8 mm wide, 1.4–3.7 times as long as wide, caducous-deciduous, margin with 8–36 glandular teeth. Hypanthium 3–5 mm long, densely villous-lanate; sepals 4.4–5.8 mm long, 2.6–3.7 mm wide, more or less narrowly triangular, 1.2–2.0 times as long as wide, margin entire or glandular-serrate, with 1–3 teeth; petals 6–9 mm long and wide; stamens ca. 20, anthers purple; styles 4–5. Fruit 9–11 mm long, 7–14 mm in diameter, 0.8–1.3 times as long as wide, depressed-globose, subglobose, or slightly pyriform, yellowish, orange, or red; the immature fruit crowned by the persistent, erect to spreading sepals, at maturity sepals reflexed; flesh yellowish; pyrenes 4–5, dorsally sulcate, ventrolaterally smooth, hypostyle pilose. Chromosome number unknown. Figs. 4F, 67.

Phenology. Flowering in May and June, fruiting in June to October.

Distribution (Fig. 68). Asian Turkey; in openings of forests with *Abies* and at roadsides; at ca. 1000 m.

ADDITIONAL SPECIMENS EXAMINED. **Turkey.** Prov. Cankiri, ad opp. Ilgaz, *Bornmüller 13417* (BM, W), *Davis 21490* (BM, K), *Davis 25077* (BM, K); prov. Kastamonu, Daday to Azdavay, 35 km from Daday, *Davis 38661* (K); Bolu, *Lancaster s.n.* (BM); prov. Kastambuli, Tosya, Pescam, *Sintenis 5230* (G, JE, LD).

27. Crataegus ×peloponnesiaca Byatt, Candollea 31: 299, fig. 1h. 1976. (*Crataegus heldreichii* × *Crataegus pycnoloba*.)—TYPE: GREECE, Peloponnesus, Achaia, Vrahni pr. Kalavrita, 1400 m, 10 Jun 1975, *Polunin 12876* (holotype: LTR!).

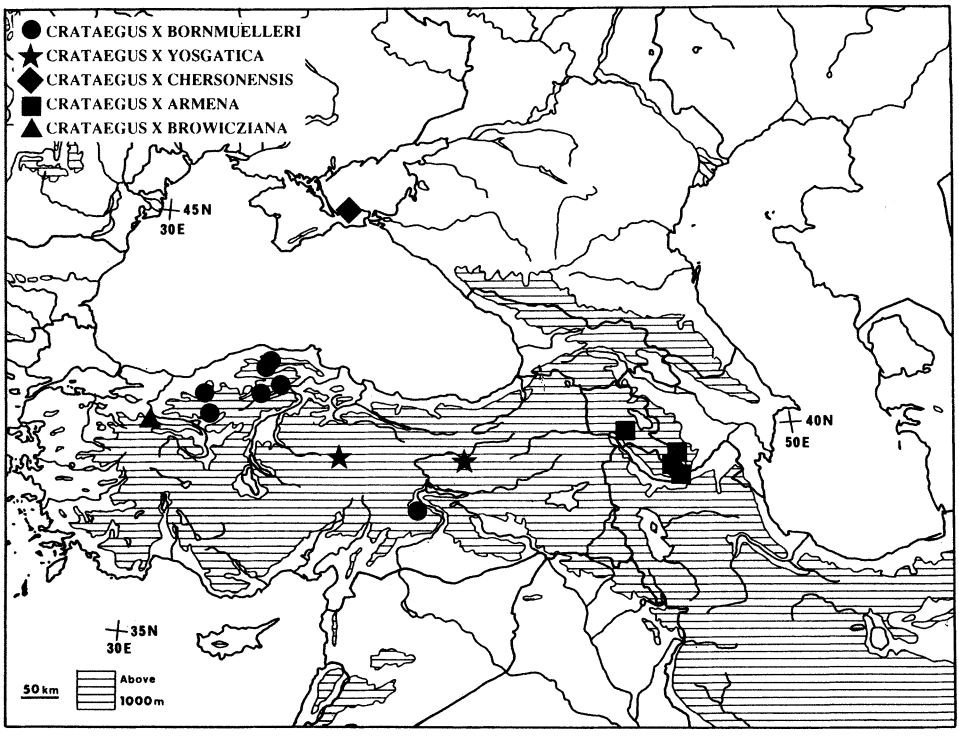


FIG. 68. Distribution of *Crataegus* ×*bornmuelleri*, *C.* ×*yosgatica*, *C.* ×*chersonensis*, *C.* ×*armena*, and *C.* ×*browicziana*, based on specimens seen and literature records cited by Davis (1972).

Shrub, rarely a tree, up to ca. 7 m tall. Twigs densely subsericeous, rarely subsericeous-lanate; thorns up to ca. 1.5 cm long, more or less stout. Buds 1.4–2.3 mm long, 1.4–2.5 mm in diameter. Leaf blades densely sericeous above and beneath, dark greyish green above, greyish green beneath, more or less broadly cuneate at base, lobes parallel-sided or tapering towards base, margin entire or serrate, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 0.9–3.2 cm long, 1.0–3.6 cm wide, lobes 2–3 pairs, basal pair 2.0–3.7 times as long as wide, extending 0.9–1.0 times the width of lamina to midrib, each lobe entire or with 1–4 teeth in the distal 2/7–1/16, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 1–6 mm long, 0.1–0.3 times as long as lamina; stipules 2–8 mm long, entire or with 1–6 teeth. Subterminal leaf blades of short shoots 1.4–3.8 cm long, 1.2–3.0 cm wide, lobes 2–4 pairs, basal pair 2.3–3.0 times as long as wide, extending 0.8–1.0 times the width of lamina to midrib, each lobe entire or with 1–7 teeth in the distal 1/3–1/11, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 6–16 mm long, 0.3–0.5 times as long as lamina. Leaf blades of elongate shoots 1.8–4.4 cm long, 2.1–4.4 cm wide, lobes 2–4 pairs, basal pair 1.9–3.3 times as long as wide, extending 0.9–1.0 times the width of lamina to midrib, each lobe with 1–7 teeth in the distal 1/2–1/10, basal pair of sinuses in the basal 1/5–1/10 of lamina; petiole 5–14 mm long, 0.2–0.4 times as long as lamina; stipules 5–9 mm long, entire or more or less serrate with 1–22 teeth. Inflorescence 1.0–2.5 cm long, corymbose, 6–16-flowered, more or less compact, subsericeous, rarely

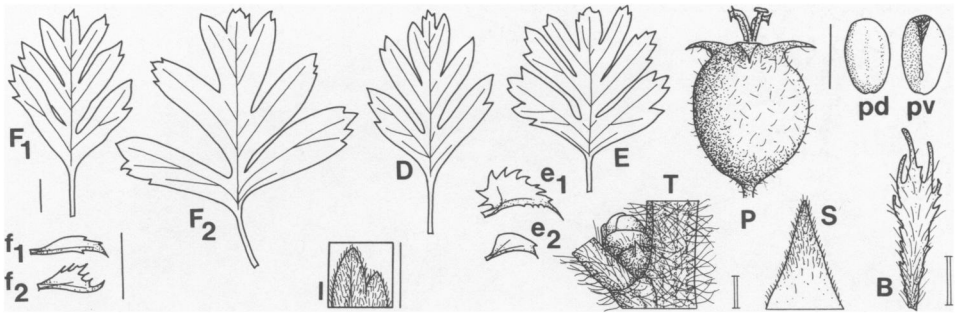


FIG. 69. *Crataegus* ×*peloponnesiaca*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, D, E, e_1, F_1, f_2, I, S: *Christensen 1396*; e_2: *Christensen 1403*; pd, pv: *Christensen 1588*; F_2, f_1, I, P: *Christensen 1728*.)

subsericeous-lanate; pedicels 1–14 mm long, densely subsericeous, rarely subsericeous-lanate; bracts 2.1–5.3 mm long, 0.4–1.1 mm wide, 2.7–9.7 times as long as wide, caducous, margin entire or denticulate with 1–7 glandular teeth. Hypanthium 3–5 mm long, densely subsericeous, rarely subsericeous-lanate; sepals 1.2–4.2 mm long, 1.4–2.8 mm wide, broadly to narrowly triangular, 0.5–2.2 times as long as wide, margin entire or with few glandular teeth, apex acute; petals 4–6 mm long and wide; stamens 18–20, anthers purple; styles (2–) 3–5. Fruit 8–9 mm long, 7–9 mm wide, 1.0–1.3 times as long as wide, globose to more or less pyriform, red, more or less subsericeous, rarely subsericeous-lanate; the immature fruit crowned by the persistent, erect, spreading, or reflexed sepals, at maturity sepals more or less reflexed; flesh yellowish; pyrenes (2–) 3–5, hypostyle pilose. Chromosome number unknown. Fig. 69.

Additional illustration: Fig. 3M in Christensen (1984).

Phenology. Flowering in June and July, fruiting in August.

Distribution (Fig. 70). Mountains of northern and central Peloponnesus (Killini, Chelmos, Menalon); on calcareous rocks; in scrub and openings in forest with *Abies* and *Pinus*; 1110–1550 m.

REPRESENTATIVE SPECIMENS. **Greece.** KORINTHIA: above Ano Sinikia Trikalon, Mt Killini, between the monastery of Ag. Vlasios and the refuge Ziria, *Christensen 1285* (C); along rd from Dervenion to Goura, just after southern turn-off to Sarandapichon, *Christensen 1492* (C), *Christensen 1562* (C).—ACHAIA: 5 km ENE of Kalavrita, between Vrachnion and Souvardon, *Christensen 1399* (C); along rd from Feneos to Akrata, 19–20 km after Zarouchla, between Agrinion and Valimi, *Christensen 1588* (C).—ARKADIA: Mt Menalon, at ski center above Kardaras, *Christensen 1728* (C).

See Christensen (1992) for a morphometric study of *C.* ×*peloponnesiaca* and its parents.

VI. Crataegus nothoseries **Crataegifoliae** Christensen, nothoser. nov. (*Crataegus* ser. *Crataegus* × *Crataegus* ser. *Tanacetifoliae*.)

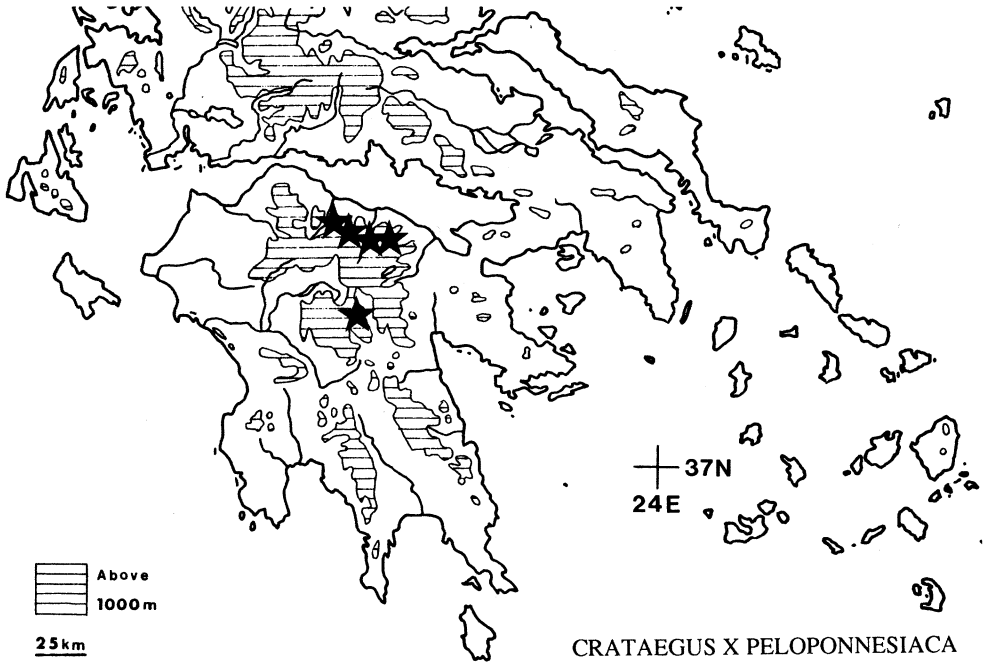


FIG. 70. Distribution of *Crataegus ×peloponnesiaca*.

Twigs with dense indumentum, aphyllous thorns up to ca. 1 cm long. Petioles of subterminal leaf blades of flowering shoots 0.1–0.2 times as long as lamina. Stipules of leaves of flowering shoots ca. 4 mm long, more or less serrate. Inflorescence corymbose, 4–12-flowered, more or less lax, with dense indumentum; bracts 4.4–7.3 times as long as wide, denticulate, caducous. Sepals entire or with a few glandular teeth. Styles (1–) 2.

28. Crataegus ×yosgatica Christensen, nothosp. nov. (*Crataegus monogyna* × *Crataegus tanacetifolia.*)—TYPE: TURKEY, prov. Yosgat, ca. 27 km W of Akdagmadeni, along Sivas-Yosgat rd, 1350 m, 13 Jun 1975, *Browicz & Zielinski 574* (holotype: KOR!; isotype: KOR!).

Ramunculi dense villosi. Folia distalia ramorum fertilium 2.4–3.9 cm longa, 1.8–2.9 cm lata, profunde quinque-septempartita, lobis glanduloso-serratis. Inflorescentiae 4–12-florae, laxae, dense villosae; bracteae 3.5–3.9 mm longae, 0.5–0.8 mm latae, denticulatae, caducae. Styli 2, rarius 1.

Habit unknown. Twigs densely villous; thorns up to ca. 1 cm long. Buds ca. 1.6 mm long and in diameter. Leaf blades villous above and beneath, more or less lustrous dark green above, greyish green beneath, cuneate or attenuate at base, lobes acute, margin glandular-serrate with more or less spherical glands, these ca. 0.1 mm in diameter, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 2.4–3.9 cm long, 1.8–2.9 cm wide, lobes 2–3 pairs, basal pair 3.3–4.4 times as long as wide, extending 0.6–0.8 times the width of lamina to

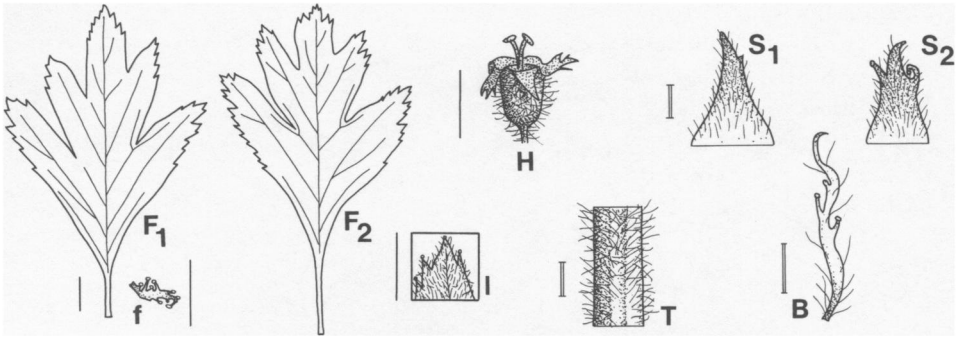


FIG. 71. *Crataegus* ×*yosgatica*. B: bract; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; H: hypanthium; I: indumentum of abaxial leaf surface; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_1, F_2, H, I, S_1, S_2, T: *Browicz 574;* B, f: *Yildirimli 3293*.)

midrib, each lobe with 5–8 teeth in the distal 1/2–1/6, basal pair of sinuses in the basal 1/2–2/5 of lamina; petiole 3–7 mm long, 0.1–0.2 times as long as lamina; stipules ca. 4 mm long, more or less serrate with ca. 6 teeth. Subterminal leaf blades of short shoots 3.4–3.8 cm long, 2.1–2.7 cm wide, lobes 2–3 pairs, basal pair 2.9–3.6 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 5–13 teeth in the distal 1/3–1/4, basal pair of sinuses in the basal 1/2 of lamina; petiole 6–10 mm long, 0.2–0.3 times as long as lamina. Inflorescence 2–3 cm long, corymbose, 4–12-flowered, more or less lax, densely villous; pedicels 4–23 mm long, densely villous; bracts 3.5–3.9 mm long, 0.4–0.8 mm wide, 4.4–7.3 times as long as wide, caducous, margin denticulate with 4–10 teeth. Hypanthium 3–4 mm long, densely villous; sepals 2.8–3.5 mm long, 1.9–2.6 mm wide, more or less narrowly triangular, 1.2–1.6 times as long as wide, margin entire or with 1–4 glandular teeth; petals ca. 6 mm long, 6–7 mm wide; styles (1–) 2. Fruits not seen. Chromosome number unknown. Fig. 71.

Phenology. Flowering in June.

Distribution (Fig. 68). Central Turkey; in open forest with *Quercus*; 1350–1600 m.

ADDITIONAL SPECIMEN EXAMINED. **Turkey.** Tunceli, Pülüinür, du pont a la village Yesilköy, *Yildirimli 3293* (G).

VII. **Crataegus** nothoseries **Orientagynae** Christensen, nothoser. nov. (*Crataegus* ser. *Orientales* × *Crataegus* ser. *Pentagynae*.)

Twigs with sparse or dense indumentum; aphyllous thorns up to ca. 13 mm long. Petioles of subterminal leaf blades of flowering shoots 0.2–0.5 times as long as lamina. Stipules entire or irregularly serrate, those of leaves of flowering shoots 5–10 mm long, those of leaves of elongate shoots 8–15 mm long. Inflorescence corymbose, 6–25-flowered, more or less lax, with sparse or dense indumentum; bracts 7.5–12.0 times as long as wide, entire or denticulate, caducous. Sepals entire. Fruit orange- to blackish red; pyrenes 3–4 (–5), dorsally and ventro-laterally sulcate, hypostyle pilose.

29. Crataegus ×pseudoazarolus Popov, Trudy Prikl. Bot. 22: 442, fig. 101. 1929. (*Crataegus azarolus* var. *pontica* × *Crataegus pentagyna.*)—TYPE: U.S.S.R., Turkmenia, Kalinskiy r-n, Kopet-Dagh, Aïdere, *Popov s.n.* (holotype: LE).

Crataegus nikitinii Essenova, Novit. Syst. Pl. Vasc. 13: 160, fig. [1]. 1976.—TYPE: *Essenova s.n.* (holotype: ASH; isotype: LE!).

Crataegus ×androssovii Essenova & Kerimova, Novit. Syst. Pl. Vasc. 14: 122, figs. 1, 2. 1977.—TYPE: *Essenova & Kerimova 15* (holotype: ASH; isotype: LE!).

Crataegus cinovskisii Kassumova, Bot. Zurn. (Moscow & Leningrad) 70: 266. 1985.—TYPE: *Kassumova s.n.* (holotype: BAK).

Shrub or tree up to ca. 6 m tall. Twigs densely to sparsely lanate-tomentose or lanate; thorns up to ca. 1.3 cm long, rare. Buds 2.3–3.0 mm long, 1.8–3.0 mm in diameter. Leaf blades more or less coriaceous, dark or bright green and more or less villous to appressed-pubescent above, more or less greyish green and more or less villous to appressed-pubescent throughout or only in vein axils beneath, cuneate or attenuate at base, lobes acute, margin coarsely crenate-serrate, basal pair of veins straight or divergent. Subterminal leaf blades of flowering shoots 3.2–4.5 cm long, 2.7–4.6 cm wide, lobes 2–3 pairs, basal pair 3.0–4.1 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 1–5 teeth in the distal 2/5–1/9, basal pair of sinuses in the basal 3/10–1/5 of lamina; petiole 7–15 mm long, 0.2–0.5 times as long as lamina; stipules 5–10 mm long, entire or with 3–6 teeth. Subterminal leaf blades of short shoots 4.0–5.1 cm long, 3.2–4.9 cm wide, lobes 2–3 pairs, basal pair 3.0–3.7 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 3–8 teeth in the distal 3/10–1/5, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 12–35 mm long, 0.3–0.7 times as long as lamina. Leaf blades of elongate shoots 3.7–5.0 cm long, 4.1–5.0 cm wide, lobes 2–3 pairs, basal pair 2.3–3.0 times as long as wide, extending ca. 0.9 times the width of lamina to midrib, each lobe with 4–6 teeth in the distal 1/3–1/4, basal pair of sinuses in the basal 1/5–1/10 of lamina; petiole 10–18 mm long, ca. 0.4 times as long as lamina; stipules 8–15 mm long, entire or with 1–2 teeth. Inflorescence corymbose, 6–25-flowered, more or less lax, more or less lanate-tomentose or lanate; pedicels 2–17 mm long, more or less lanate-tomentose or lanate; bracts 2.1–2.6 mm long, 0.2–0.4 mm wide, 7.5–12.0 times as long as wide, caducous, margin with 0–2 teeth; sepals 1.2–2.1 mm long, 2.3–3.0 mm wide, broadly triangular, 0.5–0.8 times as long as wide, margin entire, apex obtuse or subacute; petals 4–5 mm long, ca. 6 mm wide; stamens 15–20, anthers purple; styles 3–4 (–5). Fruit 7–18 mm long, 9–22 mm in diameter, 0.5–1.3 times as long as wide, depressed-globose or subglobose, orange- to blackish red, more or less lanate-tomentose or lanate, crowned by the persistent, recurved or suberect sepals; pyrenes 3–4 (–5), dorsally sulcate, ventro-laterally more or less sulcate or smooth, hypostyle pilose. Chromosome number: 2n (4x) = 68. Fig. 72.

Phenology. Flowering in May, fruiting in August to October.

Distribution (Fig. 75). Nakhichevan and Kopet-Dagh in Turkmenia; on mountain slopes, in scrub with *Cerasus, Cotoneaster, Rhamnus*, in vineyards, and at roadsides; 500–1600 m.

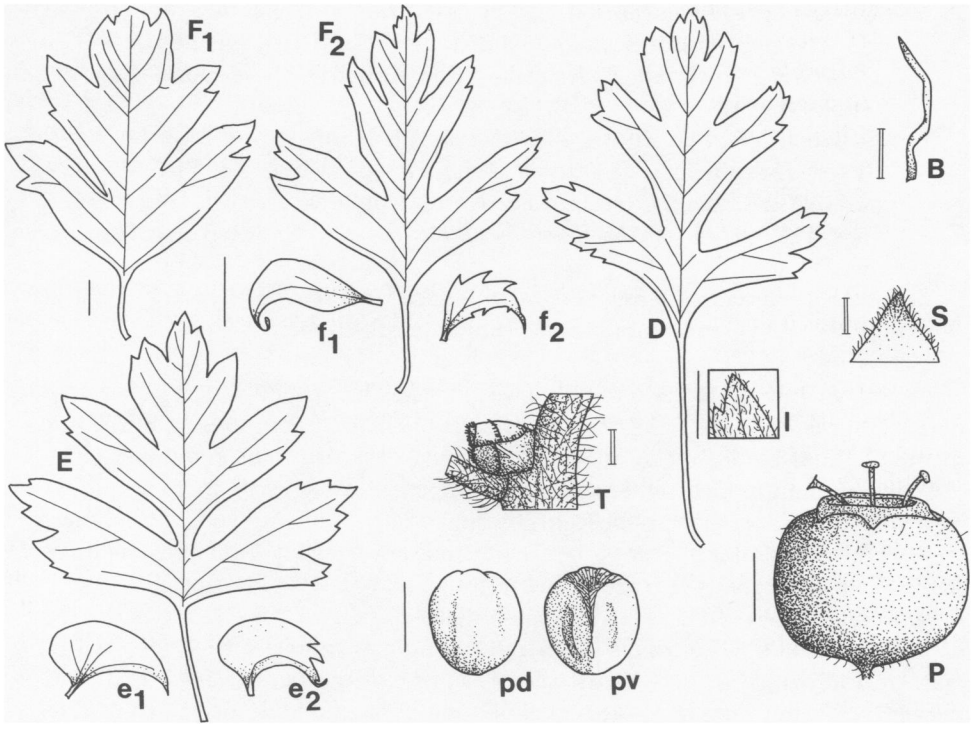


FIG. 72. *Crataegus* ×*pseudoazarolus*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e_1, e_2: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_1, P, pd, pv: *Essenova 15*; B, F_2, f_1, f_2, s: *Essenova s.n.*; D, E, e_1, e_2, I, T: *Jilenko s.n.*)

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** TURKMENIA: Kopet-Dagh, cultivated in the Botanical Garden, Ashkhabad, *Jilenko s.n.* (JE, LE).

Crataegus cinovskisii Kassumova (1985) may represent a new infraspecific taxon of *C.* ×*pseudoazarolus*. I have not yet had the opportunity to study the type.

VIII. Crataegus nothoseries **Orientaegus** Christensen, nothoser. nov. (*Crataegus* ser. *Crataegus* × *Crataegus* ser. *Orientales*.)

Twigs glabrous or with more or less dense indumentum; aphyllous thorns up to ca. 3.5 cm long. Petioles of subterminal leaf blades of flowering shoots 0.2–0.5 times as long as lamina. Stipules entire or more or less serrate, those of leaf blades of flowering shoots 3–19 mm long, those of leaf blades of elongate shoots 4–30 mm long. Inflorescence corymbose, 4–16-flowered, more or less lax, glabrous or with more or less dense indumentum. Sepals entire, rarely with a few glandular or eglandular teeth. Fruit red; flesh yellowish; pyrenes 1–3 (–5), dorsally sulcate, ventro-laterally sulcate or smooth, hypostyle pilose.

30. Crataegus ×sinaïca Boissier, Diagn. pl. orient. 2(2): 48. 1856, pro sp. (*Crataegus azarolus* × *Crataegus monogyna*.) *Crataegus maura* var. *haematoclada* Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 303. 1853. *Mespilus monogyna* var. *sinaïca* (Boissier) Wenzig, Linnaea 38: 157. 1874. *Crataegus azarolus* var. *sinaïca* (Boissier) Lange, Revis. Crataeg. 52. 1897.—TYPE: EGYPT, South Sinaï, in praeruptis St. Catharinae, 19 May & 11 Aug 1835, *Schimper 271 & 373* (lectotype, here designated: G!; isolectotypes: G! W!).

Shrub or tree up to ca. 5 m tall. Twigs glabrous-subglabrous or sparsely villous-lanate; thorns up to ca. 3.5 cm long, stout, often slightly recurved. Leaf blades more or less coriaceous, more or less lustrous dark green and glabrous or more or less villous above, pale or greyish green and glabrous or villous in vein axils and along major veins beneath, more or less narrowly cuneate at base, lobes acute or obtuse, margin entire or serrate, basal pair of veins straight or more or less divergent. Subterminal leaf blades of flowering shoots 1.6–5.0 cm long, 1.0–4.7 cm wide, lobes 1–3 pairs, basal pair 2.1–4.0 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe entire or with 1–5 teeth in the distal 1/5– 1/20, basal pair of sinuses in the apical 1/10 to basal 1/5 of lamina; petiole 5–16 mm long, 0.2–0.5 times as long as lamina; stipules 4–19 mm long, entire or more or less irregularly serrate with 1–13 teeth. Subterminal leaf blades of short shoots 1.6–4.4 cm long, 0.9–3.0 cm wide, lobes 1–3 pairs, basal pair 1.9–3.8 times as long as wide, extending 0.4–0.9 times the width of lamina to midrib, each lobe entire or with 2–10 teeth in the distal 1/4–1/14, basal pair of sinuses in the apical 3/10 to basal 3/10 of lamina; petiole 5–18 mm long, 0.3–0.5 times as long as lamina. Leaf blades of elongate shoots 2.2–5.9 cm long, 2.4–5.5 cm wide, lobes 2–3 pairs, basal pair 1.8–2.3 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 5–12 teeth in the distal 1/2–1/6, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 6–27 mm long, 0.3–0.5 times as long as lamina; stipules 4–11 mm long, serrate, with 10–15 teeth. Inflorescence 1.0–4.5 cm long, corymbose, 6–14-flowered, more or less lax, glabrous or sparsely villous; pedicels 2–28 mm long, glabrous or sparsely villous; bracts 2.1–4.6 mm long, 0.2–0.4 mm wide, 7.5–26.0 times as long as wide, caducous, margin entire or denticulate with 1–7 teeth. Hypanthium 3–4 mm long, glabrous or sparsely villous; sepals 1.6–3.9 mm long, 1.8–3.5 mm wide, broadly to narrowly triangular, 0.7–1.6 times as long as wide, margin entire, rarely with 1–2 glandular or eglandular teeth; petals 4–8 mm long, 4–7 mm wide; stamens 19–20, anthers purple; styles 1–2 (–3). Fruit 9–12 mm long, 6–12 mm in diameter, 0.9–1.5 times as long as wide, subglobose, broadly obovoid or ellipsoidal, orange-red to dark red, glabrous or sparsely villous, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 1–2 (–3), dorsally sulcate, ventro-laterally sulcate or smooth, hypostyle pilose. Figs. 73, 74.

Phenology. Flowering in March to May, fruiting in May to October.

Distribution (Fig. 75). Central and eastern parts of the Mediterranean region; on rocky mountain slopes, in scrub and woodlands; 100–1800 m.

KEY TO THE SUBSPECIES OF CRATAEGUS SINAICA

1. Twigs glabrous-subglabrous. Subterminal leaf blades of flowering shoots 1.6–3.5 cm long; petiole 5–12 mm long. Inflorescence 1.0–2.5 cm long. Petals 4–5 mm long. Styles and pyrenes 1 (–3). 30a. *C.* ×*sinaïca* subsp. *sinaïca*.

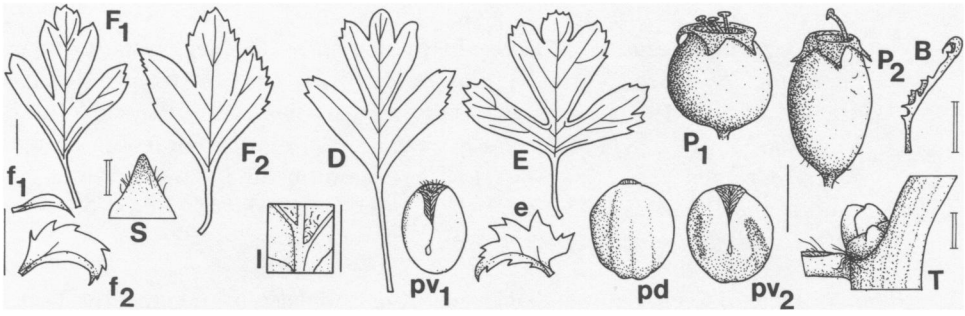


FIG. 73. *Crataegus* ×*sinaïca* subsp. *sinaïca*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of elongate shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv_1, pv_2: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_2, P_2: *Handel-Mazzetti 2623*; D, E, F_1, f_1: *Lindberg s.n.*; P_1, pd, pv_1, pv_2, T: *Kaiser 345*; B, e, f_2, I, S: *Shalaby s.n.*)

1. Twigs sparsely villous-lanate. Subterminal leaf blades of flowering shoots 3.9–5.0 cm long; petiole 12–16 mm long. Inflorescence 3.5–4.5 cm long. Petals 7–8 mm long. Styles and pyrenes (1–) 2 (–3). 30b. *C.* ×*sinaïca* subsp. *rossii*.

30a. Crataegus ×sinaïca subsp. sinaïca.

Mespilus monogyna var. *ehrenbergii* Wenzig, Linnaea 38: 157. 1874.—TYPE: *Ehrenberg s.n.* (holotype: B!).

Crataegus montesantosii Diapulis, Repert. Spec. Nov. Regni Veg. 34: 65. 1934.—TYPE: *Ehrenberg s.n.* (holotype: B, destroyed).

Twigs glabrous-subglabrous. Leaves glabrous or sparsely villous especially in vein axils beneath. Subterminal leaf blades of flowering shoots 1.6–3.5 cm long, 1.0–2.3 cm wide; petiole 5–12 mm long; stipules 4–7 mm long. Subterminal leaf blades of short shoots 1.6–2.7 cm long, 0.9–1.9 cm wide; petiole 5–12 mm long. Leaf blades of elongate shoots 2.2–3.5 cm long, 2.4–3.4 cm wide; petiole 6–9 mm long; stipules 4–7 mm long. Inflorescence 1.0–2.5 cm long; sepals 1.6–2.8 mm long, 1.8–3.0 mm wide, usually broadly triangular, 0.7–1.2 times as long as wide, entire; petals 4–5 mm long and wide; styles 1 (–3). Pyrenes 1 (–3), ventro-laterally more or less sulcate or smooth. Chromosome number unknown. Fig. 73.

Additional illustration: Fig. LXXVIII.5 in Mouterde (1970).

Distribution (Fig. 75). Sinaï, Cyprus, Lebanon, Syria, and Asian Turkey.

ADDITIONAL SPECIMENS EXAMINED. **Egypt.** SINAI: Mt Sinaï et Sainte-Catherine, *Bové 181* (G, P); sine loc., *Bove s.n.* (G); Abu Beasbid, *Kaiser 345* (G); sine loc., *Kaiser 178* (G), *Kaiser 422* (G), *Kaiser 721* (G); St. Catherine, *Schimper s.n.* (W); Gebl Musa, *Shalaby s.n.* (W); along stepway towards Gebl Musa S of St. Catherine monastery, *Snogerup 2724* (LD). **Cyprus.** Mt Troodos, Planatia, *Lindberg s.n.* (H). **Syria.** Pr. Damaskus, *Meyer 408* (W); El Qanawat, *Mouterde 6970* (G); Jebel ed Druz, *Pabot s.n.* (G). **Turkey.** Kurdistan, Taurus Armenius, pr. vicum Gölcük ad lacum subsalsum eodem nomine, *Handel-Mazzetti 2623* (W).

The type of *Mespilus monogyna* var. *ehrenbergii* Wenzig (1874), *Ehrenberg s.n.* (B!), was studied by Diapulis and annotated by him as *C. montesantosii*, spec. nov.; however, the specimen is not cited in Diapulis (1934). The type of *C. montesantosii*

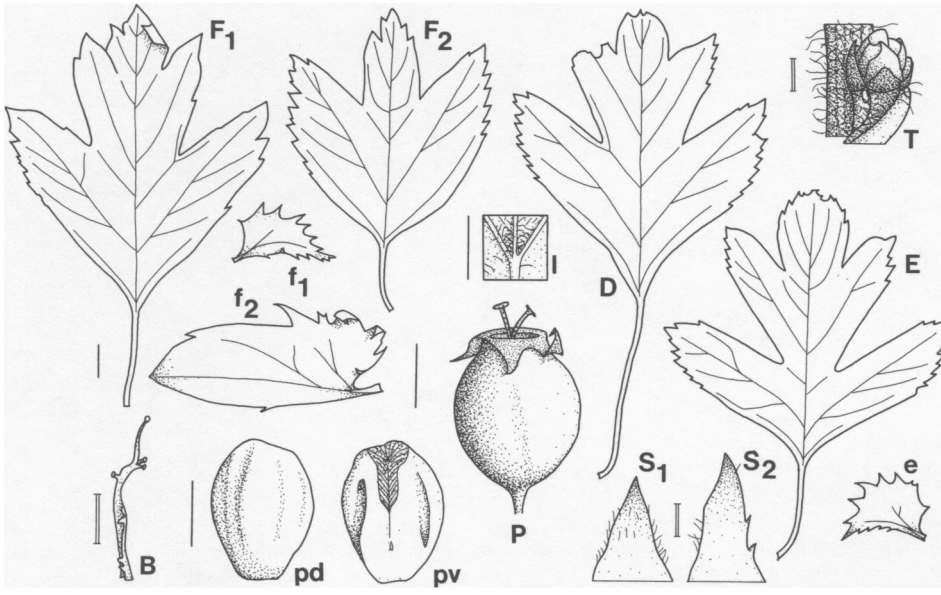


FIG. 74. *Crataegus* ×*sinaïca* subsp. *rossii*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D, E, e: *Kralik 217*; B, F_1, F_2, f_1, f_2, I, P, pd, pv, S_1, S_2, T: *Ross 729*.)

Diapulis (1934) was apparently lost to fire during the Second World War; if necessary, *Ehrenberg s.n.* (B!) could be chosen as a neotype.

30b. Crataegus ×**sinaïca** subsp. **rossii** Christensen, subsp. nov. (*Crataegus azarolus* × *Crataegus monogyna.*)—TYPE: SICILY, in sepibus reg. infer. et mont. Palermo, Apr–Jun 1908, *Ross 729* (holotype: GB!; isotype: LD!).

Ramunculi sparsim villoso-lanati. Folia distalia ramorum fertilium 3.9–5.0 cm longa, 3.5–4.7 cm lata, profunde quinque-septempartita; petioli 12–16 mm longi. Inflorescentiae 3.5–4.5 cm longae. Sepala post anthesin reflexa. Pyrenae 2, rarius 1 vel 3, dorsaliter et ventraliter sulcatae.

Twigs sparsely villous-lanate. Leaves sparsely villous above, especially along veins, sparsely villous in vein axils and along major veins beneath. Subterminal leaf blades of flowering shoots 3.9–5.0 cm long, 3.5–4.7 cm wide; petiole 12–16 mm long; stipules 5–19 mm long. Subterminal leaf blades of short shoots 3.5–4.4 cm long, 2.7–3.0 cm wide; petiole 10–18 mm long. Leaf blades of elongate shoots 4.8–5.9 cm long, ca. 5.5 cm wide; petiole 14–27 mm long; stipules 7–11 mm long. Inflorescence 3.5–4.5 cm long; sepals 2.8–3.9 mm long, 2.3–3.5 mm wide, more or less narrowly triangular, 1.1–1.6 times as long as wide, margin entire, rarely with 1–2 glandular or eglandular teeth; petals 7–8 mm long, 6–7 mm wide; styles (1–) 2 (–3). Pyrenes (1–) 2 (–3), ventro-laterally sulcate. Chromosome number unknown. Fig. 74.

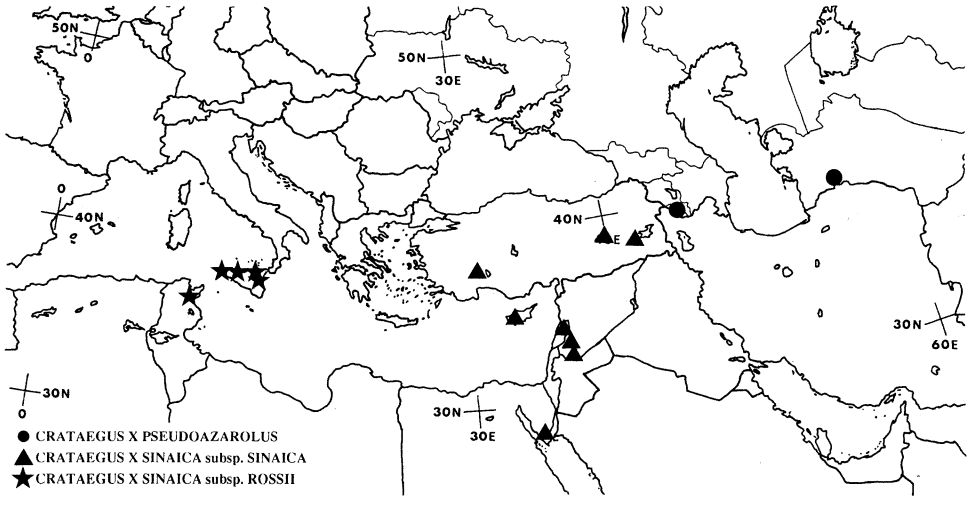


FIG. 75. Distribution of *Crataegus* ×*pseudoazarolus*, *C.* ×*sinaïca* subsp. *sinaïca*, and *C.* ×*sinaïca* subsp. *rossii*, based on specimens seen and literature records cited by Davis (1972) and Kassumova (1985).

Distribution (Fig. 75). Sicily and northern Tunisia.

ADDITIONAL SPECIMENS EXAMINED. **Italy.** SICILY: Mt Etna, Nicolosi, *Citarda s.n.* (JE); Isl. Marettimo, between the village and Castello, *Davis 40171* (LD); Valdemone, *Todaro 728* (JE). **Tunisia.** Zaghouan, *Kralik 217* (W).

31. Crataegus ×albanica Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 189. 1960, pro sp. (*Crataegus monogyna* × *Crataegus orientalis* subsp. *orientalis*.)—TYPE: GREECE, prov. Ioannina, Mt Kourenta, 25 Jun 1896, *Baldacci 117* (holotype: LE; isotypes: BM! K!).

Shrub or tree up to ca. 7 m tall. Twigs densely lanate; thorns up to ca. 18 mm, more or less stout. Buds 0.9–3.5 mm long, 0.9–2.5 mm in diameter. Leaf blades more or less dark green and lanate above, greyish green and densely lanate beneath, cuneate or attenuate at base, lobes more or less acute, margin serrate to very deeply incised-serrate, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 2.1–4.7 cm long, 2.3–4.5 cm wide, lobes 2–3 pairs, basal pair 1.6–4.2 times as long as wide, extending 0.8–1.0 times the width of lamina to midrib, each lobe entire or with 1–3 teeth in the distal 2/5–1/15, basal pair of sinuses in the basal 1/2–1/10 of lamina; petiole 5–18 mm long, 0.2–0.5 times as long as lamina; stipules 3–10 mm long, entire or with 1–4 teeth. Subterminal leaf blades of short shoots 3.1–4.9 cm long, 2.3–4.2 cm wide, lobes 2–4 pairs, basal pair 2.4–4.0 times as long as wide, extending 0.8–1.0 times the width of lamina to midrib, each lobe with 1–10 teeth in the distal 1/2–1/15, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 14–32 mm long, 0.4–0.7 times as long as lamina. Leaf blades of elongate shoots 2.8–6.2 cm long, 3.3–6.1 cm wide, lobes 2–4 pairs, basal pair 1.2–3.2 times as long as wide, extending 0.9–1.0 times the width of lamina to midrib, each lobe with 3–8 (–22) teeth in the distal 3/4–1/8, basal pair of sinuses in the basal

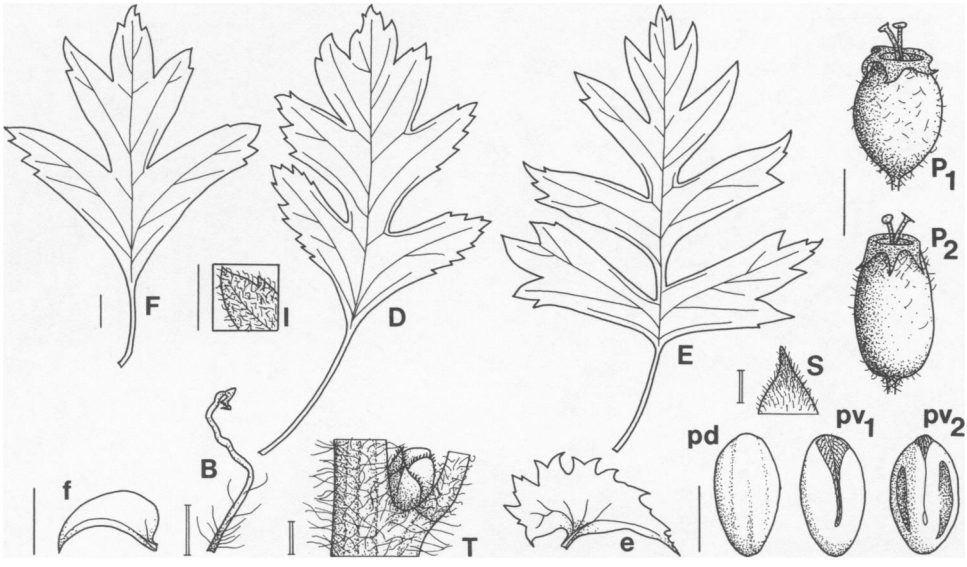


FIG. 76. *Crataegus* ×*albanica*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv_1, pv_2: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, S: *Baldacci 47*; D, E, e, F, f, I, P_2, pd, pv_1, T: *Christensen 1807*; P_1: *Christensen 1941*; pv_2: *Christensen 1969*.)

3/10–1/10 of lamina; petiole 9–25 mm long, 0.2–0.5 times as long as lamina; stipules 5–30 mm long, regularly serrate or irregularly serrate-entire with (1–) 6–30 teeth, rarely entire. Inflorescence ca. 3 cm long, corymbose, 8–16-flowered, more or less lax, densely lanate; pedicels 6–25 mm long, densely lanate; bracts 2.1–3.9 mm long, 0.1–0.2 mm wide, 22–24 times as long as wide, caducous, margin with 0–1 glandular tooth. Hypanthium ca. 3 mm long, densely lanate; sepals 1.2–3.9 mm long, 1.4–3.2 mm wide, broadly to narrowly triangular, 0.6–1.6 times as long as wide, margin entire; petals 5–7 mm long and wide; stamens 18–20, anthers purple; styles 1–3. Fruit 8–13 mm long, 6–9 mm in diameter, 1.1–1.9 times as long as wide, subglobose to cylindrical, red, more or less lanate; the immature fruit often yellowish and crowned by the persistent and usually erect to spreading sepals, at maturity sepals reflexed; flesh yellowish; pyrenes 1–3, dorsally sulcate, ventro-laterally smooth or sulcate, hypostyle pilose. Chromosome number unknown. Fig. 76.

Phenology. Flowering in June and July, fruiting in August-September.

Distribution (Fig. 77). Greece and southern Yugoslavia; on limestone, quartzite, and micaceous schist; in scrub with *Quercus, Pyrus, Acer*, openings in forest with *Abies* and *Pinus*, in rocky places and at field edges; 600–1500 m.

REPRESENTATIVE SPECIMENS. **Greece.** ACHAIA: Mt Erimanthos, above Michas, 14 km SE of Chalandritsa, *Christensen 1762* (C).—IOANNINA: Mt Mitsikeli, *Baldacci 47* (BM, MO); Mt Kourenta, above Psina, 18 km SW of Ioannina, *Christensen 1807* (C).—TRIKALA: Lakmos Mts, Mt Boutaï, 2 km SW of Chalikion, 11 km S of Metsovon, *Christensen 1846* (C); Chalikion, in montos. versus Lakmos, *Sintenis 894* (JE, LD, W).—FLORINA: Triklarion Mts, just NNW of Kristallopigi, *Christensen 1920*

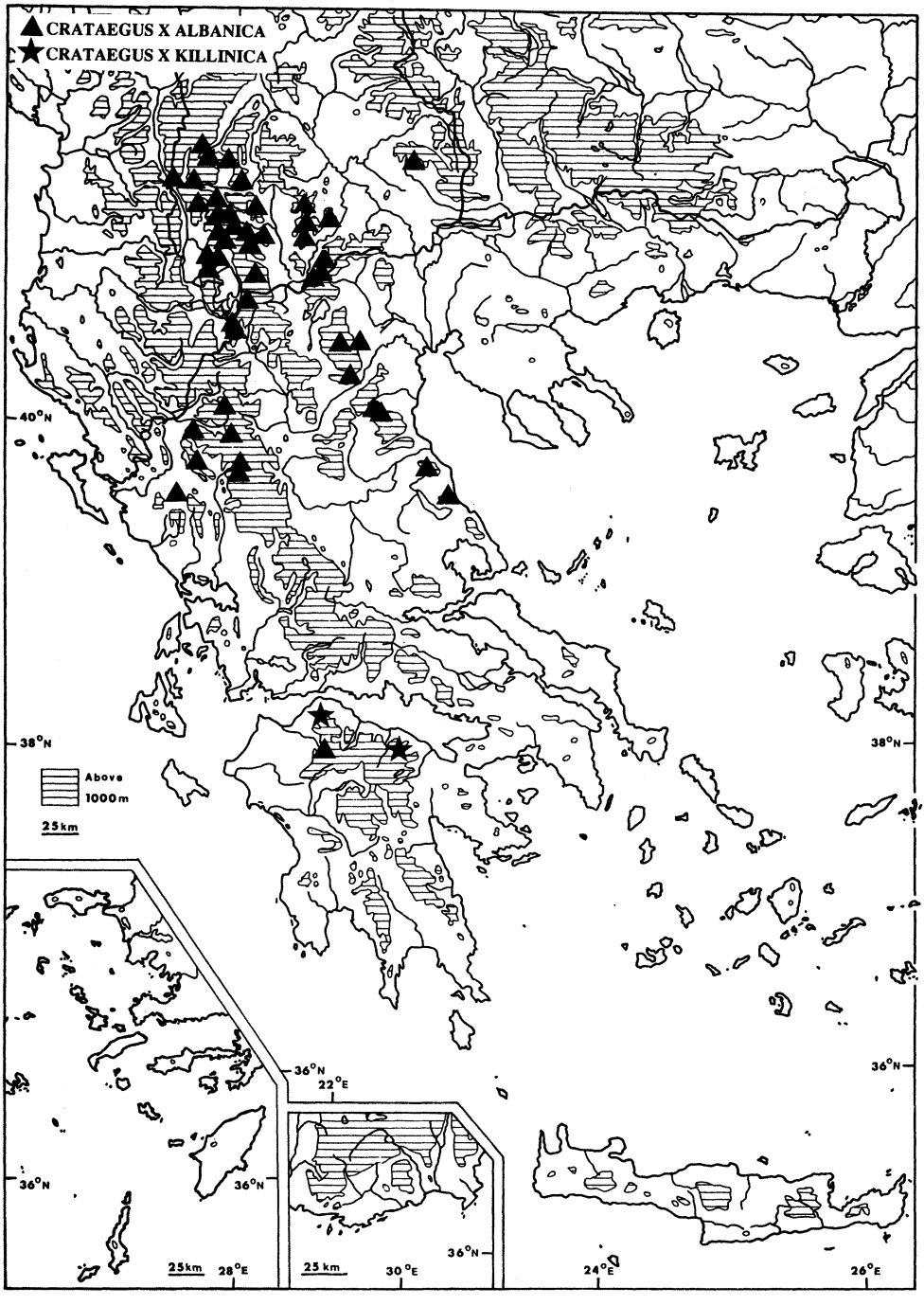


FIG. 77. Distribution of *Crataegus* ×*albanica* and *C.* ×*killinica*, based on specimens seen and literature records cited by Dzekov (1973) and Byatt (1976b).

(C).—IMATHIA: Mt Vermion, 4 km along rd from Hotel Seli above Kato Vermion to Ano Seli and ski center Tria-pente Pigadia, *Christensen 1939* (C).—PIERIA: Mt Olimpos, 11 km along rd from Petra to Kokkinopilos, *Christensen 1969* (C).—LARISSA: Mt Ossa, 0–6 km along rd from Spilia to Anatoli, *Christensen 1973* (C); Keramidi, 40 km ESE of Larissa, *Raus 968* (ATH). **Yugoslavia**. Makedonija, NE von Debar, Grn. Kosovrasti, *Krendl s.n.* (W).

Schneider (1906) referred *Baldacci 47* and *Baldacci 117* (the type of *C.* ×*albanica*) to *C. orientalis* var. *tournefortii* (Grisebach) Schneider (=4a. *C. orientalis* subsp. *orientalis*).

See Christensen (1992) for a morphometric study of *C.* ×*albanica* and its parents.

32. Crataegus ×**killinica** Christensen, nothosp. nov. (*Crataegus heldreichii* × *Crataegus monogyna*.)—TYPE: GREECE, prov. Korinthia, Mt Killini, between the village of Ano Sinikia Trikalon and the monastery of Ag. Vlasios, 1060–1110 m, 12 Jun 1987, *Christensen & Møller 1275* (holotype: C!; isotypes: ATH! B! BM! K! UPA! W!).

Ramunculi dense villoso-lanati. Folia distalia ramorum fertilium 1.6–3.5 cm longa, 1.6–3.2 cm lata, profunde tri-novempartita; stipulae 4–7 mm longae, plus minusve integrae. Inflorescentiae 4–10-florae, compactae, dense lanatae; bracteae caducae, 1.8–2.6 mm longae, ca. 0.2 mm latae. Sepala post anthesin reflexa. Pyrenae 1–3, rarius 5, dorsaliter sulcatae, ventraliter laeves vel sulcatae.

Shrub 2–3 m tall. Twigs densely villous-lanate; thorns up to ca. 1 cm long. Buds ca. 1.2 mm long, ca. 1.6 mm in diameter. Leaf blades often more or less coriaceous, villous-lanate above and beneath, more or less dark green above, greyish green or yellowish green beneath, broadly cuneate-attenuate at base, lobes subacute, serrate with more or less coarse teeth, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 1.6–3.5 cm long, 1.6–3.2 cm wide, lobes 1–4 pairs, basal pair 2.0–2.4 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 1–5 teeth in the distal 1/4–1/15, basal pair of sinuses in the apical 3/10 to basal 1/10 of lamina; petiole 4–16 mm long, 0.2–0.5 times as long as lamina; stipules 4–7 mm long, entire or with 1–3 teeth. Subterminal leaf blades of short shoots 2.5–4.0 cm long, 2.0–4.0 cm wide, lobes 3–4 pairs, basal pair 2.0–2.6 times as long as wide, extending 0.6–1.0 times the width of lamina to midrib, each lobe with 2–4 teeth in the distal 3/10–1/14, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 14–32 mm long, 0.5–0.9 times as long as lamina. Leaf blades of elongate shoots 2.4–4.0 cm long, 2.6–3.5 cm wide, lobes 2–3 pairs, basal pair 2.0–2.9 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 3–4 teeth in the distal 2/5–1/7, basal pair of sinuses in the basal 2/5–1/5 of lamina; petiole 8–19 mm long, 0.3–0.5 times as long as lamina; stipules 8–12 mm long, more or less serrate with 2–20 teeth. Inflorescence 2–3 cm long, corymbose, 4–10-flowered, more or less lax, densely lanate; pedicels 4–23 mm long, densely lanate; bracts 1.8–2.6 mm long, ca. 0.2 mm wide, 10.0–15.0 times as long as wide, caducous, margin entire or with 1 tooth. Hypanthium 3–4 mm long, densely lanate; sepals 1.2–2.3 mm long, 1.9–2.1 mm wide, more or less broadly triangular, 0.6–1.1 times as long as wide, margin entire, apex acute or obtuse; petals ca. 6 mm long and wide; stamens not seen; styles 1–3 (–5). Fruit 8–10 mm long, 6–8 mm in diameter, 1.0–1.5 times as long as wide, subglobose to ellipsoi-

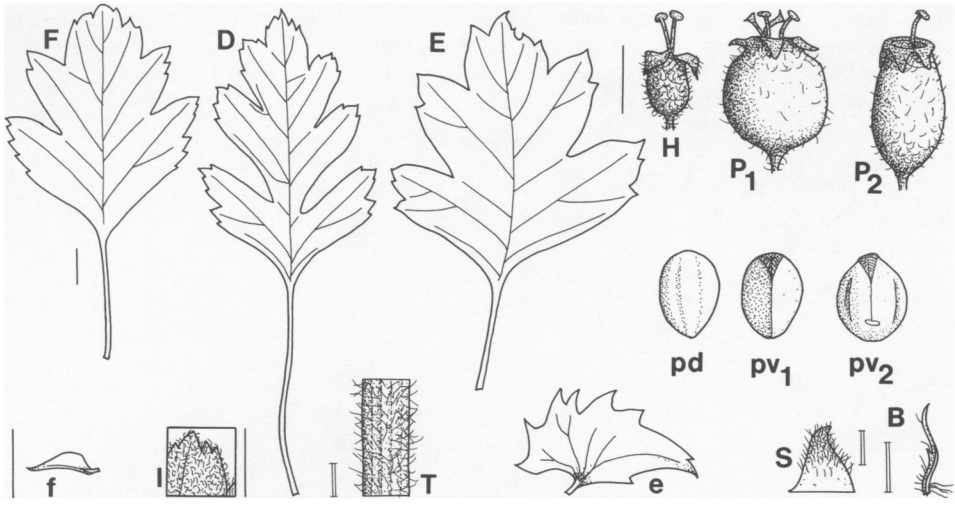


FIG. 78. *Crataegus* ×*killinica*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; H: hypanthium; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv_1, pv_2: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, D, E, e, F, f, H, I, S: *Christensen 1275*; T: *Christensen 1525*; P_2: *Christensen 1533*; pv_2: *Christensen 1777*; P_1, pd, pv_1: *Christensen 1790*.)

dal, red, more or less villous-lanate, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 1–3 (–5), dorsally sulcate, ventro-laterally smooth or sulcate, hypostyle pilose. Chromosome number unknown. Fig. 78.

Phenology. Flowering in June, fruiting in August and September.

Distribution (Fig. 77). Mt. Killini and Mt. Panachaikon in the northern Peloponnesus; on calcareous rocks; in open forest with *Pinus, Acer, Quercus;* 990–1170 m.

Additional Specimens Examined. **Greece.** Korinthia. Mt. Killini: between the monastery of Ag. Vlasios above Ano Sinikia Trikalon and refuge Ziria, *Christensen 1290* (C), *Christensen 1533* (C); between Ano Sinikia Trikalon and the monastery of Ag. Vlasios, *Christensen 1525* (C, E, MO; merotypes of *C.* ×*killinica*).—Achaia. Mt. Panachaikon: valley of Valitsianikon river, along rd from Balas to refuge, *Christensen 1777* (C), *Christensen 1790* (C).

See Christensen (1992) for a morphometric study of *C.* ×*killinica* and its parents.

IX. Crataegus nothoseries **Crataegynae** Christensen, nothoser. nov. (*Crataegus* ser. *Crataegus* × *Crataegus* ser. *Pentagynae.*)

Twigs glabrous or sparsely villous; aphyllous thorns up to ca. 1.2 cm long. Petioles of subterminal leaf blades of flowering shoots 0.3–0.6 times as long as lamina. Stipules of leaves of flowering shoots entire or more or less serrate, 6–16 mm long, those of leaves of elongate shoots more or less serrate, 7–26 mm long. Inflorescence corymbose, 7–16-flowered, lax, glabrous or sparsely villous; bracts 7.5–22.0 times as long as wide, entire or denticulate, caducous. Sepals entire. Fruit

dark red to blackish purple; flesh more or less reddish or yellowish; pyrenes 1–2 (–4), dorsally and ventro-laterally sulcate.

33. Crataegus ×zangezura Pojarkova in Komarov, Fl. URSS 9: 508. 1939. (*Crataegus pentagyna* × *Crataegus pseudoheterophylla.*)—TYPE: U.S.S.R., Armenia, Zangezur, prope opp. Goris (Genjuri), in parte inferiore faucium Goris-czaj, 21 Sep 1936, *Pojarkova 540* (holotype: LE; isotype: LE, photos: C!).

Shrub or small tree. Twigs glabrous-subglabrous; thorns up to ca. 1.2 cm long, rare. Buds 1.9–3.0 mm long, 1.8–2.3 mm in diameter. Leaf blades sparsely villous and dark green above, glaucous- or greyish green and more or less villous in vein axils beneath, cuneate to truncate at base, lobes acute, margin serrate or incised-serrate, basal pair of veins divergent. Subterminal leaf blades of flowering shoots 2.8–5.0 cm long, 2.5–4.8 cm wide, lobes 2–4 pairs, basal pair 2.2–3.1 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 2–11 teeth in the distal 2/3–3/20, basal pair of sinuses in the apical 4/9 to basal 1/5 of lamina; petiole 12–25 mm long, 0.4–0.6 times as long as lamina; stipules 6–12 mm long, entire or with 1–6 teeth. Subterminal leaf blades of short shoots 2.6–4.9 cm long, 2.3–5.4 cm wide, lobes 2–4 pairs, basal pair 2.2–3.1 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 3–14 teeth in the distal 5/8–1/9, basal pair of sinuses in the basal 1/2–3/10 of lamina; petiole 12–36 mm long, 0.4–0.8 times as long as lamina. Leaf blades of elongate shoots 3.2–5.5 cm long, 3.8–6.0 cm wide, lobes 2–4 pairs, basal pair 1.8–2.6 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 4–14 teeth in the distal 5/8–1/4, basal pair of sinuses in the basal 2/5–1/4 of lamina; petiole 17–23 mm long, 0.3–0.6 times as long as lamina; stipules 7–14 mm long, more or less irregularly denticulate-serrate or regularly serrate, with 3–12 teeth. Inflorescence 2.5–4.0 cm long, corymbose, 10–14-flowered, lax, glabrous or sparsely villous; pedicels 3–30 mm long, glabrous or sparsely villous; bracts 1.8–1.9 mm long, 0.1–0.2 mm wide, 10.0–22.0 times as long as wide, caducous, margin entire or with ca. 1 tooth. Hypanthium 3–4 mm long, glabrous or more or less villous; sepals 1.8–3.0 mm long, 1.9–2.8 mm wide, triangular, 0.6–1.3 times as long as wide, margin entire, apex acute; petals ca. 7 mm long, ca. 6 mm wide; stamens 18–20, anthers purple; styles 1–2 (–3) or (1–) 2 (–3). Fruit 8–9 mm long, 5–9 mm in diameter,0.9–1.8 times as long as wide, subglobose to more or less cylindrical, dark red to blackish purple, glabrous or sparsely villous, crowned by the persistent, reflexed sepals, often angular at base; flesh more or less reddish; pyrenes 1–2 (–3) or (1–) 2 (–3), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number: 2 (4x) = 68. Figs. 79, 80.

Phenology. Flowering in April, fruiting in May to October.

Distribution (Fig. 82). Kopet-Dagh in Turkmenia, Iran, and Caucasia; on rocky mountain slopes and in scrub.

KEY TO THE NOTHOSUBSPECIES OF CRATAEGUS ×ZANGEZURA

1. Subterminal leaf blades of flowering shoots 2.8–4.1 cm long; lobes 2–3 pairs. Fruit subglobose to cylindrical, 1.0–1.8 times as long as wide, often angular at base; pyrenes 1–2 (–3).
33a. *C.* ×*zangezura* nothosubsp. *zangezura.*

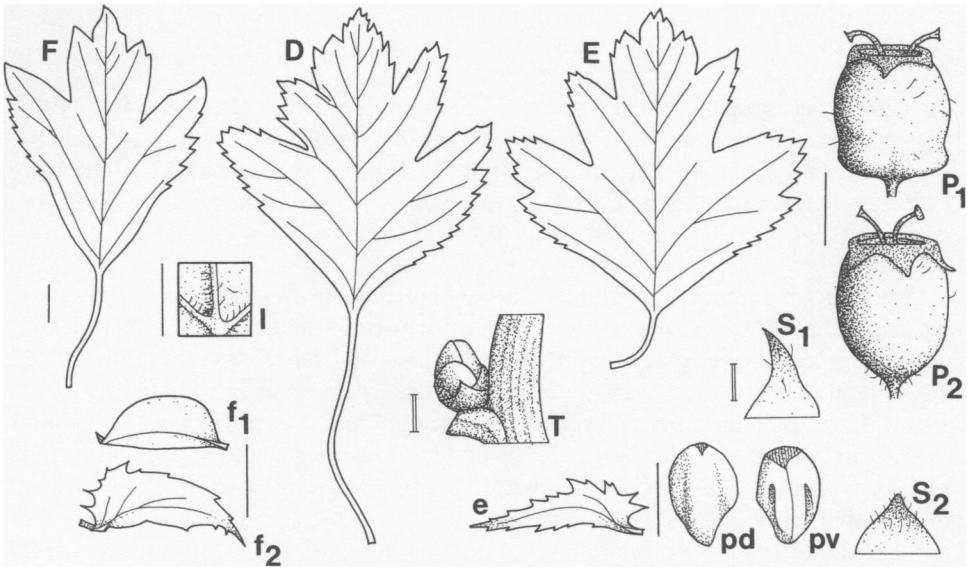


FIG. 79. *Crataegus* ×*zangezura* nothosubsp. *zangezura*. D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of elongate shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (P_1: *Pojarkova 25*; f_1, pd, pv: *Pojarkova 527*; E, e, F, f_2, S_1, T: *Pojarkova 536*; D, I, P_2, S_2: *Szovits s.n.*)

1. Subterminal leaf blades of flowering shoots 2.9–5.0 cm long; lobes 2–4 pairs. Fruit subglobose, 0.9–1.1 times as long as wide; pyrenes (1–) 2 (–3).
33b. *C.* ×*zangezura* nothosubsp. *pseudoambigua*.

33a. Crataegus ×zangezura nothosubsp. **zangezura.** (*Crataegus pentagyna* subsp. *pentagyna* × *Crataegus pseudoheterophylla* subsp. *pseudoheterophylla*.)

Subterminal leaf blades of flowering shoots 2.8–4.1 cm long, 2.8–4.0 cm wide, lobes 2–3 pairs. Subterminal leaf blades of short shoots 3.2–4.6 cm long, 3.1–3.7 cm wide, lobes 2–3 pairs. Styles 1–2 (–3). Fruit 8–9 mm long, 5–9 mm in diameter, 1.0–1.8 times as long as wide, subglobose to more or less cylindrical, often angular at base; pyrenes 1–2 (–3). Chromosome number unknown. Fig. 79.

Distribution (Fig. 82). Georgia, Armenia, and Azerbaijan.

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** GEORGIA: inter opp. Borghomi et pag. Likani, ad fl. Kura, *Juzepczuk137* (LE).—ARMENIA: Jerevan, Zapli, *Pojarkova 25* (LE); Zangezur, Goris, Gorisczaj, *Pojarkova 527* (LE); Goris, *Pojarkova 539* (LE).—AZERBAIJAN: Kirovabadskyi r-n, *Bespanova s.n.* (LE).

33b. Crataegus ×zangezura nothosubsp. **pseudoambigua** (Pojarkova) Christensen, comb. et stat. nov. (*Crataegus pentagyna* subsp. *pseudomelanocarpa* × *Crataegus pseudoheterophylla* subsp. *turkestanica*.) *Crataegus* ×*pseudoambigua* Pojarkova in Komarov, Fl. URSS 9: 509. 1939.—TYPE: U.S.S.R.,

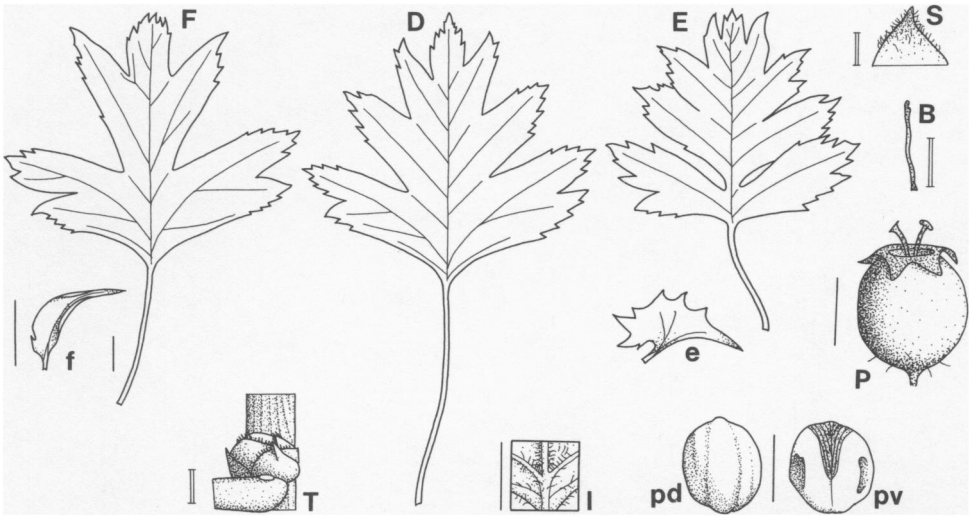


FIG. 80. *Crataegus* ×*zangezura* nothosubsp. *pseudoambigua*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D, F, f, P, pd, pv, T: *Jilenko s.n.*; B, E, e, I, S: *Rodin 3040*.)

Turcomania, jugi Kopet-Dagh, angustiis Aïdere, 8 Oct 1930, *Iljin 840* (holotype: LE!).

Subterminal leaf blades of flowering shoots 2.9–5.0 cm long, 2.5–4.8 mm wide, lobes 2–4 pairs. Subterminal leaf blades of short shoots 2.6–4.9 cm long, 2.3–5.4 cm wide, lobes 2–4 pairs. Styles (1–) 2 (–3). Fruit 8–9 mm long and in diameter, 0.9–1.1 times as long as wide, subglobose; pyrenes (1–) 2 (–3). Chromosome number: 2n (4x) = 68. Fig.80.

Additional illustration: Fig. 97 in Popov (1929).

Distribution (Fig. 82). Kopet-Dagh in Turkmenia.

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** TURKMENIA. Kopet-Dagh: cultivated in the Botanical Garden, Ashkhabad, *Jilenko s.n.* (JE, LD); Zakasp. obl. Krasnovod. u., Ioldere, *Lipsky 3151* (LE), *Samokiski 1611* (LE); 16 km SW Kizyl-Arvat, *Rodin 3040* (LE); Aïdere, *Rodin 3126* (LE).

34. Crataegus ×**rubrinervis** Lange, Bot. Tidsskr. 13: 25. 1882–1883. (*Crataegus monogyna* × *Crataegus pentagyna* subsp. *pentagyna*.)—TYPE: DENMARK, cultivated at the Botanical Garden of the University of Copenhagen, 20 Oct 1881, *Lange s.n.* (holotype: C!).

Crataegus ×*dipyrena* Pojarkova in Komarov, Fl. URSS 9: 508. 1939.—TYPE: *Tranzschel s.n.* (holotype: LE; isotype: LE, photos: C!).

Shrub up to ca. 2 m tall. Twigs glabrous or sparsely villous; thorns up to ca. 0.8 cm long, rare. Buds 2.8–4.4 mm long, 2.4–3.5 mm in diameter. Leaf blades dark green and sparsely villous or glabrous above, pale green and more or less villous

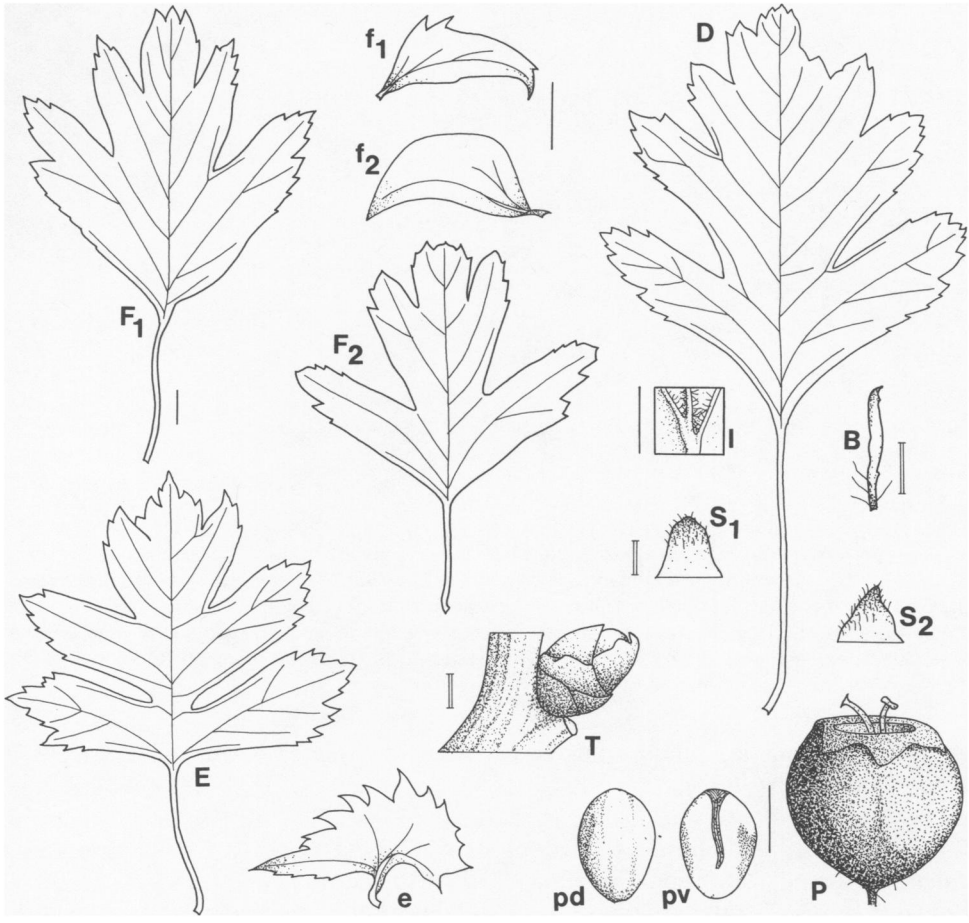


FIG. 81. *Crataegus* ×*rubrinervis*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D, f_2, P, pd, pv, T: unknown collector *39*; E, e: unknown collector *s.n.*; F_1, S_1: *Noé 1232*; B, F_2, f_1: *Wierzbicki s.n.*)

throughout or only in vein axils beneath, broadly cuneate or more or less rounded at base, lobes acute or obtuse, margin serrate or crenate-serrate, with more or less coarse teeth, basal pair of veins straight or divergent. Subterminal leaf blades of flowering shoots 3.4–5.7 cm long, 3.4–6.0 cm wide, lobes 1–3 pairs, basal pair 2.8–3.3 times as long as wide, extending 0.7–0.8 times the width of lamina to midrib, each lobe with 2–8 teeth in the distal 1/3–1/16, basal pair of sinuses in the apical 4/9 to basal 3/10 of lamina; petiole 13–29 mm long, 0.3–0.5 times as long as lamina; stipules 7–16 mm long, entire or with 1–2 teeth. Subterminal leaf blades of short shoots 3.8–6.3 cm long, 3.6–5.6 cm wide, lobes 3–4 pairs, basal pair 2.6–3.4 times as long as wide, extending 0.6–0.7 times the width of lamina to midrib, each lobe with 4–10 teeth in the distal 2/5–1/9, basal pair of sinuses in the basal 2/5–3/10 of

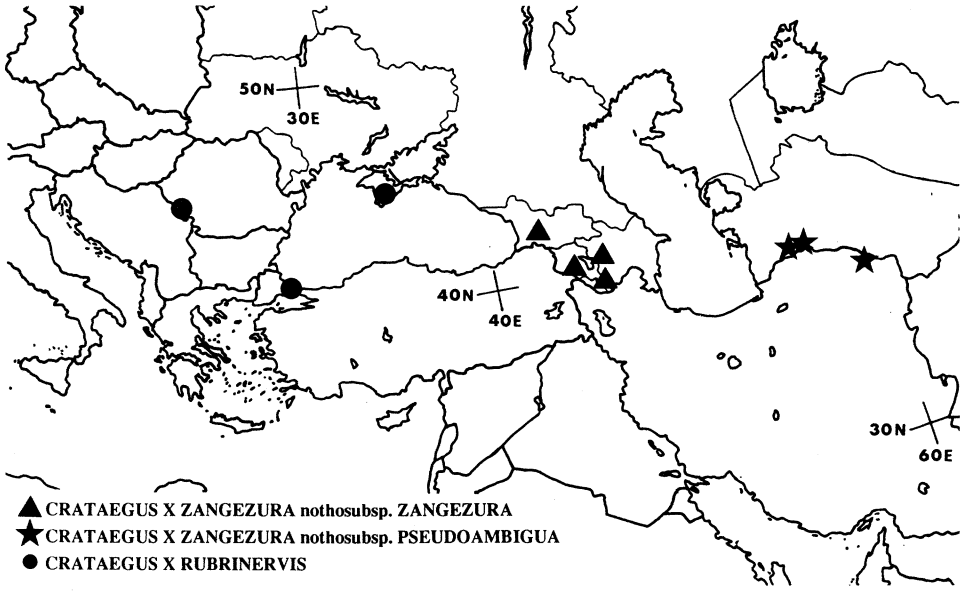


FIG. 82. Distribution of *Crataegus* ×*zangezura* nothosubsp. *zangezura* and nothosubsp. *pseudoambigua,* and of *C.* ×*rubrinervis,* based on specimens seen and literature records cited by Rechinger (1969).

lamina; petiole 24–41 mm long, 0.6–0.7 times as long as lamina. Leaf blades of elongate shoots 4.4–7.2 cm long, 5.5–8.5 cm wide, lobes 3–4 pairs, basal pair 1.8–2.1 times as long as wide, extending ca. 0.9 times the width of lamina to midrib, each lobe with 11–13 teeth in the distal 2/5–3/5, basal pair of sinuses in the basal 1/5 of lamina; petiole 19–23 mm long, 0.3–0.5 times as long as lamina; stipules 12–26 mm long, serrate, with 15–28 teeth. Inflorescence 3.0–4.5 cm long, corymbose, 7–16-flowered, lax, glabrous or sparsely villous; pedicels 3–23 mm long, glabrous or more or less villous; bracts 2.5–2.6 mm long, 0.3–0.4 mm wide, ca. 7.5 times as long as wide, caducous, margin entire. Hypanthium ca. 4 mm long, glabrous or more or less villous; sepals 1.2–2.5 mm long, 1.9–2.6 mm wide, usually broadly triangular, 0.6–1.0 (–1.3) times as long as wide, margin entire; petals 5–7 mm long and wide; stamens 18–20, anthers purple; styles (1–) 2 (–4). Fruit 8–13 mm long, 8–14 mm in diameter, 0.9–1.2 times as long as wide, subglobose, blackish purple or black, often pruinose, glabrous or more or less villous, crowned by the persistent, reflexed or recurved sepals; flesh yellowish or reddish; pyrenes (1–) 2 (–4), dorsally sulcate, ventro-laterally more or less sulcate or smooth, hypostyle pilose. Chromosome number unknown. Fig. 81.

Phenology. Flowering in May, fruiting in October.

Distribution (Fig. 82). Romania, European Turkey, and the Crimea; on rocky mountain slopes and in scrub.

ADDITIONAL SPECIMENS EXAMINED. **Romania.** Banat, ad Oravita, *Wierzbicki s.n.* (W). **Turkey.** European Turkey, Büyükdere, *Noé 1232* (JE). **Austria.** Vienna, the Botanical Garden, cultivated, collector unknown *39* (W), *2K3* (W).

X. NOTHOSPECIES of **Crataegus** series **Crataegus**.

35. Crataegus ×chersonensis Christensen, nothosp. nov. (*Crataegus meyeri* × *Crataegus microphylla.*)—TYPE: U.S.S.R., the Crimea, Leninski distr., promunturium Kazantip, 3 Jun1977, *Belyanina s.n.* (holotype: H!).

Ramunculi villosi. Folia distalia ramorum fertilium 4.2–5.7 cm longa, 3.5–5.6 cm lata, quinque-septempartita; stipulae denticulato-serratae. Inflorescentiae 4–14-florae, villosae; bracteae 2.6–4.6 mm longae, 0.2–0.4 mm latae, integrae vel denticulatae, caducae. Sepala integra. Styli 1–2.

Habit unknown. Twigs more or less densely villous; thorns rare. Leaves bright green and sparsely villous above, pale green and more or less densely villous beneath, attenuate at base, lobes more or less obtuse, margin serrate with more or less coarse teeth, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 4.2–5.7 cm long, 3.5–5.6 cm wide, lobes 2–3 pairs, basal pair 1.7–2.0 times as long as wide, extending 0.4–0.7 times the width of lamina to midrib, each lobe with 7–11 teeth in the distal 3/10–1/6, basal pair of sinuses in the apical 2/5 of lamina; petiole 14–25 mm long, 0.3–0.4 times as long as lamina; stipules 5–14 mm long, irregularly denticulate-serrate with 1–4 teeth. Subterminal leaf blades of short shoots 3.2–4.5 cm long, 3.2–3.3 cm wide, lobes 2 pairs, basal pair 2.1–2.2 times as long as wide, extending 0.5–0.6 times the width of lamina to midrib, each lobe with 7–9 teeth in the distal 1/2, basal pair of sinuses in the apical 4/9–1/2 of lamina; petiole 12–19 mm long, ca. 0.4 times as long as lamina. Inflorescence 3.5–5.0 cm long, corymbose, 4-14-flowered, lax, more or less densely villous; pedicels 5–36 mm long, villous; bracts 2.6–4.6 mm long, 0.2–0.4 mm wide, 12.0–26.0 times as long as wide, caducous, margin entire or denticulate with 1–3 teeth. Hypanthium ca. 3 mm long, villous; sepals 2.6–2.8 mm long, 2.5–2.8 mm wide, triangular, 1.0–1.1 times as long as wide, margin entire, apex acute or obtuse; petals ca. 6 mm long and wide; stamens 16–22, anthers purple; styles 1–2. Fruit not seen. Chromosome number unknown. Fig. 83.

Phenology. Flowering in June.

Distribution (Fig. 68). The Crimea; in scrub; near sea level.

Crataegus ×chersonensis is known only from the type.

36. Crataegus ×armena Pojarkova in Komarov, Fl. URSS 9: 509. 1939. (*Crataegus meyeri* × *Crataegus monogyna.*)—TYPE: U.S.S.R., Armenia, distr. Megri, prope opp. Lishk, 1 Oct 1936, *Pojarkova 754* (holotype: LE; isotype: LE!).

Shrub up to ca. 2.5 m tall. Twigs more or less villous; thorns up to ca. 15 mm long, stout. Buds 2.1–2.3 mm long, 1.4–2.5 mm wide. Leaves dark green and more or less villous above, pale green and more or less densely villous beneath, cuneate to more or less truncate at base, lobes more or less acute, margin serrate or incised-serrate with coarse teeth, basal pair of veins divergent or straight. Subterminal leaf blades of flowering shoots 2.9–4.1 cm long, 2.0–3.6 cm wide, lobes 2–3 pairs, basal pair 2.5–3.6 times as long as wide, extending 0.7–0.9 times the width of lamina to midrib, each lobe with 1–5 teeth in the distal 1/4–1/7, rarely entire, basal pair of sinuses in the basal 2/5–3/10 of lamina; petiole 10–20 mm long, 0.3–0.5 times as long as lamina; stipules ca. 10 mm long, irregularly serrate-dentate with ca. 6 teeth.

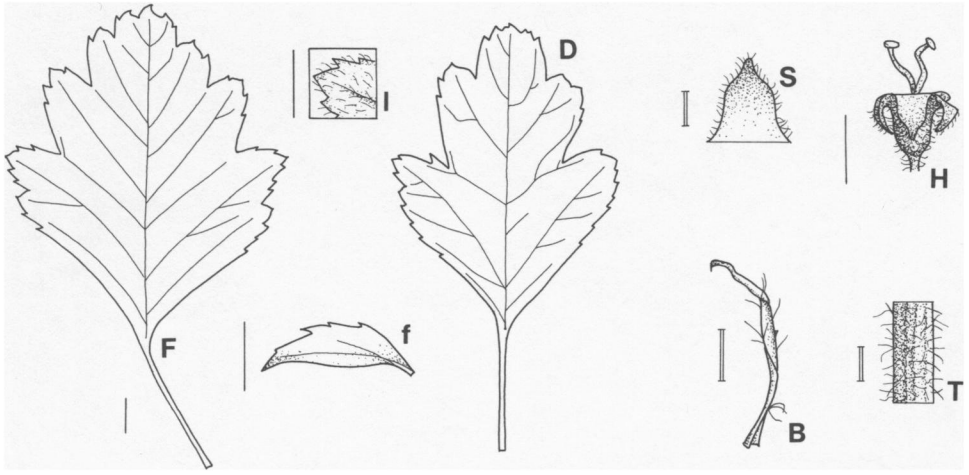


FIG. 83. *Crataegus ×chersonensis*. B: bract; D: subterminal leaf of short shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; H: hypanthium; I: indumentum of abaxial leaf surface; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (*Belyanina s.n.*)

Subterminal leaf blades of short shoots 3.8–4.2 cm long, 3.5–3.6 cm wide, lobes 3 pairs, basal pair 2.4–2.7 times as long as wide, extending ca. 0.8 times the width of lamina to midrib, each lobe with 4–5 teeth in the distal 2/7–1/4, basal pair of sinuses in the basal 3/10 of lamina; petiole 26–28 mm long, 0.7–0.9 times as long as lamina. Leaf blades of elongate shoots 3.1–3.8 cm long, 3.8–5.0 cm wide, lobes 3–4 pairs, basal pair 2.0–2.2 times as long as wide, extending 0.8–1.0 times the width of lamina to midrib, each lobe with 5–8 teeth in the distal 2/5–2/9, basal pair of sinuses in the basal 3/10–1/10 of lamina; petiole 15–22 mm long, 0.4–0.6 times as long as lamina; stipules 11–13 mm long, serrate with ca. 17 teeth. Inflorescence corymbose, 1–5-flowered, more or less lax, villous; pedicels 8–27 mm long, more or less villous; bracts caducous. Flowers not seen; sepals 2.5–3.3 mm long, 2.1–3.2 mm wide, triangular, 0.9–1.3 times as long as wide, margin entire, apex acute. Fruit 8–12 mm long, 6–9 mm wide, 1.1–1.7 times as long as wide, red, more or less villous, cylindrical to ellipsoidal, often angular at base, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 1 (–2), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number: 2n (3x) = 51. Fig. 84.

Phenology. Fruiting in September and October.

Distribution (Fig. 68). Central and southern Armenia; in scrub and on rocky mountain slopes; 1300–2500 m.

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** ARMENIA: Jerevan, monastery of Gehart, *Pojarkova 84* (LE); Goris, *Pojarkova 571* (LE); distr. Megri, *Pojarkova 720* (LE).

According to Pojarkova (1939a), *C. ×armena* is a hybrid between *C. rhipidophylla* (*C. kyrtostyla* sensu Pojarkova) and *C. meyeri*. However, *C. ×armena* has leaves much more similar to those of *C. monogyna* than to the leaves of *C. rhipidophylla*. The basal lobe of subterminal leaf blades of flowering shoots has (0–) 1–5 teeth, as in *C. monogyna*, and not 6–16 teeth, as in *C. rhipidophylla* (and

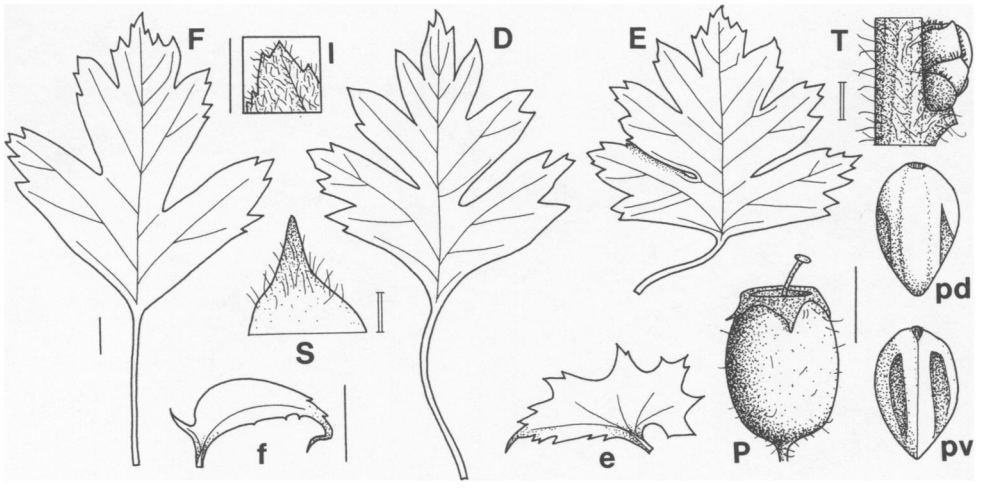


FIG. 84. *Crataegus* ×*armena*. D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F, f, I, P, pd, pv, S: *Pojarkova 571*; D, E, e, T: *Pojarkova 720*).

C. meyeri). Furthermore, in *C.* ×*armena* the stipules of leaves of flowering shoots are more or less similar to those of *C. monogyna* (and *C. meyeri*). Therefore, *C.* ×*armena* is here considered the hybrid of *C. meyeri* × *C. monogyna*.

37. Crataegus ×**hafniensis** Christensen, nothosp. nov. (*Crataegus laevigata* × *Crataegus microphylla*.)—TYPE: DENMARK, cultivated at the Botanical Garden of the University of Copenhagen, collector unknown *s.n.* (holotype: C!).

Ramunculi glabri vel sparsim villosi. Folia distalia ramorum fertilium 2.0–5.9 cm longa, 1.8–3.6 cm lata, profunde quinque-septempartita, lobis crenato-serratis; stipulae 6–9 mm longae, serratae. Inflorescentiae 2–6-florae, laxae, glabrae; bracteae denticulatae, caducae. Sepala integra, post anthesin erecta. Fructus ruber; pyrenae 1–2, rarius 3, dorsaliter et ventraliter sulcatae.

Small shrubby tree. Twigs glabrous or sparsely villous; thorns up to ca. 1.3 cm long. Buds ca. 2 mm long, ca. 1.5 mm in diameter. Leaf blades villous along major veins, lustrous dark green above, pale green beneath, rounded-attenuate at base, lobes obtuse, margin crenate-serrate with more or less coarse or fine teeth, basal pair of lateral veins convergent. Subterminal leaf blades of flowering shoots 2.0–5.9 cm long, 1.8–3.6 cm wide, lobes 2–3 pairs, basal pair 1.5–2.4 times as long as wide, extending 0.6–0.7 times the width of lamina to midrib, each lobe with 10–22 teeth in the distal 9/10–2/5, basal pair of sinuses in the apical 2/5 to basal 1/3 of lamina; petiole 6–28 mm long, 0.3–0.5 times as long as lamina; stipules 6–9 mm long, serrate with 16–24 teeth. Subterminal leaf blades of short shoots 2.5–4.9 cm long, 2.1–4.0 cm wide, lobes 1–3 pairs, basal pair 1.2–2.5 times as long as wide, extend-

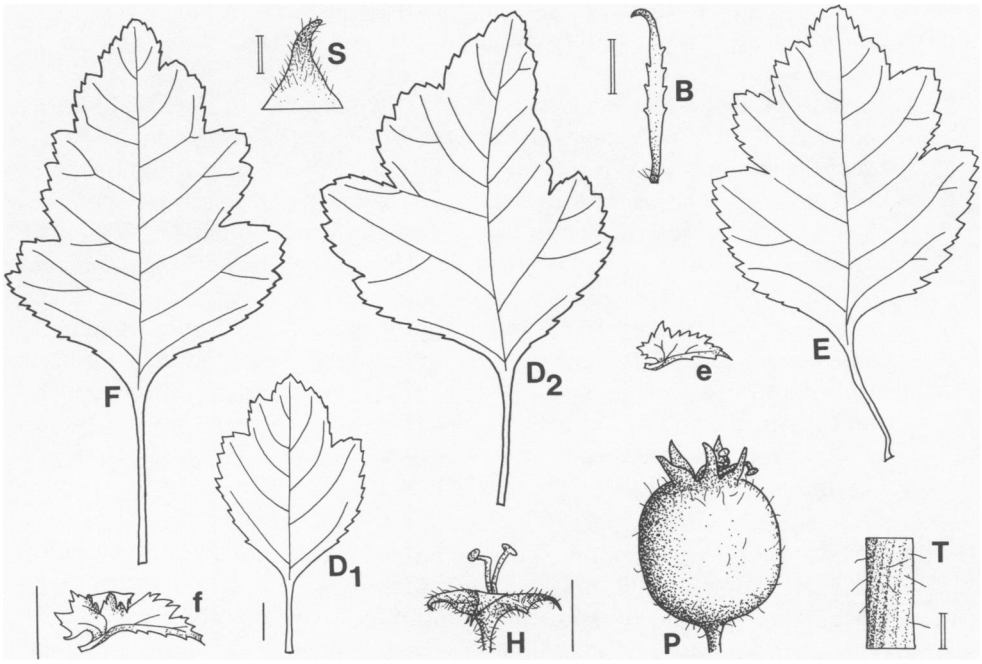


FIG. 85. *Crataegus* ×*hafniensis*. B: bract; D_1, D_2: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; H: hypanthium; P: pome; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, D_1, E, e, f, H, S, T: unknown collector *s.n.*, holotype; D_2, F, P: unknown collector *s.n.*, merotype.)

ing ca. 0.5 times the width of lamina to midrib, each lobe with 12–21 teeth in the distal 3/4–3/5, basal pair of sinuses in the apical 1/3–1/2 of lamina; petiole 10–19 mm long, 0.3–0.6 times as long as lamina. Leaf blades of elongate shoots 4.4–6.5 cm long, 3.4–5.0 cm wide, lobes 2–3 pairs, basal pair 1.3–1.9 times as long as wide, extending 0.4–0.5 times the width of lamina to midrib, each lobe with 16–29 teeth in the distal 4/5–1/2, basal pair of sinuses in the apical 2/5 to basal 2/5 of lamina; petiole 15–18 mm long, 0.3–0.4 times as long as lamina; stipules 4–16 mm long, serrate with 12–36 teeth. Inflorescence 1.5–5.0 cm long, umbellate or corymbose, 2–6-flowered, lax, glabrous; pedicels 7–38 mm long, villous in upper part; bracts ca. 3.5 mm long, ca. 0.4 mm wide, ca. 10.0 times as long as wide, caducous, margin denticulate with ca. 6 teeth. Hypanthium 3–4 mm long, villous; sepals ca. 2.5 mm long, 2.3–2.5 mm wide, triangular, 1.0–1.4 times as long as wide, margin entire, apex acute; petals 4–6 mm long, 4–7 mm wide; stamens 18–20, anthers purple; styles 1–2 (–3). Fruit 9–10 mm long and in diameter, about as long as wide, subglobose, red, crowned by the persistent, erect sepals; flesh yellowish; pyrenes 1–2 (–3), dorsally and ventro-laterally more or less sulcate, hypostyle pilose. Chromosome number unknown. Fig. 85.

Crataegus ×*hafniensis* is known only from the type tree in cultivation at the Botanical Garden of the University of Copenhagen. Because *C. laevigata* and *C. microphylla* are allopatric, natural hybridization is unknown.

ADDITIONAL SPECIMENS EXAMINED. **Denmark.** Sjælland, the Botanical Garden of the University of Copenhagen, cultivated, unknown collector (C, merotypes of *C.* ×*hafniensis*).

38. Crataegus ×macrocarpa Hegetschweiler in Hegetschweiler & Heer, Fl. Schweiz 464. 1840, pro sp. (*Crataegus laevigata* × *Crataegus rhipidophylla.*) *Oxyacantha macrocarpa* (Hegetschweiler) Roemer, Fam. nat. syn. monogr. 3: 107. 1847. *Crataegus monogyna* var. *macrocarpa* (Hegetschweiler) Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 280. 1853. *Mespilus monogyna* var. *macrocarpa* (Hegetschweiler) Wenzig, Linnaea 38: 159. 1874. *Crataegus oxyacantha* var. *vulgaris* f. *macrocarpa* (Hegetschweiler) Schneider, Ill. Handb. Laubholzk. 1: 780. 1906. *Crataegus oxyacantha* subsp. *polygyna* var. *macrocarpa* (Hegetschweiler) Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: SWITZERLAND, am Ezel und gegen Einsiedeln, *Hegetschweiler Herb. Vol. 20,* first page of *Crataegus macrocarpa* (lectotype, here designated: Z, photo: C!; isolectotypes: second and third page, Z, photos: C!).

Shrub or tree up to ca. 5 m tall. Twigs glabrous, rarely sparsely villous; thorns up to ca. 1.6 cm long, stout. Buds 1.2–3.7 mm long, 1.2–2.6 mm in diameter. Leaf blades more or less lustrous dark green and more or less villous along major veins above, pale green and more or less villous in vein axils beneath, rounded, attenuate or narrowly to broadly cuneate at base, lobes subacuminate or acute, margin serrate with more or less fine teeth, basal pair of lateral veins more or less straight. Subterminal leaf blades of flowering shoots 1.9–5.1 cm long, 1.6–4.9 cm wide, lobes 1–3 pairs, basal pair 1.4–2.7 times as long as wide, extending 0.4–0.8 times the width of lamina to midrib, each lobe with 7–30 teeth in the distal 7/10–1/8, basal pair of sinuses in the apical 1/5 to basal 2/5 of lamina; petiole 7–25 mm long, 0.3–0.5 (–0.8) times as long as lamina; stipules 6–12 mm long, serrate with 8–49 teeth. Subterminal leaf blades of short shoots 2.9–5.6 cm long, 2.1–4.7 cm wide, lobes 1–3 pairs, basal pair 1.6–2.9 times as long as wide, extending 0.5–0.8 times the width of lamina to midrib, each lobe with 9–30 teeth in the distal 9/10–1/6, basal pair of sinuses in the apical 3/10–1/2 of lamina; petiole 11–30 mm long, 0.4–0.8 times as long as lamina. Leaf blades of elongate shoots 2.2–4.9 cm long, 2.4–5.2 cm wide, lobes 2–3 pairs, basal pair 1.7–2.7 times as long as wide, extending 0.5–0.8 times the width of lamina to midrib, each lobe with 8–30 teeth in the distal 4/5–2/5, basal pair of sinuses in the apical 3/10 to basal 3/10 of lamina; petiole 7–20 mm long, 0.2–0.5 times as long as lamina; stipules 6–18 mm long, serrate with 13–51 teeth. Inflorescence 2.5–5.0 cm long, corymbose, 4–13-flowered, lax, glabrous, rarely sparsely villous; pedicels 5–45 mm long, glabrous or sparsely villous in upper part; bracts 1.9–3.2 mm long, 0.2–0.5 mm wide, 6.0–15.0 times as long as wide, caducous, margin denticulate with 1–7 teeth. Hypanthium 3–5 mm long, glabrous or more or less villous; sepals 1.8–4.9 mm long, 1.6–3.7 mm wide, narrowly triangular, 1.0–2.2 times as long as wide, margin entire, apex more or less acuminate or acute; petals 6–9 mm long, 5–10 mm wide; stamens 15–20, anthers purple; styles 1–2 (–3). Fruit 6–13 mm long, 5–13 mm wide, 1.0–1.8 times as long as wide, cylindrical or broadly to narrowly ellipsoidal, rarely subglobose, dark or bright red, glabrous or more or less villous, often angular at base; flesh yellowish; pyrenes 1–2 (–3), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome numbers: 2n (2x)= 34; 2n (3x) = 51; 2n = 52; 2n (4x) = 68. Figs. 86, 88.

Phenology. Flowering in May and June, fruiting in June to October.

Distribution (Figs. 87, 89). From southern Scandinavia and the Baltic region to central Europe, occasionally planted as an ornamental in parts of its natural range; on calcareous rocks, schist, and siliceous rocks; in forest with *Acer, Carpinus, Fagus, Fraxinus*, in scrub with *Prunus, Rosa, Viburnum*, in grasslands, at edges of lakes, in hedges, at field edges and roadsides; 0–1000 m.

See Byatt (1976a) and Christensen (1982a) for morphometric studies of *C.* ×*macrocarpa* and its parents. For a discussion of the application of the name *C. calycina* Petermann (1846, 1849), see 20. *C. rhipidophylla*.

KEY TO THE NOTHOVARIETIES OF CRATAEGUS ×MACROCARPA

1. Fruits crowned by reflexed or spreading sepals. 38a. *C.* ×*macrocarpa* nothovar. *macrocarpa*.
1. Most or all fruits crowned by erect-suberect sepals. 38b. *C.* ×*macrocarpa* nothovar. *hadensis*.

38a. Crataegus ×macrocarpa nothovar. **macrocarpa.** (*Crataegus laevigata* × *Crataegus rhipidophylla* var. *rhipidophylla*.)

Crataegus ovalis Kitaibel in Kanitz, Linnaea 32: 586. 1863.—TYPE: *Kitaibel s.n.* (holotype: BP, photo: C!).

Crataegus masovica Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 87. 1891.—TYPE: *Baenitz s.n.* (lectotype, here designated: JE!; isolectotypes: BR! GB! JE!).

Crataegus eremitagensis Raunkiær, Biol. Meddel. Kongel. Danske Vidensk. Selsk. 5: 62. 1925.—TYPE: *Raunkiær s.n.* (lectotype, here designated: C!; isolectotype: C!).

Crataegus schumacheri Raunkiær, Biol. Meddel. Kongel. Danske Vidensk. Selsk. 5: 68. 1925.—TYPE: *Raunkiær s.n.* (lectotype, here designated: C!).

Crataegus ×*macrocarpa* var. *curvisepaloides* Hrabetová-Uhrová, Preslia 41: 178, fig. 4, tab. XII. 1969. —TYPE: *Hrabetová s.n.* (holotype: BRNU).

Crataegus ×*pseudooxyacantha* Cinovskis, Crat. balt. 70, fig. 7. 1971.—TYPE: *Browicz 871* (holotype: LATV!).

Crataegus ×*pseudooxyacantha* var. *subcurvisepala* Cinovskis, Crat. balt. 72, fig. 8. 1971.—TYPE: *Cinovskis s.n.* (holotype: LATV!).

Crataegus austromoravica Hrabetová-Uhrová, Preslia 45: 35, tab. V. 1973.—TYPE: *Husák s.n.* (holotype: BRNU 427831).

Crataegus bohemica Hrabetová-Uhrová, Preslia 45: 109, tab. XII. 1973.—TYPE: *Kubát Fl. Bohem. Septen. 1885.14812* (holotype: LIT).

Crataegus macrocarpa var. *belanensis* Hrabetová-Uhrová, Preslia 45: 110, tab. XV. 1973.—TYPE: *Hrabetová s.n.* (holotype: BRNU 429065).

Crataegus ×*uhrovae* Soó, Acta Bot. Acad. Sci. Hung. 18: 175. 1973.—TYPE: *Domin s.n.* (holotype PRC!).

Crataegus ×*pyricarpa* Doll, Gleditschia 2: 9, fig. 1. 1974.—TYPE: *Doll s.n.* (holotype: JE!).

Crataegus ×*macrocarpa* subsp. *sudetica* Hrabetová-Uhrová, Preslia 48: 82, tab. IV. 1976.—TYPE: *Hrabetová s.n.* (holotype: BRNU 430584).

Fruit crowned by the persistent, reflexed, or spreading sepals. Chromosome numbers: 2n (3x) = 51; 2n (4x)= 68. Fig. 86.

Additional illustrations: Fig. 1a in Bakker (1964); Figs. 7, 8 in Cinovskis (1971).

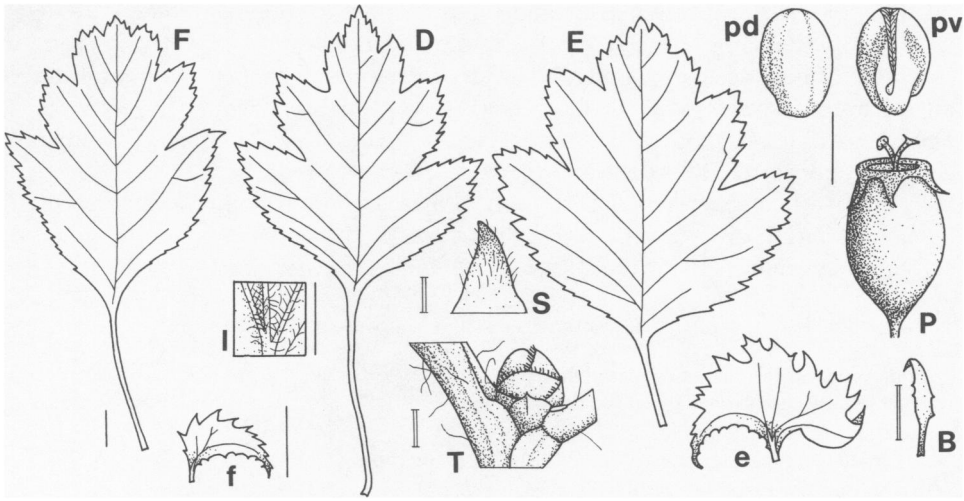


FIG. 86. *Crataegus* ×*macrocarpa* nothovar. *macrocarpa*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, I, S, T: *Baenitz s.n.;* E, e, F, f, P: *Browicz s.n.*; pd, pv: *Christensen A7*; D: *Couteaux 63g101.*)

Distribution (Fig. 87). From southern Scandinavia and the Baltic region to central Europe.

REPRESENTATIVE SPECIMENS. **Denmark.** Bornholm, Brudesengen, Almindingen, *Ostenfeld s.n.* (C). **Sweden.** Blekinge, Sölvesborg, Valje, *Holmgren s.n.* (BR, C); Stockholm, Hagaparken, Annero, *Lindman11/204* (S). **Latvia.** Distr. Liepaja, Mazmedze, ad litora antiquamaris Baltici, *Cinovskis s.n.* (LATV, merotype of *C.* ×*pseudooxyacantha* var. *subcurvisepala*). **Poland.** Wroclawskie, Walbrzych, *Boratynski s.n.* (C); zarosla przyprowadzacej dolacu pr prawej stronie trasy Pyrzyce-Szczecin w poblizu skrzyzowania do miejscowosci Kolbacz, *Zielinski s.n.*(C). **Czechoslovakia.** Bohemia centr., distr. Votice, Mt Cerenská hora, situ septentr.-orient. ab opp.Votice, *Chrtek s.n.* (LD); Moravia occid., distr. Zdár nad Sázavou, in declivi septen.-occid. collis U tri krízú (Kalvárie) dict ad opp. Nové Mesto na Morave, *Smejkal Fl. Exs. Cech. 1530* (BR, C, H, JE). **Germany.** Mecklenburg, Wolgast, *Doll s.n.* (JE); Sachsen, Görlitz, Hügel bei ehemaligen Basaltbruch n-lich Leuba, *Manitz s.n.* (JE); Niedersachsen, Bad Harzburg, *Delvosalle s.n.* (BR); Kalterherberge, Hautes Fagnes, valleé de la Schwalm, vallon du Jagersief, *Duvigneau 72A879* (BR); Sarre, Nohfelden, *Lawalreé 11892* (BR); Elb-Tal, Hamburg, Boberg, Boberger Furth, *Mang 70.85* (C). **Austria.** Voralberg, Montafon, Tschagguns-Vandans, Ill-Weg links, *Polatschek s.n.* (W); Oberösterreich, Mühlviertel, Stratberg, *Wurm-Zöchbauer s.n.* (W). **France.** Puy-de-Dome, Clermont-Ferrand, *Héribaud-Joseph 3* (C). **Belgium.** Vyle-Tharoul, *Lawalreé 11103* (BR). **Luxembourg.** Saint-Hubert, route de Poix, *Lawalreé 16966* (BR, C).

38b. Crataegus ×**macrocarpa** nothovar. **hadensis** (Hrabetová-Uhrová) Christensen, comb. nov. (*Crataegus laevigata* × *Crataegus rhipidophylla* var. *lindmanii.*) *Crataegus* ×*calciphila* var. *hadensis* Hrabetová-Uhrová, Preslia 45: 110, tab. XVI. 1973.—TYPE: CZECHOSLOVAKIA, Brno, Hády, ad marginem Querceti secundum viam Klajdovka versus, 350 m, 19 Sep 1956, *Hrabetová s.n.* (holotype: BRNU 427682).

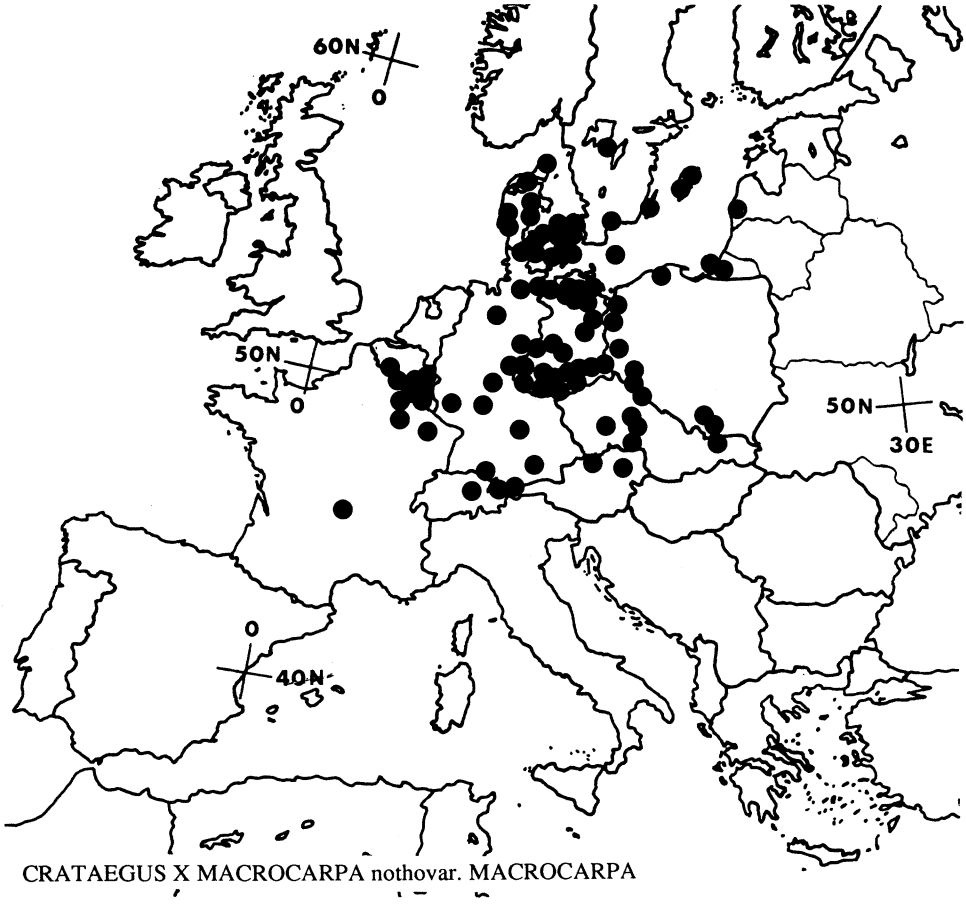


FIG. 87. Distribution of *Crataegus* ×*macrocarpa* nothovar. *macrocarpa* (incl. *C.* ×*macrocarpa* s.l.). *Crataegus* ×*macrocarpa* nothovar. *macrocarpa* has also been reported from northeastern Italy (Pignatti 1982), but I have not seen any herbarium specimens from there.

Crataegus calycina Petermann, Anal. Pfl.-Schlüss. 135. 1846; Deutschl. Fl. 176, fig. 26.204N. 1849. *Crataegus monogyna* var. *calycina* (Petermann) Buia in Savulescu, Fl. reip. pop. rom. 4: 260. 1956.—TYPE: *Petermann s.n.* (lectotype, designated by Byatt, 1974: LAU!; isolectotypes: S, W!).

Crataegus calciphila Hrabetová-Uhrová in Spisy Prír. Fak. Univ. v. Brne K15 L11 1956/8 no. 378: 433, figs. 2–4. 1956. *Crataegus* ×*macrocarpa* subsp. *calciphila* (Hrabetová-Uhrová) Hrabetová-Uhrová, Práce Bot. Zool. Prir. Brno 1967: 18. 1967.—TYPE: *Hrabetová s.n.* (holotype: BRNU).

Crataegus mikulcicensis Hrabetová-Uhrová, Preslia 45: 32, fig. 1, tab. III. 1973.—TYPE: *Hrabetová s.n.* (holotype: BRNU 427661).

Crataegus oxyacantha subsp. *nemorensis* Hrabetová-Uhrová, Preslia 45: 33, fig. 2, tab. IV. 1973. *Crataegus laevigata* subsp. *nemorensis* (Hrabetová-Uhrová) Dostál, Folia Mus. Rerum Nat. Bohem. Occid., Bot. 21: 8. 1984.—TYPE: *Hrabetová s.n.* (holotype: BRNU 427670).

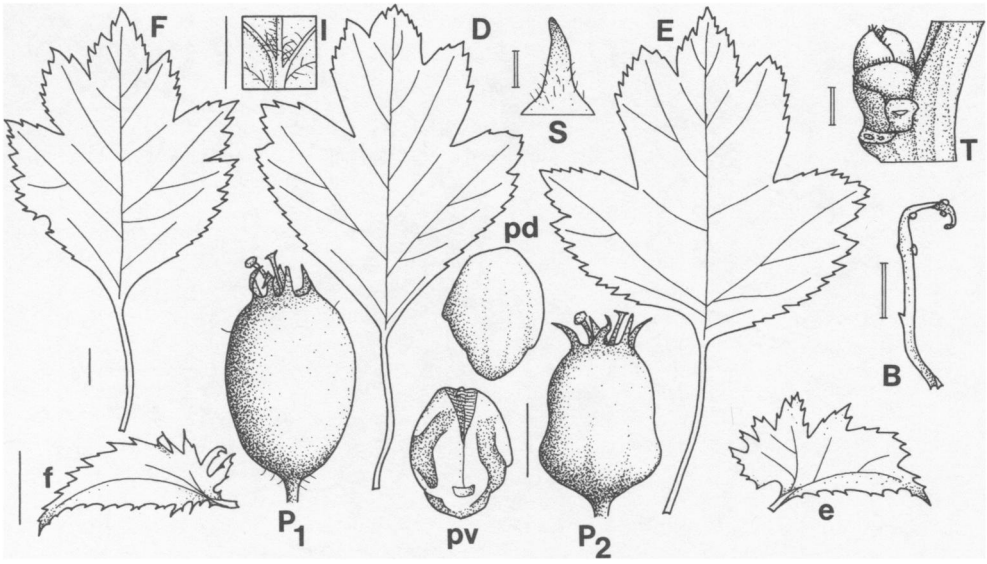


FIG. 88. *Crataegus* ×*macrocarpa* nothovar. *hadensis*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (pd, pv: *Bauch s.n.*; B, I, P_1, S, T: *Hrabetová Fl. Exs. Cech. 1439*; P_2: *Mang 69.85*; E, e, F, f: *Petermann s.n.*; D: *Ronniger s.n.*)

Crataegus lepida Hrabetová-Uhrová, Preslia 45: 108, tab. 10. 1973, non *Crataegus lepida* Beadle, 1901.—TYPE: *Kubát Fl. Bohem. sept. 1885.15174* (holotype: LIT).

Crataegus ×*roubalii* Chrtek & Krísa, Novit. Inst. Bot. Univ. Carol. Prag. 1976: 34. 1976.—TYPE: *Chrtek, Krísa & Chrtková s.n.* (holotype: PRC!).

Crataegus ×*brandenii* Doll, Natur Naturschutz Mecklenburg 19: 13, figs. 4, 23. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Most or all fruits crowned by the persistent, erect-suberect sepals. Chromosome numbers: 2n (2x) = 34; 2n (3x) = 51; 2n = 52. Fig. 88.

Additional illustrations: Fig. 13 in Cinovskis (1971); Fig. 2I in Christensen (1985).

Distribution (Fig. 89). From southern Scandinavia to central Europe.

REPRESENTATIVE SPECIMENS. **Denmark.** Copenhagen, Amager, Stadsgraven near Langebro, *Christensen s.n.* (C); Fyn, Fyns Hoved, near Korshavn, *Christensen KH7* (C). **Sweden.** Västergötland, Skövde, Billingen, *Hülphers s.n.* (LAU). **Poland.** Miedzylesie, pow. Bystrzyca Klodzka, *Boratynscy s.n.* (C); Góry Trzebnickie kolo Trzebnicy, *Gostynska s.n.* (C). **Czechoslovakia.** Brno, in declivo stepposo Hády dicto, *Hrabetová s.n.* (BR); Moravia centr.-merid., distr. Brno, in declivibus collis Hády dicti ad urb. Brno, *Hrabetová Fl. Exs. Cech. 1439* (BR, C, JE). **Germany.** Schmölln, Kellerberg, *Bauch s.n.* (JE); Haardt b. Schleusingen, *Haussknecht s.n.* (JE); Elb-Tal, Hamburg, Boberg, *Mang 64.85*(C). **Austria.** Niederösterreich, Anniger, Einöd, *Ronniger s.n.* (W). **Switzerland.** Kt. Schaffhausen, längs der Randenstrasse in der Egg am Westhang des Beringer-Randens n-lich Beringer, *Koch 44.530* (BR). **France.** Haut-Rhin,Delle, *Duffour Soc. Fr. Exs. 2374* (BR). **Belgium.** Louette-St.-Pierre, Camps des Fauvettes, *André s.n.* (BR); Bilstrain, gare de Dolhain, *Lawalreé 7668* (BR). **Luxembourg.** Bord de la Wiltz, Merholz, *Castagne s.n.* (BR).

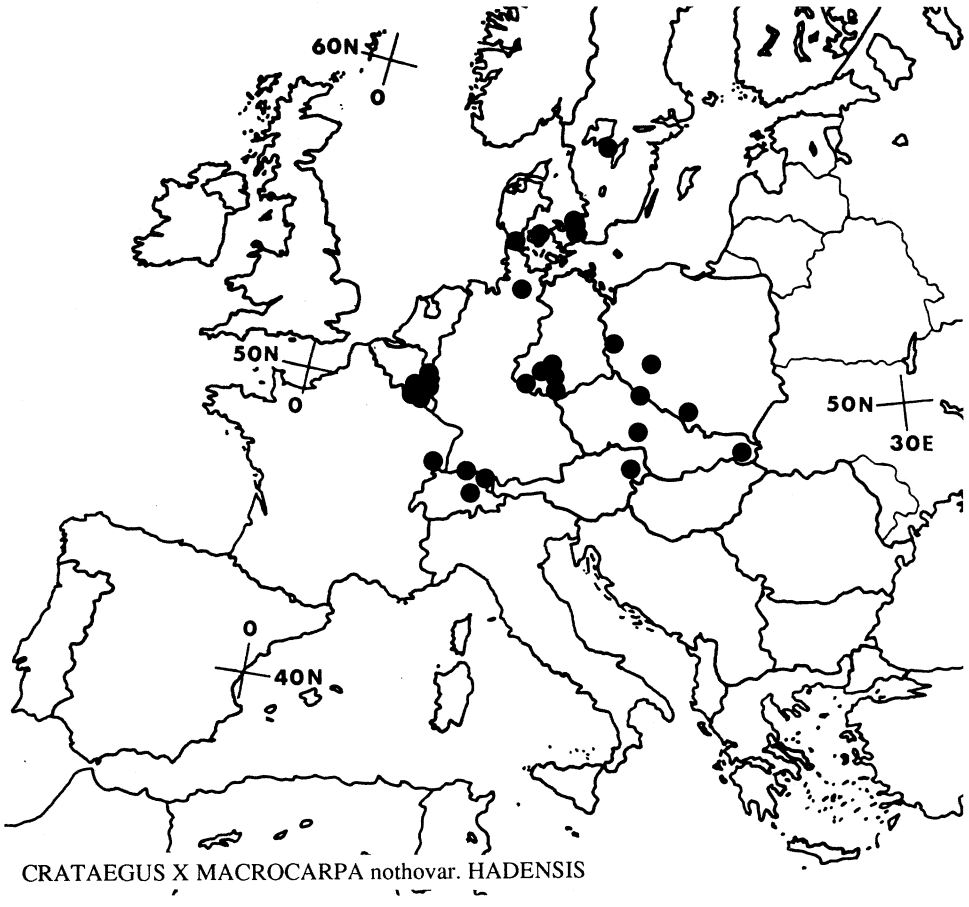


FIG. 89. Distribution of *Crataegus* ×*macrocarpa* nothovar. *hadensis*.

39. Crataegus ×media Bechstein, Diana 1: 88. 1797; Arch. Bot. Leipzig 2(1): 77. 1799. (*Crataegus laevigata* × *Crataegus monogyna*.) *Oxyacantha media* (Bechstein) Roemer, Fam. nat. syn. monogr. 3: 108. 1847. *Crataegus oxyacantha* var. *media* (Bechstein) Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 284. 1853.—TYPE: unknown; recorded from GERMANY, Thüringen.—Neotype, here designated: GERMANY, Thüringen, Jena, südlich Münchenroda, am Weg nach Vollradisroda, 750 m, 30 May 1982, *Manitz s.n.* (JE!).

Shrub or small tree. Twigs glabrous or villous; thorns up to ca. 1.8 cm long, stout, straight or slightly recurved. Buds 1.2–3.5 mm long, 1.2–2.3 mm in diameter. Leaf blades more or less lustrous dark green and villous throughout or only along major veins above, pale green or more or less glaucous-green and villous throughout or only in vein axils beneath, lobes acute or obtuse, margin serrate, with more or less coarse teeth, basal pair of lateral veins more or less straight. Subterminal leaf blades of flowering shoots 0.9–4.5 cm long, 0.8–4.3 cm wide, lobes 1–3 pairs, basal

pair 1.6–3.4 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 4–14 teeth in the distal 5/9–1/10, basal pair of sinuses in the apical 3/10 to basal 1/5 of lamina; petiole 4–22 mm long, 0.2–0.6 times as long as lamina; stipules 2–12 mm long, serrate, rarely denticulate-entire, with (0–) 5–24 teeth. Subterminal leaf blades of short shoots 1.4–5.2 cm long, 1.0–4.4 cm wide, lobes 1–3 pairs, basal pair 1.5–3.0 times as long as wide, extending 0.4–0.9 times the width of lamina to midrib, each lobe with 5–19 teeth in the distal 3/4–3/10, basal pair of sinuses in the apical 1/5 to basal 3/10 of lamina; petiole 5–35 mm long, 0.3–0.8 times as long as lamina. Leaf blades of elongate shoots 1.7–5.7 cm long, 1.6–5.2 cm wide, lobes 1–3 pairs, basal pair 1.8–2.7 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 6–18 teeth in the distal 2/3–1/4, basal pair of sinuses in the apical 2/5 to basal 3/10 of lamina; petiole 5–21 mm long, 0.3–0.5 times as long as lamina; stipules 6–20 mm long, serrate, with 11–47 teeth. Inflorescence 2.0–4.5 cm long, corymbose, 4–13-flowered, lax, glabrous or villous; pedicels 4–35 mm long, glabrous or villous; bracts 1.9–4.4 mm long, 0.2–0.5 mm wide, 4.0–25.0 times as long as wide, caducous, margin denticulate with 1–12 teeth. Hypanthium 3–4 mm long, glabrous or villous; sepals 1.9–3.3 mm long, 1.8–3.5 mm wide, broadly to more or less narrowly triangular, 0.6–1.1 (–1.9) times as long as wide, margin entire, rarely with 1–3 glandular teeth; petals 6–9 mm long, 5–9 mm wide; stamens 17–21, anthers purple; styles 1–2 (–3). Fruit 5–11 mm long, 5–10 mm wide, 1.0–1.3 (–1.6) times as long as wide, subglobose or more or less cylindrical, bright or dark red, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 1–2 (–3), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number: 2n (2x) = 34. Figs. 90, 91.

Phenology. Flowering in April to June, fruiting in May to October.

Distribution (Fig. 92). From the British Isles, southern Scandinavia, and the Baltic region to northern parts of the Balkan Peninsula, Italy, and France, introduced to eastern parts of the U.S.A.; on calcareous and siliceous rocks; in woodlands, openings in mixed forest, along rivers, field edges, roadsides, in hedges, and on rocky mountain slopes; 0–1300 m.

Lambinon (1981) suggested that *C.* ×*media* be considered a nomen ambiguum. *Crataegus* ×*media* is traditionally thought a hybrid of *C. laevigata* × *C. monogyna* (e.g., Tutin et al. 1968), but according to Lippert (1978), it is probably a hybrid of *C. laevigata* × *C. rhipidophylla*. The Spermatophyta Committee (Anon. 1986) did not recommend rejection of the name *C.* ×*media*, because no type specimen had ever been found nor had a neotype been designated. Furthermore, the Committee noted that the option exists to choose as the neotype a hybrid of *C. laevigata* × *C. monogyna,* so that the name would be applied in the traditional sense. The neotype here designated is *C.* ×*media* in the traditional sense (e.g., Tutin et al. 1968).

Crataegus ×*media* is often referred to as *C.* ×*intermixta* (Wenzig) Beck (e.g., Cinovskis 1971, Christensen 1985), based on *Mespilus oxyacantha* var. *intermixta* Wenzig (1874). Examination of Wenzig's syntypes shows that he included in his variety four different taxa, as interpreted here; these are *C. songarica* (*Hooker f. & Thomson s.n.*, C! W!), *C. pseudoheterophylla* subsp. *turkestanica* (*Hooker f. & Thomson s.n.*, LD! MEL! W!), *C.* ×*zangezura* nothosubsp. *zangezura* (*Szovits s.n.*, C! LE! MEL! W!), and *C.* ×*media* (*Heuffel s.n.*, B, destroyed). The lectotype of *Mespilus oxyacantha* var. *intermixta* here designated is *C. songarica*; thus, *C.* ×*intermixta* (Wenzig) Beck is a synonym of *C. songarica*.

See 20. *C. rhipidophylla* for a discussion of the application of the names *C.* ×*lindmanii* Cinovskis (1968) and *C. lindmanii* Hrabetová-Uhrová (1969c).

See Bradshaw (1953), Byatt (1975b, 1976a), Synnott (1978), Christensen (1982a, 1984), and Gosler (1990) for morphometric studies of *C.* ×*media* and its parents.

Key to the Nothovarieties of Crataegus ×media

1. Inflorescence glabrous-subglabrous. Subterminal leaf blades of flowering shoots 22–42 mm long, villous in vein axils beneath. 39a. *C.* ×*media* nothovar. *media.*
1. Inflorescence villous. Subterminal leaf blades of flowering shoots 9–31 mm long, often entirely villous beneath. 39b. *C.* ×*media* nothovar. *sicula.*

39a. Crataegus ×media nothovar. **media.** (*Crataegus laevigata* × *Crataegus monogyna* var. *monogyna.*)

Crataegus oxyacantha var. *rosea* Willdenow, Berlin. Baumz. 89. 1796. *Crataegus oxyacantha* var. *rosea* Loudon, Arbor. frutic. brit. 2: 832, fig. 612. 1838, nom. superfl. *Oxyacantha monogyna* var. *rosea* (Willdenow) Roemer, Fam. nat. syn. monogr. 3: 108. 1847. *Crataegus monogyna* var. *rosea* (Willdenow) Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 280. 1853. *Crataegus oxyacantha* f. *rosea* (Willdenow) Rehder, Bibl. cult. trees shrubs 249. 1949.—Type: unknown.

Mespilus oxyacantha var. *laciniata* Wallroth, Sched. crit. 219. 1822. *Crataegus oxyacantha* var. *vulgaris* f. *laciniata* (Wallroth) Reichenbach, Icon. fl. germ. helv. 25: 24. 1909–1912. *Crataegus oxyacantha* subsp. *polygyna* var. *laciniata* (Wallroth) Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—Type: Tab. 149 in Blackwell, Herb. blackwell. 1750–1752 (lectotype, here designated).

Crataegus oxyacantha var. *eriocarpa* Lindley ex Loudon, Arbor. frutic. brit. 2: 831, fig. 607. 1838, non *Crataegus oxyacantha* var. *eriocarpa* Gillot, 1882. *Crataegus monogyna* var. *eriocarpa* (Loudon) Hegi, Ill. Fl. Mitt-Eur. 4(2): 737. 1923.—Type: Fig. 607 in Loudon, Arbor. frutic. brit. 2. 1838 (lectotype, here designated).

Crataegus oxyacantha var. *quercifolia* Booth ex Loudon, Arbor. frutic. brit. 2: 830, fig. 608.—Type: Fig. 608 in Loudon, Arbor. frutic. brit. 2. 1838 (lectotype, here designated).

Crataegus oxyacantha var. *aurea* Loudon, Arbor. frutic. brit. 2: 831, fig. 610. 1838. *Crataegus oxyacantha* var. *vulgaris* f. *aurea* (Loudon) Schneider, Ill. Handb. Laubholzk. 1: 781. 1906. *Crataegus oxyacantha* var. *media* f. *aurea* (Loudon) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 733. 1926.—Type: Fig. 610 in Loudon, Arbor. frutic. brit. 2. 1838 (lectotype, here designated).

Crataegus oxyacantha var. *multiplex* Loudon, Arbor. frutic. brit. 2: 832, fig. 609. 1838.—Type: Fig. 609 in Loudon, Arbor. frutic. brit. 2. 1838 (lectotype, here designated).

Crataegus decipiens Petermann, Anal. Pfl.-Schlüss. 135. 1846. *Crataegus oxyacantha* var. *vulgaris* f. *decipiens* (Petermann) Reichenbach, Icon. fl. germ. helv. 25: 24. 1909–1912.—Type: *Petermann s.n.* (lectotype, here designated: W!).

Oxyacantha monogyna var. *subrotunda* Roemer, Fam. nat. syn. monogr. 3: 108. 1847.—TYPE: *Lasch s.n.* (not located; see Lasch, Linnaea 5: 440. 1830).

Oxyacantha monogyna var. *laschiana* Roemer, Fam. nat. syn. monogr. 3: 108. 1847.—TYPE: *Lasch s.n.* (not located; see Lasch, Linnaea 5: 440. 1830).

Oxyacantha monogyna var. *acuminata* Roemer, Fam. nat. syn. monogr. 3: 108. 1847.—TYPE: *Lasch s.n.* (not located; see Lasch, Linnaea 5: 440. 1830).

Oxyacantha vulgaris var. *xanthocarpa* Roemer, Fam. nat. syn. monogr. 3: 110. 1847. *Crataegus oxyacantha* var. *xanthocarpa* (Roemer) Lange, Revis. Crataeg. 71. 1897.—TYPE: unknown.

Crataegus flexilis Gandoger, Bull. Soc. Bot. France 18: 445. 1871.—TYPE: *Gandoger s.n.* (holotype: LY!).

Crataegus hortorum Gandoger, Bull. Soc. Bot. France 18: 446. 1871.—TYPE: *Gandoger 1*, 14 May 1868 (holotype: LY!).

Crataegus bastardi Gandoger, Bull. Soc. Bot. France 18: 448. 1871.—TYPE: *Bichet s.n.* (not located; no specimen at LY).

Crataegus oenochroa Gandoger, Bull. Soc. Bot. France 18: 448. 1871.—TYPE: *Gandoger 7* (holotype: LY!).

Crataegus oxyacantha var. *media* f. *koernickei* Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 91. 1891.—TYPE: *Körnicke s.n.* (holotype: not located).

Crataegus monogyna f. *subdigyna* Johansson, Kongl. Svenska Vetenskabsakad. Handl. 29: 107. 1897.—TYPE: unknown; recorded from SWEDEN, Gotland, Myra and Fårö.

Crataegus oxyacantha var. *vulgaris* f. *rubra* Schneider, Ill. Handb. Laubholzk. 1: 780. 1906. *Crataegus oxyacantha* var. *media* f. *rubra* (Schneider) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 733. 1926.—TYPE: unknown.

Crataegus oxyacantha var. *vulgaris* f. *gireoudi* Späth ex Schneider, Ill. Handb. Laubholzk. 1: 780. 1906. *Crataegus oxyacantha* var. *media* f. *gireoudi* (Schneider) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 733. 1926.—TYPE: unknown.

Crataegus oxyacantha var. *deltoxyacantha* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 113, tabs. I.2, VII.24–29. 1956. *Crataegus* ×*deltoxyacantha* (Pénzes) Baranec, Acta Dendrobiol. 1986: 26. 1986.—TYPE: *Pénzes 76* (holotype: BP!).

Crataegus ×*curonica* Cinovskis, Crat. balt. 76, fig. 10. 1971.—TYPE: *Cinovskis M-2* (holotype: LATV!).

Crataegus ×*estonica* Cinovskis, Crat. balt. 79, fig. 11. 1971.—TYPE: *Cinovskis s.n.* (holotype: LATV!).

Crataegus ×*kupfferi* Cinovskis, Crat. balt. 89, fig. 15. 1971.—TYPE: *Lackschewitz 8524* (holotype: LATV!).

Crataegus ×*mechowa* Doll, Natur Naturschutz Mecklenburg 13: 21, figs. 12, 25. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*oxyacanthoides* Doll, Natur Naturschutz Mecklenburg 13: 21, figs. 13, 20, 25. 1976, non *Crataegus oxyacanthoides* Thuillier, 1799.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*petiolata* Doll, Natur Naturschutz Mecklenburg 13: 23, figs. 14, 26. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*rosacea* Doll, Natur Naturschutz 13: 23, figs. 15, 26. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus kaussmanniana Doll, Arch. Freunde Naturgesch. Mecklenburg 19: 13, fig. 1. 1979.—TYPE: *Doll s.n.* (holotype: JE).

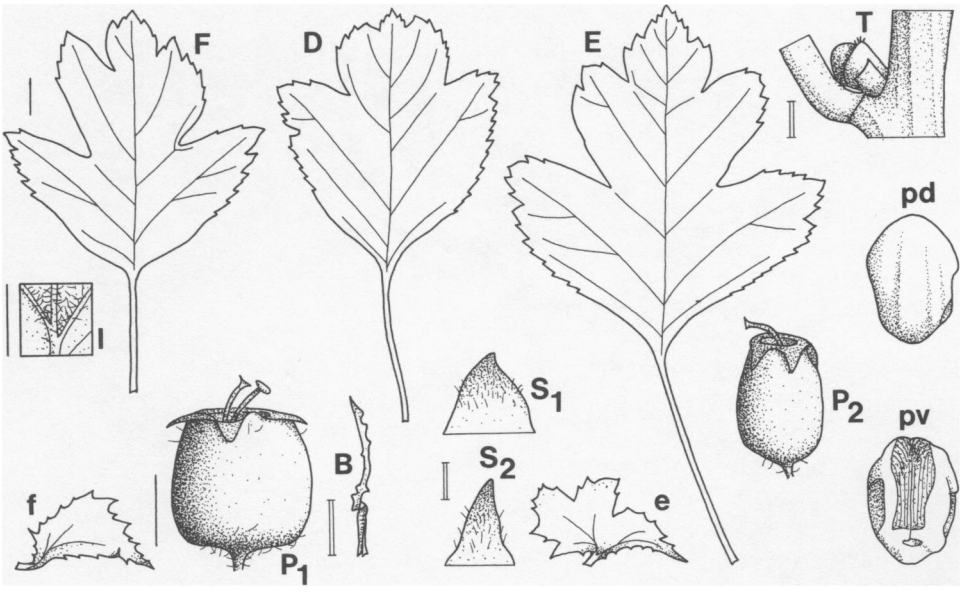


FIG. 90. *Crataegus* ×*media* nothovar. *media*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S_1, S_2: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D, I, P_2: *Buch s.n.*; pd, pv: *Christensen A2*; F, f, P_1, S_1: *Christensen D98*; B, E, e, S_2: *Lawalrée 23044*.)

Twigs glabrous or more or less villous. Leaves more or less villous along major veins above and in vein axils beneath. Subterminal leaf blades of flowering shoots 2.2–4.5 cm long, 1.6–4.3 cm wide; petiole 7–22 mm long; stipules 6–12 mm long. Subterminal leaf blades of short shoots 1.6–5.2 cm long, 1.4–4.4 cm wide; petiole 5–35 mm long. Leaf blades of elongate shoots 1.7–5.7 cm long, 1.6–5.2 cm wide; petiole 5–21 mm long, 3/10–1/2 of lamina length; stipules 6–20 mm long. Inflorescence glabrous-subglabrous; pedicels glabrous or more or less villous. Hypanthium glabrous or more or less villous; sepals usually more or less broadly triangular, 0.6–1.3 times as long as wide, margin entire. Fruit 7–11 mm long, 7–10 mm in diameter, glabrous or more or less villous. Chromosome number: 2n (2x) = 34. Fig. 90.

Additional illustrations: Figs. 11, 15 in Cinovskis (1971); Figs. 15e, 16h, i in Christensen (1982a).

Distribution (Fig. 91). From the British Isles, southern Scandinavia, and the Baltic region to northern parts of the Balkan Peninsula, Italy, and France, introduced to the eastern parts of the U.S.A., occasionally also planted as an ornamental within its natural range; sea level to 1300 m.

REPRESENTATIVE SPECIMENS. **England.** Surrey, Thames bank between Richmond and Twickenham, *Batko s.n.* (GB); London, Hampstead, *Syme s.n.* (BR). **Denmark.** Falster, Orehoved Skov, *Grøntved s.n.* (C); Sjælland, Egevang, Sorø, *Ostenfeld s.n.* (C). **Sweden.** Gotland, Visby, *Buch s.n.* (H), Blekinge, Sölvesborg, Valje, *Holmgren s.n.* (C). **Latvia.** Curonia, Kreis Grobin, Matern, *Lackschewitz 7759* (LATV, =*Lackschewitz 8859*). **Estonia.** Ins. Osilia, Halbinsel Kilbasaar, *Lackschewitz*

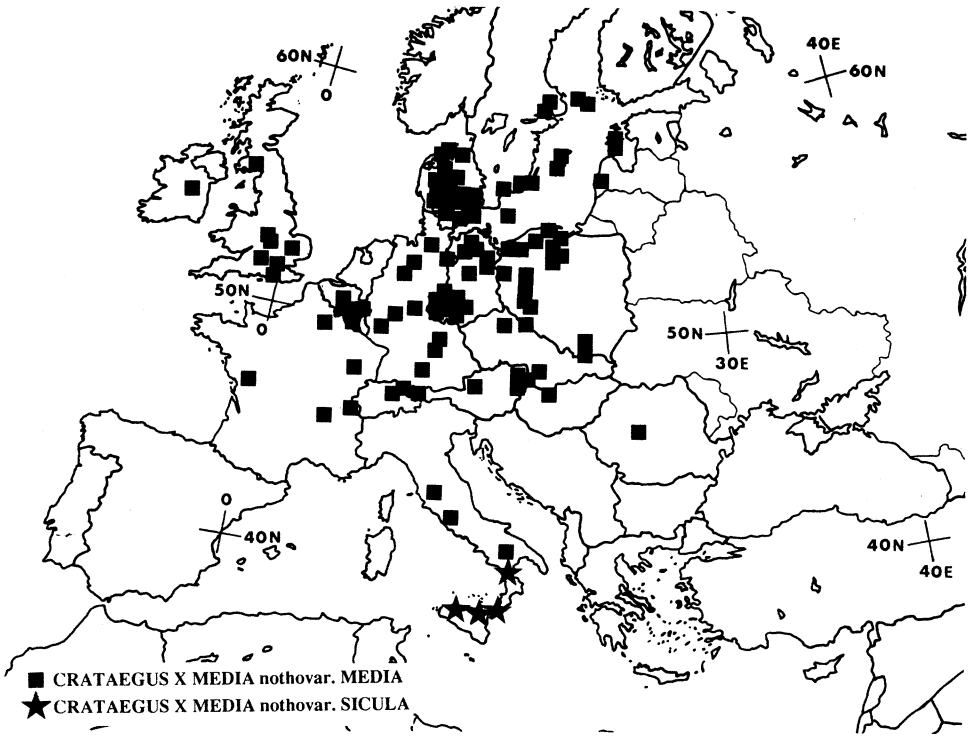


FIG. 91. Distribution of *Crataegus* ×*media* nothovar. *media* and nothovar. *sicula*, based on specimens seen and literature records cited by Synnott (1978). *Crataegus* × *media* nothovar. *media* also occurs in Slovenia, Yugoslavia (Petauer 1980).

4239 (GB, =*Kupffer 15485*). **Poland.** Las przy szosiez Ostromecka do Chelmna, *Gostynska-Jakuszewska s.n.* (C); Poznan-Staroleka, *Zielinski s.n.* (C). **Germany.** Thüringen, Orlamünde, bei Heilingen, *Bisse s.n.* (JE); Hessen, Kreis Limburg-Weilburg, Limburger Becken, Runkel-Steeden, Kerkenbachtal, bei der Alten Mühle, 50°24.5′N, 8°8.5′E, *Kalheber 80.1917* (GB). **Belgium.** Linkenbeek, *André s.n.* (BR); Tintange, bifurcation des routes Strainchamps et Wiltz, *Lawalrée 11056* (BR). **Switzerland.** Uetliberg b. Zürich, *Bornemann s.n.* (JE); Kt. St. Gallen, Sittertobel südlich der Kräzernbrücke am Weg zum Kraftwerk Kubel bei St. Gallen-Brüggen, *Koch 45.467* (BR). **Austria.** Voralberg, Rätikon, Brand-Palüd Maiensäss, *Polatschek s.n.*(W). **Italy.** Etruria, prov. di Grosseto, Mt Amiata, Miniera del Sielo, *Fiori Fl. Ital. Exs. 2884* (G); Basilicata, Pignola, in nemore Pantone d'Averno, *Gavlioli s.n.* (FI). **France.** Vendée, foret de Mervent et haies des environs, Fontenay-le-Comte, *Billot Fl. Gall. Germ. Exs. 1188* (JE).

39b. Crataegus ×media nothovar. **sicula** (Koch) Christensen, comb. et stat. nov. (*Crataegus laevigata* × *Crataegus monogyna* var. *lasiocarpa.*) *Crataegus sicula* Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 288. 1853.—Type: Sicily, Val Demone, *Todaro s.n.* (holotype: W!; isotype: GOET!).

Twigs more or less villous. Leaves more or less villous above and beneath, or villous along major veins above and in vein axils beneath. Subterminal leaf blades of flowering shoots 0.9–3.1 cm long, 0.8–2.4 cm wide; petiole 4–13 mm long; stipules 2–7 mm long, serrate with 5–18 teeth. Subterminal leaf blades of short

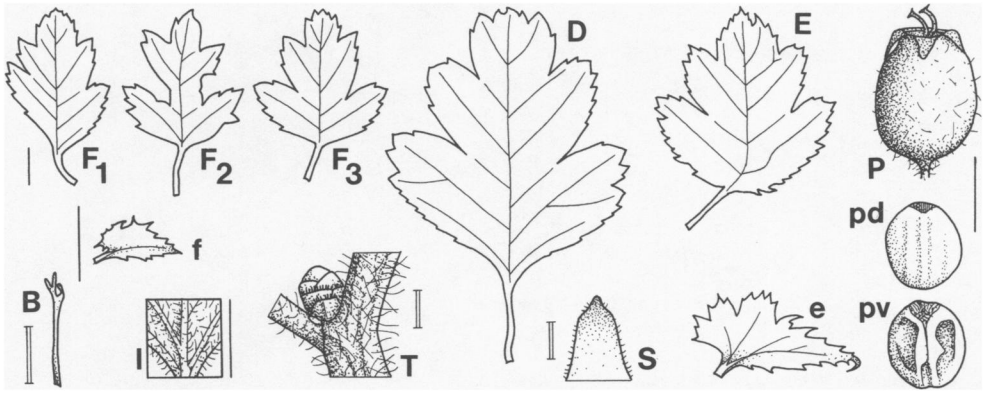


FIG. 92. *Crataegus* ×*media* nothovar. *sicula*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2, F_3: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_3, pd, pv: *Huter 117*; E, e: *Lojacono-Pojero 541*; B, D, F_1, F_2, f, I, P, S, T: *Todaro s.n.*)

shoots 1.4–3.8 cm long, 1.0–3.2 cm wide; petiole 6–10 mm long. Leaf blades of elongate shoots 1.8–2.6 cm long, 1.6–2.4 cm wide; petiole 5–7 mm long; stipules 7–11 mm long. Inflorescence more or less villous, pedicels more or less villous. Hypanthium more or less villous; sepals broadly to narrowly triangular, 0.9–1.9 times as long as wide, margin entire, rarely with 1–3 glandular teeth. Fruit 5–10 mm long and in diameter, more or less villous. Chromosome number unknown. Fig. 92.

Additional illustrations: Figs. 443r–t, 444f–g_1 in Schneider (1906); Fig. 13 in Christensen (1984).

Distribution (Fig. 91). Calabria in southern Italy and Sicily, sea level to ca. 400 m.

ADDITIONAL SPECIMENS EXAMINED. **Italy.** CALABRIA: Mt Pollino, *Fiori s.n.* (FI); Piani di Naisiti, prope Reggio, *Huter 117* (W).—SICILY: Palermo, Fiume Oreto, *Citarda s.n.* (JE); Boschetti di Renda, *Lojacono-Pojero Pl. Sic. Rar. 541* (LD); Mirto, *Todaro Fl. Sic. Exs. 729* (JE).

40. Crataegus ×browicziana Christensen, nothosp. nov. (*Crataegus microphylla* × *Crataegus rhipidophylla.*)—TYPE: TURKEY, prov. Kütahya, Kütahya to Eskisehir, 900 m, in calcareous gorge 10–15 km N of Kütahya, 7 Jul 1962, *Davis & Coode 37006* (holotype: E!).

Ramunculi glabri. Folia distalia ramorum fertilium 2.0–3.1 cm longa, 1.7–3.1 cm lata, profunde quinque-septempartita, lobis serratis; stipulae 5–8 mm longae, denticulato-serratae. Inflorescentiae ferentes usque ad 7 flores, glabrae, laxae; bracteae caducae. Sepala post anthesin reflexa. Pyrena 1, rarius 2, dorsaliter et ventraliter sulcata.

Shrub up to ca. 2 m tall. Twigs glabrous; thorns up to ca. 8 mm long, stout. Buds 1.6–1.8 mm long, 1.2–1.4 mm in diameter. Leaf blades more or less lustrous dark green and sparsely villous above, more or less greyish green and more or less

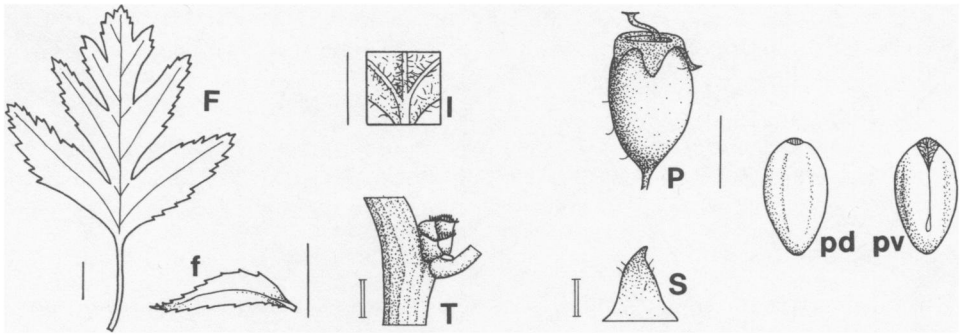


FIG. 93. *Crataegus* ×*browicziana*. F: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (*Davis 37006*.)

villous in vein axils beneath, broadly cuneate to more or less rounded at base, lobes subacute, more or less tapering towards base, margin serrate, basal pair of veins more or less divergent. Subterminal leaf blades of flowering shoots 2.0–3.1 cm long, 1.7–3.1 cm wide, lobes 2–3 pairs, basal pair 2.7–3.0 times as long as wide, extending 0.8–0.9 times the width of lamina to midrib, each lobe with 11–19 teeth in the distal 3/5–4/9, basal pair of sinuses in the basal 3/10–1/10 of lamina; petiole 9–11 mm long, 0.3–0.5 times as long as lamina; stipules 5–8 mm long, denticulate-serrate with 14–20 teeth. Inflorescence up to ca. 40 mm long, corymbose, up to 7-flowered, lax, glabrous; pedicels 8–25 mm, glabrous; bracts caducous. Flowers not seen; sepals 1.8–2.1 mm long, 1.8–1.9 mm wide, triangular, 0.9–1.2 times as long as wide, margin entire, apex more or less obtuse; styles 1 (–2). Fruit 8–9 mm long, 4–7 mm in diameter, 1.3–2.0 times as long as wide, oblong-cylindrical, brick-red, glabrous or sparsely villous, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 1 (–2), dorsally and ventro-laterally sulcate, hypostyle pilose. Chromosome number unknown. Fig. 93.

Phenology. Fruiting in July.

Distribution (Fig. 68). Province Kütahya in Asian Turkey.

Crataegus ×*browicziana* is known only from the type. The epithet honors Prof. K. Browicz, Institute of Dendrology and Kórnik Arboretum, Kórnik, Poland, who discovered this hybrid (see Davis 1972).

41. Crataegus ×kyrtostyla Fingerhuth, Linnaea 4: 379, tab. III.1. 1829, pro sp. (*Crataegus monogyna* × *Crataegus rhipidophylla*.) *Oxyacantha kyrtostyla* (Fingerhuth) Roemer, Fam. nat. syn. monogr. 3: 106. 1847. *Mespilus monogyna* f. *kyrtostyla* (Fingerhuth) Koch, Dendrol. 161. 1869. *Crataegus oxyacantha* var. *kyrtostyla* (errore *kurtostyla*) (Fingerhuth) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 118. 1871. *Crataegus monogyna* var. *kyrtostyla* (Fingerhuth) Beck, Fl. Niederösterreich 2(1): 706. 1892. *Crataegus oxyacantha* subsp. *monogyna* var. *kyrtostyla* (Fingerhuth) Rouy & Camus, Fl. France 7: 6. 1901.—TYPE: unknown (see Lippert 1978);

recorded from GERMANY, Eiffel near Schleiden.—Neotype, designated by Christensen, 1985: LUXEMBOURG, a 50 m de la frontiere belge, en face du pont de Romeldange sur la Sure, 11 Aug 1960, *Lawalrée 11088* (BR!).

Crataegus subsphaericea Gandoger, Bull. Soc. Bot. France 18: 448. 1871.—TYPE: *Gandoger 5* (holotype: LY!).

Crataegus silvicola Gandoger, Bull. Soc. Bot. France 18: 448. 1871.—TYPE: not located, no material at LY.—Neotype, here designated: *Magnier Pl. Gall. Sept. Belg. 72* (LY!).

Shrub or tree up to ca. 7 m tall. Twigs glabrous or sparsely villous; thorns up to ca. 1.6 cm long. Buds 1.8–3.7 mm long, 1.4–2.8 mm in diameter. Leaf blades more or less lustrous dark green and more or less villous along major veins above, pale green or more or less glaucous-green and more or less villous in vein axils beneath, attenuate or broadly to narrowly cuneate at base, lobes acute or more or less obtuse, margin more or less irregularly serrate, basal pair of veins divergent, rarely more or less straight. Subterminal leaf blades of flowering shoots 1.7–7.1 cm long, 1.5–5.6 cm wide, lobes 1–4 pairs, basal pair 1.7–3.7 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 2–22 teeth in the distal 9/10–1/10, basal pair of sinuses in the apical (3/10–) 2/5 to basal 1/5 of lamina; petiole 7–31 mm long, 0.3–0.6 times as long as lamina; stipules 5–16 mm long, irregularly serrate-denticulate-entire or denticulate, with 3–22 teeth, rarely some stipules entire. Subterminal leaf blades of short shoots 2.4–5.8 cm long, 2.3–4.6 cm wide, lobes 2–4 pairs, basal pair 2.0–3.3 times as long as wide, extending 0.6–1.0 times the width of lamina to midrib, each lobe with 7–19 teeth in the distal 2/3–1/4, basal pair of sinuses in the apical 2/5 to basal 1/5 of lamina; petiole 17–38 mm long, 0.5–1.1 times as long as lamina. Leaf blades of elongate shoots 2.6–8.8 cm long, 2.8–7.4 cm wide; lobes 2–4 pairs, basal pair 1.7–2.8 (–4.0) times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 8–27 teeth in the distal 3/4–1/4, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 10–42 mm long, 0.3–0.6 times as long as lamina; stipules 9–26 mm long, serrate with 16–57 teeth. Inflorescence 3.0–5.5 cm long, corymbose, 7–18-flowered, lax, glabrous or sparsely villous; pedicels 2–34 mm long, glabrous or sparsely villous; bracts 1.9–3.9 mm long, 0.2–0.4 mm wide, 5.5–22.0 times as long as wide, caducous, margin denticulate with 2–6 teeth. Hypanthium 3–5 mm long, glabrous or more or less villous; sepals 1.9–5.1 mm long, 1.8–3.0 mm wide, usually more or less narrowly triangular, 0.9–2.2 times as long as wide, margin entire, apex acute or more or less acuminate; petals 4–9 mm long, 5–8 mm wide; stamens 17–20, anthers purple; styles 1 (–2). Fruit 7–14 mm long, 5–12 mm in diameter, 1.1–1.8 times as long as wide, cylindrical, ellipsoidal or subglobose, dark or bright red, glabrous or more or less villous, crowned by the persistent, erect to reflexed sepals, often angular at base; flesh yellowish; pyrenes 1 (–2), dorsally and ventro-laterally sulcate, hypostyle pilose. Figs. 94, 96.

Phenology. Flowering in April to June, fruiting in June to October (January).

Distribution (Figs. 95, 97). From southern Scandinavia and central Europe to the Balkan Peninsula, Turkey, Caucasia, the Crimea, and the Baltic region; on limestone, serpentine, schist, as well as granite and siliceous rocks; in woodlands with *Abies, Carpinus, Fraxinus, Quercus, Acer, Corylus, Sambucus, Pyrus*, in grasslands, at field edges, in hedges, and at roadsides; 0–1800 m.

In recent years, there has been some confusion concerning the correct name for the hybrid between *C. monogyna* and *C. rhipidophylla*. *Crataegus kyrtostyla* Fingerhuth (1829) is traditionally considered a hybrid of *C. monogyna* × *C. rhipidophylla* (e.g., Franco in Tutin et al. 1968; Gostynska-Jakuszewska 1975, 1979). However, Pojarkova (1939a) considered *C. kyrtostyla* conspecific with *C. rhipidophylla*, and Lippert (1978) treated *C. kyrtostyla* as synonym of *C. monogyna*. No type material has ever been located, but some years ago Christensen (1985) designated a neotype for *C. kyrtostyla*, which is *C. monogyna* × *C. rhipidophylla*. Unfortunately, this neotype was apparently badly chosen, because it is not in accordance with the protologue and especially tab. III.1 of Fingerhuth (Lambinon in Kerguélen 1987; Lambinon & Duvigneaud 1988). Lambinon and Duvigneaud (1988) used the binary name *C.* ×*heterodonta* Pojarkova (1965) for *C. monogyna* × *C. rhipidophylla*, but if the contentions of Lippert and of Lambinon and Duvigneaud are correct, *C. subsphaericea* Gandoger (1871) and *C. silvicola* Gandoger (1871) have priority.

See Byatt (1976a) and Christensen (1982a, 1984, 1985, 1992) for morphometric studies of *C.* ×*kyrtostyla* and its parents.

Key to the Nothovarieties of Crataegus ×kyrtostyla

1. Fruits crowned by reflexed or spreading sepals. 41a. *C.* ×*kyrtostyla* nothovar. *kyrtostyla*.
1. Most or all fruits crowned by erect or erect to spreading sepals. 41b. *C.* ×*kyrtostyla* nothovar. *domicensis*.

41a. Crataegus ×kyrtostyla nothovar. **kyrtostyla.** (*Crataegus monogyna* × *Crataegus rhipidophylla* var. *rhipidophylla.*)

Crataegus oxyacantha var. *pteridifolia* Loddiges ex Loudon, Arbor. frutic. brit. 2: 831, fig. 604. 1838. *Crataegus monogyna* var. *pteridifolia* (Loudon) Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 279. 1853.—Type: Fig. 604 in Loudon, Arbor. frutic. brit. 2. 1838 (lectotype, here designated).

Crataegus monogyna f. *filicifolia* Koehne, Deut. Dendrol. 238. 1893. *Crataegus monogyna* var. *filicifolia* (Koehne) Lange, Revis. Crataeg. 39, fig. F. 1897. *Crataegus monogyna* var. *typica* f. *fissa* subf. *filicifolia* (Koehne) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 737. 1926.—Type: unknown.

Crataegus raavadensis Raunkiær, Biol. Meddel. Kongel. Danske Vidensk. Selsk. 5: 68. 1925.—Type: *Raunkiær s.n.* (lectotype, here designated: C!; isolectotype: C!).

Crataegus fallacina Klokov in Zerov, Fl. URSR 6: 576, fig. 13. 1954.—Type: *Klokov & Sidelnik 7* (holotype: KW!).

Crataegus tanaitica Klokov in Zerov, Fl. URSR 6: 576. 1954.—Type: *Ivanova s.n.* (holotype: KW).

Crataegus monogyna subsp. *intermedia* var. *serromonogyna* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 116, tabs. IV.12, VII.51–53. 1956.—Type: *Pénzes 30* (holotype: BP!; isotype: BP!).

Crataegus monogyna subsp. *intermedia* var. *csapodyae* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 116, tabs. III.11, VII.57–59. 1956.—Type: *Pénzes 79* (lectotype, here designated: BP 401745!; isolectotype: BP!).

Crataegus monogyna subsp. *heterophylla* var. *borosii* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 120, tabs. IV.17, VII.69–71. 1956.—TYPE: *Boros s.n.* (holotype: BP 401978!).

Crataegus heterodonta Pojarkova, Novit. Syst. Pl. Vasc. 1965: 130, figs. 1, 2. 1965. *Crataegus monogyna* subsp. *monogyna* var. *heterodonta* (Pojarkova) Gostynska-Jakuszewska, Roczn. Dendrol. 31: 12. 1978.—TYPE: *Gostynska s.n.* (holotype: KOR 1838).

Crataegus ceratocarpa Kossych, Bjull. Glavn. Bot. Sada AN SSSR 57: 79. 1965.—TYPE: *Kossych s.n.* (holotype: YALT).

Crataegus monogyna subsp. *silicensis* Hrabetová-Uhrová, Biologia (Bratislava) 24: 553, fig. 4. 1969. *Crataegus* ×*silicensis* (Hrabetová-Uhrová) Baranec, Acta Dendrobiol. 1986: 41. 1986.—TYPE: *Hrabetová s.n.* (holotype: BRNU 427331).

Crataegus ×*latvica* Cinovskis, Crat. balt. 108, fig. 21. 1971.—TYPE: *Cinovskis s.n.* (holotype: LATV!).

Crataegus ×*gracilis* Cinovskis, Crat. balt. 118, fig. 24. 1971.—TYPE: *Cinovskis 606* (holotype: LATV!).

Crataegus insularis Cinovskis, Crat. balt. 120, fig. 25. 1971.—TYPE: *Cinovskis Os-1* (holotype: LATV!).

Crataegus ×*maritima* Cinovskis, Crat. balt. 123, fig. 27. 1971.—TYPE: *Cinovskis Os-3* (holotype: LATV!).

Crataegus osiliensis Cinovskis, Crat. balt. 126, fig. 28. 1971. —TYPE: *Cinovskis s.n.* (holotype: LATV!).

Crataegus ×*viidumaegica* Cinovskis, Crat. balt. 130, fig. 29. 1971.—TYPE: *Cinovskis s.n.* (holotype: LATV!).

Crataegus ×*monoli* Doll, Gleditschia 2: 9, tabs. VII, IX, fig. 4. 1974.—TYPE: *Doll s.n.* (holotype: JE!).

Crataegus ×*curcina* Doll, Gleditschia 2: 12, tabs. VI, VII, fig. 3. 1974.—TYPE: *Doll s.n.* (holotype: JE!).

Crataegus ×*feldbergii* Doll, Natur Naturschutz Mecklenburg 13: 16, figs. 7, 18, 19, 24. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*glauca* Doll, Natur Naturschutz Mecklenburg 13: 18, figs. 8, 9, 24. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus curvisepala var. *aceriformis* Hrabetová-Uhrová, Preslia 52: 57, tab. IV. 1980.—TYPE: *Hrabetová s.n.* (holotype: BRNU 465207!).

Fruits crowned by the persistent, reflexed or spreading sepals. Chromosome numbers: 2n (2x) = 34; 2n (4x) = 68. Fig. 94.

Additional illustrations: Figs. 3A, 7, 8 in Christensen (1985).

Distribution (Fig. 95). From southern Scandinavia and central Europe to the Balkan Peninsula, Turkey, Caucasia, the Crimea, and the Baltic region; cultivated and escaping in southern England, occasionally also cultivated within its natural range.

REPRESENTATIVE SPECIMENS. **Norway.** Holmestrand, *Dyring s.n.* (H). **Sweden.** Västergötl., Skövde, Havstena, *Hülphers s.n.* (C). **Finland.** Al, Lemland, Nåtø, *Palmgren s.n.* (H). **Denmark.** Ærø, Dejrø, *Grøntved 336a* (C); Vorsø, Østermark, *Jessen XIIC5b* (C). **The Netherlands.** Zuid-Holland, Wassenaar, *Nannfeld s.n.* (UPS). **Belgium.** Tintange, au sud de la ferme de Romeldange, la

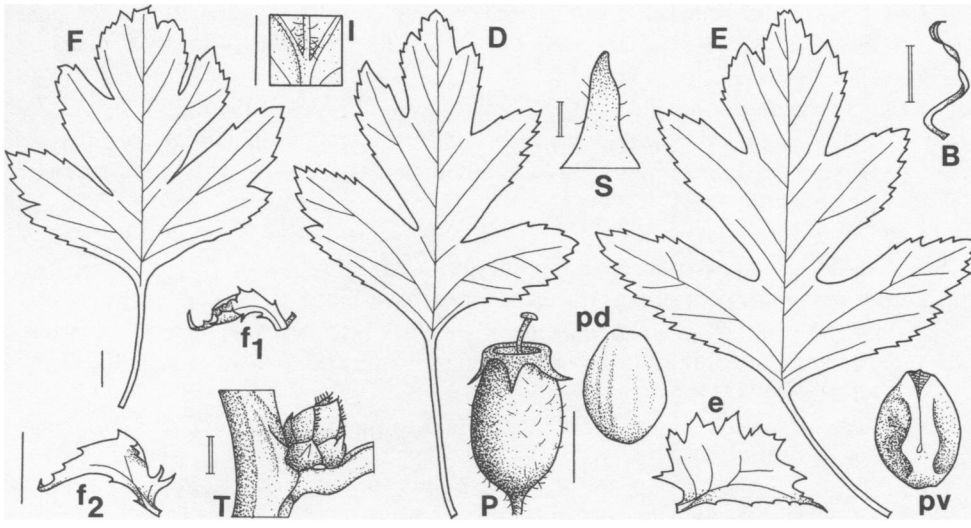


FIG. 94. *Crataegus* ×*kyrtostyla* nothovar. *kyrtostyla*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, E, F, f_1, S, T: *Borén s.n.*; f_2, I, P: *Browicz s.n.*; pd, pv: *Christensen D27*; e: *Christensen D81*.)

Sure, *Lawalrée 11096* (BR). **Switzerland.** St.Gallen, *Koch s.n.* (BR). **Austria.** Niederösterreich, Ellender Forst bei Maria Elend, *Ronniger s.n.*(W). **Germany.** Schleswig-Holstein, Eckernförde, bei Hemmelmark, *Barnieske s.n.*(B); Kernberge bei Jena, etwas oberhalb v. Wöllnitz, *Bauch s.n.* (JE). **Czechoslovakia.** Moravia centr.-merid., Brno, in frutic. decl. merid.-occid. collis Hády dicti supra suburbem Brno-Malomerice, *Hrabetová Fl. Exs. Cech. 1636* (C, GB, JE, LD). **Bulgaria.** Prope Dermendere, *Kech s.n.* (LD, W); nördliche Schwarzmeerküste, Balcik, Tal bei Ovcarskiplani, 4 km westlich der Stadt, *Manitz s.n.* (JE). **Romania.** Dobrogea, Babadagh, Wald von Cukarova, *Sintenis 962* (LD). **Greece.** Prov. Grevena, along road from Katara pass to Perivolion, 0–1 km before Perivolion, *Christensen 1877* (C). **Turkey.** Kirklari, 15 km W Igneada, *Bauer 2611* (W); Pontus austr., Mt. Ak-Dagh, *Bornmüller 2373* (JE). **Poland.** Olsztynskie, pow. Ketrzyn,w rowie szosie miedzy Pozarkami i Kwiedzina, *Boratynscy s.n.* (C); zbocza doliny Wisly, w rezerwacie miedzy Wioslem a Widlicami, wojem, gdanski, pow. Toczem, *Gostynska s.n.* (KOR 1854; paratype of *C. heterodonta*). **U.S.S.R.** The Crimea: distr. Sympheropolis, in valle fl. Fundukly, pr. pag. Ssolovjevka, *Kossych Gerb. Fl. SSSR 5467* (C, JE; topotype of *C. ceratocarpa*).—Ukraine: Ust-Medveditsya, collector unknown *s.n.* (KW; paratype of *C. tanaitica*); okr. Kiev, *Semenkev s.n.* (KW). **Estonia.** Ins. Osilia, Insel Abro, süd-östlich vom Gutshofe, *Kupffer 22636* (GB; paratype of *C.* ×*osiliensis*).

41b. Crataegus ×kyrtostyla nothovar. **domicensis** (Hrabetová-Uhrová) Christensen, stat. nov. (*Crataegus monogyna* × *Crataegus rhipidophylla* var. *lindmanii*.) *Crataegus domicensis* Hrabetová-Uhrová, Biologia (Bratislava) 24: 549, fig. 2. 1969. *Crataegus* ×*kyrtostyla* nothosubsp. *domicensis* (Hrabetová-Uhrová) Christensen, Feddes Repert. 96: 376. 1985.—Type: Czechoslovakia. Slovakia, Júhoslovensky kras, in planitie carstica fruticosa supra cavam Domica, 380 m, 7 Oct 1967, *Hrabetová s.n.* (holotype: BRNU 430254!).

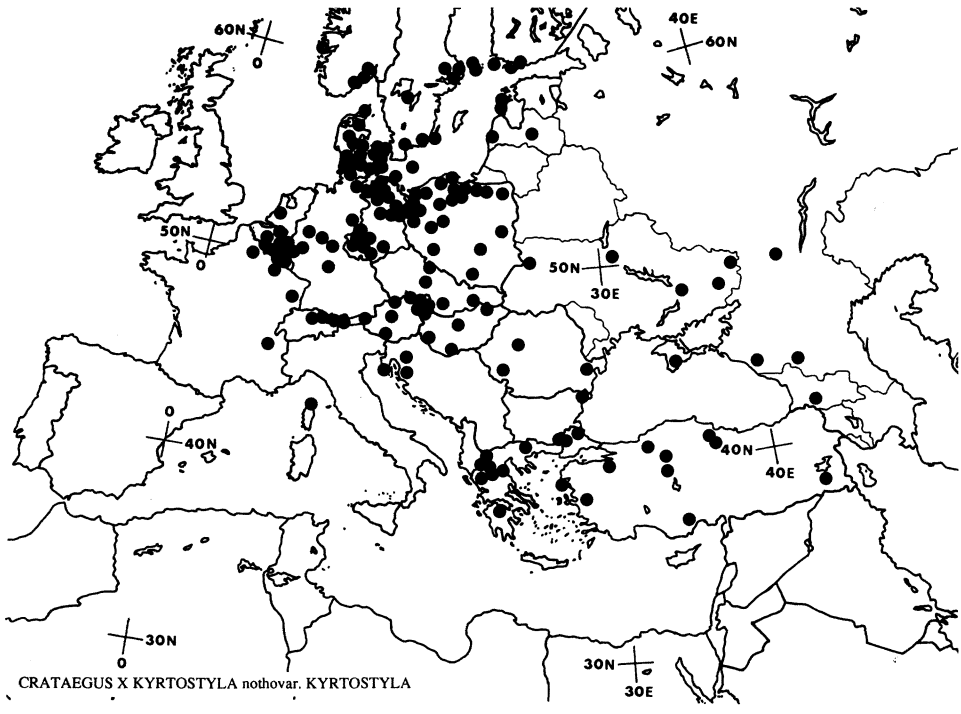


FIG. 95. Distribution of *Crataegus* ×*kyrtostyla* nothovar. *kyrtostyla* (incl. *C.* ×*kyrtostyla* s.l.), based on specimens seen and literature records cited by Bergmeier (1988).

Crataegus plagiosepala Pojarkova, Novit. Syst. Pl. Vasc. 1965: 135, figs. 2, 3. 1965.—TYPE: *Browicz & Gostynska s.n.* (holotype: LE; isotype: KOR 2511!).

Crataegus araneosa Doll, Natur Naturschutz Mecklenburg 13: 11, figs. 1, 23. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*bergiana* Doll, Natur Naturschutz Mecklenburg 13: 13, figs. 2, 23. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus dabelowa Doll, Natur Naturschutz Mecklenburg 13: 15, figs. 6, 24. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*luzinii* Doll, Natur Naturschutz Mecklenburg 13: 19, figs. 11, 18, 19, 25. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*pseudoalemanniensis* Doll, Natur Naturschutz Mecklenburg 13: 23, figs. 15, 25. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Crataegus ×*werdana* Doll, Natur Naturschutz Mecklenburg 13: 26, figs. 17, 26. 1976.—TYPE: *Doll s.n.* (holotype: JE).

Most or all fruits crowned by the persistent, erect or erect to spreading sepals. Chromosome numbers: 2n (2x) = 34; 2n (3x) = 51. Fig. 96.

Additional illustrations: Figs. 2F, 2H, 3C in Christensen (1985).

Distribution (Fig. 97). Known from Sweden, Denmark, Germany, Poland, Czechoslovakia, Switzerland, and France.

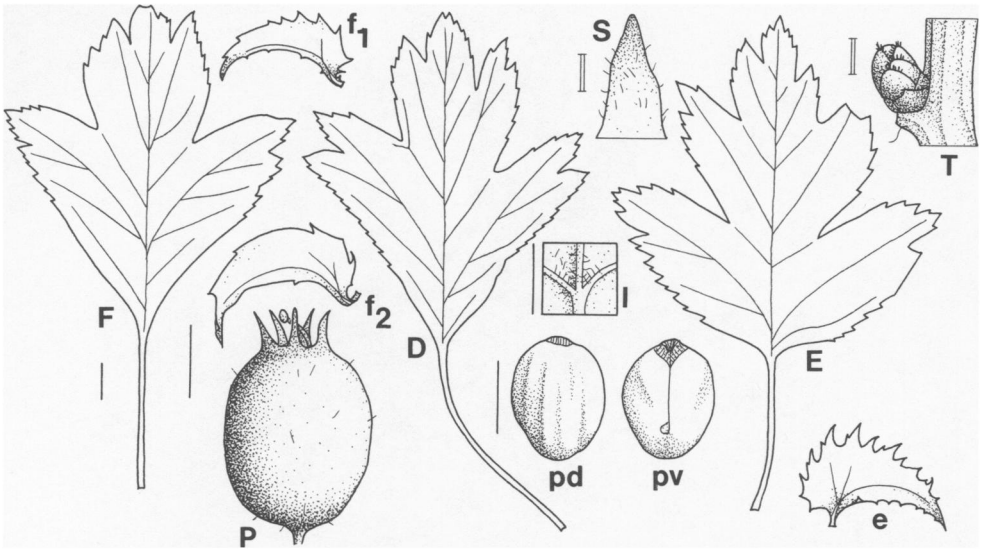


FIG. 96. *Crataegus* ×*kyrtostyla* nothovar. *domicensis*. D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D, e, F, f_1, f_2: *Browicz s.n.*; E, I, P, pd, pv, S, T: *Hrabetová s.n.*)

ADDITIONAL SPECIMENS EXAMINED. **Sweden.** Motala, *Thedenius Frist. Sv. Pharm. Växt. V. 62* (C). **Denmark.** Amager, Copenhagen, Stadsgraven near Langebro, *Christensen s.n.* (C). **Poland.** Morawica, *Browicz s.n.* (KOR); Helenow kolo Lublina, *Browicz s.n.* (KOR 2509; paratype of *C. plagiosepala*); Ciecierzyn kolo Lublina, *Browicz s.n.* (KOR 2510; paratype of *C. plagiosepala*); zbocza doliny Wisly pod Dobrzyniem, *Gostynska s.n.* (C). **Czechoslovakia.** Slovakia, Júhoslovensky kras, planitia Silicensio, in prato magno NW a Barakolalas, *Hrabetová s.n.* (BRNU). **Switzerland.** Bregaglia, Soglio, *Trepp s.n.* (BR).

Crataegus section **Sanguineae** Schneider, Ill. Handb. Laubholzk. 1: 768. 1906.—
TYPE: *Crataegus sanguinea* Pallas.

Deciduous shrubs or trees. Aphyllous thorns up to ca. 4 cm long. Leaf blades shallowly to deeply lobed, lobes serrate, intercalary veins running to sinuses absent or present; stipules more or less persistent, serrate. Subterminal leaf blades of flowering shoots with 3–13 pairs of lobes. Flowers in terminal, more or less lax, 7–70-flowered corymbs on leafy short shoots; bracts linear-lanceolate, caducous, margin entire or denticulate; sepals persistent, reflexed after anthesis, margin entire or with a few glandular teeth; petals white; stamens about 20, anthers white, pale yellow, pink, or purplish; styles 2–5. Fruit yellow, orange, red, or black; flesh yellowish, greenish, or reddish; pyrenes 2–5, dorsally sulcate, ventro-laterally foveate or smooth; hypostyle glabrous or pilose.

Section *Sanguineae* comprises about 17 species, 1 in east-central and southeastern Europe (*C. nigra* Waldstein & Kitaibel) and about 16 in Asia.

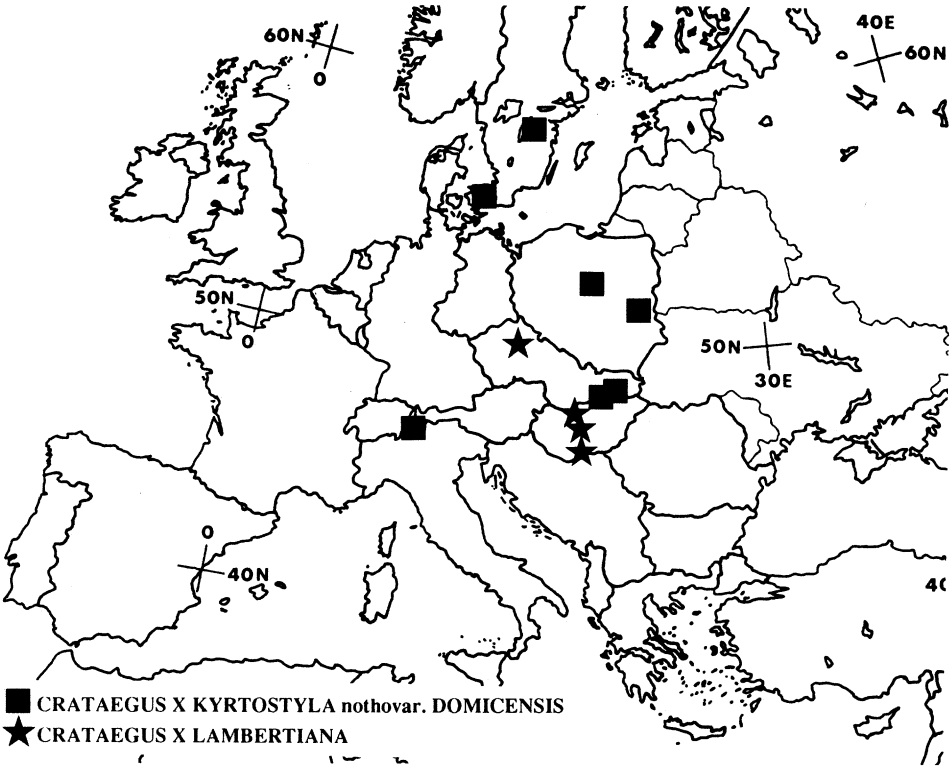


FIG. 97. Distribution of *Crataegus* ×*kyrtostyla* nothovar. *domicensis* and *C.* ×*lambertiana*. *Crataegus* ×*kyrtostyla* nothovar. *domicensis* has been reported from France (Kerguélen 1987), but I have not seen any herbarium specimens from there.

Crataegus nothosection **Crataeguineae** Christensen, nothosect. nov. (*Crataegus* sect. *Crataegus* × *Crataegus* sect. *Sanguineae.*)

Deciduous shrubs or trees. Aphyllous thorns up to ca. 1.5 cm long. Leaf blades more or less deeply lobed, lobes serrate, intercalary veins running to sinuses present or absent; stipules more or less persistent, denticulate or serrate, rarely entire. Subterminal leaf blades of flowering shoots with 2–5 pairs of lobes. Flowers in terminal, lax, 4–30-flowered corymbs on leafy short shoots; bracts 6.3–25.0 times as long as wide, caducous, margin entire or denticulate; sepals persistent, reflexed after anthesis, margin entire; petals white; stamens 15–21, anthers yellow or purplish; styles (1–) 2–5. Fruit yellow, red, or blackish purple; flesh yellowish or reddish; pyrenes (1–) 2–5, dorsally and ventro-laterally sulcate; hypostyle pilose or glabrous.

42. Crataegus ×**dsungarica** Zabel ex Lange, Revis. Crataeg. 43. 1897, pro sp. (*Crataegus songarica* × *Crataegus wattiana.*). *Crataegus* ×*almaatensis* Pojarkova, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 12: 108. 1950.—TYPE: DENMARK, Sjælland, cultivated in the Botanical Garden

of the University of Copenhagen, 11 Sep 1896, unknown collector *s.n.* (lectotype, here designated: C!).

Small tree. Twigs glabrous; thorns up to ca. 0.8 cm long, stout. Buds 1.5–3.0 mm long, 1.5–2.0 mm in diameter. Leaf blades dark green and more or less villous or glabrous above, pale green and villous in vein axils beneath, narrowly cuneate or more or less rounded at base, lobes acuminate or acute, margin serrate with more or less coarse teeth, basal pair of veins divergent, straight or convergent. Subterminal leaf blades of flowering shoots 4.1–6.2 cm long, 2.4–4.9 cm wide, lobes 2–3 pairs, basal pair 1.3–4.5 times as long as wide, extending 0.5–0.6 times the width of lamina to midrib, each lobe with 2–9 teeth in the distal 2/3–1/12, basal pair of sinuses in the apical 2/5 to basal 3/10 of lamina; petiole 13–20 mm long, 0.3–0.6 times as long as lamina; stipules 7–19 mm long, irregularly denticulate-serrate with 1–20 teeth. Leaf blades of elongate shoots ca. 5.8 cm long, ca. 6.1 cm wide, lobes 3 pairs, basal pair ca. 2.4 times as long as wide, extending ca. 0.7 times the width of lamina to midrib, each lobe with ca. 15 teeth in the distal 3/5, basal pair of sinuses in the basal 1/2 of lamina; petiole ca. 14 mm long, ca. 0.3 times as long as lamina; stipules ca. 15 mm long, serrate. Inflorescence 3.0–4.5 cm long, corymbose, 14–19-flowered, lax, glabrous; pedicels 7–20 mm long, more or less villous; bracts 1.5–2.2 mm long, ca. 0.2 mm wide, 7.0–11.0 times as long as wide, caducous, margin denticulate, with 3–4 teeth. Hypanthium 3–4 mm long, glabrous or villous; sepals 1.4–3.2 mm long, 2.0–2.5 mm wide, usually narrowly triangular, 0.7–1.5 times as long as wide, margin entire, apex acuminate or acute, rarely obtuse; petals 5–6 mm long, ca. 6 mm wide; stamens ca. 17, anthers purplish or yellow; styles 3–4. Fruit 7–10 mm long and in diameter, 0.9–1.0 times as long as wide, globose or depressed-globose, blackish purple, glabrous or more or less villous, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes 3–4, dorsally and ventrolaterally sulcate; hypostyle pilose. Chromosome number unknown. Fig. 98.

Additional illustrations: Figs. 437k–m, 438p, q in Schneider (1906).

Phenology. Flowering in June and July, fruiting in August to October.

Distribution (Fig. 101). Tian-Shan Mountains, in the gorge of River Almaatinka; on mountain slopes.

Additional Specimens Examined. **Denmark.** Sjælland, Copenhagen, Garden of the Royal Veterinary and Agricultural University, cultivated, unknown collector *s.n.* (C). **Sweden.** Alnarp, cultivated, *Ulriksen s.n.* (C). **Germany.** Rixdorf, Späth's Nursery, cultivated, *Lange s.n.* (C).

Pojarkova (1950) considered *C.* ×*dsungarica* Lange (1897) conspecific with *C. songarica* Koch (1853), because Lange (1897: 43) cited *C. pinnatifida* var. *songarica* (Koch) Dippel (1893) as a synonym of *C.* ×*dsungarica*. She therefore published the name *C.* ×*almaatensis* for the hybrid between *C. songarica* and *C. wattiana* [=*C. altaica* (Loudon) Lange]. However, original material of *C.* ×*dsungarica* Lange deposited at C is *C. songarica* × *C. wattiana*, and the lectotype here designated is *C.* ×*dsungarica* in the traditional sense.

43. Crataegus ×**aberrans** (Lange) Christensen, stat. nov. (*Crataegus ambigua* subsp. *ambigua* × *Crataegus wattiana*.) *Crataegus rubrinervis* var. *aberrans* Lange, Revis. Crataeg. 45. 1897.—Type: Denmark, Sjælland, cultivated at

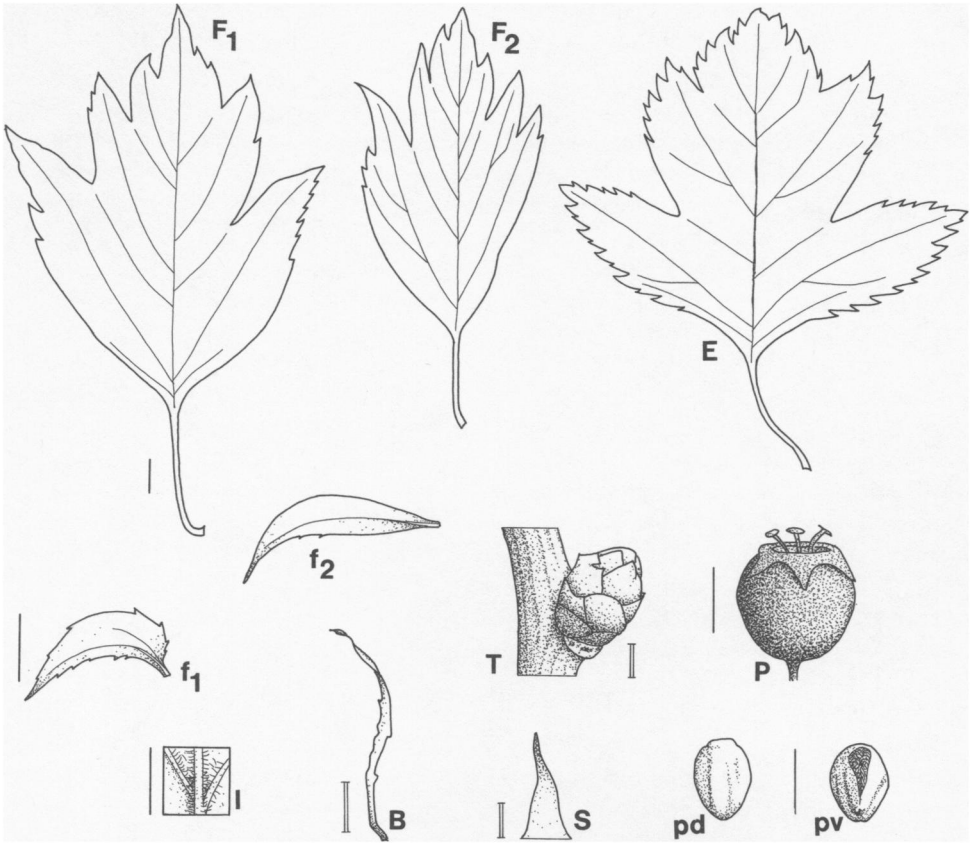


FIG. 98. *Crataegus* ×*dsungarica*. B: bract; E: leaf from central portion of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (B, F_2, f_2, I, S: unknown collector *s.n.*; F_1, f_1, P, pd, pv, T: unknown collector *s.n.*; E: *Ulriksen s.n.*)

the Botanical Garden of the University of Copenhagen, 16 Nov 1893, *Lange s.n.* (lectotype, here designated: C!).

Small tree. Twigs glabrous; thorns up to ca. 1.5 cm long, stout. Buds 1.5–4.0 mm long, 1.5–3.9 mm in diameter. Leaves more or less lustrous dark green and more or less villous throughout or only along veins above, pale or greyish green and villous in vein axils or throughout beneath, broadly cuneate, truncate or subcordate at base, lobes acute, margin serrate or glandular-serrate, with more or less spherical glands, these ca. 0.1 mm in diameter, basal pair of veins divergent or straight; petiole eglandular or glandular with 1–6 glands. Subterminal leaf blades of flowering shoots 4.8–7.0 cm long, 3.5–6.4 cm wide, lobes 2–3 pairs, basal pair 2.2–2.5 times as long as wide, extending 0.5–0.9 times the width of lamina to midrib, each lobe with 7–19 teeth in the distal 4/5–2/3, basal pair of sinuses in the basal 1/2–1/4 of lamina; petiole 15–28 mm long, 0.3–0.5 times as long as lamina; stipules 4–14 mm long, serrate with

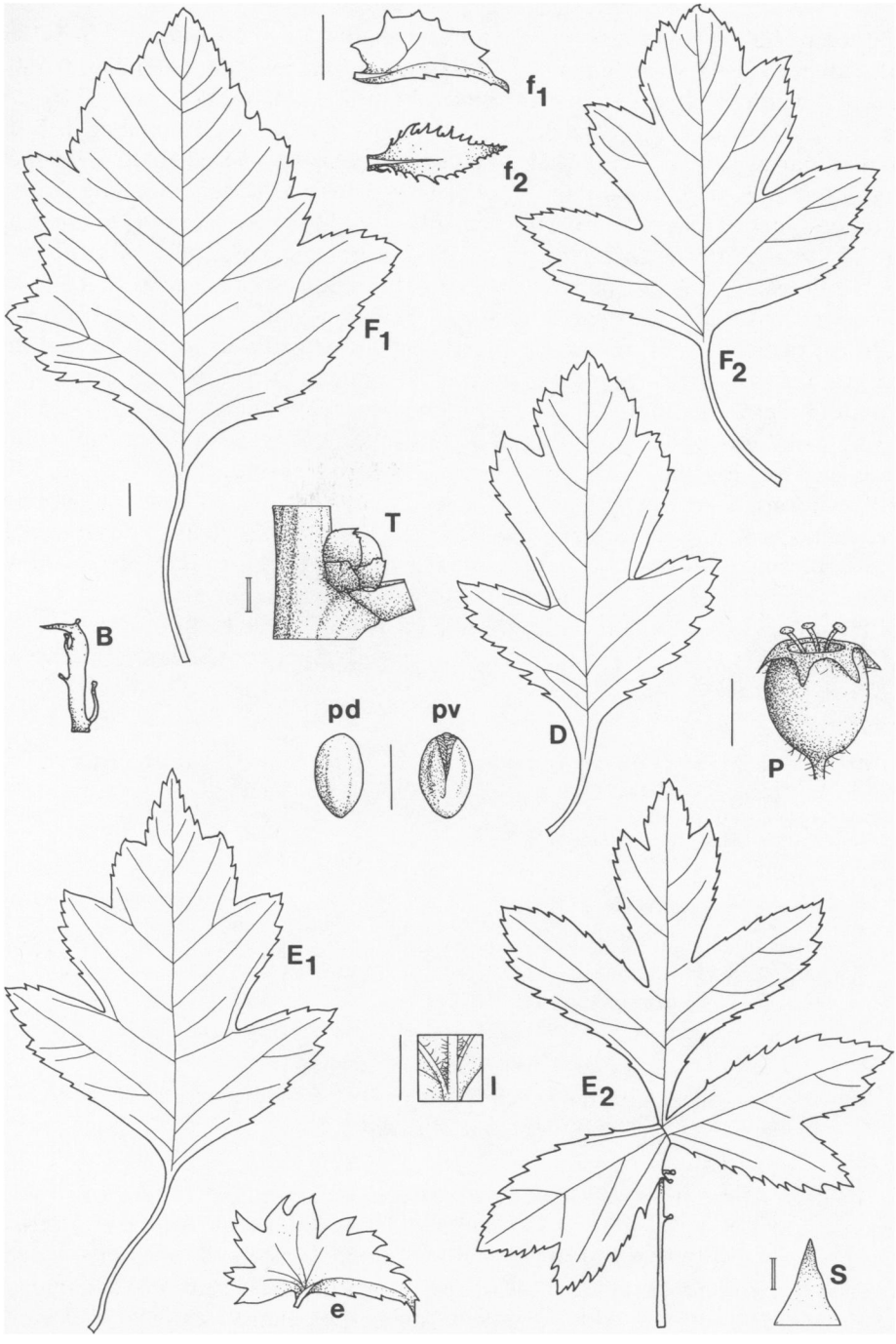


FIG. 99. *Crataegus* ×*aberrans*. B: bract; D: subterminal leaf of short shoot; E_1, E_2: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (D: *Borisova 657*; F_2, I: *Lange s.n.*; P, pd, pv, T: *Lange s.n.*; F_1, f_1, E_1, e, S: *Lange s.n.*; B, E_2, f_2: *Manger s.n.*)

9–30 teeth. Subterminal leaf blades of short shoots 4.8–6.2 cm long, 3.5–5.7 cm wide, lobes 2–3 pairs, basal pair 1.8–2.5 times as long as wide, extending 0.6–0.9 times the width of lamina to midrib, each lobe with 11–18 teeth in outer 9/10–2/3, basal pair of sinuses in the basal 2/5–3/10 of lamina; petiole 10–30 mm long, 0.2–0.6 times as long as lamina. Leaf blades of elongate shoots 5.9–7.8 cm long, 4.7–9.0 cm long, lobes 2–3 pairs, basal pair 1.7–2.9 times a long as wide, extending 0.6–1.0 times the width of lamina to midrib, each lobe with 11–35 teeth or only in the distal 4/5–2/3, basal pair of sinuses in the basal 2/5–1/10 of lamina; petiole 17–34 mm long, 0.3–0.5 times as long as lamina; stipules 8–24 mm long, serrate with 17–63 teeth. Inflorescence 4.5–9.5 cm long, corymbose, 6–30-flowered, lax, sparsely villous or glabrous; pedicels 4–24 mm long, sparsely villous or glabrous; bracts ca. 2.4 mm long, ca. 0.4 mm wide, ca. 6 times as long as wide, caducous, margin denticulate, with ca. 5 teeth. Hypanthium ca. 3 mm long, sparsely villous; sepals 1.6–3.5 mm long, 1.2–3.2 mm wide, triangular, 0.9–1.6 times as long as wide, margin entire; petals ca. 4 mm long and wide; stamens ca. 20, anthers purple; styles (2–) 3–5. Fruit 9–10 mm long, 7–9 mm in diameter, 1.0–1.3 times as long as wide, subglobose, brick-red, sparsely villous or glabrous, crowned by the persistent, reflexed sepals; flesh yellowish; pyrenes (2–) 3–5, dorsally sulcate, ventro-laterally shallowly sulcate, hypostyle pilose. Chromosome number unknown. Fig. 99.

Phenology. Flowering in June; fruiting in July to November.

Distribution (Fig. 101). Known only from the vicinity of Chklarov (Orenburg, U.S.S.R.) and along the Volga.

ADDITIONAL SPECIMENS EXAMINED. **Afghanistan.** Kabul, cultivated, *Manger s.n.* p.p. (JE). **U.S.S.R.** Vicinity of Orenburg, Ilekski r-n, *Borisova 657* (MEL); Volga, cultivated at the Botanical Garden, Copenhagen, Denmark, *Lange s.n.* (C). **Denmark.** Sjælland, cultivated at the Botanical Garden of the University of Copenhagen, *Lange s.n.* (C).

44. Crataegus ×tianschanica Pojarkova in Komarov, Fl. URSS 9: 507. 1939. (*Crataegus pseudoheterophylla* subsp. *turkestanica* × *Crataegus wattiana*.)—TYPE: U.S.S.R., Tian-Shan, Namangan distr., Aibek et Tuste, 16 Aug 1912, *Knorring 141* (holotype: LE; isotype: LE!).

Crataegus monticola Cinovskis, Introd. Pl. Hort. Bot. Riga 1974: 51, fig. 1. 1974.—TYPE: *Cinovskis KII103* (holotype: LATV).

Crataegus rubens Cinovskis, Introd. Pl. Hort. Bot. Riga 1974: 53, fig. 2. 1974.—TYPE: *Cinovskis K211* (holotype: LATV).

Tree up to ca. 10 m tall. Twigs glabrous; thorns up to ca. 1.5 cm long, stout, rare. Buds 3.2–3.9 mm long, 2.3–3.5 mm wide. Leaf blades more or less dark or greyish green and glabrous or sparsely villous along veins above, greyish green and glabrous or more or less villous in vein axils beneath, lobes acute or subacuminate, margin glandular-serrate with more or less spherical glands, these ca. 0.2 mm in diameter. Subterminal leaf blades of flowering shoots 2.0–8.0 cm long, 1.5–5.2 cm wide, lobes (2–) 4–5 pairs, basal pair 2.2–3.0 times as long as wide, extending 0.4–0.9 times the width of lamina to midrib, each lobe with 8–22 teeth or only in the distal 4/5–1/2, basal pair of sinuses in the basal 1/3–1/6 of lamina; stipules 7–10 mm long, serrate with 15–25 teeth. Subterminal leaf blades of short shoots ca. 2.9 cm long, ca. 2.8 cm wide, lobes 3 pairs, basal pair ca. 3.0 times as long as wide,

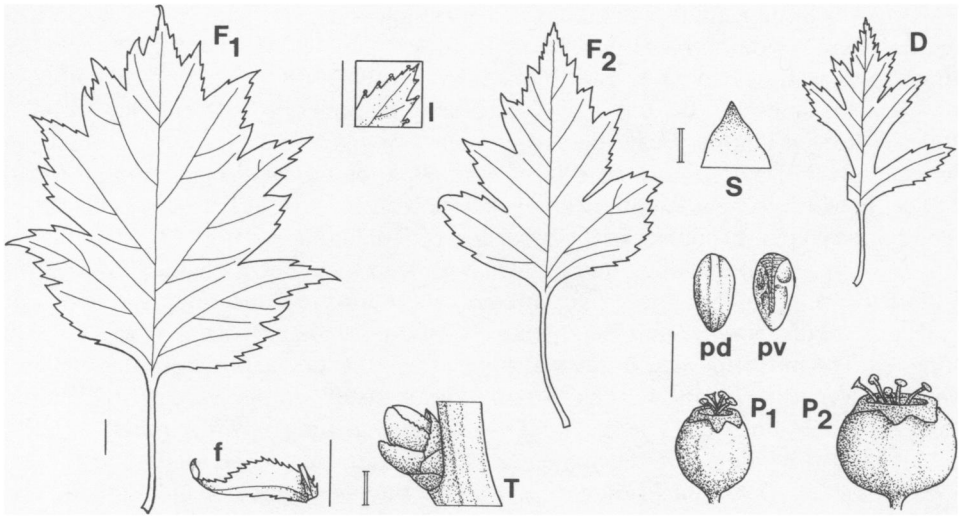


FIG. 100. *Crataegus* ×*tianschanica*. D: subterminal leaf of short shoot; F_1, F_2: subterminal leaf of flowering shoot; f: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P_1, P_2: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (F_1, f, P_2: *Guvanov s.n.*; D, I, P_1, pd, pv, T: *Knorring 141*; F_2, S: *Nabkev 224.*)

extending ca. 0.9 times the width of lamina to midrib, each lobe with ca. 10 teeth in the distal 4/5, basal pair of sinuses in the basal 1/5 of lamina; petiole ca. 12 mm long, ca. 0.4 times as long as lamina. Leaf blades of elongate shoots with lobes extending 0.5–0.7 times the width of lamina to midrib; petiole 0.2–0.3 times as long as lamina. Inflorescence 3.5–4.5 cm long, corymbose, 4–14(–20)-flowered, lax, glabrous; pedicels 2–16 mm long, glabrous; bracts caducous. Hypanthium glabrous, length unknown; sepals 1.6–2.1 (–3.0) mm long, 1.8–1.9 mm wide, more or less broadly triangular, 0.9–1.3 times as long as wide, margin entire, apex acute; petals not seen; stamens 18–20, anthers pale purple; styles 4–5. Fruit (4–) 7–10 mm long, (5–) 6–9 mm wide, 0.9–1.1 times as long as wide, subglobose, yellow or reddish, crowned by the persistent, recurved sepals; flesh yellowish; pyrenes 4–5, dorsally and ventrolaterally sulcate; hypostyle glabrous. Chromosome number unknown. Fig. 100.

Additional illustration: Fig. 2 in Pojarkova (1970).

Phenology. Flowering in June, fruiting in July and August.

Distribution (Fig. 101). Endemic to Tian-Shan; on rocky mountain slopes and in scrub; 1000–1500 m.

ADDITIONAL SPECIMENS EXAMINED. **U.S.S.R.** TIAN-SHAN: Namanganski obl., Kurashenski khr., Gava-Sai 5 na SZ ot Chusta, *Guvanov s.n.*(LE); distr. Tashkent, sistema r. Chatkai, r. Kok-su, *Minkwitz 1351* (LE); Chatkalski khr., r. Iadsha-ata, r. Aibek, *Nabkev 224* (LE).

45. Crataegus ×lambertiana Lange, Fortegnelse Frilands-Træer Buske 77. 1871, pro sp. (*Crataegus monogyna* × *Crataegus nigra.*) Crataegus ×*atrorubella* Cinovskis, Crat. balt. 206. 1971.—TYPE: DENMARK, Sjælland, Copenhagen, cultivated in the garden of the Royal Veterinary and Agricultural University, *Lange s.n.* (lectotype, here designated: C!).

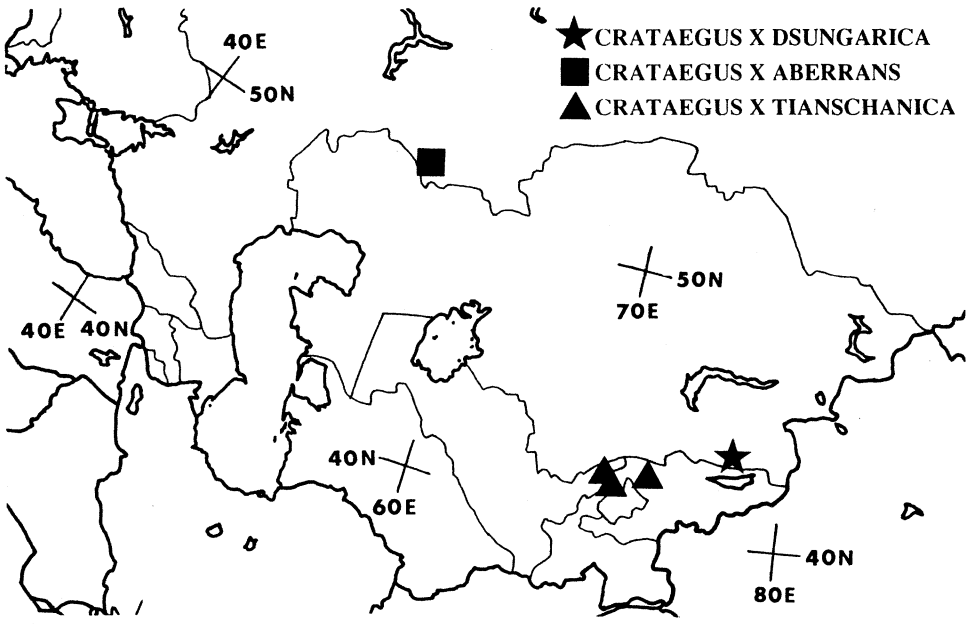


FIG. 101. Distribution of *Crataegus* ×*dsungarica*, *C.* ×*aberrans*, and *C.* ×*tianschanica*, based on specimens seen and literature records cited by Cinovskis (1974).

Crataegus ×*degenii* Zsak, Bot. Közlem. 32: 191, fig. 3. 1935.—TYPE: *Zsak s.n.* (holotype: BP?).

Crataegus ×*degenii* var. *monogynoides* Zsak, Bot. Közlem. 32: 191, fig. 4. 1935.—TYPE: fig. 4 in Zsak, Bot. Közlem. 32. 1935 (lectotype, here designated).

Crataegus ×*schneideri* Cinovskis, Crat. balt. 199, fig. 59. 1971.—TYPE: *Koehne Herb. Dendrol. 127* (holotype: W).

Small tree. Twigs more or less densely villous; thorns up to ca. 2 cm long. Buds ca. 3.2 mm long, ca. 2.1 mm in diameter. Leaf blades dark green and more or less villous above, pale or greyish green and more or less villous beneath, lobes more or less acute, margin serrate with fine or more or less coarse teeth, basal pair of veins divergent. Subterminal leaf blades of flowering shoots 4.2–6.4 cm long, 3.6–6.6 cm wide, lobes 3–5 pairs, basal pair 2.4–3.0 times as long as wide, extending 0.5–0.8 times the width of lamina to midrib, each lobe with 1–11 teeth in the distal 1/3–1/9, basal pair of sinuses in the basal 1/2–1/5 of lamina; petiole 15–28 mm long, 0.3–0.4 times as long as lamina; stipules 6–20 mm long, more or less irregularly denticulate with 3–21 teeth, rarely entire. Subterminal leaf blades of short shoots 4.3–5.6 cm long, 3.0–5.0 cm wide, lobes 3–5 pairs, basal pair 2.3–3.5 times as long as wide, extending 0.5–0.7 times the width of lamina to midrib, each lobe with 6–11 teeth in the distal 2/5–3/10; petiole 21–25 mm long, 0.4–0.5 times as long as lamina. Leaf blades of elongate shoots 4.0–8.0 cm long, 3.9–7.4 cm wide, lobes 3–5 pairs, basal pair 2.7–3.0 times as long as wide, extending 0.5–0.8 times the width of lamina to midrib, each lobe with 5–11 teeth in the distal 1/2–1/8, basal pair of sinuses in the apical 4/9 to basal 1/3 of lamina; petiole 17–36 mm long, 0.3–0.4 times as long as

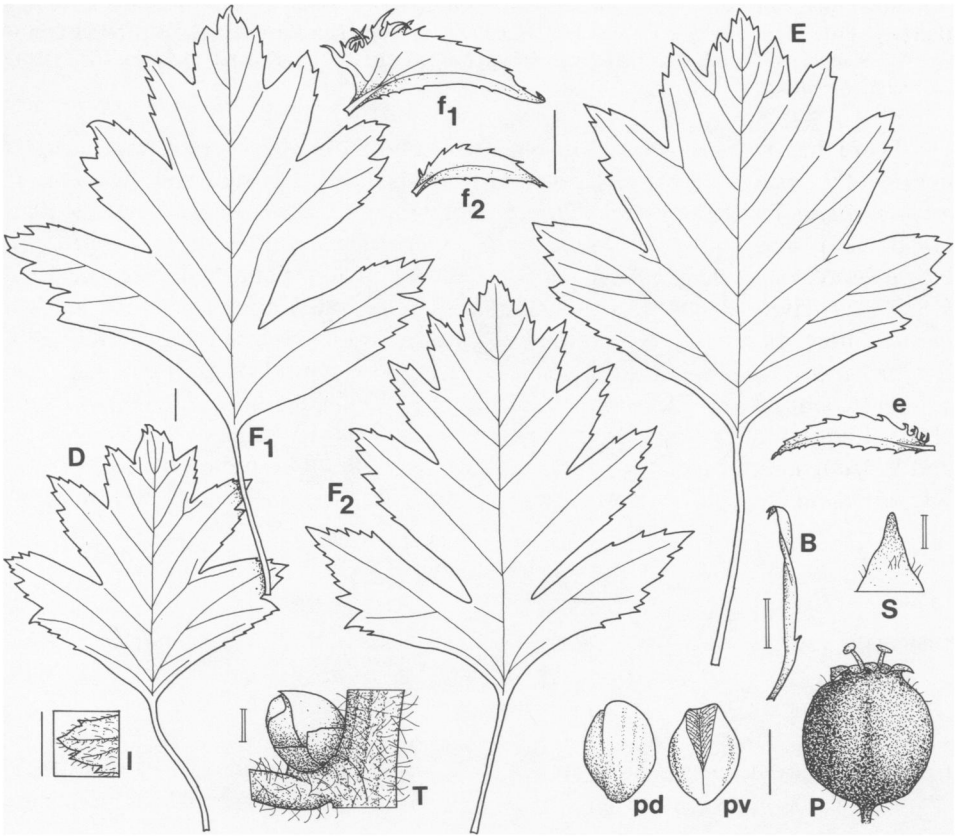


FIG. 102. *Crataegus* ×*lambertiana*. B: bract; D: subterminal leaf of short shoot; E: leaf from central portion of elongate shoot; e: stipule of leaf of elongate shoot; F_1, F_2: subterminal leaf of flowering shoot; f_1, f_2: stipule of leaf of flowering shoot; I: indumentum of abaxial leaf surface; P: pome; pd: dorsal surface of pyrene; pv: ventral surface of pyrene; S: sepal; T: part of twig. Solid bar = 5 mm; double bar = 1 mm. (P, pd, pv, T: *Boros s.n.*; E, e: *Kárpáti s.n.*; B, D, I: *Kárpáti s.n.*; F_1, f_1: *Patzelt s.n.*; F_2, f_2, S: *Sælan s.n.*).

lamina; stipules 6–25 mm long, serrate with 13–34 teeth. Inflorescence 2.5–4.5 cm long, corymbose, 9–21-flowered, lax, more or less densely villous; pedicels 5–16 mm, villous; bracts 3.9–5.8 mm long, 0.2–0.7 mm wide, 6.3–25.0 times as long as wide, caducous, margin denticulate with 2–4 teeth. Hypanthium 3–4 mm long, villous; sepals 1.2–3.0 mm long, 1.5–2.8 mm wide, broadly to narrowly triangular, 0.6–1.5 times as long as wide, margin entire, apex acute; petals ca.7 mm long and wide; stamens 16–21, anthers yellow; styles (1–) 2–3 (–4). Fruit 8–12 mm long, 6–11 mm wide, 1.0–1.3 times as long as wide, subglobose, blackish purple, more or less villous, crowned by the persistent, reflexed or recurved sepals; flesh whitish yellow; pyrenes (1–) 2–3 (–4), dorsally sulcate, ventro-laterally more or less sulcate to more or less foveate; hypostyle pilose. Chromosome number unknown. Fig. 102.

Additional illustration: Fig. K in Lange (1897).

Phenology. Flowering in May, fruiting in August to October.

Distribution (Fig. 97). Czechoslovakia and Hungary; in woodlands; 90–120 m.

ADDITIONAL SPECIMENS EXAMINED. **Czechoslovakia.** Kutna Hora, Neuhof, *Patzelt s.n.* (CGE). **Hungary.** Prov. Fejér, in ripa Danibii ins. Szalki-sziget, prope Dunapentele, *Boros s.n.* (BP); prov. Pest, ins. Csepel, ad Danubium prope Szigetújfalu, *Kárpáti s.n.* (GB). **Finland.** Helsinki, Ulrikesberg, cultivated, *Sælan s.n.* (H).

There has recently been some controversy about the correct name for the hybrid of *C. monogyna* and *C. nigra*. Cinovskis (1971) considered the name *C.* ×*lambertiana* Lange (1871) a later homonym of *C. lambertiana* hort. ex Koch (1853: 229), and published the name *C.* ×*atrorubella* Cinovskis as a substitute. However, *C. lambertiana* hort. ex Koch is not validly published, because Koch (1853: 229) cited it only as a synonym of *C. hypolasia* Koch. Therefore, *C. lambertiana* hort. ex Koch (1853) cannot displace *C.* ×*lambertiana* Lange (1871).

Crataegus ×*lambertiana* has been considered a hybrid of *C. nigra* × *C. sanguinea* (Koehne 1893; Cinovskis 1971) and of *C. pentagyna* × *C. sanguinea* (Dippel 1893). Lange (1871) considered *C.* ×*lambertiana* closely related to *C. monogyna* and *C. sanguinea*, but later stated (Lange 1897) that the putative parents of *C.* ×*lambertiana* are *C. nigra* and *C. monogyna* or *C. oxyacantha* (=*C. laevigata*).

EXCLUDED NAMES

Crataegus azarolus var. *turcomanica* Popov ex Evreinoff, J. Agric Trop. Bot. Appl. 10: 177, 178. 1963.—Not validly published (see Greuter 1988: Arts. 36.1, 37.1). [*Crataegus azarolus* var. *pontica* (Koch) Christensen.]

Crataegus azarolus var. *typica* Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 111. 1871.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus azarolus* L. var. *azarolus*.]

Crataegus azarolus var. *typica* Fiori, Nuov. Fl. Italia 1: 785. 1924.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus azarolus* var. *chlorocarpa* (Moris) Christensen.]

Crataegus calycina var. *eucalycina* Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 123. 1956.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus rhipidophylla* var. *lindmanii* (Hrabetová-Uhrová) Christensen.]

Crataegus curvisepala subsp. *carpatica* Hrabetová-Uhrová in Dostál, Nová kvetena CSSR 1: 504. 1989.—Not validly published (see Greuter 1988: Arts. 36.1, 37.1).

Crataegus curvisepala subsp. *cremnicensis* Hrabetová-Uhrová in Dostál, Nová kvetena CSSR 1: 504. 1989.—Not validly published (see Greuter 1988: Arts. 36.1, 37.1).

Crataegus (*curvisepala* subsp. *curvisepala* ×*laevigata*) var. *angustiloba* Petauer, Biol. Vestn. 28: 79. 1980.—Not validly published (see Greuter 1988: Art. 40). [*Petauer s.n.* (LJU 98255!), *Crataegus* ×*macrocarpa* Hegetschweiler nothovar. *macrocarpa*.]

Crataegus (*curvisepala* subsp. *curvisepala* ×*laevigata*) var. *latiloba* Petauer, Biol. Vestn. 28: 79. 1980.—Not validly published (see Greuter 1988: Art. 40). [*Petauer s.n.* (LJU 98124!), *Crataegus* ×*macrocarpa* Hegetschweiler nothovar. *macrocarpa*.]

Crataegus (*curvisepala* subsp. *curvisepala* ×*laevigata*) var. *naviculiformis* Petauer, Biol. Vestn. 28: 79. 1980.—Not validly published (see Greuter 1988: Art. 40). [*Petauer s.n.* (LJU 98121!), *Crataegus* ×*macrocarpa* Hegetschweiler nothovar. *macrocarpa*.]

Crataegus (*laevigata* × *monogyna*) var. *digyna* Petauer, Biol. Vestn. 28: 79. 1980.—Not validly published (see Greuter 1988: Art. 40). [*Martincic s.n.* (LJU 10687!), *Crataegus laevigata* (Poiret) DC.]

Crataegus (*laevigata* × *monogyna*) var. *laevigatoides* Petauer, Biol. Vestn. 28: 78. 1980.—Not validly published (see Greuter 1988: Art. 40). [*Petauer s.n.* (LJU 98167!), *Crataegus* ×*media* Bechstein nothovar. *media*.]

Crataegus (*laevigata* × *monogyna*) var. *ramosissima* Petauer, Biol, Vestn. 28: 78. 1980.—Not validly published (see Greuter 1988: Art. 40). [*Petauer s.n.* (LJU 98045!), *Crataegus* ×*media* Bechstein nothovar. *media*.]

Crataegus (*laevigata* × *monogyna*) var. *semiserrata* Petauer, Biol. Vestn. 28: 78. 1980.—Not validly published (see Greuter 1988: Art. 40). [*Petauer s.n.* (LJU 98156!), *Crataegus* ×*media* Bechstein nothovar. *media*.]

Crataegus ×*lindmanii* Cinovskis in Cinovskis & Knape, Daildarznieciba 7: 63. 1968, nomen nudum, non *C. lindmanii* Hrabetová-Uhrová, 1969.

Crataegus macrocarpa var. *cebinensis* Hrabetová-Uhrová, Preslia 45: 110, tabs. XIII, XIV. 1973.—Not validly published (see Greuter 1988: Art. 37.1). [*Podpera s.n.* (BRNU 257891), *Hrabetová s.n.* (BRNU 428336), *Crataegus* ×*macrocarpa* Hegetschweiler nothovar. *macrocarpa*.]

Crataegus ×*media monoxyacantha* Pénzes, Kert. Szölesz. Föisk. Évk. 18(2): 125. 1956.—Not validly published (see Greuter 1988: Art. 35.1). [*Papp s.n.* (BP!), *Crataegus* ×*media* Bechstein nothovar. *media*.]

Crataegus melanocarpa var. *polyphylla* Lange, Revis. Crataeg.: 57, fig. B1. 1897.—TYPE: unknown; no material at C. = *Crataegus nigra* Waldstein & Kitaibel.

Crataegus monogyna subsp. *maritima* Corillion, Bull. Mayenne-Sci. 1975–76–77: 75, 79. 1977.—Not validly published (see Greuter 1988: Arts. 36.1, 37.1). [*Crataegus monogyna* var. *lasiocarpa* (Lange) Christensen.]

Crataegus monogyna subsp. *transalpina* (Kerner) Pénzes, Kert. Szölész. Föisk. Évk. 18(2): 122. 1956.—Not validly published (see Greuter 1988: Art. 34.1). [*Crataegus monogyna* Jacquin var. *monogyna*.]

Crataegus monogyna var. *multiplex* Koch, Verh. Vereins Gartenbaues Königl. Preuss. Staaten 1: 279. 1853.—TYPE: unknown.

Crataegus monogyna var. *paulii* Rehder in Bailey, Cycl. Am. hort. 1: 396, fig. 578. 1900. *Crataegus oxyacantha* var. *paulii* (Rehder) Rehder in Bailey, Stand. cycl. hort. 2: 886, fig. 1103. 1914. *Crataegus oxyacantha* f. *paulii* (Rehder) Rehder, Mitt. Deutsch. Dendrol. Ges. 24: 222. 1916.—TYPE: unknown. = ?*Crataegus* ×*media* Bechstein.

Crataegus monogyna var. *sericea* Dzekov, God. Zborn. Zemjod.-Sum. Fak. Univ. Skopje 25: 227, figs. 1–9. 1973.—Not validly published (see Greuter 1988: Art. 36.1, 37.1). [*Crataegus* ×*albanica* Pojarkova.]

Crataegus monogyna var. *tricolor* Koch, Verh. Beförd. Gartenbaues Königl. Preuss. Staaten 1: 279. 1853.—TYPE: unknown.

Crataegus monogyna var. *typica* Beck, Fl. Niederösterreich 2(1): 706. 1892.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus monogyna* Jacquin var. *monogyna*.]

Crataegus monogyna var. *typica* Beck f. *genuina* Pospichal, Fl. Östl. Küstenl. 2: 226. 1898.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus monogyna* Jacquin var. *monogyna*.]

Crataegus (*monogyna* × *oxyacantha*) var. *intermixta* (Wenzig) Hegi, Ill. Fl. Mitt.-Eur. 4(2:) 739. 1923.—Not validly published (see Greuter 1988: Art. 40). [*Crataegus songarica* Koch.]

Crataegus orientalis var. *typica* Schneider, Ill. Handb. Laubholzk. 1: 787. 1906.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus orientalis* Bieberstein subsp. *orientalis*.]

Crataegus oxyacantha subsp. *monogyna* var. *ciliata* Maire, Fl. Afr. Nord 15: 136. 1980.—Not validly published (see Greuter 1988: Arts. 36.1, 37.1). [*Crataegus monogyna* Jacquin var. *monogyna*.]

Crataegus oxyacantha subsp. *monogyna* var. *dolichostyla* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *eriocalyx* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *eriostyla* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *erythandra* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *fallax* Maire, Fl. Afr. Nord 15: 136. 1980.—Not validly published (see Greuter 1988: Arts. 36.1, 37.1). [*Crataegus monogyna* Jacquin var. *monogyna*.]

Crataegus oxyacantha subsp. *monogyna* var. *gymnopoda* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *leucandra* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *miniata* Maire, Cat. pl. Maroc: 334. 1932, nomen nudum.

Crataegus oxyacantha subsp. *monogyna* var. *obtusiloba* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *rhodoandra* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *rosea* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *monogyna* var. *stenoloba* Maire, Fl. Afr. Nord 15: 136. 1980.—Not validly published (see Greuter 1988: Arts. 36.1, 37.1). [*Crataegus monogyna* Jacquin var. *monogyna*.]

Crataegus oxyacantha subsp. *monogyna* var. *suaveolens* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 181. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *polygyna* var. *erectocalyx* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; no material at E. = *Crataegus* ×*macrocarpa* nothovar. *hadensis* (Hrabetová-Uhrová) Christensen or *Crataegus rhipidophylla* var. *lindmanii* (Hrabetová-Uhrová) Christensen.

Crataegus oxyacantha subsp. *polygyna* var. *eriopoda* Léveillé, Bull. Acad.Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *polygyna* var. *foetidissima* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *polygyna* var. *gymnostyla* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *polygyna* var. *heterogyna* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; no material at E. = *Crataegus* ×*media* Bechstein or *Crataegus* ×*macrocarpa* Hegetschweiler.

Crataegus oxyacantha subsp. *polygyna* var. *inodora* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *polygyna* var. *phoenicea* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha subsp. *polygyna* var. *vestita* Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 182. 1912.—TYPE: unknown; no material at E.

Crataegus oxyacantha var. *apetala* Loddiges ex Loudon, Arbor. frutic. brit. 2: 834. 1838.—TYPE: unknown.

Crataegus oxyacantha var. *apiifolia* (Michaux) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 119. 1871. *Crataegus apiifolia* Michaux, Fl. Bor. Am. 1: 287. 1803. = *Crataegus marshallii* Eggleston.

Crataegus oxyacantha var. *aurantiaca* Loudon, Arbor. frutic. brit. 2: 831. 1838.—TYPE: unknown.

Crataegus oxyacantha var. *capitata* Smith ex Loudon, Arbor. frutic. brit. 2: 834. 1838.—TYPE: unknown.

Crataegus oxyacantha var. *flexuosa* Smith ex Loudon, Arbor. frutic. brit. 2: 835. 1838. *Crataegus monogyna* var. *flexuosa* (Loudon) Schneider, Ill. Handb. Laubholzk. 1: 781. 1906.—TYPE: unknown.

Crataegus oxyacantha L. var. *genuina* Rouy & Camus, Fl. France 7: 4. 1901.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus laevigata* (Poiret) DC.]

Crataegus oxyacantha var. *leucocarpa* Loudon, Arbor. frutic. brit. 2: 831. 1838. *Oxyacantha vulgaris* var. *leucocarpa* (Loudon) Roemer, Fam. nat. syn. monogr. 3: 110. 1847.—TYPE: unknown.

Crataegus oxyacantha var. *lucida* Loudon, Arbor. frutic. brit. 2: 832. 1838.—TYPE: unknown.

Crataegus oxyacantha var. *pendula* Loddiges ex Loudon, Arbor. frutic. brit. 2: 832. 1838. *Crataegus monogyna* var. *pendula* (Loudon) Schneider, Ill. Handb. Laubholzk. 1: 781. 1906.—TYPE: unknown.

Crataegus oxyacantha var. *pinnatifida* (Bunge) Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 118. 1871. = *Crataegus pinnatifida* Bunge.

Crataegus oxyacantha var. *plena* Weston, Bot. Univ. 1: 78. 1770. *Crataegus monogyna* var. *plena* (Weston) Willdenow, Berlin. Baumz. ed. 2, 247. 1811. *Oxyacantha monogyna* var. *plena* (Weston) Roemer, Fam. nat. syn. monogr. 3: 108. 1847. = ?*Crataegus* ×*media* Bechstein.

Crataegus oxyacantha var. *punicea* Loddiges ex Loudon, Arbor. frutic. brit. 2: 832. 1838. *Crataegus monogyna* f. *punicea* (Loudon) Schneider, Ill. Handb. Laubholzk. 1: 781. 1906. *Crataegus oxyacantha* f. *punicea* (Loudon) Rehder, Bibl. cult. trees shrubs 249. 1949.—TYPE: unknown. = ?*Crataegus* ×*media* Bechstein.

Crataegus oxyacantha var. *purpurea* Penny ex Loudon, Arbor. frutic. brit. 2: 831, fig. 611. 1838.—TYPE: unknown.

Crataegus oxyacantha var. *reginae* Loudon, Arbor. frutic. brit. 2: 832. 1838. *Crataegus monogyna* var. *reginae* (Loudon) Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 280. 1853.—TYPE: unknown.

Crataegus oxyacantha var. *sibirica* Loudon, Arbor. frutic. brit. 2: 830, fig. 555. 1838. *Crataegus monogyna* var. *sibirica* (Loudon) Koch, Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 279. 1853.—TYPE: unknown. = *Crataegus pallasii* Grisebach or *Crataegus rhipidophylla* Gandoger var. *rhipidophylla*.

Crataegus oxyacantha var. *sorbifolia* (Lange) Dippel, Handb. Laubholzk. 3: 457. 1893. *Crataegus* ×*sorbifolia* Lange, Bot. Tidsskr. 13: 24. 1882–1883, non *Crataegus sorbifolia* Desfontaines, 1829. = *Crataegus* ×*ariifolia* Cinovskis (*Crataegus laevigata* × *C.*?).

Crataegus oxyacantha var. *vulgaris* f. *splendens* Schneider, Ill. Handb. Laubholzk. 1: 780. 1906.—TYPE: unknown. = ?*Crataegus* ×*media* Bechstein.

Crataegus oxyacantha var. *stricta* Loddiges ex Loudon, Arbor. frutic. brit. 2: 832. 1838.—TYPE: unknown.

Crataegus oxyacantha L. var. *typica* Regel, Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 116. 1871.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus laevigata* (Poiret) DC.]

Crataegus oxyacantha (var. *vulgaris* × var. *monogyna*) var. *pseudolaciniata* f. *eriocalyx* Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 90. 1891. *Crataegus* (*monogyna* × *oxyacantha*) var. *pseudolacinita* f. *eriocalyx* (Sanio) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 739. 1923.—Not validly published (see Greuter 1988: Art. 40). [*Crataegus* ×*media* Bechstein nothovar. *media*.]

Crataegus oxyacantha (var. *vulgaris* × var. *monogyna*) var. *pseudolaciniata* f. *liocalyx* Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 90. 1891. *Crataegus* (*monogyna* × *oxyacantha*) var. *pseudolaciniata* f. *liocalyx* (Sanio) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 739. 1923.—Not validly published (see Greuter 1988: Art. 40). [*Crataegus* ×*media* Bechstein nothovar. *media*.]

Crataegus oxyacantha (var. *vulgaris* × var. *monogyna*) var. *pseudomonogyna* f. *glabra* Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 91. 1891. *Crataegus* (*monogyna* × *oxyacantha*) var. *intermixta* f. *glabra* (Sanio) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 733. 1923.—Not validly published (see Greuter 1988: Art. 40). [*Csato s.n.* (BP! JE!), *Crataegus monogyna* Jacquin var. *monogyna*.]

Crataegus oxyacantha (var. *vulgaris* × var. *monogyna*) var. *pseudomonogyna* f. *villosa* Sanio, Verh. Bot. Vereins Prov. Brandenburg 32: 91. 1891. *Crataegus* (*monogyna* × *oxyacantha*) var. *intermixta* f. *villosa* (Sanio) Hegi, Ill. Fl. Mitt.-Eur. 4(2): 739. 1923.—Not validly published (see Greuter 1988: Art. 40). [*Tauscher s.n.* (BP! JE! W!), *Crataegus monogyna* Jacquin var. *monogyna*.]

Crataegus oxyacanthoides subsp. *calciphila* (Hrabetová-Uhrová) A. Löve & D. Löve, Opera Bot. 5: 219. 1961.—Not validly published (see Greuter 1988: Art. 33.2). [*Crataegus laevigata* (Poiret) DC.]

Crataegus oxyacanthoides subsp. *palmstruchii* (Lindman) A. Löve & D. Löve, Opera Bot. 5: 219. 1961.—Not validly published (see Greuter 1988: Art. 33.2). [*Crataegus laevigata* (Poiret) DC.]

Crataegus pectinata Bosc ex DC., Prodr. 2: 630. 1825. *Mespilus monogyna* var. *pectinata* (DC.) Wenzig, Linnaea 4: 156. 1874. *Crataegus ambigua* var. *pectinata* (DC.) Lange, Revis. Crataeg. 46. 1897.—TYPE: unknown; recorded from Iran. = *Crataegus meyeri* Pojarkova or *Crataegus ambigua* Becker.

Crataegus semitrigyna Wierzbicki in Pénzes, Kert. Szölesz. Föisk. Évk. 18(2): 126. 1956, nomen nudum.

Crataegus ×*sintenisii* Bornmüller, Repert. Spec. Nov. Regni Veg. Beihefte 89, 1(4/5): 231. 1940, pro syn. *Crataegus azarolus* L. × *Crataegus tanacetifolia* (Poiret) Persoon.—Not validly published (see Greuter 1988: Art. 34.1). [*Sintenis 5027* (BM! JE! LD! W!), *Crataegus* ×*bornmuelleri* Zabel.]

Crataegus sororia Meyer ex Pojarkova in Komarov, Flora URSS 9: 443. 1939, pro syn.

Crataegus spinosa Gilibert, Fl. lit. inch. 4: 231. 1782.—Not validly published (see Greuter 1988: Art. 23.6c). [*Crataegus laevigata* (Poiret) DC.]

Crataegus tanacetifolia var. *glabra* Loudon, Arbor. frutic. brit. 2: 828, fig. 598. 1838.—TYPE: unknown. According to Loudon (1838), this is probably a hybrid between *C. tanacetifolia* and *C. oxyacantha* (=*Crataegus laevigata*).

Crataegus tanacetifolia var. *leeana* Loudon, Arbor. frutic. brit. 2: 828, fig. 599. 1838.—TYPE: unknown. According to Loudon (1838), this is probably a hybrid between *C. tanacetifolia* and *C. orientalis*.

Crataegus tanacetifolia (Poiret) Persoon var. *typica* Regel, Trudy. Imp. S.-Petersburgsk. Bot. Sada 1: 114. 1871.—Not validly published (see Greuter 1988: Art. 24.3). [*Crataegus tanacetifolia* (Poiret) Persoon.]

Crataegus transalpina Kerner ex Hayek, Repert. Spec. Nov. Regni Veg. Beihefte 30: 755. 1926, pro syn.

Crataegus villosa Dzekov, God. Zborn. Zemjod.-Sum. Fak. Univ. Skopje 25: 238, figs. 12–16. 1973, non *Crataegus villosa* Thunberg, 1784, nec Petermann, 1846.—Not validly published (see Greuter 1988: Arts. 36.1, 37.1, 64.1). [*Crataegus* ×*albanica* Pojarkova.]

Mespilus pentagyna var. *celsiana* (Dumont de Courset) Wenzig, Linnaea 4: 151. 1874. *Crataegus oxyacantha* var. *celsiana* (Dumont de Courset) Loudon, Arbor. frutic. brit. 2: 832. 1838.—TYPE: unknown.= *Crataegus* ×*celsiana* (Dumont de Courset) Bosc. (=*Crataegus sanguinea* × *C.*?).

Mespilus pentagyna var. *pinnatifida* (Bunge) Wenzig, Linnaea 4: 151. 1874. =*Crataegus pinnatifida* Bunge.

Oxyacantha monogyna var. *variegata* Roemer, Fam. nat. syn. monogr. 3: 108. 1847. *Crataegus oxyacantha* var. *variegata* (Roemer) Koch, Verh. Beförd. Gartenbaues Königl. Preuss. Staaten 1: 279. 1853.—TYPE: unknown.

Oxyacantha monogyna var. *xanthocarpa* Roemer, Fam. nat. syn. monogr. 3: 108. 1847.—TYPE: unknown. = ?*Crataegus monogyna* Jacquin.

Oxyacantha vulgaris var. *inermis* Roemer, Fam. nat. syn. monogr. 3: 110. 1847.—TYPE: unknown.

Oxyacantha vulgaris var. *subinermis* Roemer, Fam. nat. syn. monogr. 3: 109. 1847.—TYPE: unknown.

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APPENDIX

Chromosome Numbers of Old World Taxa of Crataegus sect. Crataegus

C. ambigua subsp. *ambigua*, 2n (3x) = 51 (Gladkova 1968, as *C. atrosanguinea*).
C. ×*armena*, 2n (3x) = 51 (Gladkova 1968), voucher: *Pojarkova 84* (LE!).
C. azarolus var. *aronia*, 2n (2x) = 34 (Gladkova 1968).
C. azarolus var. *pontica*, 2n (4x) = 68 (Gladkova 1968).
C. caucasica, 2n (3x) = 51 (Gladkova 1968).
C. heldreichii, 2n (2x) = 34 (Byatt & Murray 1977).
C. ×*kyrtostyla* nothovar. *domicensis*, 2n (2x) = 34 (Baranec 1986, as *C.* ×*kyrtostyla* and *C.* ×*plagiosepala*); 2n (3x) = 51 (Baranec 1986).
C. ×*kyrtostyla* nothovar. *kyrtostyla*, 2n (2x) = 34 (Baranec 1986, as *C.* ×*silicensis*); 2n (4x) = 68 (Baranec 1986, as *C.* ×*fallacina*).
C. laevigata, 2n (2x) = 34 (Moffett 1931a, b; Tischler 1935; Delay 1948; Gladkova 1968; Bradshaw 1975; Byatt & Murray 1977; Byatt et al. 1977; Baranec 1983; Ptak 1986). The report of 2n = 32 (Longley 1924) is apparently a miscount; the report of 2n = 48 (Ptak 1986, as *C. palmstruchii*) may be based on *C.* ×*macrocarpa*.
C. ×*macrocarpa* nothovar. *macrocarpa*, 2n (3x) =51 (Baranec 1986, as *C. macrocarpa*, *C. ovalis,* and *C. palmstruchii*; Ptak 1986); 2n (4x) = 68 (Baranec 1986, as *C.* ×*uhrovae*).
C. ×*macrocarpa* nothovar. *hadensis*, 2n (2x) = 34 (Baranec 1986, as *C. calciphila*); 2n (3x) = 51 (Baranec 1986, as *C.* ×*roubalii*; Ptak 1986), 2n = 52 (Byatt & Murray 1977).
C. ×*media* nothovar. *media*, 2n (2x) = 34 (Bradshaw 1975; Baranec 1986, as *C.* ×*deltoxyacantha* and *C.* ×*intermixta*).
C. meyeri, 2n (3x) = 51 (Gladkova 1968, as *C. stankovii* and *C. taurica*); 2n (4x) = 68 (Gladkova 1968).
C. microphylla, 2n (2x) = 34 (Gladkova 1968). The report of 2n = 32 (Longley 1924) is apparently a miscount.
C. monogyna s.l., 2n (2x) = 34 (Moffett 1931a, b; Gustafsson 1947; Bradshaw 1975; Byatt et al. 1977; Muniyamma & Phipps 1979b). The reports of 2n = 32 (Meyer 1915; Longley 1924) are apparently miscounts; the report of 2n (3x) = 51 (Gladkova 1968) may be based on *C.* ×*kyrtostyla*.
C. monogyna var. *lasiocarpa*, 2n (2x) = 34 (Byatt 1977, as *C. monogyna* subsp. *azarella*).
C. monogyna var. *monogyna*, 2n (2x) = 34 (Tischler 1935; Baranec 1983; Ptak 1986).
C. orientalis subsp. *orientalis*, 2n (4x) = 68 (Gladkova 1968).
C. orientalis subsp. *pojarkovae*, 2n (3x) = 51 (Gladkova 1968).
C. pentagyna subsp. *pentagyna*, 2n (2x) = 34 (Gladkova 1968; Byatt & Murray 1977; Magulaev 1977).
C. pentagyna subsp. *pseudomelanocarpa*, 2n (2x) = 34 (Gladkova 1968).
C. ×*pseudoazarolus*, 2n (4x) = 68 (Gladkova 1968).
C. pseudoheterophylla subsp. *pseudoheterophylla*, 2n (4x) = 68 (Gladkova 1968).
C. pseudoheterophylla subsp. *turcomanica*, 2n (3x) = 51 (Gladkova 1968).
C. pseudoheterophylla subsp. *turkestanica*, 2n (3x) = 51 (Moffett 1931a, b, as *C.monogyna* var. *cabulica* hort.; Gladkova 1968).
C. rhipidophylla var. *lindmanii*, 2n (2x) = 34 (Baranec 1983, 1986); 2n (3x) = 51 (Ptak 1986); 2n (4x) = 68 (Baranec 1986, as *C. lindmanii* and *C.* ×*dunensis*).
C. rhipidophylla var. *rhipidophylla*, 2n (2x) = 34 (Baranec 1985, as *C. rosiformis*); 2n (3x) = 51 (Baranec 1983, as *C. curvisepala*); 2n (4x) = 68 (Gladkova 1968, as *C. curvisepala*; Ptak 1986, as *C. curvisepala*).
C. sphaenophylla, 2n (3x) = 51 (Gladkova 1968).
C. songarica, 2n (4x) = 68 (Gladkova 1968).
C. ×*zangezura* nothosubsp. *pseudoambigua*, 2n (4x) = 68.

NUMERICAL LIST OF SPECIES AND NOTHOSPECIES

1. C. tanacetifolia
2. C. pycnoloba
3a. C. azarolus var. azarolus
3b. C. azarolus var. aronia
3c. C. azarolus var. chlorocarpa
3d. C. azarolus var. pontica

4a. C. orientalis subsp. orientalis
4b. C. orientalis subsp. pojarkovae
4c. C. orientalis subsp. presliana
4d. C. orientalis subsp. szovitsii
5. C. heldreichii
6a. C. pentagyna subsp. pentagyna
6b. C. pentagyna subsp. pseudomelanocarpa
7. C. dzhairensis
8. C. meyeri
9. C. kurdistanica
10. C. laevigata
11. C. caucasica
12a. C. ambigua subsp. ambigua
12b. C. ambigua subsp. transcaspica
13. C. sakranensis
14. C. songarica
15 C. pallasii
16. C. karadaghensis
17. C. heterophylloides
18. C. longipes
19. C . microphylla
20a. C. rhipidophylla var. rhipidophylla
20b. C. rhipidophylla var. lindmanii
21. C. nevadensis
22a. C. pseudoheterophylla subsp. pseudoheterophylla
22b. C. pseudoheterophylla subsp. turcomanica
22c. C. pseudoheterophylla subsp. turkestanica
23a. C. monogyna var. monogyna
23b. C. monogyna var. lasiocarpa
24. C. sphaenophylla
25. C. heterophylla
26. C. ×bornmuelleri
27. C. ×peloponnesiaca
28. C. ×yosgatica
29. C. ×pseudoazarolus
30a. C. ×sinaïca subsp. sinaïca
30b. C. ×sinaïca subsp. rossii
31. C. ×albanica
32. C. ×killinica
33a. C. ×zangezura nothosubsp. zangezura
33b. C. ×zangezura nothosubsp. pseudoambigua
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