NPAG DATA: *ALEYRODES PROLETELLA*
BRASSICA WHITEFLY

Draft - September 24, 2001

TAXONOMY:

Phylum: Arthropoda
Class: Insecta
Order: Homoptera
Suborder: Sternorrhyncha
Family: Aleyrodidae

Full Name: *Aleyrodes proletella* Linnaeus
Synonym: *Aleyrodes brassicae* Walker (Mound & Halsey, 1978; plus others)
Common Name: Brassica whitefly (Hill, 1994; Hill, 1987);
Cabbage whitefly (Penrose, 2001)

QUARANTINES:

The brassica (cabbage) whitefly is a "Q" rated insect (Penrose, 2001).

Because its distribution has become more extensive, the brassica whitefly will be of less concern as a pest of quarantine significance. (*See* Distribution.)

LIFE HISTORY:

There are usually 4 to 5 generations per year. In the summer the life-cycle takes about a month (Hill, 1987). In the Pamir Mountains of Russia, the brassica whitefly had 2 to 3 generations at the highest altitudes and 6 at the lowest areas of the study (Kadamshoev & Narzikulov, 1980)

Eggs: The elongate-oval eggs are laid upright in a semicircle on the underside of *Brassica* leaves. Initially pale and translucent, the eggs become darker. Egg-laying takes place from mid-May until September. Hatching takes about 12 days (Hill, 1987).

Larvae: Nymphs are scale-like and covered with wax; their color is white with two yellow spots on the abdomen. On the dorsal surface of the last abdominal segment is the vasiform orifice characteristic of the group. Nymphal development takes about 10 days (Hill, 1987).

Pupae: The fourth instar is called the "pupa". The pupa is thicker, immobile, and pale in color with red eyes (Hill, 1987).

Adults: The adults are tiny, about 1.5 mm long, and moth-like. The head and thorax are dark. The abdomen is yellow and covered by a conspicuous white waxy layer. The forewings have a faint, dark bar. If disturbed, the adults fly readily. The adults overwinter under the leaves of *Brassica* crops (Hill, 1987).

Identification: Guimaraes (1996) developed an identification key based on the cement gland and the setal patterns found on the abdomen of the adult female.

HOSTS:

The brassica whitefly is polyphagous (feeding on many plants), but mostly on temperate Cruciferae and Compositae (Hill, 1994).

The main hosts are cabbage, Brussels sprout, cauliflower, broccoli, and kale. The alternative hosts are swede, turnip, mustards, wild Cruciferae, many Compositae, and other plants (Hill, 1987).

Balsaminaceae:		
Impatiens parviflora	Jewelweed (?)	Mound & Halsey, 1978
Berberidaceae:		
Bongardia chryosogonum	E. Med./C. Asia; rock gardens	Mound & Halsey, 1978
C**ampanulaceae:**		
Codonopsis clematidea	Bonnet bellflower; from C. Asia	Mound & Halsey, 1978
Ostrowskia magnifica	Giant bellflower	Mound & Halsey, 1978
Compositae (Asteraceae):		
Acanthocephalus benthamianus	(Central Asian weed ?)	Mound & Halsey, 1978
Cephalorrhynchus sp.	(?)	Mound & Halsey, 1978
Cichorium sp.	Chicory/endice relative	Mound & Halsey, 1978
Inula sp.	Elecampane relative	Mound & Halsey, 1978
Lactuca muralis	Lettuce relative	Mound & Halsey, 1978
Lactuca triangulata	Lettuce relative	Mound & Halsey, 1978
Lapsana communis	Nipplewort	Mound & Halsey, 1978
Mutisia acutifolium	(Philodendron relative ?)	Mound & Halsey, 1978
Prenanthes purpurea	Rattlesnake root	Mound & Halsey, 1978
Sonchus arvenis	Perennial sowthistle	Mound & Halsey, 1978
Sonchus oleraceus	Annual sowthistle	Mound & Halsey, 1978
Sonchus sp.	Sowthistle relative	Mound & Halsey, 1978
Steptorhamphus crambifolium	(?)	Mound & Halsey, 1978
Taraxacum officinale	Common dandelion	Mound & Halsey, 1978
Cruciferae (Brassicaceae:		
Brassica balearica	Balearic cabbage	Mound & Halsey, 1978
Brassica cretica	(Mustard relative ?)	Mound & Halsey, 1978
Brassica incana	(As above)	Mound & Halsey, 1978
Brassica macrocarpa	(“)	Mound & Halsey, 1978
Brassica oleracea	Wild cabbage	Mound & Halsey, 1978
Brassica robertiana	(Mustard relative ?)	Mound & Halsey, 1978
Brassica tinei	(As above)	Mound & Halsey, 1978
Cheiranthus sp.	(= *Erysimum*) Wallflower	Mound & Halsey, 1978
Lepidium latiolum	Pepperweed relative	Mound & Halsey, 1978
Euphorbiaceae:		
Euphorbia peplus	Spurge relative	Mound & Halsey, 1978
Fagaceae:		
Quercus robur	English oak	Mound & Halsey, 1978
Leguminosae (Fabaceae):		
Vicia faba	Broad bean	Mound & Halsey, 1978
Papaveraceae:		
Chelidonium majus	Celandine	Mound & Halsey, 1978
R**anunculaceae:**		
Aquilegia montana	Columbine relative	Mound & Halsey, 1978
Aquilegia lactiflora	Columbine relative	Mound & Halsey, 1978
Thalictrum minus	Meadow rue	Mound & Halsey, 1978

Scophulariaceae:		
Linaria sp.	Toadflax relative	Mound & Halsey, 1978
Umbelliferae (Apiaceae):		
Laser trilobcus	(?)	Mound & Halsey, 1978
Petroselinum sp.	Parsley relative	Mound & Halsey, 1978

DISTRIBUTION:

Europe:	Austria, England, Czechoslavakia, Finland, France, Germany, Hungary, Italy, Poland, Spain, Sweden, Switzerland, Yugoslavia (Mound & Halsey, 1978)
Africa:	Canary Islands, Egypt, Morocco (Mound & Halsey, 1978); Angola, Kenya, Mozambique (Mound & Halsey, 1978); North and Eastern Africa (Hill, 1987)
Asia:	Russia (Pamir Mountains; Kadamshoev & Narzikulov, 1980); Taiwan (Ko-Chiun *et al*., 1998)
Australia:	Australia (deBarro & Carver, 1997; introduced)
Pacific Is.:	New Zealand (Dale, Hayes, & Johannesson, 1976; introduced)
Atlantic Is.:	Bermuda (Nakahara & Hilburn, 1989; introduced)
S. America:	Brazil (Mound & Halsey, 1978; introduced; the date on the reference is 1901)

DAMAGE WHERE ESTABLISHED:

Pest Status: Hill (1994) places the brassica whitefly in a list containing "the more important and widespread Aleyodidae recorded as pests of cultivated plants in the warmer parts of the world."

The brassica whitefly is an occasional and local pest in the southern parts of the UK, often being quite abundant and very conspicuous. Control measures are seldom required (Hill, 1987).

Brassicas: Hill (1987) lists the brassica whitefly as a "major pest" of *Brassica* species (cabbage, cauliflower, broccoli, Brussels sprout, kale, swede, turnip, and others); the alternative category was "minor pest."

Cabbage: In Italy, the brassica whitefly was an important pest of cabbage (Patti & Rapisarda, 1981.

Rape: Hill (1987) does *not* list the brassica whitefly as either a "major pest" or "minor pest" of rape, *Brassica napus.* Hill listed the species that are particularly damaging to rape but states that almosts all of the pests that feed on the brassicas will be found feeding on rape plants, usually as minor pests.

METHODS OF CONTROL:

Chemical Control:

According to Hill (1987), a number of insecticides are effective against whiteflies. Newer insecticides, such as Admire and Fulfill, are being developed (Leidner, 1994).

Cultural Activities:

If established, cultural control may not be not a significant factor because many plants are hosts. However, the removal or control of weeds near fields may be helpful.

Natural Enemies:

Various species have been recorded as natural enemies of brassica whitefly (Mound and Halsey, 1978):

Coleoptera:	
Coccinellidae (ladybird beetles)	*Clitostethus arcuatus*
Diptera:	
Drosophilidae	*Acletoxenus formosus*
Hymenoptera:	
Chalcidoidae (parasitic wasps)	
Aphelinidae	*Encarsia aleyrodes, E. inaron, E. lutea, E. partenopea, E. tricolor*
Eulophidae	*Euderomphale cerris, E. chelidonii*
Eupelmidae	*Eupelmus urozonus, Macroneura vesicularis*
Mymaridae	*Alaptius minimus*

Various articles discuss the effectiveness of various species in biological control (Abd-Rabou, 2000; Carden, 1972; Hafez *et al*., 1983; Hommes, 1983; Williams, 1996; Williams, 1995; Wiliams, 1991).

Resistance:

Resistance occurs in *Brassica oleracea*; however, F1 generation plants from crosses between resistant and susceptible plants did *not* show significant resistance (Ellis *et al*., 1996; Ramsey & Ellis, 1996). For heading cabbage, ‘Savoy’ was the most susceptible and red cabbage the least susceptible (Hommes, 1983; abstract).

PERTINENT POINTS/PREDICTED CONSEQUENCES:

Potential Damage: Whiteflies may be pests of crops and ornamental plants in two ways, through their debilitating effect in sucking plant sap and through the introduction of virus diseases. Under optimum conditions, very large populations can develop within three weeks. These can reduce the yield of a plant by competing for valuable nutrients and causing premature leaf shedding. Moreover, the value of a crop may be seriously reduced by being soiled with honeydew and the accompanying sooty mold (Mound & Halsey, 1978).

No references were found that identify the brassica whitefly as a virus vector (Need to check Mound *et al.*, 1983; *Plant Virus Epidemiology*). One reference noted that it was *not* a vector of BYNV, broccoli necrotic yellows virus (Tomlinson, Webb, & Faithfull, 1972).

Potential Distribution: The numerous climatic zones (Walter *et al.*, 1975) in which the brassica whitefly occurs (or has been able to establish) indicates that the brassica whitefly will adapt to most conditions:

Zone I	Equatoral Zone	Taiwan (Introduced)
Zone II	Tropical Zone	Kenya
Zone III-IV	An Intermediate Zone	Egypt (Introduced)
Zone IV	Mediteranean Zone	Morocco; Italy; Spain
Zone V	Warm Temperate Zone	New Zealand (Introduced)
Zone VI	Typical Temperate Zone	USA (Connecticut); England; Austria
Zone VII	Arid Temperate Zone	Russia (Pamir Mountains)
Zone VIII	Cool Temperate Zone	Finland

Potential for Dispersal: The brassica whitefly, with its numerous hosts and small size, is probably easily distributed with plant material. Its recent introductions probably support this hypothesis: Australia (deBarro & Carver, 1997); Bermuda (Nakahara & Hilburn, 1989); New Zealand (Dale, Hayes, & Johannesson, 1976); Taiwan (Ko-Chiun *et al*., 1998); United States (Skinner, 1993).

As a small winged insect, the brassica whitefly is likely to be easily dispersed by the wind.

Method of Introduction: One of three hypotheses may account for the introduction of brassica whitefly:

1. Long established in the eastern United States, the brassica whitefly (1) moved with ornamental plants (or plant material) to the West or (2) naturally expanded its range to the West.

Many native weeds are hosts and extend from east to west in the United States; examples are annual sowthistle (*Sonchus oleraceus*) and perennial sowthistle (*Sonchus arvensis*) (ARS, 1976). Many weeds that are distributed from east to west in the United States are potential hosts;

examples are Virginia pepperweed (*Lepidium virginicum*), wild mustard (*Brassica kaber*) and black mustard (*Brassica nigra*) (ARS, 1976).

2. Long established in South America (in Brazil in 1901), the brassica whitefly moved through Central America to Mexico and then to California.

There is considerable movement of brassica crops, particularly cabbage, from Mexico to the United States (L. Zaleski, PDC; personal communication).

3. As a pest of various herbs and ornamentals, the brassica whitefly moved with the herbs or ornamentals to California.

Among the ornamentals (Jelitto & Schacht, 1995) known to be hosts are the following: *Bongardia chrysogonum*, a rock garden plant from the eastern Mediterranean and Central Asia; *Codonopsis clematidea* (bonnet bellflower from Central Asia), and *Ostrowskia magnifica* (giant bellflower).

Races: No information was found on races within *Aleyrodes proletella*.

The wide distribution in various Climatic Zones would indicate either (1) the existence of ecotypes, ecological variants adapted to local conditions, or (2) great ability to adapt.

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