ABSTRACT

Hippeastrum, known in Europe and in United States of America as *Amaryllis*, improper name attributed to the genus by many specialists, has different origin from the true genus *Amaryllis*.

All *Hippeastrum* species are indigenous to the regions with tropical and subtropical climate of Central and South America, being centered in Brazil and Peru, but they are distributed from Mexico to Chile and Argentina.

Hippeastrum is grown mainly as a potted plant in the home but also as a cut flower in the greenhouse.

In the origin areas as in other countries with warm and mild climate (Japan, India, Bangladesh, Australia, some areas of United States of America), *Hippeastrum* is grown outside as garden plant.

The true *Amaryllis* (*Amaryllis belladonna*) is originated in South Africa and is not widely spread as *Hippeastrum* is. *Amaryllis belladonna* is grown outside, in garden, not only in the origin country but also in regions with temperate climate as Romania is, its bulbs resisting in the soil during the cold season.

The present paper is focussed on evolution assortment composed of 39 new *Hippeastrum vittatum* cultivars for their morphological features, biological and ornamental qualitys. Cultivars were offered to Floriculture discipline of the Horticulture faculty from University of Agricultural Sciences and Veterinary Medicine, Bucharest by the lamented dutch flowers bulbs producer Sahin. Besides this study were carried out also researches concerning the improving the tehnologies of bulbs and potted plants producing at this specie including some aspects of plant physiology and the perfume flowers biochemistry. All research were performed for the first time in our country and obtained results are original.

The first part of the thesis is constituted by an excesive documentation, which the update the research at the world level and in our country as regard as the *Hippeastrum* genus.

In the first doctoral thesis chapter there is presented the level of researches concerning the taxonomy, morphology and biology of *Hippeastrum* genus is alloted a larger space to the *Hippeastrum* genus taxonomy for demonstrating the autenticity of the two genera: *Hippeastrum* and *Amaryllis* included in the *Amaryllidaceae* family but with distinct features. The last paper witch mentions the differences between *Amaryllis belladonna* and *Hippeastrum* cames from

United States of America (Carter, 2008). The author maintains that the differences which separates the two genera are clearly. The *Amaryllis* genus is monotipic and contains only one specie: *Amaryllis belladonna* and *Hippeastrum* included more species which contributed to obtain the splendid hybrids from today. It is of course an attention documentar studies concerning plant morphological features, growth and development biology and multiplication of *Hippeastrum* plants. It is also tacked the dormancy problem – an important period from the life of *Hippeastrum* plant taking into consideration that the opinions of the different specialists about dormancy are divided. These are also research regarding the chemical composition, enzymesystems and the role of plant growth regulators on the flowering of *Hippeastrum* plant. In the same chapter are presented the *Hippeastrum* species and cultivars taking into consideration the fact that *Hippeastrum* is one of the diverse and exotic member of the *Amaryllidaceae* family. Because of the multitude of cultivars from the market, we made a grouping of them depending on the flower shape, size and colour.

The following chapter emphasized aspects producing the *Hippeastrum* bulbs, potted plants and cut flowers. There are presented the main producing countries and the pedo-climatic conditions from geografic areals of producing countries also the main importer countries and the bulbs volume sales. There are presented the agrochemical factor with major implication in bulb producing. There are also update the research concerning producing the potted plants and the cultures for cut flowers, flowering control and forcing time, physiological disorders, diseases and insects which affect the *Hippeastrum* plants during growing, finishing with harvest, storage and marketing of potted plants and cut flowers.

The second part of the thesis starts with the chapter III, presenting the own research purpose, the objectives and the experimental program.

Research which made the object of the present doctoral thesis have been performed with the aim to evaluate of an assortment of *Hippeastrum vittatum* cultivars recent introduced in our country and the improving the producing of bulbs and some plants at this species.

The main objectives were:

- Evaluation of morphological, ormanental and biological characteristics of 39 cultivars of *Hippeastrum vittatum* from the most appreciated in actual assortment at the world level and establishing the best of them in the usual greenhouse conditions.
- Dynamics of ornamental and biological features during more culture years.

- Oportunity of some tehnological interventions on the bulbs before planting (hydrating, removing the exterior tunics) with the aim to obtain ornamental plants.
- Perfecting the substrate for culture in recipients using local components.
- Behaviour of *Hippeastrum vittatum* specie in different soils existant on the market compared to a substrate used by the growers in our country.
- Improving the multiplication capacity of *Hippeastrum* cultivars with a low multiplication coefficient.
- Study of respiratory capacity of *Hippeastrum* plants organes in the flowering moment.
- Study of volatile components from the flowers of a *Hippeastrum* cultivar which has perfume.

The used biological material (chapter IV) was represented by 39 *Hippeastrum vittatum* cultivars coming from Holland and two populations from the same specie: one existent in greenhouses of the Horticulture faculty from USAMV, Bucharest and one brought from a grower from Bistrița Năsăud.

The originally research obtained results are presented in the chapter V. Thus, in the underchapter 5.1. there are presented research results obtained as regard as the evaluation the morphological characteres, biological and ornamental qualities of some *Hippeastrum vittatum* cultivars recently introduced in our country.

The bulbs used as initial planting material in 2005 year are different from the cultivar to cultivar as regards of their aspect and size. The main *Hippeastrum* bulbs indicators are: size, weight, and fermity, the number and the turgidity of the main roots, the number and size of bulbiferum buds.

Large differences recorded for these indicators at studied cultivars allow to divide them in 3-4 grupes of classification. Start of bulb emergence is a long duration process from 10-15 days from planting to 70-80 days and even more.

The rate of leaves appearance is 0,7-1,3 leaves at 10 days. In the first month from planting it is larger 1,3 leaves at 10 days but after that it is established at about 0,7 leaves on the plant.

Leaves lenght is also a characteristic of the cultivar and varies from 30,5 cm to 57,7 cm.

Not all the external basal buds emerge after planting the mother bulbs. Their ability to emerge is about 60- 70%. This process takes place in the first 25 days from planting. One basal

external bud forms about 2 leaves with a lenght of 4,6- 20,5 cm. The formed bulblets from the basal buds are in a number to 2,7 depending on the cultivar. Not all the buds manage to pass from the bud to bulblet, the propagation coefficient being zero in the first year of culture.

The appearence of flower stems takes place in the first 10- 45 days from planting. The majority of cultivars emited flower stems after 10- 15 days from planting (45,6%) and only a few, afer 30-35 days.

The number of flower stems per bulb varied between 1 and 3. The most cultivars formed two flower stems.The lenght of flower stems varied between 4 and 50.4 cm, being influenced not only by the genetical factors bud also by the culture conditions. The number of flowers per plant was 5-10 at 61.9% cultivars. Large differences between cultivars registered also at flowers features (diameter, lenght, colour, the tepals number, scent).

On the base of quality indicators and biological features registered, the studied cultivars are divided in 3-4 grupes well difinited as: 4 grupes of earliness (very early, early, halflate, late), 4 grupes of flower stems lenght (short, middle, long and very long), 3 grupes depending on the number of flowers per plant (less flowers, middle and many flowers), 4 grupes of flower size (small, middle, large and very large). Between the registered indicators were established correlations as: between the bulb size and weight and vegetative growth or flowers number. The bulbs obtained in 2005 year were analyzed in the spring of 2006, before replanting (in the same pot but in a fresh substrate, unused). Generally in 2006 year was observed a regress of the plant at all indicators. About half of the cultivars did not formed flower stems and at those which formed flower stems the flowers failed at different phases during their development. The flowers quality also registred a visibly regress. The same trend of regress had also the plants in 2007 year (the third year of culture). In 2007 year as in 2006, many cultivars did not formed flower stems and those which managed to emite flower stems had a very small number of flowers. The results of 2008 year show a return of the studied indicators at the level of 2005 year and even over it.

The return process of morphological and ornamental characteristics continued in 2009 and 2010 years when it comes out that the growth and flowering of the plant returned. This depended on the adaptation capacity of plant at the new conditions, capacity which differed from the cultivar to cultivar. Finally, the obtained results were sintetized during 2005-2010 years. The accent was put on the planting material quality which suffered an important waning after one year of culture. The majority of cultivars suffered a waning of the main indicators during the 2

and 3 years of culture. After that took place a return of the plant, sometimes overtaking the level of the first year of culture when was used planting material special produced for a flower culture. The research carried out stands out the importance of growerbulbs activity who produce planting material especially for flower cultures. The recovering of planting material is used by the amateurs.

In the underchapter 5.2. there is presented the influence of some technological interventions about the *Hippeastrum* bulbs before planting on the leaves emergence and plants growing.

Obtained results did not justify the removing of external parchmently tunics and the bulbs soaking before planting. The differences compared to control are insignificantly, sometimes with negative influence.

In the underchapter 5.3. there are presented research results concerning the consumption of nutritive elements and pH level during *Hippeastrum* plants growing.

Hippeastrum is a plant with a relative high food consumption. The content of nutritive elements control from culture substrate is absolutely necessary especially during the May-July period to verify and establish the correct doses of fertilizers. The experimented substrates composed from soils and mineral components in current technologies brought together physical and chemical qualities demanded by this species.

In the underchapter 5.4. there are presented research results regarding the testing of some soils industrially prepared, existed on the Romanian market. There were tested eight soils variants, different from the point of view of physical and chemical properties and control tratament: a mixture composed from: garden soil, leaves soil, rotten manure, peat and sand in a ratio of 1:1:1:1: 0.5. The analysed indicators certify the positive effect of all soils on the number of leaves and their lenght growing, without significant differences between them. Only the control gave the largest growth: 6,47 leaves on the plant with an average lenght of 27,33 cm during the period of 10-month, the duration of the experiment in 2009 year. From the testing soils, on the first place was classic substrate (control) followed by Florisol which is a Romanian peat from the North of the country, prepared by a Dutch method. The chemical analysis (pH, salt content and NPK) made 3 moments during the growth period (April, June and August) certify optimal pH, mineral salts and sufficient nutritive elements at the majority of tratamens.

In the underchapter 5.5. there are presented obtained results regarding the *Hippeastrum* bulbs propagation. The *Hippeastrum* bulb propagation potential is a genetic feature and is different from one to other cultivar. There are cultivars which actually does not propagate (as '*Roma'*, '*Celica'*, '*Picotee'*, '*Faro'*, '*Amigo'*, '*Gift CHN'*) and sometimes vanish in 2-4 years and cultivars with a relative large propagation potential (as '*Red Lion'*, '*Fairytale'* '*Baby Star'*). There were experimented two treatments of bulb cutting and more undertreatments (halves, quarters, eights and twelfths), one treatment represented by a bulb which was notched in 4 notches and control (the classical method of separation the bulblets formed at the base of mother bulb). The number of bulblets formed varied from 2,2 (V2a – cut into halves) to 33,4 (V3b – cut in to twelfts and separation into 48 twin scales). The quality of formed bulblets is proportional reverse to the size of segments. It is important the fact that not all the bulblets survive. Many of them die during growth, especially in the phase of transition "in vivo". The notching of the bulb whith segments attached at the neck was the most efficent propagation method, followed by the cut of the bulb into halves (2 segments).

In the underchapter 5.6. there are presents the results concerning the respiration of plants organes and the chemical composition of *Hippeastrum* flowers scent.

The respiration rate of plants from three *Hippeastrum vittatum* cultivars ('*Fairytale'*, '*Olympus'* and '*Dancing Queen'*) at the moment of flowering was higher at flowers (the average of three cultivars was 63,22 mg CO_2/kg/hour) followed by the leaves (56,89 mg CO_2/kg/hour), the bulb (29,5 mg CO_2/kg/hour) and the lower, at flower stems (3,57 mg CO_2/kg/hour). The highest respiration intensity was determined at '*Olympus'* cultivar (followed by '*Dancing Queen'* and '*Fairytale'*) which had a less advanced maturity, respectivelly a more intense metabolism compared to other cultivars.

Generally, *Hippeastrum* flowers have no scent. Because between the 39 *Hippeastrum* cultivars was one whith perfumed flowers ('*Dancing Queen'*), we determined the volatile substances which determine the parfume. Were identified 21 volatile substances the main being terpenes (38,55%), esters (9,76%), alcohols (6,23%), hydrocarbures (1,46%) and aldehides (0,55%).

In the perfume of '*Dancing Queen'* cultivar flowers was determined a larger quantity of eucaliptol (23,67%), linalool (4,92%) α-farnesene (4,26%), octanol (5,06%), dipfenylethylbenzoate (3,43%).

Finally, based on the obtained results there are presented conclusions and recommendations.