SUMMARY

of the doctoral thesis entitled:

STUDIES ON THE EVOLUTION OF BULBS QUALITY AND OF FLOWERS AT SOME VARIETIES OF TULIP AND HYACINTHS

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The doctoral thesis includes both scientific documentation, technical research specific to the horticultural field, as well as the results and conclusions derived from them.

Some of the results of the research carried out were included in scientific papers presented at various international conferences and subsequently published in the horticulture volumes of these events.

The thesis has 160 pages, includes an abstract, an introduction, 5 chapters, a bibliography with 118 references, 10 tables, 62 figures, 8 annexes as well as a list of scientific papers published during the doctoral internship.

Chapter I, entitled *Current state of research on evolution quality of bulb and flowers in some varieties of tulips and hyacinths*, includes a brief history of the origin of hyacinth and tulip flowers, as well as the role and importance of flowers in human life. Flowers have played a central role in human life, being ecologically, culturally and aesthetically essential. They symbolized prosperity and love, being indispensable in various social events.

Studies have highlighted the psychological and emotional benefits of flowers, and the flower trade has become a significant global industry. Countries such as the Netherlands and Colombia have stood out in flower production, highlighting the economic and cultural impact of this activity.

Tulipa spp. (tulip) is part of the *Liliaceae* family, native to Asia Minor and Central Asia, it is important in the floricultural assortment, having over 150 species and 3000 varieties. Through the hybridizations carried out, especially in the Netherlands, numerous varieties for gardens and cut flowers have resulted. Hyacinth (*Hyacinthus orientalis*), from the order *Asparagales*, is appreciated for its intense fragrance and variety of colors, being a popular spring flower in Romania.

The global flower market is projected to reach $57.4 billion by 2024, with the Netherlands as the top exporter, followed by Colombia and Kenya. In 2023, the Netherlands cultivated 15,017 hectares with tulips and 1,292 hectares with hyacinths. Romania imports varieties such as Hamilton and Kolpakowskiana, having no native varieties in the Official Catalogue of Crop Plant Varieties.

In this introductory chapter, cultivation technologies are presented, including unconventional hydroponic technology for obtaining hyacinth and tulip flowers.

In the second part of the paper, the chapters with his own research are presented.

The purpose of this doctoral thesis was a comparative study of some hyacinth and tulip cultivations cultivated in order to obtain superior quality flowers, in different technological variants of cultivation.

The main objectives of the thesis were: to evaluate the influence of bulb size and storage period on flower quality in the analyzed cultivars; assessment of the type of crop of plants in the greenhouse and field; study of the influence of temperature on the duration of time until flowering; evaluation of the effect of plant quality during the bulb storage period.

In **Chapter II** entitled *Study on the behavior of some hyacinths and tulips in different environmental conditions*, the experiences carried out in greenhouse conditions are presented. The influence of the shelf life of tulip and hyacinth bulbs in low temperature conditions on flower development was pursued.

The study carried out between 2018 and 2020 at the Faculty of Horticulture, in the Research Center for the Study of the Quality of Agri-Food Products of the University of Agronomic Sciences and Veterinary Medicine in Bucharest, aimed to optimize the production and quality of hyacinth and tulip bulbs and flowers, by improving their cultivation technology. The studies aimed at evaluating different cultivars in order to maximize the yield and quality of the products, with a focus on the development and improvement of technologies specific to these species.

As for the ‚*Gipsy Queen'* variety grown in 2019, a significant decrease in leaf length was observed with the delay in planting, indicating high sensitivity. ‚*Jan Boss'* showed an initial decline, followed by a recovery in the later stage, suggesting better adaptability. ‚*Miss Saigon'* showed a similar reaction, and moderate declines were maintained in the ‚*White Pearl'* variety , indicating greater resistance to late planting. In the initial stage, ‚*Gipsy Queen'* and ‚*Miss Saigon'* had the longest leaf lengths, and ‚*Jan Boss'* and ‚*Pink Pearl'* the shortest. In 2020, ‚*Miss Saigon'* recorded the longest leaf length (15 cm), followed by ‚*Jan Boss'* and ‚*Pink Pearl'* (12 cm). ‚*Gipsy Queen'* showed a progressive decrease with the planting delay, and ‚*Jan Boss'* had an initial decrease followed by an increase in the final stage. ‚*White Pearl'* was the most stable, with declines.

Analyzing the height of the flower stems, in 2019 and 2020, it was observed that late plantings led to a reduction in the height of the stems. In 2019, ‚*Gipsy Queen'* had the highest growth, followed by ‚*Jan Boss'* and ‚*Miss Saigon'*. In 2020, ‚*Gipsy Queen'* continued

to stand out, followed by *‚Jan Boss'* and *‚Miss Saigon'*, while *‚Pink Pearl'* had slower growth.

Analysis of the mass of the bulbs showed significant differences between the varieties in terms of the ability to maintain moisture. The *‚White Pearl'* and *‚Delft Blue'* varieties demonstrated more effective moisture preservation. Correlations between respiration rate and sugars, as well as between transpiration and water content, vary between cultivation.

Weight loss analysis of hyacinth (*Hyacinthus orientalis*) and tulip (*Tulipa gesneriana L.*) bulbs in greenhouse conditions highlights significant variations between varieties in terms of water and nutrient holding capacity from planting to flowering. For hyacinths, the varieties *‚White Pearl'* (70.2 g) and *‚'Splendid Cornelia'* (63.5 g) demonstrated a superior water-holding capacity, suggesting a more efficient bulb structure or advanced moisture conservation mechanisms. The mass of the bulbs at planting varies between 75.6 g (*‚Pink Pearl'*) and 105.8 g *(‚Delft Blue'*), reflecting both genetic differences and growing conditions. *‚Blue Pearl'* and *‚Pink Pearl'* recorded the greatest weight loss, indicating more accelerated dehydration. Bulbs with a high starting mass, such as *‚Delft Blue',* had relatively smaller drops, demonstrating a better ability to maintain moisture. In the later stages of flowering, *the ‚Blue Pearl'* and *‚Gipsy Queen'* bulbs showed significant weight loss, while *‚White Pearl'* and *‚Splendid Cornelia'* maintained higher masses, indicating more effective moisture conservation until the end of the flowering period. In the case of tulips, varieties with a high initial mass, such as *‚Bluching Lady'* and *‚Golden Tango'*, demonstrated better conservation of bulb moisture, maintaining relatively high masses until the end of the flowering period. In contrast, varieties with low starting mass, such as *‚Sparkling Flag'* and *‚Vogue'*, suffered rapid weight loss, suggesting more pronounced dehydration. The choice of varieties for planting should take into account these features to ensure the quality of bulbs for replanting.

Chapter III, entitled *Change in physiological parameters during the period storage under controlled conditions of the hyacinth and tulips*, presents the impact on their physiological parameters, including respiration rate, transpiration and soluble sugar content by storing hyacinth bulbs and tulips at low temperatures for a long time. The respiration rate varies between varieties, highlighting differences in metabolic activity and resource conservation. The sweat rate decreases as the bulbs lose water, thus helping to prevent excessive dehydration.The soluble sugar content (TSS) increases, indicating the mobilization of sugars for metabolic processes and adaptation to heat stress. The results of the studies suggest that low temperatures are essential for completing the dormant state and initiating the growth of tulip buds. The bulbs, being complex structures, store resources in the fleshy leaves and in the terminal and lateral buds, which contribute to the formation of secondary bulbs.

Chapter IV – *Results on the phytosanitary status of the bulbs of tulips and hyacinth – provenance 2018, 2019 (in vitro),* refers to the phytosanitary status of tulip and hyacinth bulbs.

The quality and quantity of flowers are essential in cultivation technology, and plant protection and the health of the planting material are essential. Pathogens can cause necrosis, rot and wilt in tulips and hyacinths, and early diagnosis is important for minimizing losses and proper crop management. For hyacinths, mushrooms *Fusarium*, *Penicillium*, *Aspergillus* and *Rhizopus* have been detected in different varieties, thus, *‚Jan Boss'* having the largest spectrum of pathogens. The incidence of fungi was 60% for *Fusarium* and *Penicillium*, 80% for *Aspergillus* and 40% for *Rhizopus*.

Chapter V of the thesis is reserved for the conclusions and recommendations formulated on the investigated topic.