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SUMMARY OF PhD THESIS

CULTURAL BEHAVIOUR OF SEVERALCHERRY VARIETY GRAFTED ON LOW VIGOUR ROOTSTOCKS GROWN IN VÎLCEA AREA

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Summary

Keywords: *cherry, varieties, rootstocks, low vigour*

The present PhD thesis is structured into two different parts containing six chapters, 153 pages, 52 figures, 56 tables, 21 images and 127 references

Thesis content is structured as follows:

Part I – contains two chapters discussing on The Importance Of Cherry Growing, Actual State Of Facts, Global And Local Tendencies (Chapter I) as well as on the *RESEARCH CURRENT STATUS ON VARIETIES AGRO-PRODUCTIVITY (CHAPTER II)*

Part II – contains personal contributions brought to this thesis by the candidate and it is structured under four chapters:

Chapter III - presents the ecological framework of the research.

Chapter IV - presents materials, methods and working techniques, measurements and instruments employed.

Chapter V – contains research results data and experimental data analysis.

Chapter VI – underlines correlations between cherry growing and fructification processes.

Present PhD thesis finally points out general research findings.

The outcome of present scientific research on the given theme materialized into 5 scientific articles published in several specialized magazines (one article published in a SCI (Science Citation Index) Romanian magazine, one article accepted and pending for publication by a SCI foreign magazine, and three articles published in B+ Romanian magazines. Another important outcome was the participation into three scientific conferences that took place in Romania.

Cherry trees are grown in Romania all over the country with better or weaker results, depending on the local climatic conditions. Cherry cultivated land surface in 2011 amounted to 6.853 ha which ranked Romania 18 worldwide, in terms of cultivated land surface but ranked Romania, worldwide, amongst top 10 countries in terms of obtained production (81.842 t). Biggest share in terms of cherry orchards belongs to the following counties: Iaşi, Vaslui, Botoşani, Bacău, Neamţ, Vrancea, Argeş, Giurgiu, Dolj.

Cherries are one of the main components in modern human nutrition. They can be consumed both as a fresh product as well as processed products under the form of juice, gems, compotes, etc. Given their technological characteristics, cherries are an important feedstock in the food industry.

Lately in Romania, cherry culture has been limited to the existing cherry trees in family gardens or to small cherry orchards designed to satisfy some local markets demand and only small amounts of cherry fruits have been harnessed.

As a consequence, cherry fruit production has been dropping ever since the year 2005 when the production amounted to 117.859 t of cherry fruits (Romania ranked 4 worldwide in 2005 in terms of cherry fruit production). Such a dropping production trend has maintained almost constantly along the 2006-2012 period and cherry fruit production amounted in between 65.500 t and 81.842 t, placing Romania on 7-8 ranks worldwide. The year of 2013 ranked Romania 9 with a cherry fruit production of 80.477 t. Statistical data reveal that total land surface cultivated with cherry and morello cherry trees by the end of 1989 was of 14.700 ha. After 1990, as a consequence of the enforcement of the Land Fund Law as well as a result of deforestation undertaken by the new land owners, land surfaces cultivated with cherry trees dropped to only 7.079 ha which ranked out country 18 worldwide.

The demand of cherry fruits both on local and international markets continues to be higher than the supply, especially regarding early and late cherry varieties. That is why horticultural specialists concentrate nowadays on introducing new cherry varieties as well as on augmenting the cultivated land surface.

In Romania, the old cherry varieties have been constantly improved especially since the introduction of foreign but also local valuable cherry varieties, as well as by clone selections of the existing varieties.

Present thesis brings only a modest contribution to specialized literature in the field gathering basic information from other sciences such as fruit growing science (research on cherry tree varieties) correlated with biochemy rudiments (research on the chemical composition of cherry fruits, research on winter time enzymatic activities of the cherry trees as well as on how to diminish the cracking process in cherry fruits). In the end, the present paper points out to which are the most valuable cherry tree varieties out of the four researched ones within the framework of this PhD thesis.

Chapter I presents the economic role and nutritional value of cherry fruits, their role played in a healthy diet, their main chemical components but also the ornamental value of the cherry trees. An account of the actual state of facts regarding national and international cherry culture is presented, stressing out the main varieties and their given productions during the past few years as well as the main root stocks that have been used in cherry orchards during this period. National and international mainstream scientific research as well as the main centers of scientific research in the field are presented.

Chapter II describes the main ideas that characterize cherry culture in terms of *productivity* defined as the ability of a certain variety to harness both ecological and technological given resources in order to produce a maximum possible yield, constantly and at the same pace but also in terms of *quality,* another important variety characteristic which is given by complex biological traits.

Factors which may influence upon the agro-productivity of a certain variety are presented here: *ecological factors* such as temperature, humidity, light, soil, *biological factors* such as growing and fructification special abilities, the interaction between variety and root stock which in turn may influence upon a series of cherry specific traits (tree vigor, the amount of productive buds per trunk section surface unit, productivity value, fruit quantity per trunk section unit) and *technological factors* which may influence upon the productivity of a certain variety.

Chapter III describes the research ecological and geographical framework.

Experimental activity was performed in Copaceni locality, Valcea County. Along with other four counties (Dolj, Gorj, Mehedinţi and Olt) Valcea County belongs to South-West Developmental Region which covers 29212 km^2, and is located between 22°2’ and 24°2’ meridians and 43°3’ şi 45°3’ parallels in Romania. Copaceni locality covers 6317 Km^2 at it is situated at 45 degrees latitude and 23.983 45º0’ 0’’ North longitude, 23º 58’ 59’’ East longitude and at 329 m altitude. Geographical coordinates place this locality in full temperate zone whose main characteristic is the sequence of the four seasons. Temperate continental transition climate.

Monthly average temperatures are presented (for the years 2012–2015), absolute maximal and minimal temperatures (2012–2015), monthly and annual average precipitations (2012–2015) as well as the quality of the soil.

In Chapter IV describes material and methods employed throughout the research activity undertaken. In order to provide answers to the present theme of research, several measurements and observations were performed during 2012-2015 period such as:

- *Observations regarding the influence of climate factors upon triggering and developing processes in experimental varieties engrafted on Gi-Sel-A5 root stock* (stomatal conductance, photosynthesis rate, perspiration rate, stomatal CO_2 concentration, water utilization rate, leaves humidity, cellular membranes permeability and assimilating pigments in cherry tree leaves).
- *Observations regarding the growing particularities of cherry trees and setting out productivity values* (trunk diameter, growing measurements, fruit medium weight, fruit production, fruit quality,productivity value and the number of fruits per trunk section surface unit).

This chapter also presents the main physiological processes that influence upon the quality of the fruits in researched cherry varieties (fruit humidity, total dry soluble substance, titratable acidity, acidity and dry soluble substance ratio, C Vitamin, polyphenols and carotenoids content, enzymatic activity and fruit resistance to cracking measurements)

A non-destructive method was used to determine physiological parameters in leaves and leaves under observation were not detached form the tree. The method was based on LC pro+ instrument which is able to simultaneously determine several physiological and environmental indicators (net photosynthesis rate (A =µmol/m^2/s), perspiration rate (E =mmol/m^2/s), stomatal conductance (gs =mmol/m^2/s), substomatal (Ci= µmol/mol), water utilization rate (WUE= µmol/mol), permeability values, total electrolytes amount, quantitative measurement of assimilating pigments, humidity measurement, determining ionic flow in cherry branches)

Chapter IV also discusses results obtained as a consequence of using foliar treatment to diminish the cracking process in cherry fruits. A solution based on humic acids, *Vitis vinifera* and *Gleditsia triacanthos* seed extract and Calcium Chloride and Zinc Sulfate was used.

Chapter V discusses research findings**.**

Chapter VI presents correlations between various physiological processes during vegetative and repose periods, correlations between various cherry tree characteristics and correlations between various chemical components in cherry fruits.

Corroborated data obtained as a result of the present study lead to the following conclusions:

- growing behavior under the climate conditions of Valcea County is more favorable to of of a Kordia and Regina varieties, followed by Simone and Summit varieties;
- growing particularities and productivity values are in favor of all four researched varieties.
- In terms of biochemical components quality of the cherry fruits, Summit, Kordia and Regina varieties are to be most appreciated followed by Simone;
- flowering period in Summit and Kordia varieties is 7 days earlier (12.04.-4.05) that in Regina and Simone (19.04- 14.05).

Our final opinion is that all four researched varieties may be successfully grown in Valcea County.