REVIEW

On a dissertation for obtaining the educational and scientific degree "Doctor" in the field of higher education 6. Agricultural Sciences and Veterinary Medicine, Professional field 6.1. Crop production, Scientific specialty "Fruit growing".

Author of the dissertation:

Mladen Nanev Petrov, full-time doctoral student at the Department of Fruit Growing at the Agricultural University, Plovdiv

Topic of the dissertation: "A study on GF 677 and GXN 15 (Garnem) clonal rootstocks grown in nursery and peach and plum orchards".

Member of the scientific jury:

Prof. Boryana Mincheva Stefanova PhD, Research Institute of Mountain Stockbreeding and Agricultire Troyan, PF 6.1. Crop production, Scientific specialty "Fruit growing". Appointed a member of the Scientific Jury according to Order РД 16-1125 от 10.10.2024.

1. Brief introduction of the candidate.

Mladen Nanev Petrov was born in 1992 in Karlovo. He graduated from the Agricultural University in Plovdiv in 2016 with a master's degree in Plant Protection. Since 2018, he has been a full-time doctoral student at AU Plovdiv in the scientific specialty of Fruit Growing, supervised by Assoc. Dr. Sava Tabakov from the Faculty of Fruit Growing. Works with modern information technologies, uses English. Creates and manages agricultural holdings, knows how to work in a team. Mladen Petrov deals with the sale and service of agricultural machinery, as a manager of the company Tractor Invest EOOD, Karlovo.

2. Relevance of the problem.

The consumption of plum and peach fruits is most economically significant for the temperate climate zone. Their production is of interest to many agricultural producers and private farmers, as ecologically plastic species capable of adapting to agro-ecological conditions. Therefore, studying the behavior of different rootstock combinations for the conditions of a given region is important for the profitability of their production. Rootstocks in fruit growing influence the growth force, the timing of fruiting, the fertility of the plants and the quality of the produce. Through them, the area of distribution of the fruit species can be expanded, overcoming unfavorable soil and climatic conditions related to the trend towards global warming and the cycles of prolonged drought caused by it, which represent a significant problem for fruit growing. Planting density and cultivation technology depend on the choice of substrate.

Taking into account the modern trends for the development of technologies for sustainable fruit production, more and better quality healthy agricultural production, the presented dissertation is relevant and significant for science and practice.

3. Purpose, tasks, hypotheses and research methods.

The aim of the dissertation is to present new knowledge about the growth characteristics of the GF 677 and GXN 15 (Garnem) rootstocks in a nursery and their influence on the vegetative and reproductive manifestations of three peach and plum varieties in a plantation under the specific soil-climatic conditions of South Bulgaria and to determine the most suitable of them.

For this purpose, 5 tasks have been developed, related to the study and analysis of the behavior of the GF 677 and GXN 15 (Garnem) rootstocks in a nursery for the period 2018-2020 and in fruit-bearing plantations, respectively, of plums, created in 2016, with a 5x4m scheme and of peaches created in 2014 with a 5x3.5 scheme, in the land of the village Brestnik, Plovdiv region, with results for the period 2018-2020. The climatic factors for the period of the study are characterized and the conditions and the way of maintaining the plantations, the applied pruning formations are described. All cultivars included in the study were characterized in detail by origin, biological and morphological characters.

The indicators reported are standard for growth in the nursery, vegetative and reproductive in the orchards, as well as leaf diagnostics, biochemical composition (sugars, organic acids, polyphenols, anthocyanins) and content and heavy metals in fresh fruit. Fundamental and classical methods were used for setting up and setting up the experiments and some indicators learned in practice, but also modern methods for parameters and indicators, extremely more modern and scientifically significant for this kind of research, such as High Performance Liquid Chromatography (HPLC) in the analyzes of sugars and organic acids.

4. Transparency and presentation of the obtained results.

The state of the problem is analyzed in a 20-page literature review, citing 227 bibliographic sources, including 196 in Latin.

The Results and Discussion chapter is developed in a volume of 72 pages. The experimental data for the period 2018-2020 are presented with 25 tables, 51 figures and 28 color photos.

19 main conclusions are presented. Formulated precisely and clearly, grouped according to the directions in the research, expressing the specific results.

5. Discussion of results and used literature.

The dissertation is developed according to the classic scheme with eight main sections, but for a clearer presentation and easy reading comprehension, the subsections in Material and methods and in Results and discussion should be more specifically formulated and distinguished from each other.

Research has been conducted in the following areas:

- in a nursery - % of interception, branching ability, total growth
- in plum and peach plantations – growth and productivity,
- phenology
- biochemical composition of fresh fruits
- macro-, microelements and heavy metals in leaves and fruits
- statistical data processing.

Most of the literature used is from before 2010, related to old breeding methods, attitude to abiotic factors, shoot formation, etc. (old Russian literature), and there is much newer and more suitable for the topic. The newer sources, after 2010, are about 30%, which I consider not enough. In the future, strive to find and use significantly newer and more up-to-date literature, now available everywhere on the Internet, there are many highly regarded open access scholarly publications.

The literature review shows the candidate's ability to collect, process and analyze the available literature on the problem, from where to justify and set the specific goal of the research.

The bibliography is well arranged and written accurately, active links to more modern, digital, literary sources are shown.

6. Contributions of the dissertation work

I accept the reference for the contributions, scientific and scientific-applied, but they should have been formulated more clearly and concretely, in relation to the work performed and to express the importance of the development in a scientific and applied aspect.

I. SCIENTIFIC

for the first time in Bulgaria, a study was made of peach-almond rootstocks - hybrids, GF 677 (P. dulcis x Prunus persica) and GXN15 (Garnem) (Garfi, P. dulcis Nemared, P. persica), which gives extensive information about

1. the influence they have on the growth and reproductive manifestations of modern peach and plum varieties in nursery and plantation.
2. their influence on the course and duration of phenophases in fruiting plantations.
3. their influence on the chemical composition of plum and peach fruits.

II. SCIENTIFIC APPLIED

In the nursery, the compatibility of the rootstocks with the peach and plum varieties was studied and the percentage of interception, branching ability, total growth was determined.

In the study **in plum plantations**, it was found that the vegetative rootstocks peach-almond hybrids GF 677 (P. dulcis x P. persica) and GXN15 (Garnem) (Garfi, P. dulcis Nemared, P. persica) gave higher yields than unit area, compared to the traditional seed plum (P. serasifera) and, unlike it, do not form shoots.

In peach orchard studies, the peach-almond hybrid GF 677 (P. dulcis x P. persica) gave higher yields than GXN15 (Garnem) (Garfi, P. dulcis x Nemared, P. persica).

It has been proven that GXN15 (Garnem) induces strong growth of the grafted variety, provokes the expansion of the crowns, respectively increases their volume in both plums and peaches, and this reduces productivity indices, compared to GF 677. Statistically insignificant effect on the mass of the fruit and inversely on the yield.

A contribution can also be added to the biochemical analyzes of fresh plum and peach fruits, to establish the content of simple sugars and organic acids, by HPLC, as well as the content of macro and micro elements and heavy metals in leaves and fruits and their influence by the type of pad.

As a result of all the conclusions and contributions, a recommendation was made for the implementation of the vegetative rootstock GF677 (P. dulcis x P. persica)

in modern plum production, as an alternative to the massively used in our country seed plum (P. cerasifera), for earlier entry into fruiting and increasing yields.

7. Critical notes, questions and recommendations to the candidate

I appreciate the merits of the presented dissertation, the good information, scientific and practical knowledge of the doctoral student Mladen Petrov. The developed dissertation is a logically complete, structured and executed scientific product using an adequate methodology.

I allow myself to make some notes and recommendations to the author, with the sole purpose of better specifying the writing of scientific publications in the future. I recommend that for future scientific developments, the characterization of all growth, reproductive and pomological qualities in plum be based on the methodology of UPOV (2002), EUROPEAN PLUM (Prunus domestica L.), and for peach UPOV (2014) Code: PRUNU_PER PEACH Prunus persica (L.) Batsch, as well as the BBSH system of Meier et al., 1994 (Growth stages of mono-and dicotyledonous plants) for phenological observations in stone fruit species. This will give significance and greater scientific value to the work.

To use specific scientific terms and to work on improving the scientific statement, since the way of expression is not in a precise scientific style, which damages the merits of the work.

Table 8 on page 72 is missing a unit of measure for the amount of wood cut. In Table 22, on page 92, the column for anthocyanins is blank, so you do not need to include it in the table content, just comment on the absence of anthocyanins.

You could look for some correlations between growth vigour, cut branch, yield and fruit weight in all variants, since you have the relevant data, and these relationships will show you mathematical models of the mutual influence of these factors.

I have a question for the PhD student. Where were the in vitro vegetative rootstocks included in the study produced? Are they specifically manufactured for your trials or offered for commercialization?

Of course, these notes do not diminish the value of the dissertation.

The main goal of the Educational and Scientific Degree Doctor is for the candidate to acquire the ability to conduct experiments methodically correctly, to collect and analyze the obtained results objectively and to formulate correct conclusions from them. In this case, the doctoral student Mladen Petrov has basically achieved it and has the potential to engage in research work.

8. Published articles and citations.

The abstract, in a summarized form on 46 pages, objectively reflects the structure and content of the dissertation, through its 16 tables and 16 figures. It meets the requirements for form and content.

It also reflects three scientific works related to the dissertation, in which the doctoral student is not the first author, but they are directly related to the topic and are part of the results. Two of the publications are in Agricultural Sciences, a publication of the Agricultural University indexed in CABI, one after participating in the IV Balkan Symposium in Turkey, published in Acta Hortic. 1289, Web of science. This fully covers

the national minimum requirements set by the rules of AU Plovdiv for the implementation of the Law for development of the academic staff of the RB.

CONCLUSION: Based on the different research methods applied by the doctoral student, the correctly performed experiments, the summaries and conclusions made, I believe that the presented dissertation meets the requirements of Law for development of the academic staff of the RB, Rules for implementation regulations on the terms and conditions for obtaining scientific degrees and holding academic positions in AU Plovdiv, which gives me reason to evaluate it **POSITIVE**.

I propose to award MLADEN NANEV PETROV the educational and scientific degree **"Doctor"** in the field of higher education 6. Agricultural Sciences and Veterinary Medicine, Professional field 6.1. Plant Growing, Scientific specialty "Fruit growing".

Date: 11.11.2024

REVIEWER

RIMSA Troyan

(Prof. Boryana Stefanova PhD)