Review

Of the PhD thesis for acquiring the educational-and-scientific degree 'Doctor' in the doctoral programme 'Fruit-Growing', Professional Field 6.1. Crop Production, Area of Higher Education 6. Agricultural Sciences and Veterinary Medicine.

Author of the PhD Thesis: Assist. Prof. Georgi Ivanov Govedarov, self-training PhD student at the Department of Fruit-Growing, Agricultural University of Plovdiv

PhD Thesis Title: Opportunities for accelerated production of pear and quince trees on different quince rootstocks

Reviewer: Argir Todorov Zhivondov from the Fruit-Growing Institute in Plovdiv, Professional Field 6.1. 'Crop Production', Major 'Breeding and Seed Production of Cultivated Plants', member of the Scientific Board of Examiners in accordance with Order No. RD-16-1374 of 13.12.2019 of the Rector of the Agricultural University of Plovdiv.

1. Brief biographical data of the PhD student

Assist. Prof. Georgi Ivanov Govedorov was born on 19.02.1959 in Plovdiv. In 1977 he graduated from the Secondary School of Mathematics in Dobrich. He completed his higher education in 1984 at the Higher Institute of Agriculture in Plovdiv. During the period 1984-1988 he worked as an agronomist, supervisor of a field team, a seed production area and greenhouses in the town of Rakovski. Since 1988 to date he is an Assistant Professor at the Department of Fruit-Growing, the Agricultural University of Plovdiv. He has been conducting seminars, delivering lectures and supervising student internships. He has a good command of English and Russian languages. He has good communication skills to work in a team. He possesses a good level of computer literacy to handle basic computer programmes and the Internet.

2. Relevance of the PhD Thesis

The production of fruit trees is the first and major stage of fruit production. The relatively long, most often two-year technological production

cycle, requires profound and accurate knowledge, high qualification, precision work and rational adherence to seasonal agricultural practices, and all that entails many responsibilities. On its turn, those responsibilities are related to the authenticity of the cultivar/rootstock combinations and the production of healthy planting material.

The increasing interest in shortening the technological process for the production of fruit planting material has been manifested for decades. Nowadays, there are still separate technological units for some fruit species that need to be further improved to facilitate the production process. I am convinced that the PhD thesis defended today, provides answers to some of the important and topical questions posed above, with the aim of accelerating the production of pear and quince trees.

3. Aim, Tasks, Hypothesis and Methods of Study

In his PhD thesis, Assist. Prof. Georgi Govedarov has concentrated his efforts on improving the efficiency of pear and quince tree production, by applying practices to accelerate the production cycle to a year. To achieve this goal, he has carried out research studies in three directions:

- in a mother plantation for the production of vegetative quince rootstocks;
- in a mother plantation for the production of cuttings of quince tree cultivars;
- in a second-year nursery garden for accelerated production of pear and quince trees.

Observations and studies were carried out in the period 1999-2002 in the Experimental Fields of the Department of Fruit-Growing at the Agricultural University of Plovdiv, on the territory of the village of Brestnik.

From a methodological point of view, the doctoral student approached all the observations and reported characteristics correctly and with the necessary precision. The studies were based on a system of indicators, which allowed and guaranteed the achievement of the aims set. The accelerated method of producing pear and quince trees was discussed and compared to the traditional method in a second-year nursery garden. Meteorological characteristics during the years of the study were presented.

4. Visualization and Presenting the Results Obtained

The PhD thesis submitted to me for a review by Assist. Prof. Georgi Govedorov has a total volume of 113 pages and contains 25 figures and 29 tables. The tables are properly positioned in the text and well designed. The figures clearly illustrate the results obtained.

The content of the thesis is structured correctly and all the sections are in a sufficient volume and optimal ratio between them. All the biometric observations and data readings are methodically correct and the results were mathematically processed.

5. Discussion of the Results and References

In the thesis submitted for a review, three groups of studies were carried out, described above in item 3. The observations in the mother plantation for the production of four vegetative quince rootstocks – Provanska, MA, BA29 and B12 – were carried out both during the growing season and during dormancy. Brief pomological characteristics of the four quince rootstock were made. Differences in rootstock production and their rooting ability were reported. The rootstocks were graded for quality according to their thickness and degree of rooting. Their growth characteristics in the mother plantation were studied.

The studies in the nursery covered a system of indicators related to accelerating the production of pear and quince trees, shortening the technological cycle by one year. According to me, that group of research studies is the most essential part in the thesis. Alternative studies were conducted in a traditional first- and second-year nursery to compare the final results. The survival of rootstocks and their thickening, although slight, were established. The percentage of successfully grafted buds, the time of sprouting and the growth dynamics of the grafted plants were studied.

Studies have been carried out in a quince mother plantation for the production of cuttings. Methods for reducing fruit bud setting that are difficult to distinguish from the vegetative ones, were identified. Fruit buds grafted in the nursery created some inconvenience in tree training.

The results of the studies on the different groups of indicators are well interpreted in order to obtain sufficient information volume. The mathematical

processing done is an additional guarantee, enabling the doctoral student and presenting a sound basis for him to draw 14 conclusions, the most important of which I consider to be the 7th, 8th, 9th and 10th. All the conclusions are accurate and reflect objectively the studies described in the thesis and in the author's abstract.

The doctoral student included 135 titles in the list of references, 36 of them in Cyrillic and 99 in Latin. The works of all the authors are correctly cited in the literature review, which covers 21 pages in the thesis. Material and Methods section comprises 8 pages, clearly indicating how the observations were made and the indicators reported. The main section, Results and Discussion, represents a little over 50% of the volume of the thesis. The thesis is designed according to the requirements.

6. Contributions of the PhD thesis

On the basis of the results obtained from the studies, a total of 10 contributions were formulated, 4 of them being original in character, 3 – scientific-and-applied and 3 – confirmatory, the major ones being, as follows:

Original in character:

- A comparison was made between the time of sprouting of the grafted pear and quince buds in the accelerated production method and in the traditional one;
- The dynamics of the development of the grafted pear and quince buds and the growth dynamics of the grafted trees obtained by the accelerated production method were compared to the traditional one;

Applied and confirmatory in character:

- The most appropriate time for planting the quince rootstocks for the accelerated production method is in the period 15 November – 15 December;
- The stem thickness of the rootstocks, fractions 4-7 mm and 7-12 mm, reached in the mother plantation does not significantly affect their development in the nursery, because by the time of grafting they become thick enough to become suitable for grafting;
- Grafted components of the same species survive better compared to components of different species.

7. Critical Notes and Questions

I have the following constructive questions and comments to the PhD student:

1. In the Introduction it is stated that chip budding is a relatively unknown method for the fruit-growing practice in our country. I have an experience and believe that for many years now, the same method has been used more widely in practice as an easier way to perform it, especially when the sap flow in the rootstocks is not very good.

2. The production of pear trees with an intermediate is very easy to realize in two years, not in three, as indicated in the Introduction. When applying a special technology, it could be done even within one year.

3. Why was T-budding performed instead of chip budding in spring, as the latter is known to be more suitable for spring grafting? Both methods could have been used in the study for comparison.

4. Is not a 30-day interval to report the growth dynamics of the cultivar/rootstock combinations quite long? With such a large interval between the measurements, it is likely to miss the peak period when growth was the most vigorous.

5. In case a sufficient mother plantation was provided for the production of appropriately selected cuttings, corresponding to the production capacity of the nursery, the labor-intensive defoliation of the mother trees could be avoided. In addition, not only in quince, the grafted fruit buds also produce standard trees of the same quality as the grafted leaf buds. Despite the initial temporary slowdown in growth and formation, by mid-July all the grafted trees with both types of buds used for grafting, become equal in size.

6. What exactly is the relationship between the length of the internodes in the rootstocks and their suitability for grafting, taking into account that the quince rootstocks do not form largely protruding nodes to make grafting inconvenient?

7. Were the plants irrigated and fertilized in the same way in the accelerated and in the traditional production technologies and how?

8. A separate section 'Aims and Objectives of the Study' is missing. The aim is presented at the beginning of the literature review.

9. The list of references is dominated by those of the last century. There are very few cited authors from the present century.

10. No pictures are presented in the thesis to illustrate the major technological stages of the experiments.

11. There are minor discrepancies between the pages mentioned in the content and the actual pages in the text.

The questions raised and the comments made are intended solely to improve the level of future research and to provoke scientific discussions on important issues related to the production of fruit planting material, with a view to reaching new easier technological solutions. In no way they discredit the merits of the PhD thesis.

8. Evaluation of the Author's Abstract and Publications on the Thesis

The author's abstract fully complies with the requirements. It reflects in an objective manner the structure and, to a sufficient extent, the most important sections of the thesis. It is within 32 pages.

In connection with the thesis, the candidate has presented four scientific publications in Bulgarian scientific journals, two of which are in print. One of the publications is in co-authorship, the doctoral student being the leading author, and the PhD student is the only author of the other three publications.

CONCLUSIONS

I believe that the PhD thesis defended today by the self-training PhD student Georgi Ivanov Govedorov has significant contributions of scientific and applied character, which I fully accept. I am convinced that they are useful and contain sufficiently important information, leading to shortening the technological cycle for the production of pear and quince trees. All that is the reason to give a POSITIVE evaluation of the submitted thesis, which fully meets the requirements of the Development of the Academic Staff in the Republic of Bulgaria Act and the Regulations of the Agricultural University of Plovdiv for its application. I will vote positively for awarding the educational-and-scientific degree 'Doctor' in the professional field 6.1. Crop Production, PhD programme 'Fruit-growing'.

I allow myself to propose to the colleagues, members of the Scientific Board of Examiners, to vote positively like me for awarding the educational-and-scientific degree 'Doctor' to Assistant Professor Georgi Govedarov.

January 7th, 2020

Plovdiv

Reviewer: .....

(Prof. Dr. A. Zhivondov)