Organization of a nursery of maternal plants in the Chechen Republic and soil requirements

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Abstract. The relevance of the study is determined by the lack of sufficient healthy planting material in the Russian Federation, especially in the Chechen Republic. Therefore, this project considers the way of cultivation of the maternal plants of fruit crops (the scheme that rootstocks are planted). Besides, the soil requirements (the content of humus, macroelements, microelements and soil reaction (pH) at different depths and the work that must be done with the recommendations before planting the healthy rootstock material is also illustrated in this research project.

1. Introduction
Maternal plant nursery of fruit crops is a structural unit of a specialized farms or an independent business entity engaged in the propagation of planting material and growing seedlings of fruit crops and berry plants.

Organization of fruit maternal plant nursery starts with the selection of a land plot, the size of which should ensure the production of the planned volume of healthy planting material with the possibility of a subsequent increase in production and updating of uterine sediments by attracting new promising varieties and stocks. Besides, before planting the material as maternal plant nursery, all the material must be certified by the authorized federal service, where it states about the healthiness conditions (virus – free) of the planting material.

The structure of the maternal plant nursery is formed according to the approved project on the basis of a carefully developed feasibility study after a comprehensive survey of the features of the terrain and soils on their appropriateness for the production of hosiery material, taking into account zonal features.

The nursery is placed on garden areas with high fertility soils that have light physical structure and good air-water and thermal conditions. The density of the soil in the layer up to 80 cm should not exceed 1.50 g / cm³.

On the lands allocated for planting maternal plant nursery, soil analysis must be carried out to the depth of 2.5 m. The content of humus, macroelements, microelements and soil reaction (pH) at different depths are must be analyzed. Appropriate values for all fruit species are considered pH from 6.0-8.5 in the 0-150 cm layer and pH 6.0-8.7 in the 150-200 cm layer.
The decisive factor for choosing a place for a nursery is the deficiency of dangerous salts in the soil, impermeability of horizons, and waterlogging. Planting stock should be free from quarantine objects and other dangerous pests and diseases, therefore, in recent years more and more attention has been paid to certification issues. Currently, the standard GOST R 53135-2008 is "Planting material of fruit, berry, subtropical, nut, citrus crops and tea. Specifications’ phytosanitary requirements established. These certification schemes should provide for the recovery of planting material from economically significant viruses.

The most favorable relief for placing the maternal plant nursery is flat terrain or gently sloping with a slope no more than 5°.

The depth of groundwater for the normal development of fruit crops maternal plant plantations should be at least 2.5 m.

After a detailed survey of the territory, topographic and soil maps are must be compiled. Taking into account the planned production volumes, recommended sowing and crop rotation, uterine plantations, seedling formation fields and other parts of the maternal plant nursery are placed in accordance with their soil requirements, the need for irrigation, and other meeting requirements. The most productive lands are allocated for the seedling formation fields, maternal plant of clonal stocks, uterine-varietal and uterine-seed gardens. Infrastructure objects, a complex of technologically necessary premises and structures, are located on less suitable sites.

A fence made of a net 1.5 m high is built along the border of the nursery to protect plants from various destruction.

Infrastructure objects are placed among the uterine plantations, seedling formation fields and other parts of the maternal plant nursery, taking into account the requirements of modern logistics to reduce the time for transitions, transfers and transportation of produced healthy free planting material through the maternal plant nursery.

2. Methodology

In the Ltd. “Scientific Production Firm “Sady Chechni” the healthy (virus – free) stated material with all certificates from an authorized federal service were planted in terms of production maternal plant nursery. The planted material was 1000 plants: Gizella – 5, VSL -2, B – 9, VSL -1, Kuban – 86, Stenley, L-2 and Evrika each variety. The landing pattern was the same for all rootstock varieties 2x0,3 m (where 2 m between rows and 0,3 m between plants). The planting material was tested for any diseases (viruses, phytoplasmosis, and any other virus-like diseases) that can be presented in the studying object. Later, the observed plants were propagated and rooted in the laboratory in Vitro in FGBOU VO “Chechen State University”, 32, Sheripova str., Grozny by its workers.

From 2 different points the soil samples were collected down to 2.5 m and the examples were sent to the FGBNU Severo-Kavkazskiy Zonal'nyy Nauchno - Issledovatel'skiy Institut Sadovodstva i Vinogradarstva, Krasnodar, 350072, Russia for agro-chemical analysis and to determine if any diseases (viruses, phytoplasmosis, and any other virus-like diseases) are presented in the samples.

The soil tests collected in the Ltd. “Scientific Production Firm “Sady Chechni” were analyzed by the following methods and GOST standards.

Where the soil testing methods were followed by:

- Determination of soil reaction (pH-water) according to GOST 26423-85;
- Determination of the electrical conductivity of the soil (EC) according to GOST 26423-85;
- Determination of the content of chloride ions (Cl-) and sodium ions (Na +) by potentiometric method in an aqueous extract;
- Determination of total humus content by the method of Tyurin;
- Determination of the content of mobile compounds of phosphorus and potassium according to the Machigin method in the modification of TsINAO according to GOST 26205-91;
- Determination of the content of metabolic calcium and metabolic magnesium by the trilonometric method in a 1.0 n extract of NaCl;
Determination of the content of exchangeable sodium according to GOST 26950-86.

From the received laboratory test results it was clearly stated that, fertilizers must be applied, more details in results and discussion.

3. Results and discussion
The soil samples were taken from 0 – 250 cm, then dried at room temperature, cleaned from any waste contaminants and chopped with pester and mortar.

Table 1. Agro-chemical soil analysis results for the samples from Ltd. “Scientific Production Firm “Sady Chechni”.

| Number of Sample | Soil layer, cm | pH water | Conductivity, μS / cm | Mass fraction of ions in the aqueous extract, mEq. / 100 g of soil | Humus, % | P₂O₅, mg/ kg | K₂O, mg/ kg | Exchangeable cations, mEq / 100g. |
|-----------------|----------------|----------|----------------------|-------------------------------------------------|---------|-------------|-------------|---------------------------------|
| 1               | 0-40           | 8.11     | 0.103                | 0.068                                           | 0.029   | 2.37        | 62.6        | 206                             |
|                 | 40-80          | 8.26     | 0.108                | 0.046                                           | 0.027   | -           | -           | -                               |
|                 | 80-120         | 8.21     | 0.110                | 0.033                                           | 0.031   | -           | -           | -                               |
|                 | 120-160        | 8.32     | 0.120                | 0.036                                           | 0.047   | -           | -           | -                               |
|                 | 160-200        | 8.36     | 0.128                | 0.039                                           | 0.051   | -           | -           | -                               |
|                 | 200-250        | 8.42     | 0.130                | 0.041                                           | 0.060   | -           | -           | -                               |
| 2               | 0-40           | 8.10     | 0.119                | 0.068                                           | 0.029   | 2.77        | 25.6        | 262                             |
|                 | 40-80          | 8.18     | 0.113                | 0.049                                           | 0.025   | -           | -           | -                               |
|                 | 80-120         | 8.17     | 0.111                | 0.032                                           | 0.027   | -           | -           | -                               |
|                 | 120-160        | 8.35     | 0.111                | 0.026                                           | 0.027   | -           | -           | -                               |
|                 | 160-200        | 8.38     | 0.113                | 0.020                                           | 0.038   | -           | -           | -                               |
|                 | 200-250        | 8.41     | 0.113                | 0.019                                           | 0.042   | -           | -           | -                               |

From the table above (table 1) it can be noticed that, the presence of harmful salts are negligible and the acidity is in appropriate range value. The presence of humus is quite low, however it can be classified as fine due to organic fertilizer application. Therefore, the plot was pre-fertilized with 30 t / ha of organic fertilizers (rotted manure), seasoned with phosphorus and potassium fertilizers at a concentration of 60 and 90 kg respectively. Consequently, the characterized soils in the table above (table 1) can be assigned to be suitable for cultivation of maternal plant nursery of fruit crops.

The landing pattern was chosen to be 2x0,3 m (figure 1) for all planting material (Gizella – 5, VSL
-2, B – 9, VSL -1, Kuban – 86, Stenley, L-2 and Evrika), where the plants were planted in distance between each other 30 cm and row distance between sorts is 2 m.

Figure 1. The planted virus-free material (maternal plant nursery) Ltd. “Scientific Production Firm “Sady Chechni”.

In the figure above (figure 1) only 2 sorts (B – 9 and Kuban – 86) of planted virus - free material are provided, to demonstrate the idea of the structure of maternal plant nursery. After 1 year, these illustrated plants (figure 1) must be grown up to 1.5 - 2 m in height, so we can get the basic clones (Nuclear stocks) from this maternal plant nursery.

4. Conclusion
To sum up, the scheme was set up and the virus – free planting rootstocks were planted. Pre-planting work was done by pre-fertilizing with 30 t / ha of rotted manure, seasoned with phosphorus and potassium fertilizers to increase the chemical and agrarian quality of soil. The laboratory test results were classified as satisfying to plant the maternal plant nursery of fruit crops rootstock material. The schematic structure of the maternal plant nursery was chosen to be 2x0.3 m as it requires in many literature sources.

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