Economic evaluation of proceedings a virus - free planting material in vitro

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Abstract. This research paper illustrates the economic evaluation of producing stone fruit healthy (virus-free) planting material, particularly Kuban – 86 and GIZELLA - 5 in Vitro. The requirements to achieve a category “healthy planting material” within pathogens requiring checking on stone fruits for the categories of “virus-free” also discussed in this project. Besides, this research shows that, proceedings a virus – free planting material in Vitro is almost 1.5 times more (in terms of 1000 plants production) profitable than traditional techniques are used (green cuttings).

1. Introduction

Virus – free planting material stands for the plants that are free from all pathogens (besides, phytoplasmosis, viruses and any other virus-like diseases) that are naturally exposed in a given culture (Kuban – 86 and GIZELLA - 5) in the Russian Federation (Chechen Republic) and tested for viruses and pathogens within recommended methods. Material received from tested material by microclonal propagation in Vitro conditions excluding the secondary infection also can be assigned as virus-free planting material and they can be called as basic clones (Nuclear stocks), however, they must be selected for pomological qualities and individually tested for the absence of viruses and any other dangerous pathogens by recommended methods. Propagated (mother-plant) clones (Propagation stocks) - plant material obtained by propagation of the Nuclear stocks in conditions excluding the secondary infection. Material obtained from a propagated clone under the same conditions remains as a propagated clone, but depending on the value of the plant type, it can be propagated only once or several times. The absence of viruses and any other dangerous pathogens is checked in all such material by sampling and testing several (up to 10 samples in 100) samples using appropriate methods. Certified clones are plant material obtained from propagated clones in compliance with the relevant requirements, which then passes the control of the certified system. Depending on the type of plant, the certified material may be buds, seed, cuttings or grafted plants. As it known, Kuban - 86 and GIZELLA - 5 are refers to stone fruits material, therefore pathogens required verification for the categories "virus-free" and "tested for viruses" are the same for both types of the samples:

Virus – free planting material standards in the Russian Federation.
Viruses:
• Apple chlorotic leafspot closterovirus
• Apple mosaic ilirvirus
• Prune dwarf ilirvirus
• Prunus nicrotic ringspot ilirvirus
• Cherry green ring mottal virus
• Plum pox pottyvirus
• Cherry leaf roll nepovirus
• Arabis mosaic nepovirus
• Raspberry ringspot nepovirus
• Strawberry latent ringspot nepovirus
• Tomato black ring nepuvirus

Viroid viruses
• Little cherry necrotic rusty mottal
• Rusty mottal
• Shirofugen stunt

Virus tested planting material.

Viruses:
• Chlorotic spotting of apple leaves
• Mosaic apple trees
• Dwarf plum
• Sharkey plums
• Nicrotic ring spotting of stone fruits
• Raspberry ring spotting
• Mosaic cutters
• Latent annular spotting of strawberries
• Black ringed tomato

In case of the tested planting material is free of the listed above viruses, it can be assigned as virus-free planting material, furthermore, it will be possible to certify the obtained product and can be planted as mother-plant material. Consequently, any other material can be propagated from the mother plant material, as it will also be classified as virus–free planting material.

2. Methodology
The economic evaluation study was carried out based on outlay and labor salaries in the laboratory of biotechnology in the Chechen State University, Grozny. Object of the study was the production costs of 100 clonal rootstocks of Kuban - 86 and Gizella - 5 stone fruit crops (rootstocks).

Instruments necessary for the preparation, storage and sterilization of culture media, distilled water are:
• Sets of laboratory glassware for storage of mother liquors, preparation and autoclaving of culture media.
• Analytical balance.
• Heated shaker (magnetic stirrer).
• pH meter.
• Cabinet for sterilization with hot air.
• Distiller.
• The autoclave.
• Household refrigerator.

For the preparation of uterine solutions and sterilize nutrient media, a standard set of measured laboratory glassware from borosilicate glass of the TS brand (heat-resistant) is required:

• graduated cylinders with nose 20; 250; 1000 ml;
• measuring glasses with a spout on 100; 250; 500; 1000 ml;
• glass pipettes for 1-10 ml.

Equipment and tools designed to maintain aseptic conditions and work with plant objects in vitro.

• Laminar boxing.
• Luminostat.
• Thermostat.
• Sets of laboratory glassware for the cultivation of sterile micro-shoots, Petri dishes, spirits.
• A set of surgical instruments.
• Plastic autoclavable Eppendorf tubes of 1.5-2 ml.
• Automatic single-channel pipettes of variable volume (2-20, 20-200, 200-1000 μl) and autoclavable tips of the corresponding volume.
• Sterile disposable ultrafilters with a pore diameter of 0.22 ct.
• Electric stove.

Laminar box is the main unit, which allows under aseptic conditions to sterilize thermolabile compounds, fill media and pass microplants.

3. Results and discussion
From the literature data, the production cost of 100 Nuclear stocks (virus-free planting material) is about 219492.

Calculation of the cost (Table 1) of obtaining virus-free basic clones of Kuban – 86 and Gizella – 5 (50 plants each respectively) in laboratory conditions (in Vitro).

| №   | Cost items for 100 plants | Kuban - 86 and Gizella - 5 (rub) |
|-----|--------------------------|----------------------------------|
| 1   | Labour cost with (acrued sallary - 30.2%) | 24790.2 |
| 2   | Price of the initial plants and indicators | 80000 |
| 3   | Energy cost | 10841 |
| 4   | Water consumption cost | 100,3 |
| 5   | The price of nutrient media preparation | 20000 |
| 6   | The usage price of equipment | 10000 |
| 7   | Depreciation deductions | 4366,5 |
|     | Total price | 125307,8 |
|     | overhead (20%) | 25061,56 |
|     | Total price of production 100 plants | 150369,36 |
|     | The price of produing 1 plant | 1503,6936 |
The calculations in the table above (Table 1) shows that, the production of 1 stone fruit rootstock in Vitro is 1503.7 rub, where the traditional method (green cuttings) of production (by literature data) is 2194.92 rub. One of the worthy reason to work in Vitro is due to the ability to produce healthy plating material whole year and no climate changes/accidents will not curve on the working process.

4. Conclusion
To sum up, the production cost of 1 healthy plant (virus - free) stone fruit (Gizella – 5 and Kuban – 86 was calculated to be around 1500 rub. However, the fact must be stated that, with the plants received from in Vitro, there is one more step called “adaptation to non-sterile conditions” and it will raise the total production cost of rootstock. The necessities to achieve a class “virus - free” within pathogens requiring checking on Gizella – 5 and Kuban – 86 were also discussed and marked.

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