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Bio-ecological methods (Sideration and Mulching) obtained in hybrid seedlings of citrus

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Abstract
The article discusses the materials reflecting the results obtained using bio-ecologica methods (germination and mulching) in hybrid seedlings of citrus. On the territory of Akaki Tsereteli State University Scientific-Research Center of Agrarian Directions were conducted experiments on hybrid seedlings of lemon (Dioscuria, Villafranca, Meyer) in2017-2018. As a result of research, the use of bio-ecological methods has protected these plants from unfavorable conditions.

Keywords: sideration, mulching, bio-ecological methods

1. Introduction
Subtropical cultures, including citrus, are well developed in soil-climatic conditions of Western Georgia, but they often suffer from adverse environmental conditions, especially, periodic frosts badly damage plants, as well as a long drought resulting in yield reduction. Therefore, it is important to carry out a system of complex measures for protection against the adverse environmental impact of citrus, which provides both direct and indirect measures ((Use of packaging materials, organic and mineral fertilizers into soil, mulching, sowing siderates, etc.), this helps to weaken the negative effects of these plants.

2. Materials and Methods
A grant project funded by Shota Rustaveli Scientific Foundation: "The problem of elevating citrus and solving it by using a distinct hybridization method" was successfully implemented in citrus plant genetics and selective laboratory of Akaki Tsereteli State University in 2009-2012.Genetically new perspective recombinants were used in distant hybridization works carried out within grant projects: spontaneous mutants of trifoliate #1 and #2, the hard hybrid of the Inchangensi "Caucasia", lemon Dioscuria, Villafranca, Meyer. According to breed combinations hybrid fruits and numerous hybrid seedlings have been obtained because of sowing seeds from them. These seedlings require observation in the later stages of development. We carry out observations and records. Based on the project "Usage of Bio-Ecological Techniques in Citrus Hybrid Relatives and Distinguishing Perspective Forms" in the Scientific-Research Center of Agrarian Directions of Akaki Tsereteli State University in 2017-2018. The purpose of the research is to conduct bio-morphological observations on hybrid seedlings of citrus, use of bio-ecological methods (Sideration, mulching) and promoting productive forms from them.

3. Experiment
Depending on the topic of research we have divided citrus plants located on the collection plot. Each variant include hybrid seedlings of citrus according to combinations:
The first variant – was left under control. Sideration, mulching and soil erosion were not used there. In this variant we have carried out all those agrotechnical activities, which are adopted in the cultivation of young gardens of citrus. (Soil budding, watering, nitrogen and complex fertilizers and etc.)
In the second variant, we have used bio-ecological methods, namely, on April 6 of this year, a soybean was sown as a green fertilizer. We have dug this soya in at the blossom phase at a depth of 15-20 cm on 10-11 July. In the same variant on August 31, we planted the soybean repeatedly for mulching.
On the experimental plots we conducted observations and records according to bio-morphological and phenomenological indicators, during vegetation and dormant period. The results of the test are given in Table # 1.

Table 1: Bio-morphological and phenomenological indicators of citrus seeds.

#	Hybrid plants according to combinations	The height of the plant before vegetation (in cm)		Vegetation period				The height of the plant at the end of the vegetation (in cm)	
				Beginning (date)		The end (date)			
		1 Variant (control)	2 Variant	1 Variant (control)	2 Variant	1 Variant (control)	2 Variant	1 Variant (control)	2 Variant
1.1	Lemon Meyer X Trifoliate Mutant #1	70	72	27.03	15.03	12.11	20.10	77	93
1.2	Lemon Meyer X Trifoliate Mutant #2	65	62	27.03	16.03	10.11	22.10	76	94
1.3	Lemon Meyer The complex hybrid "Caucasia" of X Ichangensis	68	65	28.03	15.03	12.11	14.10	72	98
2.1	Lemon Villafranca x Tifoliate Mutant # 1	86	89	25.03	15.03	13.11	17.10	94	102
2.2	Lemon Villafranca x Tifoliate Mutant # 2	86	87	30.03	20.03	13.11	17.10	94	104
2.3	Lemon Villafranca X the complex hybrid "Caucasia" of Ichangensis	79	76	28.03	18.03	14.11	20.10	90	103
3.1	Lemon Dioskuria X Trifoliate Mutant #1	82	82	30.03	20.03	13. 11	17.10	92	98
3.2	Lemon Dioskuria X Trifoliate Mutant #2	85	86	27.03	20.03	14. 11	15.10	92	105
3.3	Lemon Dioskuria the complex hybrid “Caucasia” of Inchangensis	89	87	27.03	18.03	15. 11	20.10	96	100

According to the first table the seedlings, among which was plant the soybean, are distinguished by intensive growth, namely, seedling-1.3 (Lemon Meyer X Inchangensis Complex Hybrid "Caucasus"); seedling-2.3(Lemon Villafranca Tifoliate Mutant # 1), seedling-3.2 (Lemon Dioskuria X Trifoliate Mutant #1); The increase in the height of these seedlings has reached 17-21cm on average, while the growth rate of controlled plants is about 7-10cm.

The data provided in the second table shows that mulching has had some impact on the plant phenophases, nemely, the seedlings of hybrid lemon, where the method of mulching (soya plants) was used, completed the vegetation period almost a month before and the plants were relatively early in the winter dormant period, rather than the controlled plant varieties.

Table 2: The observation results of hybrid lemon seedlings when using bio-ecological methods

#	Name of the plant	Fruit ripening	Winter dormant period	Ice damage quality (According to 5-point scale)	beginning of vegetation
1	Controlled plants (without mulching and siderates):				
1.1.	Hybrid seedlings of lemon	13.12	25.12	4	10.04
2	Plants on which were used siderates and mulching				
2.1	Hybrid seedlings of lemon	16.10	01.12	3	15.03

For the mulching, green mass of soy bean was placed to the thickness of 10 cm and left it throughout the winter.

4. Results

The soil moisture and warmth have been maintained by using these methods, and the soil heat level was regulated, resulting in less damage of young plants.

Sedarates were dug in early spring, which in turn improved the soil with food elements and the soil structure via humus.

Based on the above mentioned, mulching of citrus and siderates have a great impact and increased frost resistance. Observations have shown that the hybrid seedlings of lemon began vegetation in early spring,but the plants taken in control were badly damaged after winter frost and they also began vegetation later even in spring.

5. Conclusions

- The results of the experiment demonstrated that the seedlings among which the soya was sown distinguish with intense growth.
- Distinguished seedlings according to phenotypes represent bent forms to mother plants, which is very important and interesting in terms of cont inuing further selection work.
- The system of indirect protection contributed to normal passage of all phases, including growth and development of citrus, decreasing vegetation duration, early dormant period and the alleviation of unfavorable environmental impact.

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