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Effect of Different Planting Schemes and Feeding Area on Growth, Development and Yield of Lemon Plant

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ABSTRACT
The article presents the results of a study conducted to study the effect of different planting schemes and feeding area on the growth, development and productivity of lemon plants. Also, the article describes the phenological observations, biometric calculations, productivity and quality of fruits in the growth and development of lemon seedlings planted in different schemes.

KEYWORDS: citrus plants, lemon, growth, development, productivity, planting scheme.

Introduction

Citrus plants belong to the group of evergreen subtropical plants and, unlike ordinary fruit plants, they do not have leaf senescence. Therefore, in the climatic conditions of Uzbekistan, all plants of this type (lemon, orange, tangerine, grapefruit, sheddock, lime, etc.) are grown in greenhouses (glass structures), greenhouses (light-type film structures) and trenches (light trenches) in order to protect them from winter frosts. Each structure has its own positive and negative indicators. For example, greenhouses and greenhouses are very convenient for growing all kinds of citrus plants, but protection from the cold is somewhat difficult and expensive. Trench constructions are very cheap and convenient for growing all types of citrus plants, but their economic efficiency is relatively low due to the wide range of planting schemes.

Protecting citrus plants from winter frosts and increasing their productivity and economic efficiency at the same time requires great importance, knowledge and experience.

Growing plants in protected areas has its own important requirements. In particular, it is necessary to pay special attention to the compact formation of their feeding area, the compact formation of the surface of the earth, full use of light, air circulation, creating conditions for the acceleration of transpiration processes in the leaves, the formation of generative organs, the convenience of handling trees, the convenience of combating diseases and pests, and finally the convenience of harvesting [2].

Materials and Methods

During 2017-2019, scientific research on the selection of convenient and effective planting schemes in greenhouses for citrus plants grown in the climatic conditions of Uzbekistan was carried out in the central field section of the scientific research institute of horticulture, viticulture and winemaking named after Academician M. Mirzaev.

For the experiment, 3-year-old lemon seedlings were selected from the small "Meyer", medium-growing "Tashkent" and strong-growing "Yubileyniy" varieties, and planted in glass greenhouses in order to study their growth and development in different planting schemes in the following schemes:

Before planting the seedlings, a total of 864 m² of land allocated for the experiment in the greenhouse was leveled and 500-600 kg of humus (from 10 hectares), 500 g of superphosphate and 250 g of potash fertilizers were added and cultivated at a depth of 25-30 cm.

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A 50-cm hole was dug in the ground prepared according to research options, and during the planting of seedlings, 10 kg of humus, 100 g of superphosphate and 50 g of potassium fertilizer were added to each hole, and the seedlings were placed on it with the root neck 3-4 cm above the ground level. After the seedlings were planted, the area was compacted and 8-10 liters of water was poured for each seedling.

During the experiment, the growth and development of lemon seedlings planted in different schemes, phenological observations, biometric calculations, productivity and fruit quality level books were conducted.

During the phenological observations, the dates of planting lemon seedlings, the dates of awakening of growing and yielding buds, the dynamics of the growth of varieties, the dates of the formation of generative organs and the weight of the fruits formed on each bush, as well as their average productivity for three years, were calculated.

In the course of our research, we calculated the effect of planting schemes of lemon seedlings on the height and width of the seedlings, the ripening period of the crop, the number of harvests per bush and the productivity per hectare, and the data were processed using the method of dispersion analysis recommended by B.A. Dospekhov [1].

Results and Discussion

Observations indicate that the growth and development phases of lemon plant seedlings of small-sized, slow-growing "Meyer", medium-growing local Tashkent and strong-growing, local "Yubileyniy" varieties in the first and second years after planting the seedlings had almost the same development trend in all planting schemes. This indicates that they are biologically close to each other and that their developmental phases are the same.

Similarly, in the third year of the growing season, i.e., during the period of real yielding of seedlings, the yield in large (3.0x3.0 meters) and medium (3.0x2.5 meters) planting schemes of slow, medium and strong growing lemon varieties is 4.7 - It was observed that it increased by 5.5 times. In this case, the productivity in the planting scheme of 3.0 x 3.0 meters is 5.0 kg to 23.5 kg (4.7 times) in the slow-growing "Meyer" lemon variety, 19.2 kg to 90.0 kg in the medium-growing Tashkent variety. to (4.7 times), an increase from 20.0 kg to 104.0 kg (5.2 times) was observed in the strong-growing cultivar "Yubileyniy" (see Table 1).

Accordingly, in the planting scheme of 3.0x2.5 m, the yield of lemon per bush is from 4.6 kg to 25.0 kg (5.5 times) in the slow-growing small variety "Meyer". It was observed that it increased from 18.0 kg to 84.0 kg (1.6 times) in the medium-growing "Tashkent" variety, and from 18.0 kg to 100.0 kg (5.5 times) in the seedlings of the strong-growing "Yubileyniy" variety.

Similarly, the productivity in the schemes of dense planting of seedlings showed a decrease in productivity in seedlings of the medium and strong lemon variety compared to the small, slow-growing "Meyer" variety. In this case, the yield in the 3.0x2.0 m planting pattern increased from 4.5 kg to 25.0 kg (5.5 times) in the slow-growing lemon variety "Meyer", and from 18.6 kg to 52 in the medium-growing "Tashkent" variety. It was found that it increased up to 5 kg (2.9 times), and in the strong-growing "Yubileyniy" variety it increased from 18.0 kg to 67.0 kg (3.7 times).

Accordingly, in the planting scheme of 3.0x1.5 meters, the yield in the slow-growing lemon cultivar "Meyer" did not change significantly in subsequent years and increased from 4.5 kg to 24.5 kg (5.4 times), while the medium-growing "Tashkent" in the variety, the yield increased from 16.5 kg to only 37.1 kg (2.2 times), and in the strong-growing "Yubileyniy" variety, the yield increased from only 18.0 kg to 34.0 kg (1.8 times).

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Table 1 Determining the effect of different planting schemes on the productivity of lemon varieties, 2017-2019

Seedling planting schemes, m	Lemon varieties	Biometric calculations					
		Average productivity per bush, kg/bush				Average yield per hectare	
		2017	2018	2019	Average in 3 years	Number of plants, pcs	*tons/ga*
3,0x3,0 (control)	Meyer (growth rate)	5,0	16,0 3.2	23,5 4.7	14,8 3,0	1111,1	16,0-17,0
	Tashkent (growth rate)	19,2	68,0 3,5	90,0 4,7	59,0 3,0	1111,1	65,0-66,0
	Yubileyniy (growth rate)	20,0	81,0 4,0	104,0 5,2	68,3 3,5	1111,1	75,0-76,0
3,0x2,5	Meyer (growth rate)	4,6	17,0 3,7	25,0 5,5	15,5 3,4	1333,3	20,0-21,0
	Tashkent (growth rate)	18,0	52,0 2,9	84,0 4,7	51,3 2,9	1333,3	68,0-69,0
	Yubileyniy (growth rate)	18,0	77,0 4,3	100,0 5.5	65,0 3,6	1333,3	85,0-87,0
3,0x2,0	Meyer (growth rate)	4,5	18,0 4,0	25,0 5,5	15,8 3,5	1666,6	26,0-27,0
	Tashkent (growth rate)	18,6	49,0 2,6	52,5 2,9	40,0 2,1	1666,6	66,0-67,0
	Yubileyniy (growth rate)	18,0	62,0 3,4	67,0 3,7	49,0 2,7	1666,6	80,0-82,0
3,0x1,5	Meyer (growth rate)	4,5	17,0 3,7	24,5 5,4	15,3 3,4	2222,2	33,0-34,0
	Tashkent (growth rate)	16,8	36,5 2,2	37,1 2,2	30,0 1,8	2222,2	66,0-67,0
	Yubileyniy (growth rate)	18,0	33,5 1,8	34,0 1,8	28,5 1,5	2222,2	63,0-64,4

Therefore, the results of the research indicate that by densely placing seedlings in greenhouses, their feeding area will be reduced and their growth, development and nutrition will be limited in the following years, and as a result, the yield will decrease and the quality of the crop will change negatively.

Planting lemon seedlings in different planting schemes, on the one hand, seemed to increase the productivity of the number of bushes when densely planted, but it was found that their dense planting could have a negative effect on productivity in subsequent years. For example, when planting in a 3.0x3.0 m scheme, 1111 seedlings are planted per hectare, in a 3.0x2.5 m scheme - 1333 seedlings, in a 3.0x2.0 m scheme - 1666 seedlings, and when planted in a 3.0x1.5 m scheme - 2222 seedlings when planted in a dense scheme, the number of seedlings is 2 times more than the number of seedlings in a freely planted scheme, but in the following years, the productivity of the number of bushes will decrease, the quality of the harvest, the rapid spread of diseases and pests, and the life of the plant will be shortened.

Our research shows that the productivity of lemon seedlings planted in a dense scheme decreases over the years. The reason for this may be the narrowness of the feeding area of the seedlings, the lack of air circulation, the inability to fully use sunlight, and the difficulty of carrying out agrotechnical activities.

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Conclusion

In order to get abundant and high-quality harvest from the lemon grove for many years (30-35 years), it is necessary to choose the most optimal planting schemes depending on their growth strength and variety. 80.0-120.0 tons per hectare can be obtained through planting schemes of 3.0x3.0m for strong-growing varieties, 3.0x2.5m for medium-growing varieties and 3.0x1.5m for slow-growing small varieties.

In very dense planting schemes of seedlings (3.0x2.0m or 3.0x1.5m), one of the main factors of the plant's external environment - light, which is one of the main factors of the plant's external environment - reduces productivity, changes the quality of the crop, or shortens the life of the plant due to the reduction of the area of nutrition necessary for the plant.

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