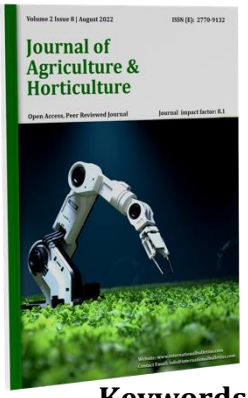


# INFLUENCE OF TREES PLANTING DENSITY ON PRODUCTIVITY IN INTENSIVE PEAR ORCHARDS

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**Abstract.** This article presents the results of scientific research aimed at determining the effect of planting density on the yield of pear trees grown on low-statured rootstocks. The study investigated the yield potential of pear varieties autumn Abbat Fettel and winter Devdji grafted on rootstocks of types BA-29 and A. The results demonstrated the relationship between planting density and the yield of these pear varieties.

**Introduction.** In countries such as China, the USA (California), Turkey, Serbia, Poland, Russia, and Japan, which are leading pear-producing nations, various improved techniques for tree spacing and shaping have been developed for super-dwarf, dwarf, and semi-dwarf pear orchards.

Tree spacing is a key factor in the development of intensive orchard systems. Such orchards should be viewed as a harmonious agrocenosis where all elements are integrated. Only with such an approach can we maximize the productivity of fruit orchards and ensure high-quality yields. Given the modern demand for intensive orchards that utilize land efficiently while ensuring high yields, the choice of the optimal planting scheme is one of the most important factors influencing the yield, tree shape, and management of fruiting through pruning and other agronomic practices [4; p.47-48]; [2; p.171-203]; [1; p.71-92]; [3; p.19]; [5; p.190-200].

**Materials and Methods.** The experiments were conducted at the "Horticulture and Viticulture" department, following a method developed for fruit tree research. Field experiments were carried out at the research and educational farm station of Tashkent State Agrarian University and the productive pear orchard of Leo Garden LLC. Biometrics were performed on 10 plants per variant, and the experiment was replicated four times.

The methodology for calculating the data and conducting phenological observations followed the guidelines of Kh.Ch. Buriyev and others in "Methods for experiments with fruit-bearing plants" (2014), and V.F. Moiseichenko's "Methodology for accounting and observation in experiments with fruit and berry crops" (1967). Statistical analysis of the experimental data was performed according to B.A. Dospekhov's (1985) method using analysis of variance.

**Results.** Our experiments aimed at determining the impact of planting density on the productivity of low-statured pear orchards showed that the highest yield in the autumn Abbat Fettel variety grafted on BA-29 rootstock occurred at a planting density of 3.5×1.5 meters. This resulted in a yield exceeding 18 t/ha from the fifth to the sixth year.

It is important to note that, although the yield per tree was higher at lower planting densities, the total yield per unit area tended to decrease due to the lower number of plants per hectare. Thus, the sparsest planting at 3.5×3.0 meters, while having the highest yield per

tree (16.4 kg/tree), had a total yield that was 7.1% lower than the 3.5×2.5 meters control variant.

The data indicate that increasing planting density results in a proportional increase in the yield of the autumn Abbat Fettel variety grafted on BA-29 rootstocks. The densest planting scheme, 3.5×1.5 meters, resulted in a yield increase of 12.5% over the control.

**Table 1**

Effect of planting density on the yield of six-year-old pear trees

| № | Yield | | | | | |
|---|---|---|---|---|---|---|
| | Abbat Fettel variety | | | Devdji variety | | |
| | per tree, kg | per hectare, t/ha | compared to the control, % | per tree, kg | per hectare, t/ha | compared to the control, % |
| on the Quince rootstock BA-29 | | | | | | |
| 3,5 x 3,0 | 16,4 | 15,6 | 92,9 | 17,2 | 16,4 | 94,8 |
| 3,5 x 2,5 – control | 14,7 | 16,8 | - | 15,1 | 17,3 | - |
| 3,5 x 2,0 | 12,8 | 18,3 | 108,9 | 13,8 | 19,7 | 113,9 |
| 3,5 x 1,5 | 9,9 | 18,9 | 112,5 | 11,2 | 21,3 | 123,1 |
| on the Quince rootstock type A | | | | | | |
| 4,0 x 4,0 | 25,1 | 15,7 | 98,7 | 26,2 | 16,4 | 98,2 |
| 4,0 x 3,5 – control | 22,2 | 15,9 | - | 23,4 | 16,7 | - |
| 4,0 x 3,0 | 20,4 | 17,0 | 106,9 | 21,7 | 18,1 | 108,4 |
| 4,0 x 2,5 | 18,1 | 18,1 | 113,8 | 19,9 | 19,9 | 119,2 |

It should be emphasized that the yield per unit area was inversely proportional to the yield of each tree, and as the plant density increased, the yield per tree increased. In this case, an inverse correlation (r = -0.89) was observed. For example, in a 4.0x4.0 m planting scheme, the total yield was 1.3% lower than the control, with the highest yield per tree. In contrast, in the densest 4.0x2.5 m scheme, the lowest yield per tree was recorded, but the highest total yield was obtained. In this experimental variant, the additional yield compared to the control was 13.8%.

Observations on the effect of different planting schemes on the yield of the winter Devdji variety of pear allowed us to identify a similar trend as observed in the autumn Abbat Fettel variety. In this pear variety, regardless of the grafting rootstock, when the planting density increased, the yield per tree decreased, while the yield per unit area increased. It is also worth noting that the data in the table allowed us to identify another important indicator. Regardless of the grafting rootstock and tree density, when comparing the two, the yield of the Devdji variety was significantly higher than that of the autumn Abbat Fettel variety. This can be explained as a characteristic biological trait of the variety.

**Conclusions:**

1. As the spacing between pear trees in rows increases, the average yield per tree also increases. For the BA-29 rootstock, yields ranged from 9 kg to 17 kg per tree, while for the A type rootstock, yields ranged from 18 kg to 26 kg per tree.

The highest yields per unit area were obtained from the densest planting schemes—3.5×1.5 meters for the autumn Abbat Fettel variety and 4.0×2.5 meters for the winter Devdji variety. These orchards achieved over 18-21 t/ha yields starting from the fifth year.

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