

Influence of resource-saving technologies, planting density, variety rootstocks on pear yield

Rustam Yunusov^{1,2}, *Laziz Yuldoshov*^{1*}, and *Makhhuba Ikramova*²

¹Bukhara State University, st. M. Iqbol 11, 200117 Bukhara, Uzbekistan

²Scientific Research Institute for Seed Breeding and Agricultural Technology of Cotton Growing, Bukhara Scientific Experimental Station, No. 309, B. Nakshband, 200100 Bukhara, Uzbekistan

Abstract. The Bukhara region has continental climatic conditions and a tendency to salinity. Growth, development, productivity and its quality in newly created dwarf intensive pear orchards under drip irrigation have been studied. 3 varieties were studied - Williams, Abbot and Carmen and 6 planting patterns (4.0 x 1.0 m, 4.0 x 1.2 m, 4.0 x 1.4 m, 4.0 x 1.6 m, 4.0 x 1.8 m, 4.0 x 2.0 m), with medium-sized rootstocks on dwarf trees using water and resource-saving technologies. The correct methods of forming and pruning dwarf pear trees have been determined. The selection of tree crowns using optimal methods of protection against complex pests and diseases has also received scientific justification. Due to the correct distribution of light along the branches of trees, the aeration of pear orchards improves, which causes significant processes of growth, development and accumulation of fruit elements. As a result, it was found that the yield of 3-year-old young intensive pear orchards grafted on a medium-sized rootstock Quince C1 with drip irrigation, water consumption decreased by 2 times compared to traditional irrigation, and the yield increased to an average of 1.6 kg per tree

1 Introduction

To increase the production of high-quality fruits, to intensify the horticultural industry and the use of new productive modern methods for the development of water and resource-saving technologies in the Republic of Uzbekistan leads to a sharp development of horticulture, to increase production to replace existing orchards.

It should be noted that a group of researchers in Uzbekistan and foreign countries conducted scientific research on methods of rejuvenation and normalization of pruning of apple tree branches and their influence on growth, development and productivity based on the study of the influence of apple varieties on the characteristics of various soil and climatic conditions, various scientific data were obtained and, in turn, scientific recommendations corresponding to each specific condition were given. These branches bear fruit, do not provide full opportunities for their rejuvenation cycles and normalization cycles and normalization of branches, the methods and levels of pruning activities have not

* Corresponding author: l.t.yuldoshev@buxdu.ru

been sufficiently studied in the soil and climatic conditions of Uzbekistan on a scientific basis.

Modern, continuous, rational and efficient use of such agrotechnical measures as the establishment of intensive dwarf orchards, with drip irrigation and fertigation, which give a plentiful and high-quality harvest, which is the imperative of the times.

In the Action Strategy adopted in the republic, special attention is paid to "the consistent development of agricultural sectors, strengthening the country's food security, increasing the production of environmentally friendly products, and significantly increasing the export potential of the agricultural sector." [1-3].

The essence of this topic lies in the fact that while increasing the productivity of young intensive orchards associated with vegetative medium-slow-growing rootstocks, maintaining new high-yielding competitive varieties of intensive type based on water and resource-saving technologies and creating a new modern orchard that gives a consistently plentiful and high-quality harvest, is one of the most important factors. It should be noted that in the field of horticulture and viticulture of the Bukhara region.

Modern pedagogical methods were used to study the impact of intensive growth of pear trees, development and productivity, water and resource-saving care technologies, planting density, variety-rootstock combinations with the full use of technologies aimed at a sharp increase in productivity, pear orchards and obtaining a quality crop [3-12].

It should be noted that the density of seedlings in variety-rootstock combinations, differing in biological characteristics, significantly affects the ability to fruit formation, yield and quality of pear fruits.

The relevance of this scientific article lies in the fact that the rootstock of medium-slow-growing pear trees, that is, intensive, dwarf, in intensive pear orchards, grafted on quince C1, dramatically increases the yield and quality of fruits of pear trees, competitive in quality of pear fruits that meet world standards. The main tasks are the creation and maintenance of orchards based on water- and resource-saving innovative cultivation technologies, their timely and effective protection from harmful organisms [5,6].

2 Materials and methods

In the course of the experiment, the generally accepted methodological guidelines developed at the All-Union Research Institute of Horticulture [13-15] for the studied pear varieties were used, they determined photometric indicators, light and photosynthetic productivity, yield and its quality indicators. The obtained scientific data on productivity were analyzed based on B Dospekhov's manual "Methodology of field experience"[16].

This study was conducted in 2020-2022 in the horticultural farm of «Siyovush Agro» LLC located on the territory of the Bogi Kalon MSG, Bukhara district. The soils of this farm are old-irrigated pasture-alluvial and have unique features of the morphological structure and characteristics, water, physical and nutritional regimes.

The climate of the Bukhara region is sharply continental, with an average annual rainfall of 125-175 mm, dry and cold winters, with an average temperature of 4.0 ° C to -13 ° C. The average relative humidity is 40-60% [3].

The object of the study is varieties with different biological characteristics, indicators of growth, development and yield of dwarf pear varieties - Williams, Abbat and Carmen, which are grafted with a medium slow rootstock Quince C 1.

Planting scheme 4.0x1.0 m, 4.0 x 1.2 m, 4.0 x 1.4 m, 4.0 x 1.6 m, 4.0 x 1.8 m and 4.0 x 2.0 m, located in the garden. With intensive care for dwarf trees, pear branches are thinned out and formed from 2-3 main trunks. On the area of 50 hectares of irrigated land in the horticultural farm of «Siyovush Agro» LLC, pear varieties Williams, Abbat and Carmen

are grafted with a medium- slow-growing rootstock Ivy C 1, and these pear orchards are grown based on innovative technologies that will save water resources.

3 Research results

The studies were carried out during 2020-2022 in the horticultural farm of «Siyovush Agro» LLC on dwarf pear varieties Williams, Abbat and Carmen, slow-growing rootstock Quince C 1. The main goal of the research is to study and implement the most optimal care factors in intensive dwarf pear orchards - grafted on vegetative rootstocks of varieties Williams, Abbat and Carmen, planting densities and variety-rootstock combinations with innovative water and resource saving technologies.

The maintenance of this horticultural farm of «Siyovush Agro» LLC, i.e. the procedure for planting seedlings, tillage, formation and pruning of young trees, watering, top dressing, disease prevention and pest protection, is organized on a scientific basis, intensive dwarf pear orchards are growing rapidly, are aimed at obtaining a high plentiful and high-quality harvest using water- and resource-saving technologies. It should be noted that the maintenance of agricultural machinery is carried out on time and at a high level.

The Williams pear variety was created in Western Europe, entered in the State Register of the Republic, medium-sized, the fruits ripen in the first decade of August. The height of the tree is on average 5-4 m, it is harvested in the fourth year after planting in the garden. Productivity -138.9 c/ha, maximum yield -232.9 c/ha. The fruit is elongated pear-shaped, the surface is rough, and the skin is thin, shiny, waxy-orange when ripe, with small dots. The average fruit weight is 140 gr. The flesh is tender and the taste is very good.

The size of the fruits of the Carmen variety is large in appearance, it is considered an aromatic variety, the size of the fruits is large, 180-200 gr. Productivity is high, 220-240 c/ha, sweet taste, good appearance, well stored in winter, resistant to diseases and pests.

Abbat - a variety of Turkey, seedlings were brought from Turkey and planted in the garden, late variety, yellow, long, pitcher-shaped, resistant to diseases and pests, belongs to the category of high-yielding varieties, on average, from one hectare of the garden gives 180-210 centers, fruits well-kept in the winter.

Quince C1 is a medium-sized pear rootstock. Saplings (quince) are propagated by seeds and vegetatively (cuttings and offspring). Physiological incompatibility with some pear varieties has also been observed. Pear varieties - Williams, Abbat and Carmen, grafted with Quince C1, grow and develop well - This rootstock is also recommended as the main rootstock for dwarf pear varieties.

In addition, the soil and climatic conditions of the «Siyovush Agro» horticultural farm are fully suitable for the growth, development and formation of the crop of pear varieties grafted on vegetative rootstocks, which is fully compatible with an increase in the productivity of intensive pear orchards and brought to large areas of cultivation of dwarf pears.

The soil of the MSG “BoGi Kalon” of the Bukhara region is among the average indicators, where the amount of humus at a depth of 0-85 cm is 0.7332-0.7708% and the indicator is low for this category of soils.

With the use of drip irrigation and the simultaneous implementation of a comprehensive protection of dwarf pear varieties from pests and diseases during the growing season, they are constantly carried out with the participation of experienced agronomists and scientists working directly in the horticultural sector of "Siyovush Agro" LLC. This factor is the main guarantee for obtaining an abundant and high-quality fruit crop.

It should also be noted that favorable conditions for the growth, development and formation of the crop occur in medium- low-growing rootstocks in intensive pear orchards. In dwarf pear trees, growth is low, i.e., connected with medium-sized rootstocks, the

substances resulting from assimilation are used to a greater extent for the formation of pear fruits, relatively (in the body) it ensures the formation of fruit growth organs and their formation in greater density branches. In addition, in these varieties of pear, the average weight of the fruit of a tree growing on a dwarf rootstock is 3.5-4.0 times greater than that of other rootstocks.

As a result of the research, it was found that during the growing season, pear trees were watered with drip irrigation as a water- and resource-saving technology, in which water consumption is reduced by 2-3 times. The advantage of drip irrigation is that it directs water to where the tree needs it, resulting in a significant reduction in soil surface salinity [8,9].

Nitrogen-220-250 kg/ha, phosphorus-180-200 kg/ha and potassium 45-60kg/ha are applied per hectare of intensive dwarf pear orchards. The main part of the fertilizer is given in the form of an aqueous solution with water during the growing season. Comprehensive measures are taken regularly and in a timely manner to protect trees in the experimental garden.

Studies conducted in pear orchards during 2020-2022 show that the formation and pruning of branches and growth of pears improved their early entry into the crop, the formation of crop elements, and the growth of harvested pear fruits. The growth of the tree trunk as a result of a sharp decrease in the rate of bud swelling is a sign that pear trees began to form fruit buds [2, 5].

In order to comprehensively study the growth, development and productivity of pear trees in young intensive orchards, experiments were conducted on a science-based basis of dependence on water and resource-saving technologies in the farm of Siyovush Agro LLC in 2020-2022. It should be noted that the optimal structure of young pear trees, foliage and light processes were determined. In 2020-2022, in varieties Williams, Abbat and Carmen in intensive pear orchards, it was revealed that in 2020 the light regime was high in young pear trees, we honor the crowns by an average of 70-85% compared to an open area, during 2021 this indicator decreased to 4-6%.

It should be noted that the percentage decrease in illumination in this order does not affect the growth of young pear trees and the formation of crop elements, even in 2022 these indicators created positive conditions for the growth of fruit buds and crown productivity.

It should be noted that during 2020-2022. Growth, development and increase in yield of pygmy pear trees in sodas in varieties Williams, Abbat and Carmen grafted on the rootstock Quince C1 in the farm of Siyovush Agro LLC is in a normal state.

Pear trees grafted on a medium-slow growing rootstock Quince C 1 in pear orchards with water and resource-saving care, contributed to the optimal growth of trees, the formation of crop elements, a stable and high-quality crop. The following integrated nutrient regimes and scientifically based tree protection measures are being implemented:

- March 20, 2021-2022 sprayed Alfasatil 1 kg, Magietro-500 g and the mineral element boron 1 l per 1 ton of water on the leaves of pear dwarf trees;

- April 1, 2021-2022 - introduced sulfate-ammonia fertilizer at the rate of 20 kg/ha for pear trees by drip irrigation;

- 04/15/2021-2022 Alfasatil 2 kg/ha, zinc 9% 1 l, manganese -1 l, deltamethyl 1 l, dissolved in 1 t of water and sprayed with pear leaves;

- May 1, 2021-2022 the pear was sprayed with the drug. Maestro 50 g, Alfasatil 1 kg, Multimen 1 kg, dissolved in 1 ton of water.

- June 1, 2021-2022 the plant was sprayed with calcium 2 l, Sipergan 2 l, ammonium nitrate 1 l.

From the results of the experiments, it was clear that in the studied varieties Williams, Abbat and Carmen in 2020, that is, in the first period of growth after planting trees, the

illumination in the lower part, where the branches are located, was -56%, and in the upper part -72%. In 2022, because of the optimal growth of dwarf pear varieties, the percentage of tree illumination decreased by 3-5%.

Table 1. Productivity and average weight of one fruit of dwarf pear trees in Siyavush Agro LLC, Bukhara region (2021-2022).

№	Food area, m	Variety and rootstock	Weight of one fruit, gr.	Productivity, centner/ha
1	4.0 x1.0m	Williams, Quince C ₁	110	50-62
2	4.0 x1.2m	Williams, Quince C ₁	126	85-100
3	4.0 x1.4m	Williams, Quince C ₁	130	102-115
4	4.0 x1.6m	Williams, Quince C ₁	118	80-82
5	4.0 x1.8m	Williams, Quince C ₁	120	83- 88
6	4.0 x2.0m	Williams, Quince C ₁	122	88- 90
	Lsd ₀₉₅ =			4.5
	E _A % =			2.4

Table 1 shows data on the productivity and weight of one fruit of pear trees of the Williams variety grafted on a medium-sized rootstock Quince C₁.

From table 1 it can be seen that among the studied of the 6 variants in different planting densities, the yield and weight of one fruit compared to the control and test variants, the differences were respectively higher by: 26g-38c/ha; 20g-53c/a; 18g-20c/ha; 10g-26c/ha; 12ga-28c/ha. From the above data, it was established that in the intensive pear orchards of «Siyavush Agro» LLC, the most acceptable planting densities of fruit pear trees turned out to be 4.0x1.2 m and 4.0x1.4 m, which contributed to the uniform penetration of the sun's rays inside the crowns, which led to an improvement in photosynthesis and meral nutrition, increase yields with good qualities.

For intensive pear trees, optimal planting density, selection of productive variety-rootstock combinations, correct formation of trees, taking into account biological characteristics, pruning methods and when introducing trees, uniform distribution of sunlight to the internal parts of the tree, the process of assimilation in the leaves led to moderate and good growth of pear trees.

4 Summary

It should be noted that the correct methods of shaping and pruning dwarf pear trees, the optimal combination of varieties and rootstocks, the use of reasonable integrated pest and disease protection for fruit crops contributes to the correct distribution of sunlight on the branches of trees. Improves aeration inside the crowns of pear orchards, tree growth and fruit formation. Ultimately, the study found that in 2022, the productivity of 3-year intensive pear orchards increased to an average of 1.6 kg per tree.

It should also be noted that in intensive dwarf pear orchards in the Williams, Abbat and Carmen varieties, it is necessary to select medium and low-growing rootstocks grafted onto Quince C₁. It is necessary to carry out complex agrotechnical measures such as: integrated protection of fruit trees from pests and diseases, when using drip irrigation, introduce organo-mineral supplements, increase special attention to the biological properties of pear varieties and use innovative modern technologies that give high efficiency, lead to a sharp increase in the profitability of pear fruit production. Drip irrigation enables more efficient use of water, reduces water consumption by 20 to 80% compared to other irrigation methods.

Reduces the amount of moisture evaporated from the soil surface, and there is no secondary salinization of the soil.

There is no surface runoff of water and its infiltration into the deep layers of the soil.

It will limit the development of weeds of cultivated plants in the struggle for water.

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