THE INTENSIVE PRODUCTION SISTEM OF TABLE GRAPES ON THE PERGOLA SISTEM vs THE TRADITIONAL TRELLIS SISTEM

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Abstract: *In the Republic of Moldova, viticulture holds significant economic importance, and methods of producing table grapes have evolved and diversified over time. A crucial aspect of this evolution is the implementation of intensive production systems like the pergola system, as opposed to traditional methods such as the standard espalier system. Intensive table grape production using the pergola system has gained popularity due to its efficiency in space utilization, optimization of yield, and ability to produce superior quality grapes. Compared to the standard espalier system, which involves vertical vine growth, the pergola system offers better sun exposure, improving the quantity and quality of fruit. This paper focuses on comparing the intensive table grape production system using the pergola system to the standard espalier system in the Republic of Moldova. We will explore the benefits and challenges associated with each system, the impact on yield and the quality of the harvest.*

Key words: *Pergola system, espalier system, grapevine, productivity, effectivness.*

INTRODUCTION

The Republic of Moldova, renowned for its picturesque landscapes and rich viticultural tradition, is a well-known destination in both the wine and table grape production worlds. In our country, viticulture is an integral part of its culture and economy, and vine cultivation systems represent an essential component in the process of producing quality wine.

Within Moldovan viticulture, two cultivation systems stand out: the trellis system and the pergola system (nowadays increasingly used in table grape growing). Each of these has distinct characteristics and specific advantages, adapting to the varied climatic conditions and terrains of the Republic of Moldova.

MATERIALS AND METHODS

The observations, records and analyzes related to the given article were carried out through various observations, measurements and determinations, which were then supplemented with laboratory chemical analyzes according to approved methods in viticulture. For a deeper argumentation of this process, it was necessary to carry out some physiological-biochemical, oenological and economic analyses.

Pergola vine cultivation systems are those in which the vine canopy is spread along a horizontal support instead of growing vertically along a trellis. The pergola system is the most widely used system worldwide for table grape production because it allows for the harvesting of more intact bunches, often larger and more uniformly colored, and it fits well with warm and arid climates, albeit with irrigation, which are usually the conditions under which grapes for fresh consumption are produced. [10].

RESEARCH RESULTS

In wine viticulture, pergola-type systems are relatively uncommon worldwide, except in Italy, some valleys in Argentina, and certain areas in China.

VINE ON PERGOLA SYSTEM: The trellis support system is a vertical-oriented plant support system: The vine is guided to grow vertically, attached to a wire network or a metal support. [2,4,12].

Guidance and pruning: Vine growth, similar to the pergola system, is controlled and directed through proper pruning of shoots and branches to achieve grape production and facilitate maintenance work Figure 1.

Figure 1. Vine on trellis support . Developed by the authors

Source: personal archive

Space efficiency: Through vertical vine guidance, this system allows for less efficient use of space but a higher planting density per hectare. [11].

Maneuverability and accessibility: Unfortunately, vines grown on trellis systems offer limited access for agricultural and harvesting work due to their vertical structure; grapes are often tangled between vines and wires.

Adaptability to various conditions: However, this support system easily fits different soil types and climates, being used in vineyard regions worldwide. [8].

VINE ON PERGOLA SYSTEM: Horizontal structure: The vine is cultivated on a pergola-type system, where the plant's canopy is stretched horizontally over a wire/mesh network or wood supported by posts.

Maximum sun exposure: The canopy stretched over a horizontal roof allows maximum exposure of leaves and clusters to sunlight, thus promoting photosynthesis and uniform ripening of grapes. [3, 4, 7].

Ventilation and aeration: The open space between the canopy and the ground ensures good air circulation in rows, reducing the risk of fungal diseases and promoting plant health.

Size, uniformity of clusters, and productivity: The pergola system allows for the development of larger and more uniform clusters due to uniform sun exposure and proper ventilation. Productivity within the pergola system is at least four times higher compared to the trellis system. Moreover, the quality obtained is vastly superior, enabling harvesting where 98% of the harvested grapes are packaged and sold directly to distribution networks.

Suitable for warm-arid climates: Pergola is ideal for regions with warm and arid climates, where adequate irrigation is necessary to maintain soil moisture and ensure consistent and high-quality grape production. [15, 17].

Pergola or trellis system? The optimal load of the vine or the fruit load - is the one that can ensure maximum yield without affecting the quality of the grapes (cluster weight, berry weight, uniformity, % dry matter). On the other hand, the final yield depends on two major factors: the use of active photosynthetic radiation (APR) and water availability.

Stoev's data shows that due to the solar energy utilized, in the conditions of the Republic of Moldova, you can obtain a potential harvest 20-30% smaller compared to plantations in Italy, California, or Turkey.

At the same time, the data demonstrates that with the use of active photosynthetic radiation (APR) - 0.5-1.0%, you can achieve a harvest of 10-12 t/ha (in the case of a vertical or horizontal trellis structure), and with APR 2-3%, you can reach 40-45 t/ha (which innovative Pergola structures can offer). [6, 9].

We can affirm that without an intensive Pergola-type structure and irrigation, we cannot plan for a harvest larger than 12-14 t/ha. However, with an intensive structure for table grape cultivation like Pergola, and depending on water availability and the possibility of fertilizing the plantation, we can achieve yields of 40-45 t/ha. [16, 9, 2].

Practical experiences conducted over the past few years have shown that in the case of the intensive Pergola system, water is used more efficiently: the temperature within the plantation during the day is much lower compared to the traditional system (21.5°C vs. 28.9°C), and consequently, evaporation is lower [5].

Therefore, intensive table grape cultivation systems like Pergola offer more advantages and possibilities compared to the traditional trellis system.

- more efficient use of active photosynthetic radiation;
- higher production potential;
- better grape quality (cluster weight, berry uniformity, more intense coloring);
- higher degree of ripeness of the production;
- more efficient water usage;
- increased ventilation, meaning a less favorable environment for disease and pests;
- possibility to avoid some phytosanitary treatments, providing a harmless product for consumers;
- easier maintenance work;
- easier harvesting;
- possibility to install anti-hail nets or rainproof film.

At the same time, there are some disadvantages compared to the traditional system:

- higher establishment costs;
- procurement or replacement of agricultural cultivation machinery and equipment.

The productive potential of the pergola system is higher (40-45 t/ha vs. 12-14 t/ha), and the active photosynthetic leaf area is greater due to the fact that we have 2 planes. The expenses are approximately twice as high. The Pergola system can be built as a standalone structure, with much lower costs.

If we are to talk about which would be more economically advantageous, then it's the Pergola system, which would ensure higher performance and could provide a potential yield increase of about 400% [10, 3].

Figure 2. The Pergola system. Developed by the authors

Source: personal archive

The Pergola system involves placing young shoots on a horizontal support system (wire mesh) at 2 meters height. The vine has a single vertical stem with 4-5 cordons, attached to the support and oriented towards the center of the row. The Pergola system has 2 planes and allows for a larger active photosynthetic leaf area. It can be open or closed-type Figure 2.

Farmers planning to plant grapevine varieties on these systems must opt for grapevine varieties resistant to winter frosts, and the plantation must be equipped with an irrigation system.

CONCLUSIONS

The conclusion on the topic "Intensive Grapevine Production System on Pergola versus Traditional Trellis System" emphasizes the significant advantages of the pergola system. It provides superior exposure to light and air, which considerably increases yield and grape quality. Although it requires higher initial investments and more complex maintenance, the benefits obtained justify these additional costs. The pergola system ensures more efficient photosynthesis and reduces the risk of fungal diseases due to better air circulation, resulting in superior-quality grapes. Additionally, this system promotes biodiversity and can contribute to the ecological sustainability of plantations. Choosing the pergola system is ideal for producers prioritizing quality and maximum yield, offering clear advantages in intensive vineyard management compared to the trellis system. In the Republic of Moldova, this table grape production system has been implemented relatively recently, for 8 years, and the results obtained prove to be very promising.

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