

INFLUENCE OF THE PROTECTIVE NETS ON FRUIT PRODUCTION IN MODERN ORCHARDS - A REVIEW

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Abstract

The protective nets and screens have become indispensable features in many fruit crops such as apple, cherry, kiwi, apricot, grapevine, and berries. Considering climate changes, the protective nets contribute both to creating a safe environment for plants by controlling hail and reducing wind, but at the same time they have an important role in reducing excessive solar radiation, pests attack, while maintaining a suitable microclimate for the crop. The net color and density influences most of the physiological processes in plant with important effect on growth, yield and fruit quality. The paper presents the main scientific results regarding the influence of protective nets on mentioned parameters.

Key words: protection system, anti-hail net, solar radiation, yield, fruit quality.

INTRODUCTION

Climate changes occurred as a result of human activities and are a worldwide problem (Klingelhofer et al., 2020).

Agriculture represents an indispensable sector in the country's economy (Tindeche et al., 2014), which is visibly affected under the conditions of climate changes (Alam, 2023).

New technologies have the role of combating or substantially reducing the factors that cause the crops depreciation and at the same time increase the plants productivity. By implementing them, farmers manage to successfully overcome the challenges that have arisen in recent years using environmentally friendly methods.

An important preventive measure used in the context of climate change is anti-hail/rain protection (Stewart and Ahmed, 2020).

This technology contributes both to the crop protection and the improvement of products quality, as well as to the reduction of solar radiation and the pest's development (Marinka, et al., 2015).

The need for the anti-hail net is primarily given by the plant's requirements as well as the crop area and the frequency of extreme weather phenomena, while the anti-rain screen is indispensable for crops with a high degree of perishability, due to fruit cracking incidence.

IMPORTANCE OF PROTECTIVE NETS. TYPES OF NETS

Anti-hail/anti-rain nets are designed to act as a barrier against hail or heavy rains, thus preventing the depreciation of crops and loss of production. They also have the role of reducing solar radiation, preventing frost, and controlling phytosanitary conditions (Oprea and Stănică, 2021). These nets can be used for a variety of crops, including fruits, vegetables, flowers and vines.

Currently, many types of protection are used depending on the plant's requirements. The material, degree of permeability, colour, or texture are just some of the important factors in choosing the method of covering the crops (Castellano et al., 2008). Depending on the plant's needs, the protection material can be white/transparent (Iglesias and Alegre, 2006), yellow (Moura et al., 2022), green, grey, or black (Cugneto and Masoero, 2021), which influences the amount of light that reaches the plants foliage (Brito et al., 2021).

For such protection, the installation of a support system is indispensable. Anti-hail nets protect crops from hailstorms that can have devastating effects on both production and plants. At the same time, they reduce solar radiation, contribute to the improvement of production quality, control diseases and pests, and ensure a

favourable microclimate, thus increasing the lifespan of plants (Aoun, 2018).

On the other hand, to prevent frost and combat the adverse effects of rain, it is recommended to install protections made of plastic material (HDPE), with different densities and colours depending on the need. This also contributes to humidity control, disease prevention, increased production, and even reduced soil erosion. Being an impermeable material, it is also used when setting up a greenhouse (Ashok and Sujitha, 2021). In the case of species susceptible to fruit cracking or highly perishable species, especially cherries, rain protection is recommended to prevent the production loss (Grandi et al., 2017).

For both types of protection, it is necessary to periodically check the nets for any possible damage and repair the affected areas (<https://www.fruitsecurityholland.com/en/hail-rain-protection-collapse/l606c13>). Both types of nets are crucial for protecting crops against specific weather-related threats, ensuring better yield quality and quantity by mitigating the risk posed by hail, rain, and frost.

INFLUENCE OF THE PROTECTIVE NETS

The innovation and continuous improvement of anti-hail/anti-rain nets have provided farmers with a reliable means to protect their crops from some of nature's most unpredictable and destructive forces, ensuring more stable yields and contributing to global food security (<https://fruitgrowersnews.com/article/orchard-covers-netting-solutions-have-varied-impact>).

Studies show that crops such as cherries and berries require protection against rain due to their perishability, the risk of frost during the flowering period, and the risk of fruit cracking, while species such as apples, pears, grapes, and kiwis require protection against hail and wind due to their sensitivity to these elements and solar radiation (Oprea and Stănică, 2021).

Numerous research papers present the beneficial effects of protective nets as well as their influence on fruit quality, which are increasingly common in species such as apples (Bastías and Boini, 2022) and pears (Kiprijanovski et al., 2016). In 2006, a study carried out in an apple plantation demonstrated that the black anti-hail

net considerably reduced the solar radiation and positively influences the trees vigour, while the transparent net affected the fruits quality (Iglesias and Alegre, 2006). Another study conducted between 2019-2021 demonstrated the effectiveness of combined anti-hail and anti-rain nets against diseases and pests. The resulted system, called "Keep in Touch", tested in different apple orchards achieved a reduction of phytosanitary treatments between 70-85% (Boutry et al., 2022).

The impact of anti-hail nets was also demonstrated in grapevine plantations in South Brazil, with favourable results on production (Forte et al., 2022). In Romania, Mehedinți County, following a comparative study within a grapevine plantation, the results of using the anti-hail net regarding production safety were positive. However, the installation of the system required the application of a greater number of treatments against diseases in the covered vineyard (Mountain, 2018).

Kiwi is one of the species that requires anti-hail and anti-wind protection. Besides the physical protection of the crop, the net colour can directly influence the development of the plants. Basile (2008) states that the photo selective effect of the nets influences the vigour of kiwi plants as follows: the area covered with the blue net shows a decrease in the plant's vigour, while the red and grey nets stimulate their vigour. In the case of softwoods such as cherries (Børve and Meland, 1998) or apricots, rain protection is recommended (Oprea and Stănică, 2021). In Romania, at the Faculty of Horticulture in Bucharest, several cherry varieties are protected with anti-rain nets with positive effect on orchard protection against late frosts and on fruit quality, including cracking elimination (Oprea and Stănică, 2021).

CONCLUSIONS

Crop protection with anti-hail and anti-rain netting is an important investment for fruit farmers, ensuring their production throughout the growing season. Although the costs of the protection system are quite high, from an economic point of view, the crop is much more advantageous considering the high number of benefits.

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