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A Chardonnay study found one shade net cut 35°C heat spikes yet worsened sunburn.

Researchers in Chile said canopy treatments in east-west rows also altered grape chemistry, water status and light exposure.

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A new study published Thursday in the journal Phyton found that efforts to protect Chardonnay grapes from rising heat and sun exposure can produce mixed results, reducing some extreme temperature events while also changing sunburn risk and

grape composition in ways that matter for wine production.

The research examined how different canopy management methods changed the microclimate around grape clusters in east-west oriented Chardonnay rows during one growing season. The authors, a team of researchers from Chilean institutions, compared a photoselective black-white shade net, a conventional Raschel shade net, leaf removal, and untreated vines.

The study comes as Mediterranean-type wine regions face more frequent heat stress. According to the paper, higher heat and radiation are increasing the risk of berry sunburn and altering grape composition, a concern that is especially important for white varieties such as Chardonnay.

The researchers found that leaf removal sharply increased the amount of incoming photosynthetically active radiation, or light used in photosynthesis, reaching levels 124.0% higher than under the conventional Raschel net, 112.6% higher than under the black-white photoselective net, and 80.9% higher than in the untreated control.

That result showed how strongly leaf removal opened the canopy and exposed grape clusters to light. But greater exposure did not translate into a simple benefit. The paper reported that the black-white photoselective net removed afternoon temperature events above 35°C, suggesting that it was effective at limiting the most intense heat spikes around the fruit. Even so, that same treatment produced the highest sunburn severity among the tested options.

That contrast was one of the main findings of the study. A practice that reduced the frequency of extreme heat did not necessarily reduce visible damage to the berries. The authors said this underlined the need to tailor canopy and shading decisions to row orientation and local vineyard conditions instead of treating any single intervention as a universal fix.

The work also found differences in vine water status and in amino acids in the grapes, which are nitrogen-related compounds that can influence fruit chemistry and may later affect must composition and fermentation in winemaking. Leaf removal produced the highest stem water potential values in the vines and increased the concentration of

proline in the grapes.

The conventional Raschel net, meanwhile, reduced arginine concentration in the berries compared with all other treatments. It also increased serine and histidine concentrations relative to both the untreated control and the black-white photoselective net, although those two amino acids did not differ significantly from the leaf-removal treatment.

The paper did not present these shifts as inherently good or bad across all production goals. Instead, it described them as evidence that shading and canopy interventions can alter not only the vineyard microclimate but also grape metabolism. For growers and wineries, that means choices made to protect fruit from heat may also shape the chemical profile of the harvested grapes.

The study focused on east-west row orientation, an important detail because fruit exposure can vary sharply depending on how vines are planted in relation to the sun. The authors said this factor should be considered when choosing adaptation strategies. In practical terms, a tool that works well in one vineyard layout may produce different results in another.

The findings could be especially relevant for the beverage sector as producers look for ways to maintain grape quality under hotter conditions. Vineyard managers are increasingly testing shade materials, leaf removal timing, and other canopy practices to limit sun damage without creating unwanted effects on ripening or fruit composition. Research like this may help guide future vineyard protocols, particularly for white wine grapes that can be sensitive to heat and direct radiation.

The article was received by the journal on July 4, accepted on August 24, and published on September 24. It appears in a special issue focused on the molecular and physiological mechanisms involved in berry development and fruit quality.

The authors said their results show that shading nets and leaf removal do not act in the same way. Each treatment changed light exposure, extreme heat frequency, vine water status, and amino acid metabolism differently. In Chardonnay vines grown in east-west oriented rows, the study suggests that reducing heat exposure alone is not enough to predict whether berries will avoid sunburn or maintain the same composition as

untreated fruit.