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Winter warming may alter phenological traits in blackcurrant

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As a result of climate change, temperate winters are becoming progressively milder with an increased risk of warm spells. Phenological traits in temperate fruit crops are triggered mainly by temperature and milder winter weather is therefore likely to induce changes in a number of events; including cold acclimation, dormancy, deacclimation, bud break and flowering. Blackcurrant (*Ribes nigrum* L.) is an important fruit crop in temperate regions. Many blackcurrant cultivars have a relatively high chilling requirement, and insufficient winter chill may therefore become more prevalent in these. Moreover, milder winters have been proposed to delay cold acclimation, affect the maximum level of freezing tolerance and accelerate the deacclimation process.

This research studied the consequences of slightly elevated temperatures during the winter season on freezing tolerance, dormancy release, carbohydrate metabolism and cropping performance in blackcurrant cultivars ‘Narve Viking’ and ‘Titania’. The plants were exposed to ambient temperatures or temperatures raised by on average 0.76 °C during the winter season.

Winter warming had no effect on dormancy release in Titania, but it significantly advanced leaf unfolding and flowering. In contrast, warming delayed breaking of dormancy in ‘Narve Viking’ with no effect on bud break and flowering, suggesting that ‘Narve Viking’ received insufficient winter chill, and that a delay in dormancy release counteracted the effects of increased temperature on spring phenology. In both cultivars, winter warming caused a significant reduction in fruit yield the following summer. The effect was most pronounced in ‘Narve Viking’, suggesting that the yield reduction was due to the decline in winter chill and the delay in dormancy release. Elevated temperatures significantly reduced freezing tolerance during acclimation in ‘Narve Viking’ and during deacclimation in ‘Titania’, indicating that winter warming has a greater effect on freezing tolerance during cold acclimation and deacclimation than mid-winter.

Following leaf fall, starch concentrations in the buds decreased while the concentrations of soluble carbohydrates increased, indicating starch-to-sugar conversion during acclimation. Shortly before budburst, starch was resynthesised. Interestingly, winter warming significantly increased the bud concentration of glucose and fructose in both cultivars, and decreased the sucrose concentration in ‘Narve Viking’, indicating that warming induced breakdown of sucrose to hexose sugars.

It was found that a modest temperature increase during the winter season may adversely affect the production of blackcurrant cultivars with a high chilling requirement, but different cultivars exhibit differential tolerance to winter warming.

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