

microclimate data will be summarized. All of the 15 anthocyanins previously reported in 'Merlot' grapes accrued in all clusters, indicating no accumulations were terminated from light exclusion during ripening. Overall, both LE and ALE clusters accumulated less anthocyanins (86.8 mg of malvidin-3-glucoside/100 g berry) than controls (160.2 mg of malvidin-3-glucoside/100 g berry). The proportions of the individual anthocyanins were altered by light exclusion. The ALE clusters had the least total anthocyanins (75.4 mg of malvidin-3-glucoside/100 g berry), but more % acylated anthocyanins (52% of the total) compared to the other treatments (CS-36%, CE-37%, and LE-42%). This work contributes toward our growing body of knowledge on environmental stresses and anthocyanin development in fruit.

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### **(189) Effect of Temperature on Growth and Metabolism of *Dendrobium nobile* Lindl.**

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Effects of temperature on growth and physiological metabolism of 1- and 2-year-old seedlings of *Dendrobium nobile* were measured. *Dendrobium nobile* seedlings were planted in the environmental controlled growth chambers at 4, 15, 25, 35, and 45 °C. The content of malondialdehyde, soluble sugar, free proline in leaves and shoots, and the activities of POD, SOD, and CAT in leaves were measured after growth for 20 and 40 d, respectively. The results showed that the content of MDA, soluble sugar, and free proline for 1-year-old leaves were 0.13  $\mu\text{mol}\cdot\text{g}^{-1}$ , 2.25  $\mu\text{mol}\cdot\text{g}^{-1}$ , and 58.4  $\mu\text{g}\cdot\text{g}^{-1}$ , respectively. The plant height was 3.100 cm taller at 25 °C than that of other treatments at 20 d. Activities of POD, SOD, CAT in leaves had a little change with the extension of time. Plants were stressed more or less at 4, 15, 35 °C. There was a negative correlation between the MDA and plant growth (height,  $P = 0.961$ ). The results of 2-year-old seedlings had the similar trend as that of 1-year-old seedlings. The resistant physiological index decreased with prolonging planting time (except soluble sugar). The optimum temperature for growing 1- or 2-year-old seedlings of *D. nobile* was 25 °C.

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### **(191) Heat Shock Induces the Accumulation of Phenolic Compounds and Antioxidants in Kale Sprouts**

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Environmental factors are known to induce the accumulation of various health-promoting phytochemicals including phenolic compounds in vegetables. The objective of this study was to determine the effect of heat shock treatment on the concentration of phenolic compounds and antioxidant capacity in kale sprouts (*Brassica oleracea* var. *onika*). Kale sprouts grown under an auto-sprouter for 4 d were soaked at 50 °C water for 10, 20, 30, 45, or 60 s. After the heat shock treatment, the sprouts were transferred to normal growing conditions (20 °C, 100  $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ , 12-h photoperiod) and recovered there for 3 d. Total phenolic concentration, antioxidant capacity, and fresh and dry weights of the sprouts were measured before and after the heat shock. As a result, the heat shock treatment significantly maintained or increased total phenolic concentration in kale sprouts during the whole recovery period while the concentration of total phenolics in control gradually decreased in the process of sprouting. Especially, 20-s heat shock treatment or over showed at least 1.5× higher total phenolic concentration than control at 2 d after the shock treatment. The variation of antioxidant capacity in kale sprouts also showed similar trend with that of total phenolic concentration. There was a significant decrease in fresh weight of kale sprouts treated with heat shock compared with control. However, the extent of decrease was little and dry weight of kale sprouts soaked at the hot water was not significantly different from that in control. In conclusion, this study suggests that heatshock treatment using hot water would be a potential strategy to improve nutritional quality of kale sprouts by inducing the accumulation of phenolic compounds with antioxidant properties.

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### **(193) Long-Term Effects of Short-Term UV Exposure on Greenhouse Seedlings**

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Ultraviolet light in the 280–315 nm waveband (UV-B) is a documented stressor of plants. Several studies have documented