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Impacts of Extreme Heat on Blueberry

Northern highbush blueberry (*Vaccinium corymbosum*) is a commercially important crop in Washington and Oregon. Blueberry production is increasingly threatened by extreme heat, which encompasses periods of high air temperature and low humidity for several days. If unmanaged, extreme heat can result in damage that reduces crop yield and quality, and threatens grower profitability.

Extreme heat can cause leaf scorching (left) and fruit shriveling (right) Photos by Lisa W. DeVetter.

Direct damage

High temperature extremes can cause direct damage to plant tissues. Direct damage is more likely to occur when high air temperatures are accompanied by elevated solar radiation. Heat stress can limit the ability of plants to naturally cool themselves through **evaporative cooling**. Evaporative cooling is a process similar to sweating whereby water inside the plant evaporates out of leaf pores and cools the leaf. Extreme heat can cause leaf pores to close, which reduces evaporative cooling, increases leaf temperature, and can potentially reduce photosynthesis. When evaporative cooling is limited, direct damage can occur despite ample irrigation water to the root system.

Direct heat damage can occur to blueberry leaves, flowers, and fruits. **Wilting** occurs when leaves become flaccid due to poor hydration status. **Scorching** leads to leaves turning brown, yellow, or black. Blue fruits typically show signs of **spotting, sunken tissue, shriveling or wrinkling, and poor coloration** at 95 °F and higher, while green fruits can show similar symptoms at 90 °F and higher. Some fruit tissue may even die in a process called **necrosis**. Flowers can be directly damaged by high air temperatures, but thresholds have yet to be identified.

Indirect damage

Indirect damage occurs when physiological processes essential for plant growth and development are interrupted. Photosynthesis is one such process, wherein sunlight is converted into a form of chemical energy that is vital for plant growth. Photosynthesis in blueberry leaves declines when air temperatures exceed an optimum range of 68-77 °F, although there is some variation by cultivar. A **decline in photosynthesis** and chemical energy production can cause downstream **reductions in plant growth, yield, and fruit quality**.

Pollination, which is essential for most blueberry cultivars to develop quality fruits, can also be impeded by elevated temperatures. Pollination occurs when pollen grains move from one flower to another, and a pollen tube forms from the pollen grain to enable fertilization and seed production. When temperatures exceed 86 °F, pollen germination decreases. When temperatures exceed 100 °F for 4 hours, pollen germination and pollen tube growth are substantially and irreversibly reduced. **Reduced fertilization** can lead to cascading **reductions in fruit set, berry size, and yields**. Wild and managed pollinator insects that transfer pollen between plants may also suffer, as heat-damaged blueberry pollen has lower nutritional content. Finally, high temperatures can shorten the bloom period and make pollination more challenging if insufficient insects are available to pollinate the large quantity of open flowers.

References

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