USDA Northwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE
Agricultural Research Service
WASHINGTON STATE UNIVERSITY

Reducing Heat Damage in Blueberry

Northern highbush blueberry (*Vaccinium corymbosum*) is a plant known for its flavorful and nutrient-rich fruits. It is commercially grown in Washington and Oregon. Blueberry production is increasingly threatened by extreme heat, which occurs when air temperatures (above 90°F) and low humidity persist over several days. If unmanaged, extreme heat can result in damage that reduces yield, crop quality, and threatens grower profitability. The actions detailed below are potential strategies to adapt blueberry production to extreme heat.

Evaporative cooling

Evaporative cooling, also known as overhead cooling, is the practice of applying overhead water on the plant canopy using sprinklers at predefined temperature thresholds. Sprinklers can be run continuously until the desired air temperature is reached (which facilitates convective cooling), or in cycles (e.g., 20 minutes on, 40 minutes off) to reduce water use. Cycling or 'pulsing' has been effective at protecting blueberries in Oregon. Sprinklers can be installed in a way that is compatible with machine harvest and equipment.

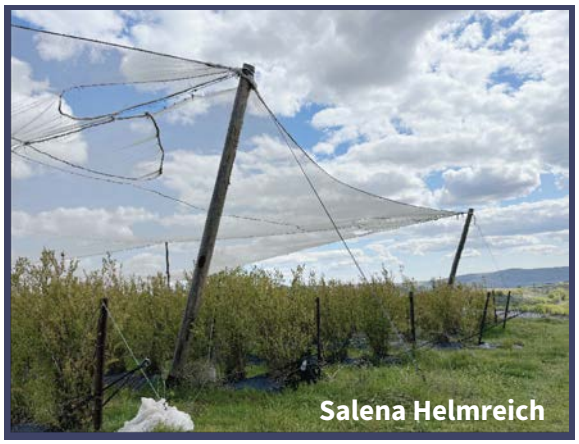
Applying evaporative cooling at lower air temperatures leads to excessive water use and may increase weed pressure as well as the risk of damage due to fungal diseases and slugs. Producers should consider the cost of sprinkler installation, as well as the estimated frequency of extreme heat occurrences in their location, to determine if evaporative cooling is the right strategy for them.


Bernadine Strik

When to use evaporative cooling:
Blooms: air temperature > 85-90°F
Green fruits: air temperature > 90°F
Blue fruits: air temperature > 95°F

Shade nets

Shade nets, or shade cloths, alleviate plant heat stress during periods of high air temperature and light intensity. Shade nets modify solar radiation without reducing the total daily hours of plant sun exposure. Nets vary in percent shade coverage based on their weave density. A 30-50% shade net is recommended for blueberry plants, while 75% or more shade can lessen fruit quality and floral bud development.


Salena Helmreich

Benefits of shade nets:
-Reduces sunburn, wilting, & sunscald
-Increases soil water retention
-Reduces water loss via transpiration
-Protects plants from extreme weather

Drawbacks of shade nets:
-More costly to install than sprinklers
-Requires reinstallation after 3-10 years
-May reduce pollinator activity if deployed during bloom
-May obstruct mechanical equipment
-Microclimate under shade may alter pest & disease pressure

Biostimulants

Also known as priming agents, biostimulants are commercially available products that may reduce heat damage by increasing the natural defense mechanisms of plants.

Biostimulants are generally formulated from organic materials like humic substances, algae and plant extracts, processed proteins and amino acids, or microorganisms.

Biostimulants have shown promise in model plant systems and with some commercial crops. However, the benefits of biostimulants on commercial blueberry farms remain uncertain. Additional research is needed to determine the effect of biostimulants on blueberry in Northwest growing conditions.

Conclusion

Evaporative cooling and shade nets are well established strategies to reduce damage due to extreme heat events and can complement breeding efforts to create more heat-resilient blueberry cultivars. Biostimulants also show promise but additional research is needed. When selecting a strategy, growers should carefully consider the costs and benefits of each approach within the context of their unique growing area and production system. Crop advisors and extension specialists can also be consulted to provide guidance on optimal heat mitigation strategies.

References

- Garcia-Salazar 2023. Protecting blueberry blooms from extreme heat injury using overhead irrigation. Michigan State University Extension.
- Isaacs et al. 2020. Hot weather causing rapid blueberry bloom. Michigan State University Extension.
- Lobos et al. 2013. Productivity and fruit quality of Vaccinium corymbosum cv. Elliott under photo-selective shading nets. Scientia Horticulturae.
- Milić et al. 2018. Bioregulators can improve fruit size, yield and plant growth of northern highbush blueberry (Vaccinium corymbosum L.). Scientia Horticulturae.
- Walters et al. 2024. Protecting blueberry bloom from extreme heat using overhead irrigation. Michigan State University Department of Entomology.
- Yang et al. 2019. Critical temperatures and heating times for fruit damage in northern highbush blueberry. HortScience.
- Yang et al. 2020. Thermal cooling with sprinklers or microsprinklers reduces heat damage & improves fruit quality in northern high-bush blueberry. HortScience.

Authors

Lisa Wasko DeVetter[1], Supriya Savalkar[1], Bhupinderjeet Singh[1], Micah Evalt[1], Pedro Rojas-Barros[1], David R. Bryla[2], Kirti Rajagopalan[1]
1: Washington State University; 2: United States Department of Agriculture Agricultural Research Service