High-intensity light promotes anthocyanin accumulation in rough bluegrass

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Anthocyanins, plant pigments known for their health-promoting properties, are in demand for medicinal and industrial uses. Anthocyanins have become sought-after natural products, but the small number of plants that naturally produce anthocyanins has limited their widespread use. Researchers at The Ohio State University say the results of their recent study (*HortScience*, September 2106) can help to increase the environmental and economic sustainability of anthocyanin extract production in turfgrasses such as rough bluegrass.

Scientists Dominic Petrella, James Metzger, Joshua Blakeslee, Edward Nangle, and David Gardner said that nonconventional plants such as turfgrasses may be one way to meet the increasing demand for anthocyanins. "The anatomy and perennial nature of turfgrasses make them attractive anthocyanin production systems," explained corresponding author Dominic Petrella. "Rough bluegrass (*Poa trivialis* L.) is an attractive anthocyanin production system, since leaf tissue can be harvested while preserving meristematic tissues that allow new leaves to rapidly grow, thereby allowing multiple harvests in a single growing season and greater anthocyanin yields."

Light experiments were designed to determine conditions that favor anthocyanin synthesis in rough bluegrass. The scientists first evaluated whether treatment with high-intensity light could increase anthocyanin content, and then determined the wavelength(s) of light capable of upregulating anthocyanin synthesis to optimize light conditions. They also investigated the role of photosynthesis on anthocyanin production.

When exposed to constant high-intensity white light, rough bluegrass plants significantly increased anthocyanin concentration compared to untreated plants. Light-treated plants exhibited an average 117.64-fold increase in anthocyanin content, and accumulated anthocyanins in both leaf blades and sheath tissue. "Our data show that the anthocyanin content of rough bluegrass after high-light treatment is comparable to or greater than many common fruits and vegetables, particularly red leaf lettuce, and consists of the same anthocyanins," Petrella noted.

To determine the primary wavelength(s) of light responsible for upregulating anthocyanin synthesis, dark-grown and light-grown rough bluegrass seedlings were exposed to blue, red, and far-red LED light. Blue light, at intensities between 150 and 250 $mmol \cdot m^{-2} \cdot s^{-1}$, was the only wavelength that increased anthocyanin content. However, when red light was applied with blue light at 30% or 50% of the total light intensity, anthocyanin content was increased compared with blue light alone.

The authors said that a major advantage of using turfgrass for anthocyanin production is the ability to harvest leaves containing anthocyanin numerous times throughout a single growing season. Results from their first experiment showed that rough bluegrass plants maintain the ability to synthesize large quantities of anthocyanin over time, even after aggressive harvesting.

Further analyses showed that the use of turfgrasses over an entire growing season could potentially increase anthocyanin yield by two-fold over currently used plant sources. "These methods may help increase both the environmental and economic sustainability of anthocyanin extract production," the authors s

More information: *ASHS HortScience*: hortsci.ashspublications.org/c … t/51/9/1111.abstract

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