

**Title** Effects of copper-based fungicides on photosynthetic gas exchange and fruit quality of tart cherry

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### Abstract

Cherry leaf spot disease (CLS), caused by *Blumeriella jaapii* (Rehm) Arx, threatens tart cherry (*Prunus cerasus* L.) production in Wisconsin and the Great Lakes region of the United States. Copper-based fungicides are effective for controlling CLS and may be useful in managing fungicide resistance, but their application is often associated with leaf bronzing. Factors contributing to bronzing and its consequences for leaf photosynthesis and fruit quality were investigated.

In a growth chamber, tart cherry ('Montmorency') seedlings that had been sprayed with copper sulfate had higher leaf bronzing severity only when dew formation was induced on foliage. One-year-old potted trees were assigned to one of the following treatments: nonsprayed, copper sulfate, tebuconazole, trifloxystrobin, or chlorothalonil. Mean leaf net CO<sub>2</sub> assimilation ( $A$ ) and stomatal conductance ( $g_s$ ) did not differ among treatments. In an orchard, mature trees were sprayed with synthetic fungicides only, synthetic fungicides integrated with copper-based fungicides, or not sprayed. Bronzing symptoms were related with lower  $A$  (2007) and  $g_s$  (2007 and 2008) prior to fruit harvest, but not in late August or September (2005 to 2008). CLS leaf severity was related with lower  $A$  and  $g_s$  in 2007 when visible symptoms were most pronounced, but effects were either not observed or were diminished by the first week of September. In 2008, when visible CLS severity exceeded 20% of the leaf surface, a relationship with  $A$  and  $g_s$  was not observed. Cherry fruit fresh weight and soluble solids concentration (SSC) did not differ among the three spray programs on the first and final sample dates during stage III drupe development (2007 to 2009). Additionally, leaf bronzing severity had marginal (2007) to no (2008) effect on the fresh weight and SSC of mature fruit. While leaf bronzing was related to lower  $A$  and  $g_s$  prior to harvest, the effects on tart cherry fruit quality were minimal. Therefore, the previously demonstrated disease control of using copper will likely outweigh the risk of phytotoxicity.