



Viticulture, enology and marketing for cold-hardy grapes



Grape cultivar sensitivity to sulfur in North Dakota

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Background and Rationale: Elemental sulfur is the oldest known pesticide. It is widely used to control powdery mildew (*Uncinula necator*) in vineyards. Sulfur is a multi-site fungicide that is often used in spray programs to prevent the development of powdery mildew-resistance to the other single-site fungicides and because it is relatively inexpensive. Sulfur phytotoxicity depends on temperature, dosage and relative humidity after application. Grape cultivars differ widely in their susceptibility to sulfur. The objective of this study was to evaluate phytotoxicity of sulfur applications to hybrid cultivars.

Treatments: Thirteen hybrids were evaluated: Alpenglow, Baltica, Bluebell, ES 12-6-18, Frontenac, Frontenac Gris, King of the North, LaCrescent, Marquette, Sabrevois, St Croix, Somerset Seedless, Valiant. Sulfur was applied at the recommended application rate (200 g/100L) and twice the dosage (400g/100Lt) as wettable powder (Bonide, 90% a.i.). Plant were sprayed on both adaxial and abaxial leaf surfaces, until run-off, using a back-pack hand-pump sprayer applying approximately 600 ml per plant.

Methods: Fifty leaves and four fruit bunches were selected at random 12 and 24 days after application to assess toxicity incidence and severity. At all sampling times leaves and bunches were assessed using a 0 to 10 rating scale where 0 = 0%, 1 = 0.8%, 2 = 2.3%, 3 = 4.7%, 4 = 9.4%, 5 = 18.8%, 6 = 37.5%, 7 = 62.5%, 8 = 81.3%, 9 = 89.5% and 10 = 100% injure of the leaf area or bunch. Maximum and minimum daily temperatures (C) and rainfall (mm) were recorded using NDAWN (North Dakota Agricultural Weather Network).

Results: Sulfur phytotoxicity symptoms were from russetting or bronzing and dead spots or flecks on leaves, to dead areas between the veins of leaves. No symptoms were observed on fruit clusters. High concentrations (2X) of sulfur caused acute injury in the form of foliar necrosis, even after relatively short exposure duration. Baltica, Bluebell, King of the North and Sabrevious were sensitive to sulfur regardless of the dosage. In contrast, Alpenglow, Es12-6-18, Frontenac, Frontenac Gris, LaCrescent, Marquette, St Croix, Somerset Seedless, and Valiant were resistance to both the recommended and twice the recommended dosage. Leaf edges were curled and both abaxial and adaxial leaf surfaces had lesions in Sabrevious and Blubell. Phytotoxic symptoms were only visible on the abaxial leaf surface with King of the North. Leaf injury progressed with Baltica to the point where they abscised and started to fall to the ground at 20 days after spraying. However, this may have resulted from the shoot injury symptoms which appeared 15 days after spraying.