



Organic Fungicides on Hops

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Research was conducted at the UVM Horticultural Farm in South Burlington, VT to evaluate the effects of different organic fungicide treatments on hops. Cascade rhizomes were harvested on April 3rd, 2010, and planted in Fafard 2 potting mix on April 7th and 12th, 2010 before successful plants were transplanted into 1 gallon pots. The pots were arranged in a greenhouse in a randomized complete block design with three replications. Each pot received twice daily drip fertigation for 2 minutes at a time, at a rate of 17-4-17, 250 ppm N. Bines were trained to the height of the greenhouse, approximately 13'. Treatments were OMRI listed organic fungicides; Kaligreen (potassium bicarbonate soluble powder), Regalia (extract of *Reynoutria sachalinensis*), Sonata (*Bacillus pumilus* strain QST 2808), and JMS Stylet Oil (white mineral oil), as well as a compost tea and a water spray control. All treatments were applied using a backpack sprayer, and sprayed to the point of runoff. Compost tea was brewed following the guidelines of the Pennsylvania Department of Environmental Protection (<http://www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/tea/tea1.htm>) and applied at a rate of 91.5 gallons/acre. All fungicides were sprayed according to label specifications. Kaligreen was applied at a rate of 2.32 lbs/acre. Regalia and Sonata were each applied at a rate of 1.86 qts/acre. Stylet Oil was applied at a rate of 3.66 qts/acre. Fungicides were applied on a 10 – 14 day interval, depending on the weather.

The number of burrs per plant was counted, and phytotoxicity and mite damage were evaluated on a visual rating with a 0 – 10 scale, with 0 representing little to no damage, and 10 being complete decimation. All data was analyzed using a mixed model analysis where replicates were considered random effects. The LSD procedure was used to separate treatment means when the F-test was significant ($P < 0.10$).

Table 1. Effects of organic fungicides on hops.

Treatment	Number of burrs	Phytotoxicity	Mite damage
Compost tea	19.0*	3.22*	2.89*
Control	17.0*	2.39*	2.67*
Kaligreen	4.89	3.61	5.28
Regalia	9.78	2.28*	2.28*
Sonata	18.3*	2.94*	3.28
Stylet Oil	14.0*	6.78	6.22
LSD (0.10)	8.41	1.21	1.00
Trial mean	13.8	3.54	3.77

* Treatments that did not perform significantly lower than the top performing treatment in a particular column are indicated with an asterisk.
NS – Treatments were not significantly different from one another.

Compost tea resulted in the greatest number of burrs per plant, most likely due to the extra nutrients provided by the tea, but did not differ significantly from the number of burrs found on the Stylet Oil, Sonata, or water control treatment.

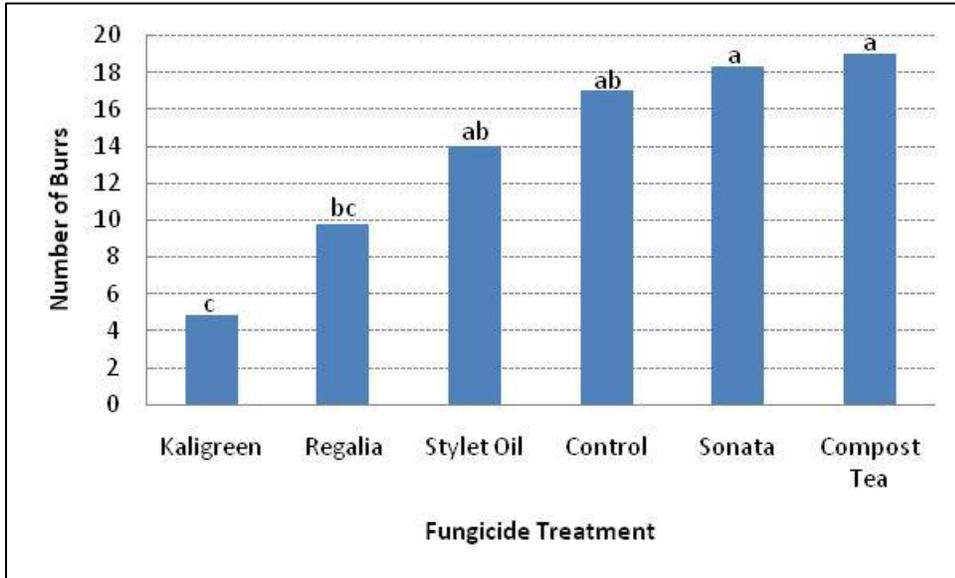


Figure 1. Effect of organic fungicides on burr development.

Stylet Oil had the most drastic affect, causing significant damage to the hop plant, resulting in chlorosis and leaf margin necrosis.

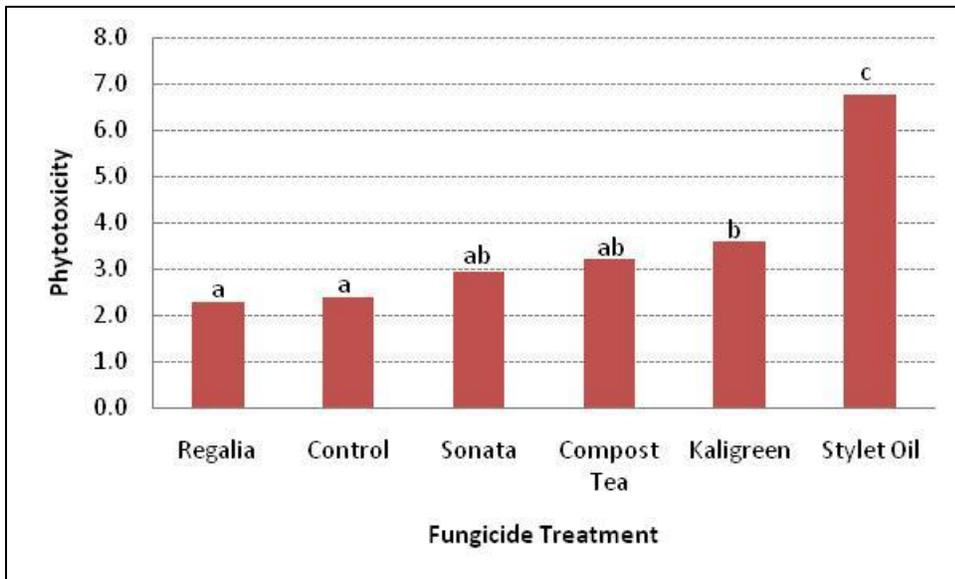


Figure 2. Phytotoxicity resulting from organic fungicides and mite damage.

It is well documented that some fungicides (sulfur and petroleum oils, for example) can have an adverse affect on the arthropod natural enemies of spider mites resulting in mite outbreaks. We certainly found this to be the case with this trial. Stylet Oil and Kaligreen had the most mite damage, whereas Regalia and compost tea had mite damage comparable to the control.

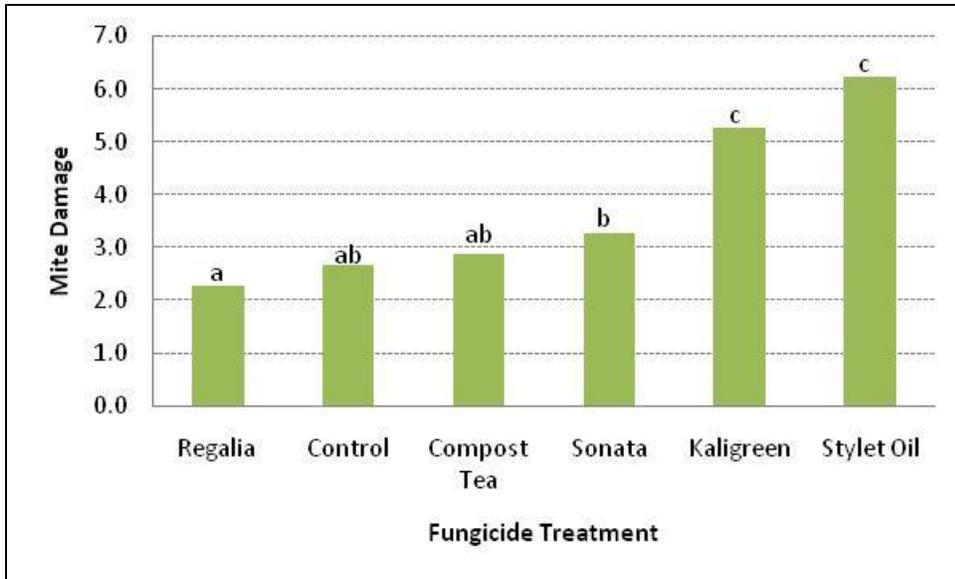


Figure 3. Mite damage as a result of fungicide treatments.

Please keep in mind that it is important to vary the type and mode of action of your chosen fungicide treatments in order to prevent disease resistance.