



Control of Powdery Mildew and Leaf Spot Disease Using Low Risk Pesticides

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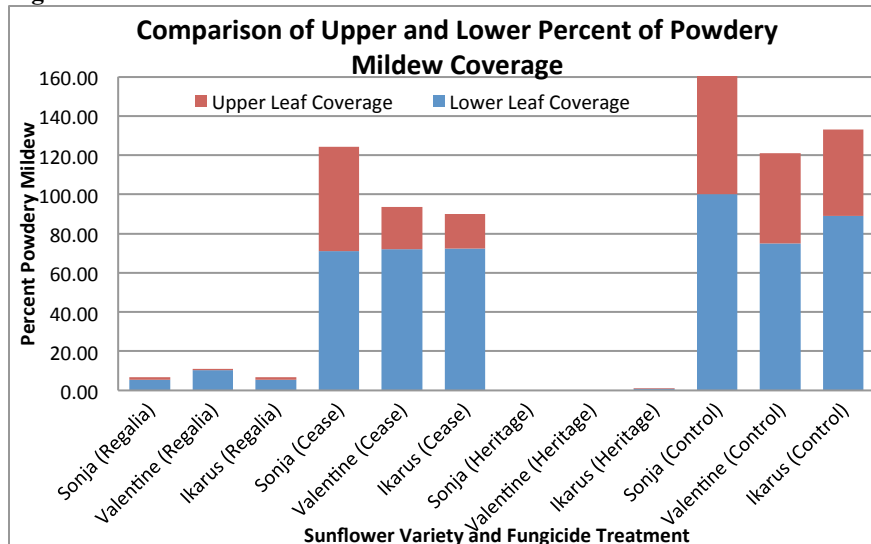
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This second year of research evaluated the effectiveness of certified organic, bio-fungicides for control of powdery mildew and leaf spot diseases on two cultivars of purple coneflower: *Echinacea purpurea* and *E. purpurea* 'Rubinstern', two cultivars of black-eyed susan: *Rudbeckia fulgida* 'Goldstrum' and *R. fulgida* 'Summer Blaze' and three cultivars of sunflower: *Helianthus annuus* 'Valentine', *H. annuus* 'Ikarus' and *H. annuus* 'Sonja'. Two low-risk, certified organic, bio-fungicides, Regalia and Cease were compared to a conventional chemical fungicide, Heritage, and a non-treated control. An additional component was added to the trial this year. The second component is testing the effectiveness of cranberry leaves as mulch for cut flowers and other perennials.

The two certified, organic bio-fungicides were chosen based on their reported differing modes of action. Cease contains a bacterium (*Bacillus subtilis* strain QST 713), that produces compounds that disrupt cell membranes, thus inhibiting the germination and growth of plant pathogens. Regalia contains an extract from giant knotweed (*Reynoutria sachalinensis*) and is reported to induce internal plant defense mechanisms, including production of cell strengtheners, antioxidants, phenolics, and pathogenesis-related proteins that inhibit plant pathogens. Heritage contains azoxystrobin, a commonly-used conventional fungicide that has a broad spectrum of activity against fungal pathogens, and has systemic and curative properties.

Trials were conducted during the summer of 2011 and 2012 at the University of Wisconsin West Madison Agricultural Research Station in Verona, WI. The weather conditions for the 2012 growing season were very hot, dry and sunny. In June the average temperature for the month was 82 °F and the total amount of rain that was received was 0.87 inches. In July, the average temperature was 88 °F with a total rainfall of 3.90 inches and August had an average

Figure 1



temperature of 80 °F with a total rainfall of 1.80 inches. Temperature charts show that June and July temperatures higher than optimum for growth of powdery mildew. August weather conditions were most favorable for growth of powdery mildew with lower temperatures and lower rainfall.

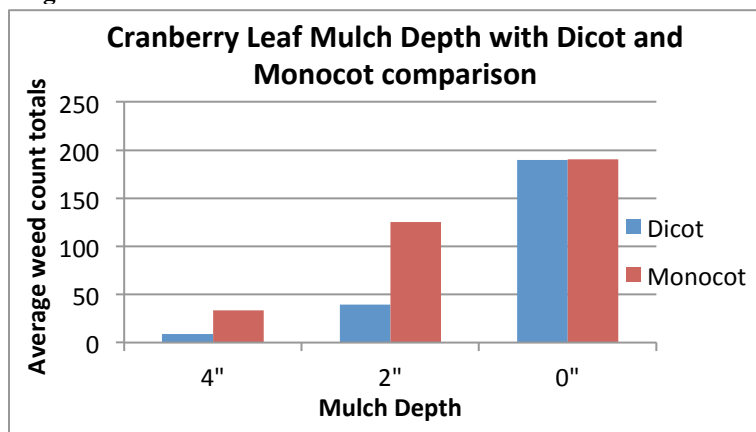
Data shows that powdery mildew developed on all the three cultivars of sunflowers (*Helianthus*) and none developed on the two species of *Echinacea* or *Rudbeckia* and

leaf spot was not detected on any of the three genera. When comparing data from 2011, the results are equivalent to the 2012 data in the amount of control each fungicide provided. The data show consistent results with the conventional fungicide Heritage providing the most control of powdery mildew, which was comparable to the organic fungicide Regalia. Cease provided less control than Regalia and performed comparably to the control plots. The control plots data showed infection of powdery mildew developing in late August or early September each year.

Early in the season, 100% of the *Echinacea* were infected with aster yellows, a virus that affects many plant species in the aster family. The virus stunted the growth, discolored the leaves and contorted the flowers; the plants were so stunted powdery mildew was impossible to detect.

The drought that occurred in June and July proved to be hard on all three genera. It was difficult to keep the plants well watered. We have purchased irrigation pipes that will be permanently set up in the study plots. The conditions of the location of the plot are very windy. As the sunflowers age and their size increases, many have been blown over or tipped to a degree that made it very difficult to spray and take accurate data. To correct this problem for the 2013 study the

Figure 2



sunflowers will be seeded in the greenhouse and planted in the plot late in June. This will provide healthy plants that are physically stronger during the time when powdery mildew infection occurs and data is being taken.

Cranberry Leaf Mulch Data

Cranberry leaf mulch was applied to 1/3 of all plots at depths of 2" and 1/3 of all plots to 4" inches, 1/3 of the plots were a non-treated control.

The cranberry mulch treatments showed significant differences in the number of weeds that were suppressed. As shown by the data, 4" and 2" mulch provided more weed suppression than the control. Figure 2 shows that the 4" controlled significantly better than the 2", and there was better control of dicot (broadleaf) weeds than monocot (grasses) in both the 4" and 2" depths and there were an equal number of dicot and monocot weeds that grew in the control sections. The smaller, slimmer grass-like blades appeared to penetrate through the small spaces between the leaves more readily than the dicot weeds.

In the untreated control sections, weeds established and grew quickly, making it difficult to get accurate weed counts. They reached heights that had the potential to alter the micro-climate and produce a more conducive environment for powdery mildew growth and made it difficult to take accurate data around the *Echinacea*, *Rudbeckia* and sunflowers. In order to correct this, at the end of July, the tallest weeds were pulled out from around the base of the *Echinacea*, *Rudbeckia* and sunflowers and on August 1st the weeds were cut to approximately 8" in height. This kept them from suppressing the plants of the fungicide study and retained the base of the weeds in the ground in order to continue taking weed counts. This is recommended for the 2013 season.

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