

Evaluation of products for the control of angular leaf spot in annual strawberry, 2014-15.

On 15 Oct 2014, bare-root plants from Canada were transplanted into raised beds fumigated with Telone C-35 (300 lb/A). The plants were irrigated by overhead sprinklers during the day for 10 days to aid establishment, then irrigated and fertilized through drip tape. The beds were 28 in. wide on 4-ft centers. On 22 Dec, selected plants were removed from the beds to form individual plots in a staggered arrangement. The plots were 9.6 ft long and contained 14 plants in two staggered rows 12 in. apart with 15 in. in-row spacing. Treatments were organized in a randomized complete block design with four adjacent beds constituting the blocks. Foliar treatments were applied with a CO₂ backpack sprayer delivering 100 gal/A at 60 psi through two TeeJet disc-core hollow cone nozzles spaced 12 in. apart on the boom. Drip (chemigation) treatments with Actigard and JC 9450 were applied through twin drip tapes in 5,450 gal water/A (0.5 gal per ft of bed). The tapes, each 11-ft-long with 12-in.emitter spacing, were placed next to each row of plants in a plot. Treatments were made weekly from 16 Jan to 13 Mar, 2014 (9 applications). To suppress fungal diseases, Captan 80WDG was applied weekly with a tractor-mounted hydraulic sprayer in 100 gal/A at 200 psi (1.8 lb/A in Dec and early Jan; 3.0 lb/A from mid-Jan to early Mar). Ripe and diseased fruit were harvested and graded twice weekly from 2 Feb to 19 Mar (13 times). Marketable fruit weighing more than 10 g each were counted and weighed to determine yield. During a 5-day period following the last harvest, 10 plants/plot were evaluated for angular leaf spot (ALS) by counting the number of leaflets per plant that showed significant symptoms of ALS i.e., were dead or more than 10% blighted. Yield and foliar disease data were analyzed by two-way ANOVA in SAS.

Because ALS was not found in the experimental area nearly two months after planting, artificial inoculations were carried out. On 22 Dec, two center plants in each plot were sprayed to run-off with a mixed inoculum of four *X. fragariae* isolates, each adjusted to 0.01 absorbance in 0.01M MgSO₄, using a Nanodrop spectrophotometer set to 600 nm. One week later, several small ALS lesions had developed on most, if not all, inoculated plants. The disease spread slowly to adjacent plants and throughout the plots, although a severe epidemic did not develop. At the end of the season, plots sprayed with Badge had the lowest number of ALS-diseased leaflets, although several treatments with the plant defense promoter Actigard reduced disease severity to equivalent levels. There were no significant differences between Actigard rates and application methods. However, foliar applications have consistently shown slightly better efficacy than drip applications in this and other experiments. Spray treatments supplementing Actigard with the biological products Actinovate or Taegro did not improve control over Actigard alone. In the ANOVA for yield, the treatment sums of squares term was not significant (P = 0.6225). It should be noted that the pinene-based spreader-sticker Nu Film P did not increase disease severity nor suppress yield in this experiment, while some non-ionic wetting agents have shown these effect in other trials. Plants treated with Badge showed mild leaf reddening indicative of copper phytotoxicity; plants in other treatments appeared normal.

Treatments (products and rates/A)	Application type	Yield (lb/A) ^z	Diseased leaflets ^y
Badge SC 1 pt	foliar spray	28646	6.6 a ^x
Actigard 50WG 0.375 oz	foliar spray	30163	7.6 ab
Actigard 50WG 0.5 oz	foliar spray	29645	7.6 ab
Taegro 4 oz + Actigard 50WG 0.5 oz	foliar spray	29964	8.3 ab
Actinovate AG 6.0 oz + Actigard 50WG 0.5 oz + NuFilm P 8 fl oz	foliar spray	29916	9.0 abc
Actigard 50WG 0.5 oz	drip ^w	29217	10.6 abcd
Actigard 50WG 0.75 oz	drip ^w	29163	11.4 bcd
Nu Film P 9.6 fl oz = 0.075% v:v	foliar spray	31099	11.6 bcd
Actinovate AG 6.0 oz + Nu Film P 8 fl oz	foliar spray	28770	13.5 cd
JC 9450 drip and 3 fl oz spray ^v	drip and spray	30056	14.2 d
Control	n.a.	29338	13.6 d

^z Treatment sums of squares for yield was not significant; therefore statistics for multiple mean comparisons are not shown.

^y Number of leaflets/plant more than 10% blighted or killed by ALS.

^x Means followed by the same letter within a column are not significantly different by Fisher’s protected LSD test ($\alpha = 0.05$).

^w Actigard drip rates were calculated as broadcast rather than banded applications for comparison to corresponding foliar treatments.

^v Drip treatments with JC 9450 were applied at 20 ppm the first week, and 10 ppm thereafter.