APPLE (*Malus* x *domestica* 'Idared')
Fire blight; *Erwinia amylovora*

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Evaluation of bactericide and chemical regulator programs for the management of fire blight on 'Idared' apples in NY, 2015.

A trial was conducted at the New York State Agricultural Experiment Station in Geneva, NY to evaluate the effectiveness of bactericide programs for the management of blossom blight and shoot blight in an apple orchard. The orchard site is a young planting of 12-yr-old 'Idared' trees on B.9 rootstocks. Treatments were applied dilute to runoff using a gas powered backpack sprayer (200 PSI). Most treatments were made at 20% bloom (9 May), 50% bloom (10 May), 80% bloom (10 May), full bloom/petal fall (20 May), and during terminal shoot growth (5 Jun). Two treatment programs designated with a "P" or "K" received applications exactly 24 hours "prior to" or "after" inoculation (15:15, GMT-5 11 May), respectively. Applications of Actigard, a systemic acquired resistance inducer, and Apogee, a plant growth regulator that thickens the xylem elements to retard vegetative growth, timed to manage shoot blight were made on 30 May respectively to allow for host response. Bloom began on 9 May and trees progressed from 10% bloom to 80% bloom in less than a day May as the high temperatures went from 70 °F on 5 May to 87 °F on 9 May with temperatures above 80 °F through 11 May. Trees were inoculated at full bloom (15:15, GMT-5 11 May) with *Erwinia amylovora* strain Ea 273 at $1x10^5$ $CFUml^{-1}$ using a hand-pumped Solo backpack sprayer. Shoots for the shoot blight treatments were inoculated on 10 Jun by bisecting the two youngest leaves with a pair of scissors dipped in the inoculum at the same concentration. Blossom blight and shoot blight symptoms were assessed on blossom clusters and terminal shoots on 3 and 30 Jun, respectively. The incidence of blossom blight was expressed as the number of blighted blossom clusters out of 5 clusters with 20 collections of clusters assessed on 4 replicate trees per treatment. Shoot blight was assessed as the percentage of current year growth with discoloration or ooze extending from the site of wounding with 20 shoots assessed for 4 replicate trees. The incidence of chemical injury in the form of russeting on fruit was calculated from the number of fruit with russeting out of five randomly collected fruit. Ten collections of five fruit were evaluated for each of four treatment replications. Disease incidence and chemical injury data were subjected to analysis of variance (ANOVA) for a randomized block design using accepted statistical procedures and software (i.e. Generalized Linear Mixed Models (GLIMMIX)) procedure of SAS (version 9.4; SAS Institute Inc., Cary, NC). All percentage data were subjected to arcsine square root transformation prior to analysis.

The incidence of blighted blossom clusters ranged from 2.5-89%, and the percentage of 1^{st} shoot growth with fire blight symptoms ranged from 23-88% in all treatments. The majority of treatment programs had less than 20% blossom blight incidence with the exception of programs relying heavily on biological pesticides (e.g. Serenade Optimum, Double Nickel), Actigard, Low MCE coppers, or lacking applications of antibiotics. Such programs still had less than 30% incidence of blossom blight, with Thyme guard, MBI-10605SH, and MBI-10605 programs having the lowest incidence of those treatments. Against shoot blight, the most effective treatment programs had less than 33% of the new shoot tissue displaying fire blight symptoms. The antibiotic products Firewall 17WP (streptomycin) and Kasumin 2L (kasugamycin, and Apogee had the lowest progression of shoot blight on new shoots. Interestingly, Thyme guard provided a good bit of control under these high inoculum conditions, and was statistically equivalent FireWall. With the exception of the untreated program, none of the fire blight management programs resulted in any fruit finish damage.

Trt	Treatment programs (amt./A)*	Timing*	Blossom blight (%)**	Fruit russet (%)
1	Non-treated	NA	89.4 ± 5.1 a	3.1 ± 1.3 a
3	Serenade Optimum 1.5 lbs. + Regulaid 3 pts.	1,4	37.3 ± 6.7 b	0.0 ± 0.0 b
4	Serenade Optimum 1.5 lbs. + Regulaid 3 pts. Ag Streptomycin 24 oz. + Regulaid 3 pts.	1,3 2,4	33.8 ± 5.8 bc	0.0 ± 0.0 b
6	Serenade Optimum 1.5 lbs + Rampart 64 fl oz + Regulaid 3 pts.	1,4	32.3 ± 3.3 bcd	0.0 ± 0.0 b
13	Actigard WG 1 oz. + FireLane 17WP 48 oz + Regulaid 3 pts.	2,3	17.5 ± 3.0 efghi	0.0 ± 0.0 b
14	Actigard WG 2 oz. FireWall 17WP 24 oz + Regulaid 3 pts.	2,5 4	25.8 ± 0.9 bcdef	0.0 ± 0.0 b
15	Actigard WG 2 oz. + Taegro 5.2 oz + Kinetic 0.125%	2,3	23.4 ± 2.2 bcdefg	0.0 ± 0.0 b
16	Double Nickel LC 1 qt.	1,3	22.5 ± 1.9 cdefgh	0.0 ± 0.0 b
18	Cueva 2 qt	1,3	19.5 ± 4.1 defghi	0.0 ± 0.0 b
20	Cueva 2 qt + Double Nickel LC 1 qt.	1,3	22.0 ± 4.2 cdefgh	0.0 ± 0.0 b
21	MBI-10605 64 fl oz	2,3	27.3 ± 2.4 bcde	0.0 ± 0.0 b
26	Thyme guard 2qts + Cohere 2pt	3,5	18.8 ± 4.9 efghi	0.0 ± 0.0 b
27	FireWall 17WP 24 oz. + Regulaid 3 pts. Thyme guard 2qts + Cohere 2pt	4 3,5	14.5 ± 1.4 efghij	0.0 ± 0.0 b

*Treatment timings were: 1 = 20% bloom (9 May); 2 = 50% bloom (10 May); 3 = 80% bloom (10 May); 4 = full bloom/petal fall (20 May); 5 = during terminal shoot growth (5 Jun). Rates are in amount per acre (see text above).
**All values represent the means and standard errors of 20 blossom cluster collections for 4 replicate trees. Values within columns followed by the same letter are not significantly different ($P \leq 0.05$) according to the LSMEANS procedure in SAS 9.4 with an adjustment for Tukey's HSD to control for family-wise error.

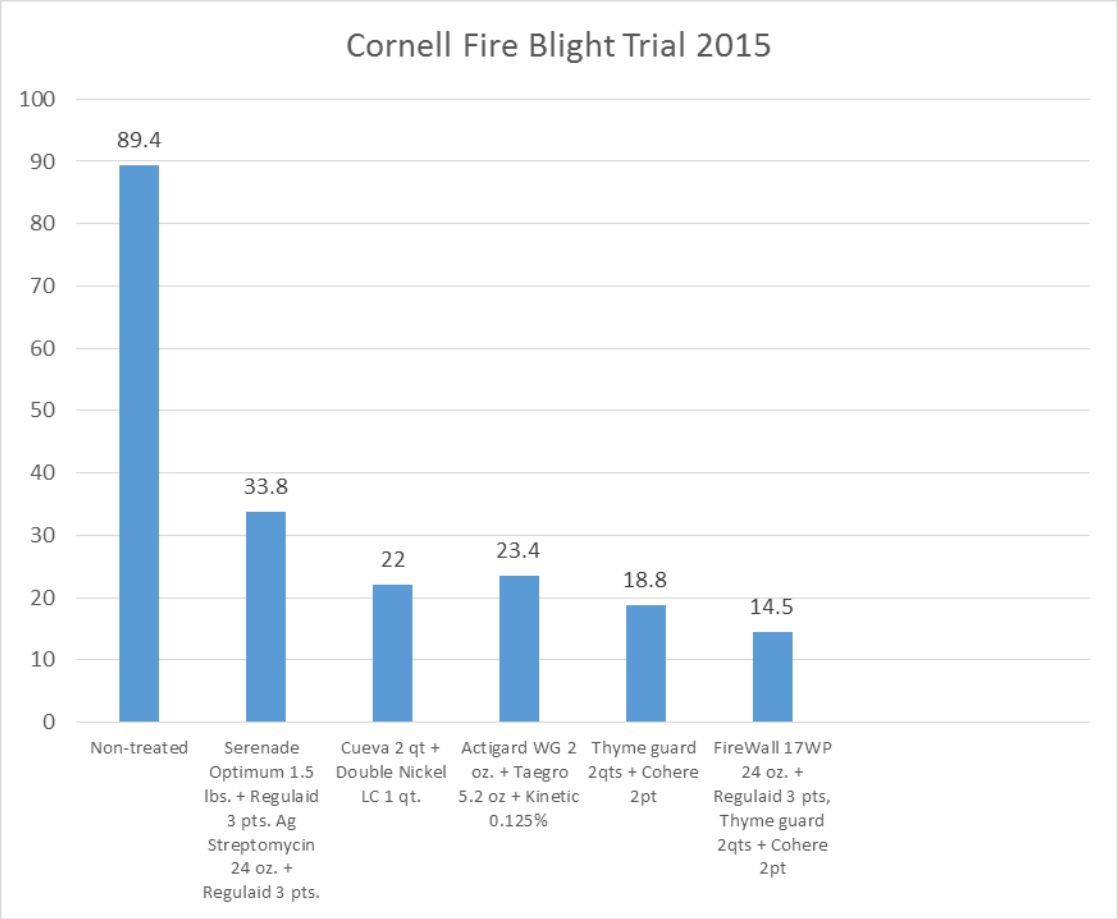

Table 2. Shoot Blight

Trt	Treatment programs (amt./A)*	Timing*	Shoot blight (% of shoot length.)**	Fruit russet (%)
1.	Non-treated	NA	88.6 ± 3.0 a	3.1 ± 1.3 a
7.	Apogee 18 oz	5	32.0 ± 3.3 cd	0.0 ± 0.0 b
8.	FireWall 17WP 24 oz. + Regulaid 3 pts.	5	38.4 ± 1.3 bcd	0.0 ± 0.0 b
9.	Kasumin 2L 16 fl oz. + Regulaid 3 pts.	5	23.2 ± 5.0 d	0.0 ± 0.0 b
14.	Actigard WG 2 oz. FireWall 17WP 24 oz + Regulaid 3 pts.	2,5 4	90.1 ± 2.6 a	0.0 ± 0.0 b
26.	Thyme guard 2qts + Cohere 2pt	3,5	53.0 ± 1.4 b	0.0 ± 0.0 b
27.	FireWall 17WP 24 oz. + Regulaid 3 pts. Thyme guard 2qts + Cohere 2pt	4 3,5	41.4 ± 1.4 bc	0.0 ± 0.0 b

*Treatment timings were: 1 = 20% bloom (9 May); 2 = 50% bloom (10 May); 3 = 80% bloom (10 May); 4 = full bloom/petal fall (20 May); 5 = during terminal shoot growth (5 Jun). Rates are in amount per acre (see text above).
**All values represent the means and standard errors of 20 shoots for 4 replicate trees. Values within columns followed by the same letter are not significantly different ($P \leq 0.05$) according to the LSMEANS procedure in SAS 9.4 with an adjustment for Tukey's HSD to control for family-wise error.