Annual Report - 2011

Prepared for the California Cling Peach Advisory Board

Title:	*Management of brown rot, powdery mildew, and peach leaf curl diseases of peach in California*
Status:	First-Year of Four
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SUMMARY OF RESEARCH ACCOMPLISHMENTS DURING 2011

We continued our research on major preharvest (foliar) and postharvest diseases of cling peach in California. We focused on leaf curl, brown rot blossom blight and fruit rot, and powdery mildew management with new fungicides.

1) For peach leaf curl, two applications of Ziram, Syllit, or of copper materials (Kocide 3000, Badge X2, Badge SC) were highly effective when timed properly according to accumulated winter precipitation. Over the past years, Ziram (even when used at the lower, non-registered 4-lb rate) and Syllit performed consistently well and represent alternatives to copper fungicides. Copper compounds are best used when winter precipitation is moderate to low. Thiram at a use rate of 3.5 lb/A was also effective and is currently registered for managing peach leaf curl.
2) For brown rot blossom blight management, trials were done on peach cultivars at KAC and UC Davis. With high rainfall in the spring, disease incidence was moderate to high in the untreated control trees, but was significantly reduced by a single application of all fungicide treatments. Several new fungicides were available for evaluation (S-2200, IKF-5411 - class not revealed to date for both; the group 7 SDHI Fontelis (penthiopyrad), the group 11 YT669 – picoxystrobin), and these were effective in reducing the disease. New fungicide pre-mixtures are continued to be introduced for stone fruit crops that were all highly effective. These include: Luna Sensation (groups 7 fluopyram +11 trifloxystrobin), Merivon (groups 7 fluxapyroxad + 11 pyraclostrobin), and Q8Y78 (groups 7 penthiopyrad + 11 picoxystrobin). The previously evaluated pre-mixtures Inspire Super (difenoconazole+cyprodonil), Inspire XT (difenoconazole + propiconazole), Quilt Xcel (azoxystrobin + propiconazole), Quadris Top (azoxystrobin + difenoconazole), and Adament (tebuconazole + trifloxystrobin) continued to perform very well. Blossoms of Fay Elberta peach were used in laboratory tests and demonstrated excellent pre- and post-infection activity of all fungicides included. The biologicals Actinovate and BotryZen showed no or only limited activity in these field and laboratory studies.
3) In timing studies for blossom blight control, two applications of Quash, Vangard, Tilt, or Adament were generally more effective than a single application at early bloom or full bloom. Still, considering the highly favorable disease conditions in the spring of 2011, the single applications were also very effective.
4) Preharvest fungicide applications were evaluated for the management of postharvest brown rot decay in three orchards. In 7-day PHI applications, among single active ingredient products, the new Fontelis, IKF-5411, YT669 were similarly effective as Quash or Tilt. For the pre-mixtures, results were variable among the cultivars, but overall, treatments with Adament, Luna Sensation, Inspire XT, or Merivon resulted in the lowest incidence of decay. On a late-maturing peach cultivar, where a higher incidence of disease occurs, two pre-harvest applications (13+7 days PHI) were more effective than a single application (7 days PHI). An organic formulation of polyoxin-D (Ph-D) that was evaluated on two cultivars was not effective on peaches in 2011, but was effective on a nectarine cultivar.
5) Evaluation of brown rot blossom blight susceptibility among peach genotypes in the UC Davis breeding program continued with 28 new and previously evaluated genotypes. The Bolinha accession had the lowest

amount of stamen infections. Disease incidence of several genotypes was statistically similar to the one of Bolinha. Some of the less susceptible genotypes were also rated less susceptible in previous years' evaluations. Several methods were tested to inoculate fruit in the field without wounding for the evaluation for fruit susceptibility to brown rot. None of the methods resulted in a high incidence of decay.

6) In powdery mildew management in a field trial with low disease pressure, Fontelis, S-2200, Xemium, Adament, Luna Sensation, Inspire XT, Inspire Super, Quadris Top, Pristine, Merivon, Q8478, a tank mixture of Xemium (SDHI) and Vivando, as well as rotations of Merivon and Vivando (metrafenone) or Indar and Quintec were all highly effective. Vivando was accepted into the IR-4 program in 2010. Some of these materials are highly specific against powdery mildews (Quintec and Vivando), others are also used extensively in blossom and fruit brown rot programs. Thus, powdery mildew-specific compounds should be used at timings in rotations when brown rot is not a target for management (e.g., early fruit development). The biological control Actinovate only numerically reduced the incidence of powdery from that of the control.

INTRODUCTION

In an integrated approach for the management of fungal diseases of peach, fungicide use is currently the most effective control component. We are developing new products with new modes of action and new pre-mixtures as well as application strategies (e.g., timing, rotation programs) for the control of brown rot blossom blight and fruit decay, powdery mildew, and peach leaf curl. This will ensure that highly effective and safe materials will always be available to the peach industry and that mixture and rotation programs can be designed to help prevent the selection of resistant populations to any given class of fungicide.

Brown rot caused by *M. fructicola* and *M. laxa* is the most important disease of stone fruit in California. In the spring, primary inoculum consisting of ascospores and conidia from mummified fruit infects blossoms and diseased blossoms supply secondary inoculum for fruit infections in the current growing season. Thus, removal of mummies from trees is a strategy to sanitize the orchard and minimize primary inoculum in the spring. To prevent new infections, fungicides are most effectively used. We have shown that many of the newer fungicides have pre-infection (protective - effective when applied before infection) and post-infection (suppressive - effective when applied up to 24 h after infection) activity. Thus, a single, properly timed fungicide application can reduce blossom blight to zero or near zero levels.

In 2011, we continued our blossom and preharvest efficacy studies with registered and new fungicide treatments. Single-active ingredient fungicides evaluated included materials in the following classes: DMIs (Tilt – propiconazole, Elite - tebuconazole, Quash - metconazole), anilinopyrimidines (Vangard - cyprodinil, Scala - pyrimethanil), and experimental fungicides such as the group 7 succinate dehydrogenase inhibitors or SDHIs Fontelis (penthiopyrad), the group 11 YT669 – picoxystrobin), and the group 19 polyoxin-D. Fungicide pre-mixtures included the previously evaluated Pristine (pyraclostrobin + boscalid), Inspire Super (difenoconazole+cyprodonil), Inspire XT (difenoconazole + propiconazole), Quadris Top (azoxystrobin + difenoconazole), and Adament (tebuconazole + trifloxystrobin), as well as the new products Luna Sensation (groups 7 fluopyram +11 trifloxystrobin), Merivon (groups 7 fluxapyroxad + 11 pyraclostrobin), and Q8Y78 (group 7 penthiopyrad + group 11 picoxystrobin). Tilt, Elite, Indar, Vangard, Scala, Adament, Pristine, and Quilt Xcel (azoxystrobin + propiconazole) are currently available in California. Fontelis, Luna Sensation, as well as Merivon are expected in the spring of 2012. The newer fungicides were registered based on research in our laboratory.

In a long-term strategy for the management of brown rot blossom blight, we are assessing the natural host resistance against in F1 progeny from crosses between less susceptible selections (e.g., Bolinha and other genotypes) and California varieties. Over the years, we evaluated many promising new genetic lines of cling peach developed by Dr. Tom Gradziel. Many of these lines have been tested for their resistance to brown rot of harvested fruit by others. We initiated tests to potentially find a less labor-intense procedure for fruit evaluation that is done directly in the field. This is a difficult task because fruit susceptibility is also determined by maturity and therefore, comparisons among genotypes must be standardized. Additionally, fruit are maturing in the field during the hottest part of the growing season and when fungal infections are less likely to become established due to sensitivity of spore inoculum to high temperatures and desiccation. Still, a field method is needed to evaluate F2 selections of peach where a greater number of fruit is available to replace the previous method of harvesting and inoculating stored fruit. The critical time for inoculations is 3-4 weeks before harvest with evaluation at 1 week before harvest because harvested fruit are essentially processed immediately (1-2 days).

We also continued our evaluations of fungicide treatments for powdery mildew control. Over the years this has been difficult due to the sporadic occurrence of the disease with generally low incidence levels. Still, several highly effective products have been identified that hopefully can be tested under higher disease pressure in 2012. Biological treatments that we evaluated over the years have been either not effective or inconsistent in their efficacy. Goals of field trials on peach leaf curl management included the identification of highly effective non-copper based materials and the timing of applications.

Objectives

I. Management of brown rot.

A) Efficacy and timing of representative compounds from each of four classes of fungicides: Qols, APs, DMI fungicides (including Quash, Inspire), and SDHIs (fluopyram, fluxapyroxad, penthiopyrad), as well as selected pre-mixtures (Pristine, Adamant, Luna Sensation, Luna Experience, BAS703, Inspire XT, Quilt Xcel, Quadris Top). Pre- and post-infection efficacy will be studied for both blossoms and fruit.

B) Persistence of anilinopyrimidine residues under high humidity and temperature.

C) Baseline sensitivities of brown rot fungi to new classes of fungicides.

D) Natural host resistance of peach to blossom blight and fruit decay

- Flower assays will be done using our standard laboratory procedure with detached pink bud blossoms
- Field assays for evaluating fruit susceptibility will be developed

II. Management of peach leaf curl

A) Evaluate the timing of Ziram (lower rates), Thiram, Syllit, and new copper formulations.

III. Etiology and management of powdery mildew on cling peach and other stone fruits.

A) Collection of powdery mildew isolates from peach in California and identification of the causal pathogen(s).

B) Efficacy of new powdery mildew fungicides (e.g., quinoxyfen, metrafenone, metconazole, fluopyram, fluxapyroxad, penthiopyrad, and pre-mixtures), currently registered products, and their use in anti-resistance rotation and mixture programs.

MATERIALS AND METHODS

Evaluation of fungicides for management of peach leaf curl. In a trial on the management of peach leaf curl caused by *Taphrina deformans* on Fay Elberta peach at UC Davis, selected rates of Ziram, copper materials (i.e., Kocide 3000, Badge X2, Badge SC), Syllit, or Thiram were applied in combination with 4% Omni oil on Dec. 10, 2010 and Jan. 19, 2011. In addition, a Ziram-Syllit rotation program was done. Rates are indicated in Fig. 1 and applications were done using an air-blast sprayer at 100 gal/A. Trees were evaluated for disease on April 12, 2011. For this, the number of infected leaves for a total of 100 leaves for each single-tree replication was determined.

Evaluation of fungicides for management of brown rot blossom blight and preharvest fruit decay. Trials were established in two orchards at the Kearney Agricultural Center (KAC) in Parlier, CA, on three peach cultivars (i.e., Elegant Lady, Ryan Sun, and July Flame) to evaluate fungicides for control of brown rot blossom blight. Fungicides that were applied to trees using an air-blast sprayer calibrated for 100 gal/A are indicated in the Figures of the Results. Randomized sub-plots of four single-tree replications for each treatment were used. In studies on Ryan Sun peach and on Summer Fire nectarine, application timings were evaluated using four selected fungicides. Applications of each fungicide were done at 30% or 50% bloom (Summer Fire) or a 10% or 30% bloom (Ryan Sun). On both cultivars, applications were also done at both timings. Randomized sub-plots of four single-tree replications for each treatment were used. Incidence of brown rot blossom blight was recorded in April 2011. For this, 200 blossoms were evaluated for blight for each of the four single-tree replications per treatment. Incidence of brown rot blossom blight was recorded in April 2011. For this, 200 blossoms were evaluated for blight for each single-tree replication and treatment.

Laboratory studies were done with cv. Fay Elberta peach blossoms obtained from the UC Davis, Plant Pathology field station. For this, pink bud blossoms were collected, allowed to open in the laboratory, and either inoculated with a conidial suspension of *M. fructicola* (20K conidia/ml) and then treated after 24 h with fungicides or natural products using a hand sprayer (post-infection activity), or treated and then inoculated after 24 h (pre-infection activity). Three replications of 7 blossoms were used for each fungicide.

For the evaluation of preharvest treatments, two orchards at KAC and one orchard at UC Davis were used. Applications were made in the field using an air-blast sprayer (100 gal/A) at 7 days PHI to Elegant Lady, Ryan Sun, and July Flame peach and at 13 and 7 days PHI to Ryan Sun in another orchard at KAC. In the second orchard with July Flame and Ryan Sun peach, simulated rain was applied for 6 h each one day after application. At UC Davis, applications to Fay Elberta peach were done at 14 or 7 days PHI. Fungicides evaluated are indicated in Figs. 8-10. In the KAC trials, four boxes of 48 fruit each were harvested for each treatment (one per single-tree replication). Fruit were packed in commercial boxes and stored for approximately 7 days at 1 C and then for 5 to 7 days at 20C. In UC Davis trial, twelve fruit from each of four single-tree replications were harvested and incubated for approximately 7 days at 20 C for development of natural incidence of decay.

Host susceptibility of F1- progeny of Bolinha peach and other selections to brown rot blossom blight and fruit decay. Blossoms of parental Bolinha Q, D62-193, and Dr. Davis accessions, additional California varieties, and selected F1 progeny as suggested by Dr. Gradziel were collected at popcorn stage in the spring of 2011. Due to the almost simultaneous bloom of most accessions in 2011, blossoms could only be sampled once. Blossoms were allowed to open in the laboratory, placed in a container with a layer of wet vermiculite, spray-inoculated with a conidial suspension of *M. fructicola* (2×10^4 spores/ml) and incubated for 4-5 days at 20 C. The incidence of stamen infections was assessed for 7-8 blossoms per each of four replications.

For evaluation of fruit susceptibility, inoculum (100,000 spores/ml) was prepared in 10% or 50% Moisturin, 0.5% Methocel, or 0.05% Tween 80. Drops (20 µl) of inoculum were applied to fruit on the tree in late afternoon and drops were covered with 1 cm x 1 cm pieces of Parafilm. Fruit were evaluated periodically over a 10-day period for the development of decay.

Efficacy of fungicides for management of powdery mildew of cling peach. A trial on the management of powdery mildew caused by *Podosphaera pannosa* was established in a commercial cv. Carson orchard in Butte Co. In addition to the biocontrol Actinovate, five single-fungicides, nine pre-mixtures, and two rotation programs were evaluated (*see* Fig. 11). Applications were done on March 4 (full bloom), March 22 (2 weeks after petal fall), and April 13 2011 (6 weeks after petal fall). Disease was evaluated on June 9. For this, fruit of each of the four single-tree replications were rated for disease.

Statistical analysis of data. Data for disease incidence (percentage data) were arcsin transformed before analysis. Data were analyzed using analysis of variance and least significant difference (LSD) mean separation procedures of SAS 9.1.

RESULTS AND DISCUSSION

Evaluation of fungicides for management of peach leaf curl. In a trial on cv. Fay Elberta peach on the management of peach leaf curl, the efficacy of selected fungicides applied alone or in a rotation during dormancy and late dormancy was evaluated. Under very high disease pressure with 73.5% of the leaves infected in the untreated control, all treatments significantly reduced the incidence of disease (Fig. 1). The incidence among treatments ranged from 2.5% (Ziram at 6 lb) to 24% (Thiram at 3.5 lb). Incidence of disease was 18% when Thiram was used at 2.5 lb/A. Thus, Thiram was also effective and is currently register for use in CA. Ziram was equally highly effective when used at the low off-label rates of 4 or 6 lb/A. As discussed with the registrant of Ziram, we are trying to get a supplemental label that would allow these reduced rates (registered rates are 8-10 lb/A). Interestingly, rates of Ziram as low as 3.75 lb/A are registered for the management of peach leaf curl East of the Rockies.

The copper materials Kocide 3000 and two formulations of Badge were similarly effective as Ziram or Syllit (Fig. 1). In contrast, in our 2009/2010 trial, similar application timings of copper products in combination with spray oil only reduced the disease by approximately 40% from the control. In Jan. 2011, the amount of rainfall at the trial location was relatively low. In comparisons of our field studies over the last few years, we could correlate a lower efficacy of copper products with high amounts of rainfall during January. Thus, copper products do not persist well during high rainfall conditions, whereas Ziram and Syllit (studies from two years only) still perform very well.

Based on this and previous years' trials, peach leaf curl can be most effectively managed by one (less conducive conditions) or two (highly conducive conditions) dormant applications with Ziram or the recently registered Syllit. Syllit represents a new class of fungicides for stone fruit production in California. Copper-based materials are best used under less favorable disease conditions (low to moderate precipitation). Additionally, the three fungicide classes can also be effectively used in rotation programs.

Efficacy of fungicides for management of blossom blight. For brown rot blossom blight management, trials were done on peach cultivars at KAC and UC Davis. With high rainfall in the spring, disease incidence was moderate to high in the untreated control trees, but was significantly reduced by a single application of all fungicide treatments. Several new fungicides were available for evaluation (S-2200, IKF-5411 - class not revealed to date for both; the group 7 SDHI Fontelis (penthiopyrad), the group 11 YT669 – picoxystrobin) and these were effective in reducing the disease. New fungicide pre-mixtures are continued to be introduced for stone fruit crops that were all highly effective. These include: Luna Sensation (groups 7 fluopyram +11 trifloxystrobin), Merivon (groups 7 fluxapyroxad + 11 pyraclostrobin), and Q8Y78 (group 7 penthiopyrad + group 11 picoxystrobin). The previously evaluated pre-mixtures Inspire Super (difenoconazole+cyprodonil), Inspire XT (difenoconazole + propiconazole), Quilt Xcel (azoxystrobin + propiconazole), Quadris Top (azoxystrobin + difenoconazole), and Adament (tebuconazole + trifloxystrobin) continued to perform very well.

In the UC Davis trial on Fay Elberta with a very high disease incidence in the control, most of the single-active ingredient treatments and all the fungicide mixtures were highly effective (Fig. 2). Disease was reduced from 45.2 infections per tree in the control to one infection (i.e., Merivon) to 16.5 infections (i.e., S-2200) per tree. In the KAC orchards with a lower disease pressure, fungicide treatments were similarly highly effective (Figs. 3 and 4). Two applications of the biocontrols Bot-Zen or Actinovate in the UC Davis plot were not or only slightly effective (Fig. 2).

Blossoms of Fay Elberta peach were used in laboratory tests and demonstrated excellent pre- and post-infection activity of all fungicides included (Fig. 5). The biologicals Actinovate and BotryZen showed no or only limited activity in these laboratory studies.

An application timing study for blossom blight control was done on a nectarine variety and on cv. Ryan Sun peach using Quash, Vangard, Tilt, and the pre-mixture Adament. Two applications of these fungicides were generally more effective than a single application at early bloom or full bloom (Fig. 6). Still, considering the highly favorable disease conditions in the spring of 2011, the single applications were also very effective. The fungicides used all have some locally systemic activity and thus, are very effective as post-infection treatments. Additionally, residues are not as easily removed after rainfall and treatments may penetrate into blossom tissues at the early opening stage in sufficient amounts to protect the flower during its entire susceptible stage.

Host susceptibility of F1- progeny of Bolinha peach and other selections to brown rot blossom blight. Evaluation of brown rot blossom blight susceptibility among peach genotypes in the UC Davis breeding program of Dr. Tom Gradziel continued with 28 new and previously evaluated genotypes. The Bolinha accession had the lowest amount of stamen infections (Fig. 7). Disease incidence of several genotypes was statistically similar to the one of Bolinha. Some of the less susceptible genotypes were also rated less susceptible in previous years' evaluations, whereas others have been variable over the years. This is presumably due to environmental conditions in the orchard, pre-disposition of the host, and cultural practices (e.g., soil fertility, nitrogen levels, etc.) that may have a more profound effect on blossom susceptibility than the genetic background of the host. Although some less susceptible peach genotypes have been identified over the years, breeding of new cling peach varieties is a long-term undertaking and for now, fungicide applications will continue to be critical in the management of blossom blight.

Efficacy of preharvest fungicides for management of fruit decays. In the trial at UC Davis on Fay Elberta using 7- or 14-day PHI treatments, very similar results were obtained for the two timings (Fig. 8). Adament and Luna Sensation reduced decay to the lowest incidence, while S-2200, Mettle (tetraconazole), Inspire Super, and Pristine were not effective. Other treatments were intermediate in their efficacy. The overall low efficacy of many treatments can be explained by the unusual early (18 mm) and late (21 mm) June rains when quiescent infections likely became established. Furthermore, a 15-mm rainfall occurred in early August (two days after fungicide application) that likely removed a large amount of residues from fruit for those fungicides that have no locally systemic activity (i.e., Pristine, Mettle, etc.). Furthermore, in the Inspire Super treatment, the cyprodonil component may have broken down under high temperatures as was previously demonstrated by us. Additionally, simulated rain was applied after each fungicide application in the orchard with July Flame and Ryan Sun peach at KAC that likely further increased the disease pressure.

At KAC, 7-day and 13+7 day PHI applications were done. Most treatments reduced the incidence of brown rot on the mid-season peach cultivars Elegant Lady and July Flame. The efficacy of Adament and Merivon was consistently very high for Elegant Lady and July Flame, whereas that of other treatments was lower or inconsistent between the two cultivars (Figs. 9,10). Low efficacy again can be explained by rainfall that at this location occurred mainly in early June (38 mm over two days) with some minor rainfall in late June and late July. On the late-maturing Ryan Sun peach (August harvest), single treatments (7 days PHI) were less effective (Fig. 9) than the two-treatment (13+7 days PHI) program (Fig. 10) where simulated rain was applied. Thus, two applications were very effective under very conducive environmental conditions.

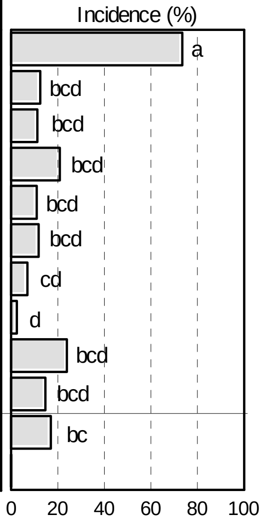
Overall, in 7-day PHI applications, among single active ingredient products, the new Fontelis, IKF-5411, YT669 were similarly effective as Quash or Tilt. For the pre-mixtures, results were variable among the cultivars, but overall, treatments with Adament, Luna Sensation, Inspire XT, or Merivon resulted in the lowest incidence of decay. An organic formulation of polyoxin-D (Ph-D) that was evaluated on two cultivars was not effective in 2011. Again, this can be explained by the unusual rainfall that occurred during the season because in 2010 this compound was effective in some trials. The labeled rate of Ph-D is low (6.2 oz of the 11.2 DF formulation) but the persistence is high. Thus, multiple applications close to harvest should prove to be consistent and effective. Potentially this fungicide could be available as an organic fungicide. Studies will be continued in 2012 with multiple applications of an organic formulation.

Evaluation of methods for inoculation of fruit in the field Several methods were tested to inoculate fruit in the field for the evaluation for fruit susceptibility to brown rot. Inoculum was prepared in Moisturin or Methocel to reduce water loss from the inoculation droplet; or was prepared in a Tween 80 solution to provide better coverage of the fuzzy fruit surface. None of the methods resulted in a high incidence of decay. In an average of three experiments, 23%, 16%, 16.7%, or 21.7% of the inoculations resulted in decay for 10% Moisturin, 50% Moisturin, Methocel, or Tween 80, respectively. These same methods resulted in a high incidence of decay in 2010 when tested on harvested fruit in the laboratory. As mentioned above, non-wound inoculation of fruit in the field during the summertime is difficult and probably a larger number of fruit needs to be inoculated.

Evaluation of fungicides for management of powdery mildew. In the powdery mildew trial in Butte Co., we evaluated single-fungicides, new pre-mixtures, as well as the biocontrol Actinovate. Disease pressure in the test plot was low with and incidence of 3.7% in the control. Fontelis, S-2200, Xemium, Adament, Luna Sensation, Inspire XT, Inspire Super, Quadris Top, Pristine, Merivon, Q8478, as well as rotations of Merivon and Vivando (metrafenone) or Indar and Quintec were all highly effective (Fig. 11). Some of these materials are highly specific against powdery mildews (Quintec and Vivando), others are also used extensively in blossom and fruit brown rot programs. Thus, powdery mildew-specific compounds should be used at timings in rotations when brown rot is not a target for management (e.g., early fruit development). The biological control Actinovate only numerically reduced the incidence of powdery mildew from that of the control.

Fig. 1. Efficacy of fungicide treatments applied during dormancy against peach leaf curl of Fay Elberta peaches in a field trial at UC Davis

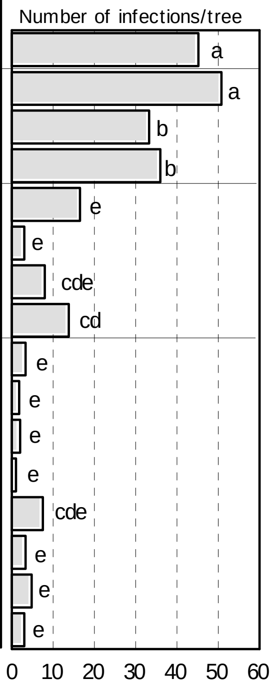
	No.	Treatment	12/10/10	1/19/11
	1	Control	---	---
	2	Syllit 400SC 32 fl oz	@	@
	3	Syllit 400SC 48 fl oz	@	@
	4	Kocide 3000 5 lb	@	@
	5	Badge X2 5 lb	@	@
	6	Badge SC 224 fl oz	@	@
	7	Ziram 76DF 4 lb	@	@
	8	Ziram 76DF 6 lb	@	@
	9	Thiram 3.5 lb	@	@
	10	Thiram 2.5 lb	@	@
Rotation	11	Ziram 76DF 4 lb	@	-
		Syllit 400SC 48 fl oz	-	@



Treatments were applied in the field in combination with a spray oil (4% Omni oil) using an air-blast sprayer (100 gal/A). Disease evaluation was done on 4-12-11. For this, the number of infected leaves for a total of 100 leaves for each replication was determined.

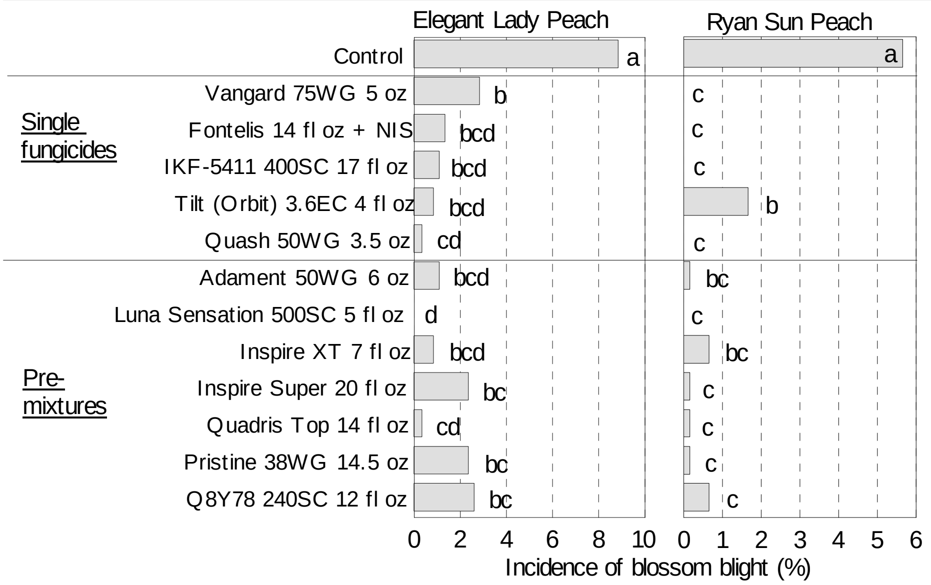
Fig. 2. Evaluation of new fungicides against brown rot blossom blight of Fay Elberta peach at UC Davis

Program	Treatment	20-40% bloom 3-9-11	80-100% bloom 3-16-11
---	Control	---	---
Biocontrols	Bot-Zen 2 lb	@	@
	Bot-Zen 4 lb	@	@
	Actinovate 12 oz	@	@
Single	S-2200 2.5 fl oz	@	---
	Quash 50WG 3.5 oz	@	---
	IKF-5411 400SC 10.5 fl oz	@	---
	IKF-5411 400SC 17 fl oz	@	---
Mixtures and Pre-mixtures	Adament 50WG 5 oz	@	---
	Luna Sensation 5 fl oz	@	---
	Pristine 38WG 14.5 oz	@	---
	Merivon (BAS703) 6.8 fl oz	@	---
	Inspire Super 20 fl oz	@	---
	Inspire XT 7 fl oz	@	---
	Quadris Top 14 fl oz	@	---
	Quash 2.5 oz + S-2200 2.5 fl oz	@	---



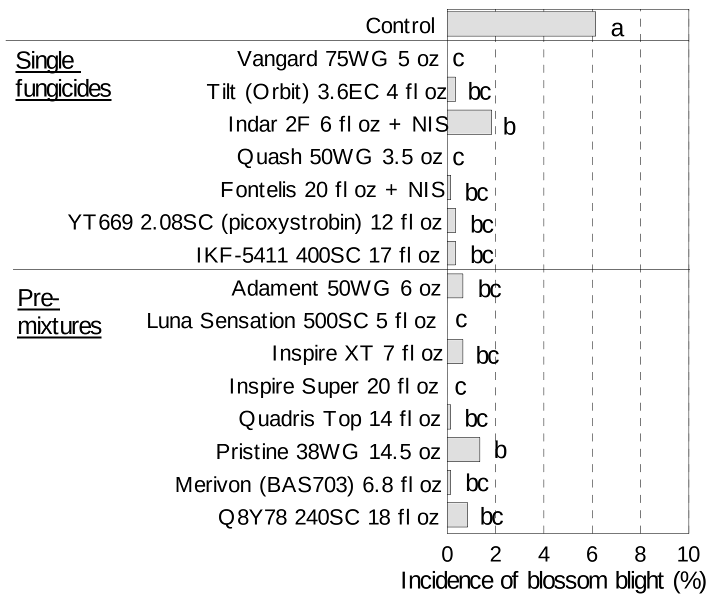
Treatments were applied using an air-blast sprayer at a rate of 100 gal/A. Evaluation was done on 4-12-11.

Fig. 3. Efficacy of fungicide treatments for management of brown rot blossom blight of two peach cultivars at the Kearney Agricultural Center - Orchard 1



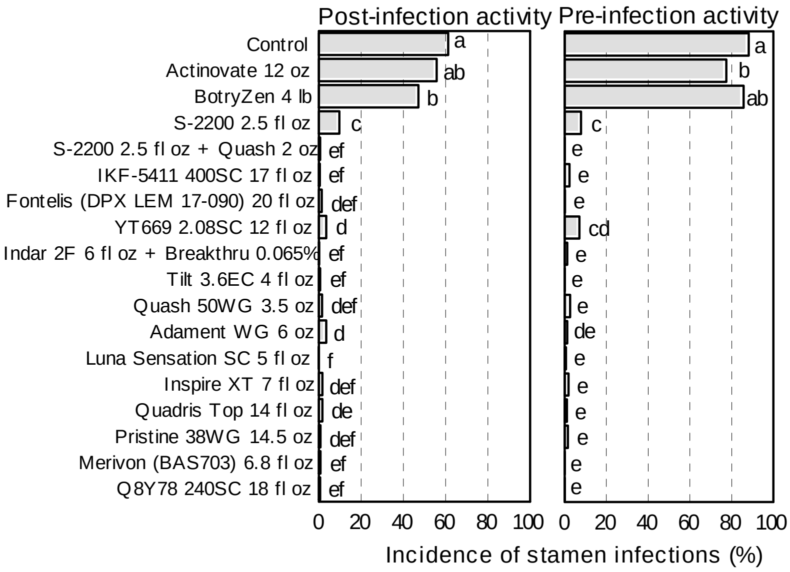
One application of each treatment was made in the field on 3-9-11 to Elegant Lady peach (90% bloom) and Ryan Sun peach (80% bloom) using an air-blast sprayer at 100 gal/A. NIS = non-ionic surfactant. Q8Y78 240SC is a pre-mix of picoxystrobin and penthiopyrad. Blossoms were evaluated for blossom blight on 4-15-11. There were four single-tree replications for each treatment.

Fig. 4. Efficacy of fungicide treatments for management of brown rot blossom blight of July Flame peach at the Kearney Agricultural Center- Orchard 2



One application of each treatment was made in the field at 80% bloom on 3-8-11 using an air-blast sprayer at 100 gal/A. NIS = non-ionic surfactant. Q8Y78 240SC is a pre-mix of picoxystrobin and penthiopyrad. Blossoms were evaluated for blight on 4-14-11. There were four single-tree replications for each treatment.

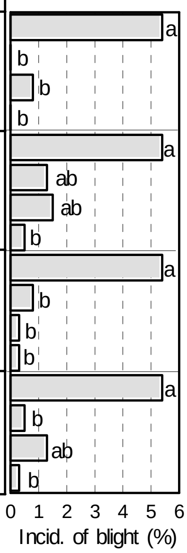
Fig. 5. Evaluation of the pre- and post-infection activity of new fungicides against brown rot blossom blight of Fay Elberta peach in the laboratory

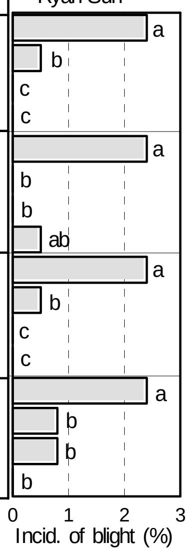


Blossoms at popcorn stage were collected in the field and allowed to open in the laboratory. Blossoms were then either treated using an air-nozzle sprayer 24 h before (pre-infection activity) or after (post-infection activity) inoculation with conidia of *M. fructicola* 20,000 conidia/ml). Blossoms were incubated at 20C for 4-5 days and were then evaluated for stamen infections.

Fig. 6. Efficacy of selected fungicides for management of brown rot blossom blight of Summer fire nectarine and Ryan Sun peach in a timing study at the Kearney Ag Center

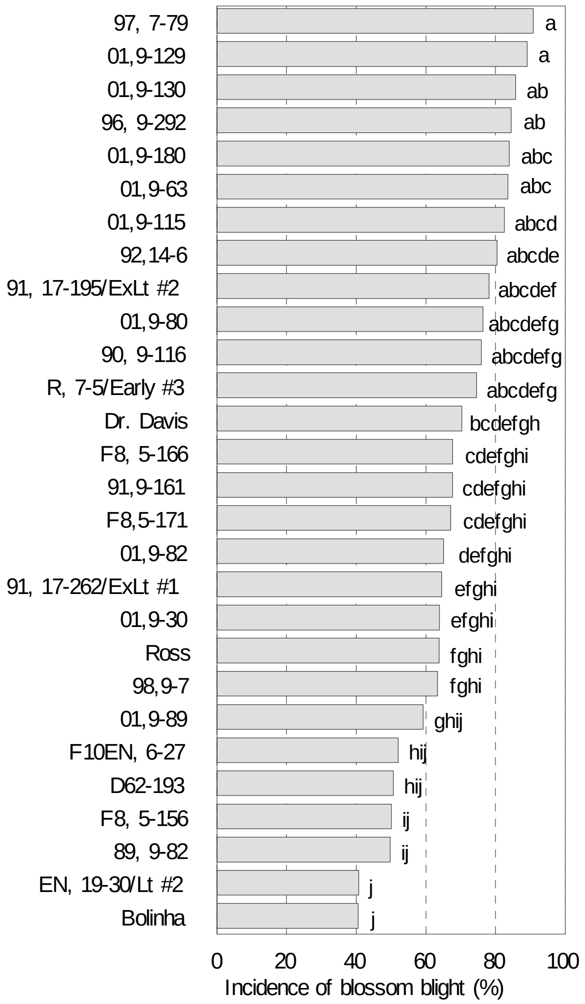
Fungicide	3-3-11 30% bloom	3-9-11 50-60% bloom	Summer Fire	3-8-11 10% bloom	3-9-11 30% bloom	Ryan Sun
Control	---	---	a	---	---	a
Quash 50WG 3.5 oz	@	---	b	@	---	b
	---	@	b	---	@	c
	@	@	b	@	@	c
Control	---	---	a	---	---	a
Vangard 75WG 5 oz	@	---	ab	@	---	b
	---	@	ab	---	@	b
	@	@	b	@	@	ab
Control	---	---	a	---	---	a
Tilt (Orbit) 3.6EC 4 fl oz	@	---	b	@	---	b
	---	@	b	---	@	c
	@	@	b	@	@	c
Control	---	---	a	---	---	a
Adament 50WG 4 oz	@	---	b	@	---	b
	---	@	ab	---	@	b
	@	@	b	@	@	b





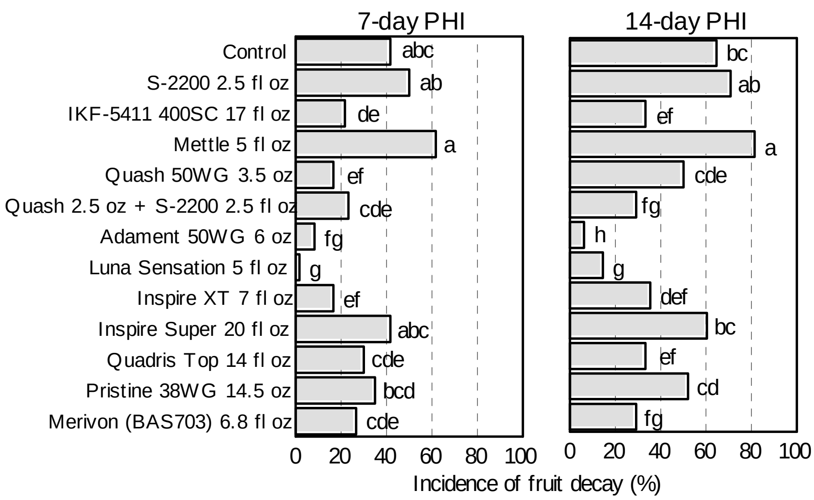
Treatments were applied in the field using an air-blast sprayer (100 gal/A). Blossoms were evaluated for blossom blight on 4-14-11. There were four single-tree replications for each treatment. Statistical analyses were done separately for each fungicide and cultivar.

Fig. 7. Host susceptibility of different peach genotypes and their F1-progeny to brown rot blossom blight



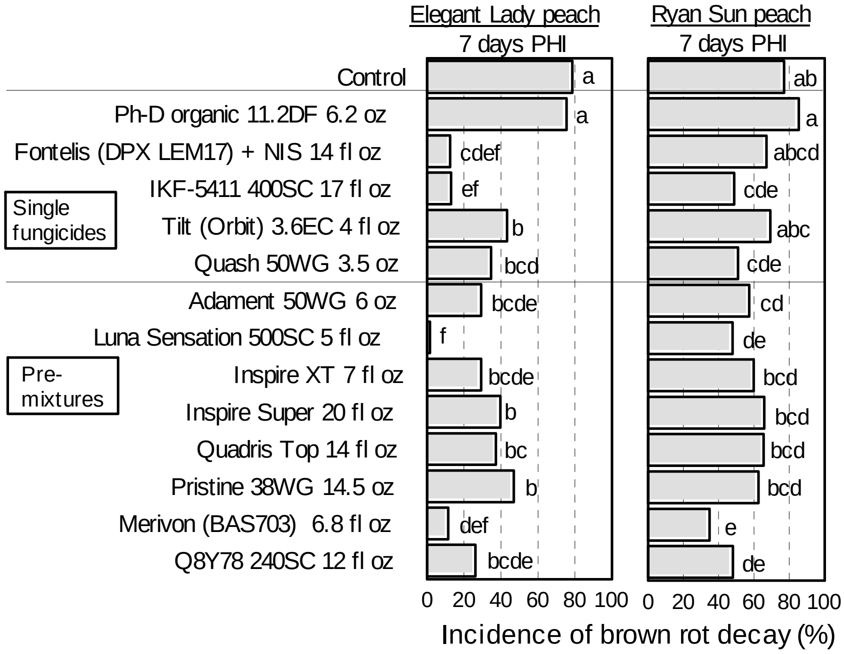
Blossoms at pink bud stage were collected, allowed to open in the laboratory, and inoculated with conidia of *Monilinia fructicola* (10^4 conidia/ml). Blossoms were evaluated for stamen infection after 5-6 days of incubation at 20C.

Fig. 8. Efficacy of 14- and 7-day PHI fungicide applications for management of postharvest brown rot of Fay Elberta peach at UC Davis 2011



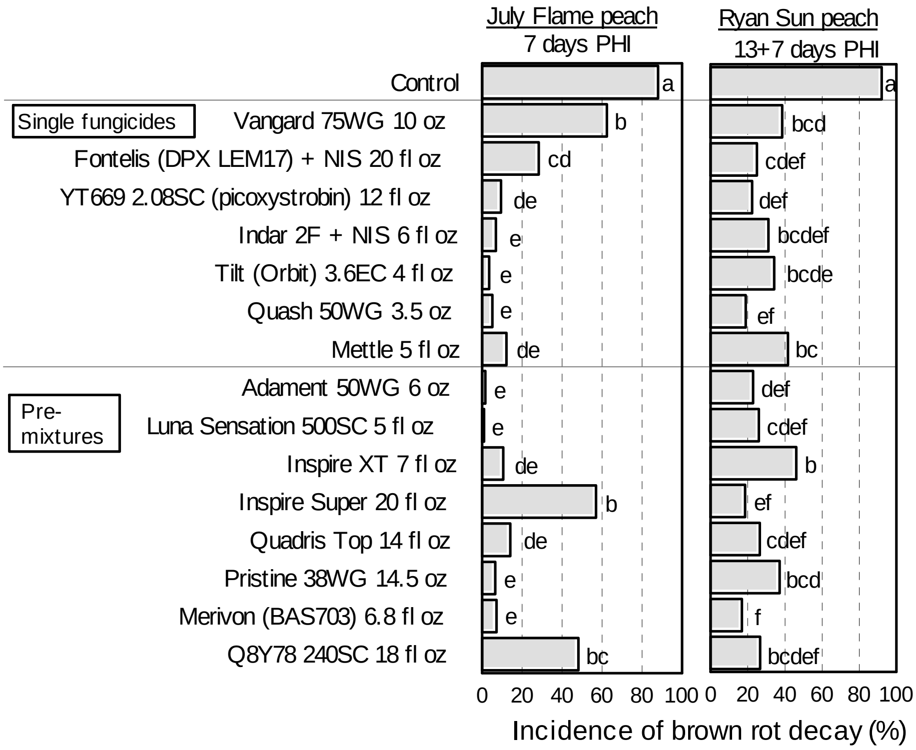
Treatments were applied in the field on 8-2-11 using an air-blast sprayer (100 gal/A). 12 fruit were harvested from each of four single-tree replications. Fruit were then incubated for 7 days at 20 C.

Fig. 9. Efficacy of preharvest fungicide treatments for management of brown rot (natural incidence of decay) of peach at the Kearney Agricultural Center - Orchard 1



Treatments were applied on 7-8 (Elegant Lady) or 8-11 (Ryan Sun) using an air-blast sprayer (100 gal/A). Fruit were harvested and stored at 1C for 7 days and were then incubated at 20C for 7 days.

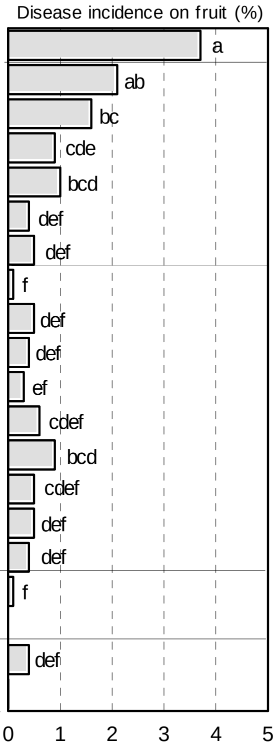
Fig. 10. Efficacy of preharvest fungicide treatments for management of brown rot (natural incidence of decay) of peach at the Kearney Agricultural Center - Orchard 2



Treatments were applied on 6-30 (July Flame) or 8-5 and 8-11-11 (Ryan Sun) using an air-blast sprayer (100 gal/A). NIS = non-ionic surfactant. Q8Y78 240SC is a pre-mix of picoxystrobin and penthiopyrad. Fruit were harvested and stored at 1C for 7 days and were then incubated at 20C for 7 days.

Fig. 11. Efficacy of fungicide treatments for management of powdery mildew of cv. Carson peach in Butte Co.

Program	Treatment	3-4 FB	3-22 PF	4-13 PF
---	Control	---	---	---
Single treatments	Actinovate 12 oz	@	@	@
	Vivando (BAS560) 15 fl oz	@	@	@
	Bumper 41.8EC 4 fl oz	@	@	@
	Quash 50WG 3.5 oz	@	@	@
	Fontelis (DPX LEM 17) + NIS 20 fl oz	@	@	@
	S-2200 3 fl oz	@	@	@
Mixture	Xemium (BAS700) 3.4 fl oz + Vivando 10.4 fl oz	@	@	@
Pre-mixtures	Adament 50WG 6 oz	@	@	@
	Luna Sensation 5 fl oz	@	@	@
	Inspire XT 7 fl oz	@	@	@
	Inspire Super 20 fl oz	@	@	@
	Quadris Top 14 fl oz	@	@	@
	Pristine 38WG 14.5 oz	@	@	@
	Merivon (BAS703) 6.8 fl oz	@	@	@
	Q8478 18 fl oz + NIS	@	@	@
Rotations	Merivon (BAS703) 6.8 fl oz	@	---	@
	Vivando 15 fl oz	---	@	---
	Indar 6 fl oz + Quintec 7 fl oz	@	---	---
	Quintec 7 fl oz	---	@	@



Treatments were applied using an air-blast sprayer at a rate of 100 gal/A. NIS=non-ionic surfactant. Q8Y78 240SC is a pre-mix of picoxystrobin and penthiopyrad. Evaluation was done on 6-9-11. For this, fruit on each of the 4 single-tree replications were evaluated for the presence of powdery mildew.