Annual Report - 2015

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:	Forth-Year of Four
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SUMMARY OF RESEARCH ACCOMPLISHMENTS DURING 2015

We continued our research on major blossom, foliar, and fruit diseases of cling peach in California including leaf curl, brown rot blossom blight and fruit rot, and powdery mildew. Due to low rainfall, some diseases had a low incidence and severity. Still, we obtained new data on the management of these diseases with new fungicides and biological treatments using inoculation studies when possible.

1. Our trial on peach leaf curl indicated that ziram (FRAC Group Multisite 3 = FG M3) used at the 4-lb or 6-lb rate was highly effective. Bravo (FG M5, chlorothalonil), Syllit (FG Unknown 12 - U12, dodine), Badge X2, Kocide 3000 (FG M1, copper), and selected combinations (e.g., Badge X2-Bravo, Kocide 3000-ziram, or Syllit-ziram) were also highly effective. These fungicides represent valuable components of a leaf curl management program. Lower rates of ziram, as well as mixtures and rotations provide cost-effective strategies for managing the disease.
2. Brown rot blossom blight incidence was low in 2015 under low rainfall conditions. Field efficacy data were obtained on peach cvs. July Flame and Ryan Sun at KARE. The lowest levels of disease were obtained with Fontelis (FG 7 – penthiopyrad), Rhyme (FG 3 – flutriafol), Luna Sensation (FG 7/11, fluopyram/trifloxystrobin), Luna Experience (FG 3/7, tebuconazole/fluopyram), Merivon (FG 7/11, fluxapyroxad/pyraclostrobin), Viathon (FG 3/33, tebuconazole/phosphite), and the experimentals EXP-2 and EXP-3. Blossoms of Fay Elberta peach were used in laboratory tests, and several new fungicides demonstrated excellent pre- and post-infection activity. The plant extract Fracture significantly reduced the incidence of blossom blight from that of the control as a post-infection treatment, with an efficacy intermediate to conventional synthetic fungicides.
3. Preharvest fungicide applications were evaluated for the management of postharvest brown rot decay on three peach varieties. In the UC Davis trials on cv. Fay Elberta, with 4-day and 7-day PHI applications, effective fungicides included the new single-active ingredients Fontelis (FG 7), Kenja (FG 7 - isofetamid), and EXP-1; as well as standard fungicides like Indar (FG 3 - fenbuconazole) and Quash (FG 3 - metconazole), the pre-mixtures Luna Sensation (FG 7/11), Merivon (FG 7/11), Viathon (FG 3/33), and the tank mixtures Tebucon + Ph-D (FG 3+19) and Kenja + IB18220 (FG ?+7). In the trial on cv. July Flame at KARE, Merivon, Luna Experience, Viathon (at the 48-fl oz rate), and the experimentals EXP-2 and EXP-3 resulted in the lowest decay incidence.
4. Evaluation of brown rot blossom blight susceptibility among peach genotypes in the UC Davis breeding program continued with 23 new or previously evaluated genotypes. A range of susceptibilities was found with Dr. Davis the most and 99,12-155 the least susceptible. Some or the Early and Extra Late accessions, as well as peach x almond and peach x Extra Late peach crosses showed promise with significantly lower disease than Dr. Davis.
5. In a field trial on powdery mildew management, only very low disease levels were detected in the non-treated control and no disease was detected in the 19 treatments that were applied at full bloom and shuck split. Low rainfall and widespread use of powdery mildew fungicides in commercial orchards have led to low incidence of the disease in most locations.

INTRODUCTION

Brown rot caused by the fungal pathogens *Monilinia fructicola* and *M. laxa* is the most important disease of stone fruit in California. The blossom blight stage of the disease cycle continues to be critical in the epidemiology of the disease. Primary inoculum in the form of ascospores produced from apothecia (*M. fructicola*) and conidia from mummified fruit or twig cankers (*M. fructicola* and *M. laxa*) infects blossoms to start the annual disease cycle. Subsequently, diseased blossoms supply secondary inoculum (i.e., conidia) for fruit infections in the current growing season. Due to the dry California climate, fruit rots are not a major problem in most years, but devastating losses may occur with late spring/summer rains and entire crops can be lost. Thus, a considerable effort has been made to increase the number of fungicides available with different modes of action and to develop peach selections less susceptible to brown rot. Thus, the first part of this report will focus on management of brown rot blossom blight and fruit decay.

Presently, fungicide treatments are the most effective and consistent method for brown rot control, and we are continually evaluating the efficacy of new compounds. Fungicide Resistance Action Committee Groups (FGs) currently registered are FG 1 (benzimidazole carbamates), FG 2 (dicarboximides), FG 3 (DMIs), FG 7 (SDHIs), FG 9 (anilinopyrimidines), FG 11 (strobilurins, QoIs), FG 17 (hydroxyanilides), and FG 19 (polyoxins). New fungicides evaluated include the FG 3 Rhyme (flutriafol), the FG 7 Fontelis (penthiopyrad) and Kenja (isofetamid), and the experimental EXP-1. Most of the new materials are introduced as pre-mixtures. This is done to provide consistent activity, high performance, and a broader range of activity against several diseases. Registrants also want to protect proprietary rights of older products, and a mixture with a new fungicide facilitates this goal. Additionally, pre-mixtures reduce the risk of resistance development to any single class of fungicides. Thus, pre-mixtures as part of rotation programs are more likely to provide a sustainable use of these active ingredients in California where the total number of applications per season is limited. New pre-mixtures include the FG 7/11 (SDHI/QoI) Merivon and Luna Sensation (pending), the FG 3/11 Luna Experience, the FG 3/33 Viathon, and the experimentals EXP-2 and EXP-3.

There is a need for more research on the management of foliar and fruit diseases of cling peach with these new chemistries and we continued our studies in 2015 to support registration by determining the spectrum of activity, the efficacy and consistency of performance, the preventative and post-infection activity, the persistence of residues, and the potential for resistance. This information is needed to design management programs that are highly effective under different environmental conditions (i.e., low to high rainfall) and that help to prevent the development of fungicide-resistant populations of the pathogens. For resistance management, ideally, any one fungicide class should only be used once or twice per season.

An additional goal is to evaluate natural products and biocontrols as possible organic alternative treatments. Many previously evaluated products were ineffective, and others such as Actinovate and Regalia were inconsistent in their efficacy in reducing blossom blight and powdery mildew. The plant extract Fracture (*Lupinus albus*) was again included in our evaluations in 2015. In Sept. 2012, the EPA gave polyoxin-D (Ph-D, Tavano, Oso) an “exempt” registration status. It is a bio-fungicide produced by fermentation processes and has the potential to be an organic fungicide. The registrants are petitioning for organic status and OMRI approval. Thus, we are evaluating it for conventional and potentially organic production of cling peach.

In collaboration with the cling peach breeding program of Dr. Tom Gradziel, evaluation of natural host resistance identified promising new genetic lines with almond and wild almond parentage. Although we are using standardized laboratory methods, levels of susceptibility have sometimes been variable over the years indicating that susceptibility may be dependent on environmental conditions during flower development through regulation of genes involved in susceptibility. Still, overall our data over the years indicate good consistency with Bolinha genotypes and several other lines showing low and Dr. Davis high incidence of stamen infections. This information will help in the discovery of molecular markers (e.g., major genes or more likely quantitative trait loci or QTLs) that are associated with host susceptibility. These markers then can be used in further breeding programs and they ultimately may reveal the mechanism of resistance.

Peach leaf curl is an ongoing disease problem in peach production and serious outbreaks can occur after wet winters. Because the use of copper in agriculture is currently reviewed by EPA and the cost of copper fungicides is increasing, alternative treatments, including new formulations of copper that allow lower application rates. Ziram has been consistently highly effective in our evaluations, whereas chlorothalonil and Syllit also showed very good efficacy. Currently we are working on obtaining: 1) a supplemental label for lower rates of ziram; 2) A new labeled rate of 6 pts/A of chlorothalonil to provide consistent efficacy similar to ziram; and 3) a higher usage rate (e.g., 48 oz/A) of dodine for more consistent control of peach leaf curl. Thus, these treatments were evaluated again in the 2014/15 season.

Powdery mildew is another important disease of cling peach that generally has a sporadic occurrence, but can result in high losses. We continued our comparative evaluations of registered and new fungicides in 2015. In the past few years, we found that among new treatments, FG 7 materials are highly effective against powdery mildew, similar to the DMI fungicides. Unfortunately, disease incidence at our trial site in 2015 was very low due to low rainfall and widespread use of fungicides with mildew activity in most locations and no data could be obtained.

Objectives

I. Management of brown rot.

- A) Efficacy and timing of representative compounds from each of five classes of fungicides: QoIs, APs, DMIs (e.g., Quash, Rhyme), hydroxyanilides (e.g., Protexio), and SDHIs (e.g., fluopyram, fluxapyroxad, penthiopyrad), potentially organic treatments such as Ph-D, Oso, and Botector, as well as selected pre-mixtures (e.g., Quadris Top, Inspire Super, Pristine, Luna Sensation, and Merivon).
    - a. Pre- and post-infection efficacy will be studied for both blossoms and fruit.
    - b. Evaluate additives to enhance growth of selected biocontrol products for blossom blight control.
- B) Baseline sensitivities of brown rot fungi to new classes of fungicides.
- C) Natural host resistance of new peach genotypes to blossom blight and fruit decay
    - a. Flower assays will be done using our standard laboratory procedure with detached blossoms collected at pink bud stage
    - b. Fruit assays will be done using standard laboratory methods

II. Management of peach leaf curl

- A) Evaluate higher rates of chlorothalonil (Bravo) and dodine (Syllit), new copper formulations, and tank mixtures of these products.

II. Management of powdery mildew on cling peach and other stone fruits.

- A) Efficacy of new powdery mildew fungicides (e.g., quinoxyfen, metrafenone, fluopyram, fluxapyroxad, penthiopyrad, and pre-mixtures), potentially organic treatments such polyoxin-D (Ph-D/Oso), as well as currently registered products, and their use in anti-resistance rotation and mixture programs.
- B) Evaluate additives to enhance growth of selected biocontrol products for powdery mildew control.

PROCEDURES

***Evaluation of fungicides for management of peach leaf curl caused by* Taphrina deformans**. Fungicides were applied in an experimental Fay Elberta orchard at UC Davis as dormant treatments using an air-blast sprayer at 100 gal/A. Selected rates of ziram, copper products (i.e., Kocide 3000, Badge X2), dodine (Syllit), or chlorothalonil (Bravo) were applied in combination with 3.5% Omni oil on Dec. 10, 2014. Tank mixtures evaluated were Syllit/Ziram, Badge/Ziram, Badge/Bravo, Bravo/Ziram, and Kocide/Ziram. Rates are indicated in Fig. 1. Trees were evaluated for disease in mid-May 2015. For this, the number of shoots with infections of a total of 50 shoots for each of four single-tree replications was determined.

Evaluation of fungicides for management of brown rot blossom blight and preharvest fruit decay. Trials were established to evaluate fungicides for control of brown rot blossom blight and fruit rot on cv. Fay Elberta peach at UC Davis, and on cvs. July Flame and Ryan Sun peach at the Kearney Agricultural Research and Extension Center (KARE) in Parlier, CA. A single application of each treatment was made at 50%, 60%, or 25% full bloom to Fay Elberta, July Flame, or Ryan Sun peach, respectively. Fungicides were applied to trees using an air-blast sprayer calibrated for 100 gal/A. Note that the EXP-1, -2, and -3 materials are different from the ones used in 2014. In the KARE trial trees were inoculated with *M. fructicola* (1000 spores/ml) using an air-blast sprayer and overhead sprinkler irrigation was applied for 8 h on each of the two days after the spray. Disease was evaluated in mid-April 2015. For this, 200 blossoms were evaluated for blight for each of the four single-tree replications per treatment.

Laboratory studies were done with cv. Fay Elberta peach blossoms obtained from the UC Davis orchard. Pink bud blossoms were collected, allowed to open in the laboratory, and were either inoculated with a conidial suspension of *M. fructicola* (20K conidia/ml) and then treated after 24 h with products as indicated in Fig. 2 using a hand sprayer (post-infection activity), or treated and inoculated after 17 h (pre-infection activity). Three replications of 8 blossoms were used for each fungicide. The incidence of stamen infection was determined after 4 to 5 days at 20 C.

For fruit rot studies at UC Davis, treatments were applied to two Fay Elberta peach orchards at 4- or 7-days PHI. In the KARE trials, treatments were applied to July Flame peach at 7-days PHI and to Ryan Sun peach at 14- and 7-days PHI. Four single-tree replications for each treatment were randomized in complete blocks. Fungicides evaluated are indicated in Figs. 3 and 4. Twelve fruit each were harvested for each treatment for the Fay Elberta trial and 48 fruit each for the trials at KARE. Fruit were spray-inoculated with *M. fructicola* (20,000 spores/ml) and incubated for 5-10 days at 20-25C, >95% RH. The incidence of fruit infection was expressed as a percentage of infected fruit per total fruit incubated for each replication.

Host susceptibility of F1- progeny of Bolinha peach and other selections to brown rot blossom blight and fruit decay. Blossoms of advanced breeding lines with almond and wild almond parentage were evaluated and compared to standards (e.g., Dr. Davis and Bolinha). Genotypes as suggested by Dr. Gradziel (*see* Fig. 6) were collected at popcorn stage in the spring of 2015. Due to environmental conditions and simultaneous flowering of many accessions in 2015, 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 4-6 days at 20C. The incidence of stamen infections was assessed for 8-10 blossoms per each of four replications.

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. Nineteen treatments with single-fungicides, mixtures, pre-mixtures, and rotation programs were applied at full bloom and 2 and 4 weeks after petal fall. Disease was evaluated on May 13, 2015. For this, 100 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 9.4.

RESULTS AND DISCUSSION

Evaluation of fungicides for management of peach leaf curl. Due to low rainfall in Dec. 2014 and early 2015, disease severity in our cv. Fay Elberta orchard at UC Davis was low, but incidence based on shoot infections (one or more infected leaves per shoot) was 47.3% (Fig. 1). At this disease pressure, all treatments applied significantly reduced the incidence of disease (Fig. 1). The most effective ones were Badge X2 (4 lbs) mixed with Bravo (4 pts) and Kocide applied at 7 lb/A. Chlorothalonil (e.g., Bravo – 6 pt rate) as well as ziram (4 and 6 lb rates), copper (Badge X2), dodine (Syllit 65WG) and selected combinations (e.g., Badge X2-Bravo, Ziram-Syllit) were also highly effective.

Ziram, chlorothalonil, and dodine represent valuable components of a leaf curl management program and alternatives to copper fungicides. Over several years of trials, Ziram, high rates of Bravo, and mixtures of these products were always the most effective treatments evaluated. These three fungicides are currently registered for use in California. Thus, several options are available for growers to manage the disease.

***Efficacy of fungicides for management of blossom blight*.** With low rainfall in late winter/early spring at UC Davis, disease incidence was very low on untreated control trees and no data could be obtained. At UC KARE where trees were inoculated, blossom blight incidence also was low with 1.5 to 2% incidence in the untreated controls. For both cultivars used, all fungicides performed statistically similar and significantly reduced the incidence of blossom blight from the control (Fig. 2). Overall, disease was reduced to lower levels on July Flame as compared to Ryan Sun. This is probably due to the different phenological stages at fungicide application: July Flame was treated at 60% bloom, whereas Ryan Sun was treated at 25% bloom. Generally, higher disease control is obtained when the fungicide is applied to open flowers because the internal flower tissues are highly susceptible. On both cultivars, no disease was observed after treatment with the new FG 7 Fontelis. On July Flame, Rhyme (FG 3), Luna products (FGs 3/7 and 7/11), Merivon (FG 7/11), Viathon (FG 3/33), and the experimental EXP-2 also reduced the disease to zero incidence.

Blossoms of Fay Elberta peach were used in laboratory tests, and all fungicides evaluated demonstrated very good to excellent pre- and post-infection activity (Fig. 3). In the post-infection study, the biological treatment Fracture also significantly reduced disease as compared to the control but the incidence of blossom blight in this treatments was still significantly higher than that of the conventional fungicide treatments. As a preventative (pre-infection activity), Fracture was ineffective (Fig. 3).

***Efficacy of preharvest fungicides for management of fruit decays*.** In the two trials at UC Davis on Fay Elberta, treatments were done at 4-day or 7-day PHI. All fungicides significantly reduced the incidence of brown rot of non-wound-inoculated fruit at both timings (Fig. 4). In the trial with 4-day PHI applications, there was no significant difference among treatments (Fig. 4A). Disease incidence was reduced from 65.6% in the control to between 9.4 and 18.8%. In the trial with 7-day PHI applications, several treatments including Rhyme, Kenja+IB18121, EXP-1, and EXP-2 were less effective than others (Fig. 4B). Most effective were Indar (FG 3), Fontelis, Kenja (both FG 7), Luna Experience (FG 3/7), Merivon (FG 7/11), Viathon (FG 3/33), as well as the mixtures Kenja+IB18220 (FG ?/7) and Tebucon+Ph-D (FG 3+19).

At KARE, 7-day and 14+7-day PHI applications were done. Most treatments were very effective using a 7-day PHI timing on the early-maturing cv. July Flame with Merivon, Luna Experience, Viathon (48-fl oz rate), and the experimentals EXP-2 and EXP-3 resulting in the lowest decay incidence (Fig. 5A). The remaining treatments also performed very well. All treatments were much less effective when applied 7 and 14 days PHI on the late-maturing cv. Ryan Sun peach. The lowest disease incidence was found on fruit treated with some of the fungicide mixtures (Fig. 5B).

In summary, numerous highly effective fungicides are currently available and continue to be developed for the management of brown rot blossom blight and fruit decay. Although Fontelis was very effective, it has a high risk for resistance development and should be used in a mixture with propiconazole or tebuconazole (FG 3) with a minimal additional expense when generic materials are used. FG 3 treatments or fungicide mixtures containing a FG 3 fungicide were consistently very effective. Overall, pre-mixtures have improved efficacy, are consistent, and have built-in resistance management with both active ingredients inhibitory to the brown rot pathogens. Additionally, all of the pre-mixtures evaluated are also effective against *Botrytis cinerea* (the green fruit rot and gray mold pathogen) and powdery mildew and thus, provide protection against multiple diseases. Applications are best done within 7 days of harvest, so high residue levels are still present at harvest when many of the infections occur. On later maturing fruit, a two-spray program (two sprays within 14 days of harvest) may be beneficial because of a higher disease pressure due to more quiescent infections and higher inoculum levels in the orchard later in the season.

Polyoxin-D was registered as Ph-D (Arysta), or as Oso and Tavano (both Certis), on stone fruit crops. The compound is of interest because it is a bio-fungicide and is exempt from tolerance in the US. The registrants are petitioning the National Organic Standards Board (NOSB) for organic status. At this time, however, it is not approved as an organic fungicide. In our previous field studies on brown rot fruit decay, polyoxin-D was effective as a 1-day PHI treatment on non-wound inoculated fruit, but had little or no efficacy when applied using a 7-day PHI application. This compound should be used in a two-spray application program (within 7 days of harvest) and in mixtures with other fungicides (e.g., DMI - FG 3). We consider this compound mainly a contact material with moderate persistence.

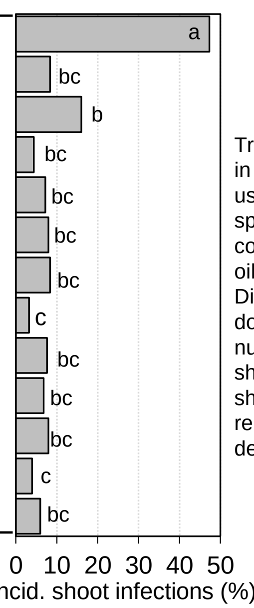
Host susceptibility of F1- progeny of Bolinha peach and other selections to brown rot blossom blight. Evaluation of brown rot blossom blight susceptibility among peach genotypes in the UC Davis breeding program continued with 23 new and previously evaluated genotypes (Fig. 6). The early-blooming Bolinha accession had a high amount of stamen infections in 2015. These blossoms were collected at the very end of bloom. Most were very small and atypical, and probably not representative of this genotype. A range of susceptibility was found among genotypes with Dr. Davis the most susceptible (87% disease incidence) and 99,12-155 (35% disease incidence) having the least amount of disease. Some or the Early and Extra Late accessions, as well as peach X almond and peach X Extra Late peach crosses showed promise with significantly lower disease than Dr. Davis (a cultivar that we use as a highly susceptible standard). As in previous years, we found that some lines were consistent and others were inconsistent in their susceptibility. All lines evaluated were grown under the same horticultural practices at the Wolfskill facility and they experienced the same environmental conditions. We collected blossoms in the popcorn stage and allowed them to open in the laboratory to minimize maturity differences of the flowers; but still, genetic characteristics affecting bloom date may also affect blossom susceptibility. This data is shared with Dr. Gradziel and is used as one trait of many in selecting new genotypes for the industry.

Evaluation of fungicides for management of powdery mildew. In the powdery mildew trial in Butte Co., very low levels of disease developed in the untreated control. Thus, no efficacy data could be obtained for the 19 treatments with single-fungicides, mixtures, pre-mixtures, and rotation programs that were applied at full bloom, 2-weeks, and 4-weeks after petal fall. Low rainfall and widespread use of highly effective powdery mildew fungicides (e.g., FG 3, FG 7, and FG 11) in commercial orchards have led to low incidence of the disease in most locations.

In previous years' trials we identified numerous highly effective fungicides for management of powdery mildew. Among new treatments, fungicides containing FG 3 (i.e., DMIs) and FG 7 (i.e., SDHIs) materials are highly effective. For organic growers, 'softer chemistries' have been identified with activity against powdery mildew and these include Fracture and Serenade Optimum. Both are approved for organic production, giving organic growers options for the management of this disease.

Fig. 1. Efficacy of fungicides applied during dormancy for management of peach leaf curl of Fay Elberta peach in a field trial at UC Davis 2014/15

Treatment*	Rate (/A)	Oil
Control	---	---
Syllit 65WG	32 oz	3.5%
Bravo Weather-Stick	4 pt	3.5%
Bravo Weather-Stick	6 pt	3.5%
Ziram 76DF	4 lb	3.5%
Ziram 76DF	6 lb	3.5%
Badge X2	7 lb	3.5%
Kocide 3000	7 lb	3.5%
Badge X2 + Ziram	5.5 lb + 4 lb	3.5%
Syllit + Ziram	24 oz + 4 lb	3.5%
Kocide 3000 + Ziram	5 lb + 4 lb	3.5%
Badge X2 + Bravo	5.5 lb + 4 pt	3.5%
Bravo + Ziram	4 pt + 4 lb	3.5%

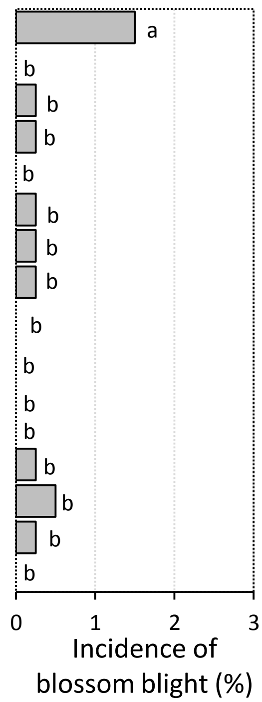


Treatments were applied in the field on 12-10-14 using an air-blast sprayer (100 gal/A) in combination with a spray oil (3.5% Omni oil). Disease evaluation was done on 5-13-15. The number of infected shoots for a total of 50 shoots for each replication was determined.

Fig. 2. Efficacy of fungicide treatments for management of brown rot blossom blight of two peach cultivars at KARE 2015

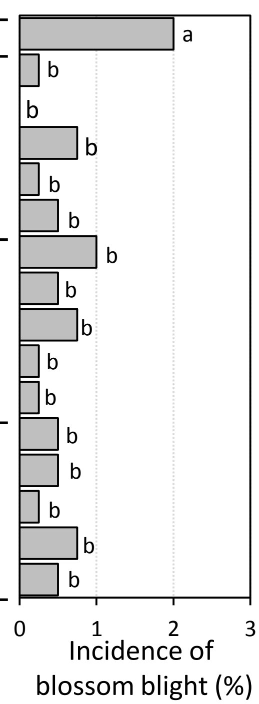
A. July Flame peach

	Treatments	Rate/A
	Control	---
Single	Rhyme	7 fl oz
Single	Rhyme + Breakthru	7 fl oz + 8 fl oz
Single	Quash	3.5 oz
Single	Fontelis	20 fl oz
Single	Kenja	12.5 fl oz
Single	EXP-1	4 fl oz
Single	EXP-1	5 fl oz
Pre-mixtures	Luna Experience + NIS	6 fl oz
Pre-mixtures	Luna Sensation + NIS	5 fl oz
Pre-mixtures	Merivon	5.5 fl oz
Pre-mixtures	EXP-2	7 fl oz
Pre-mixtures	EXP-3	7 fl oz
Pre-mixtures	EXP-3	8.5 fl oz
Pre-mixtures	Viathon	32 fl oz
Pre-mixtures	Viathon	48 fl oz



B. Ryan Sun peach

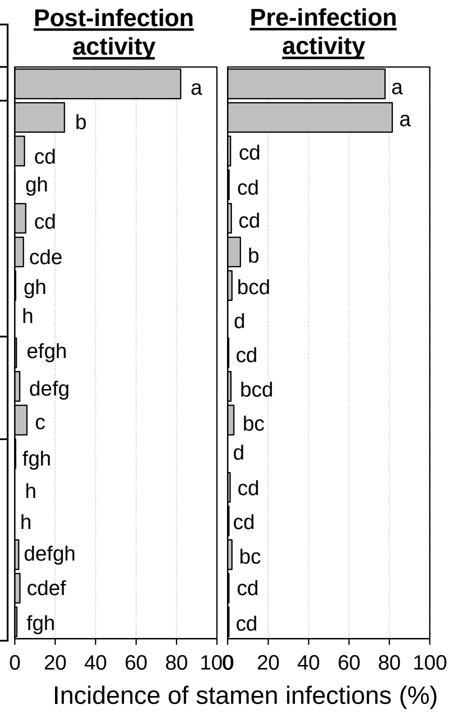
	Treatments	Rate/A
	Control	---
Single	Quash	3.5 oz
Single	Fontelis	20 fl oz
Single	Kenja	12.5 fl oz
Single	EXP-1	4 fl oz
Single	IL-54111	13.7 fl oz
Mixtures	Ph-D + Tebucon	6 oz + 4 oz
Mixtures	Kenja + IB18121	8.6 fl oz + 13.7 fl oz
Mixtures	Kenja + IB18121	8.6 fl oz + 10.8 fl oz
Mixtures	Kenja + IB18120	9.4 fl oz + 6.34 fl oz
Mixtures	Kenja + IB18120	6.85 fl oz + 4.6 fl oz
Pre-mixtures	Luna Experience + NIS	6 fl oz
Pre-mixtures	Luna Sensation + NIS	5 fl oz
Pre-mixtures	Merivon	5.5 fl oz
Pre-mixtures	EXP-2	7 fl oz
Pre-mixtures	EXP-3	7 fl oz



Treatments were applied on 2-25-15 to July Flame peach (60% bloom) and on 3-3-15 to Ryan Sun peach (25% bloom) using an air-blast sprayer (100 gal/A). Trees were inoculated with *M. fructicola* (1000 spores/ml) using an air-blast sprayer and 8 h of overhead sprinkler irrigation was applied on two consecutive days. Disease was evaluated in mid-April 2015.

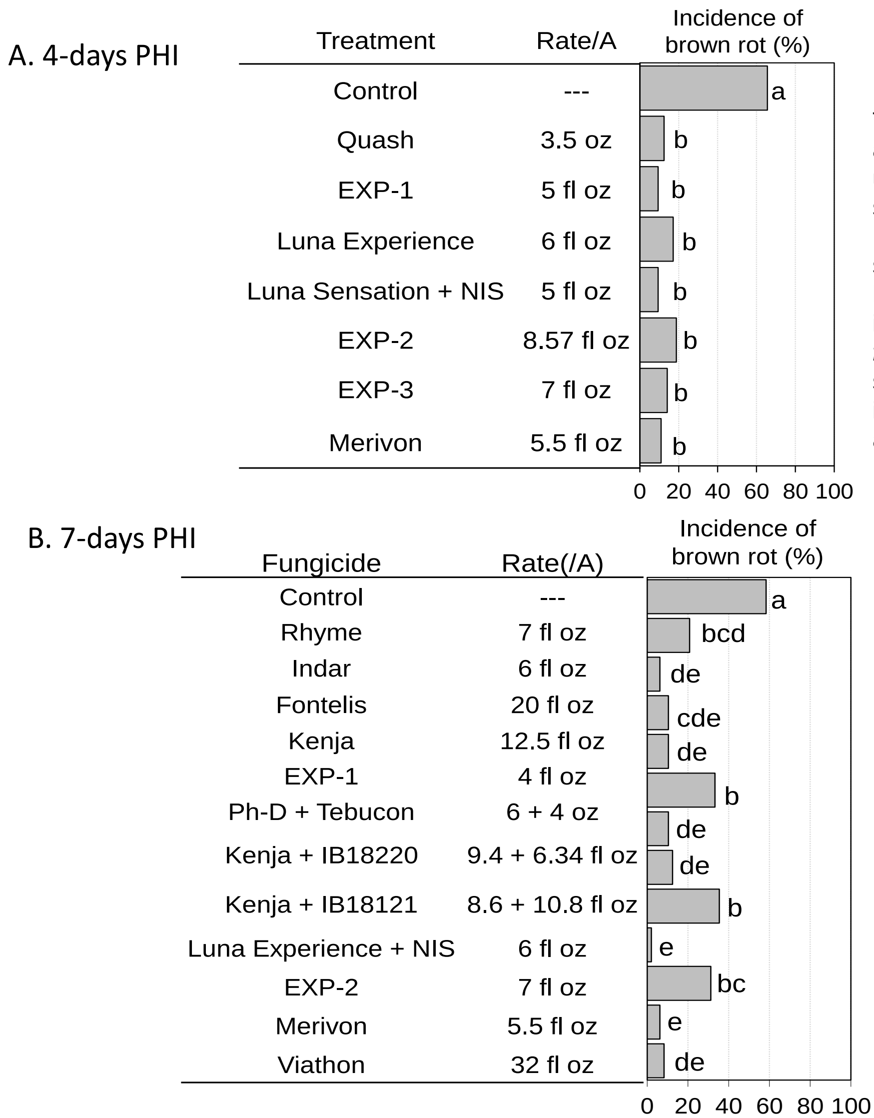
Fig. 3. Efficacy of pre- and post-infection treatments for management of brown rot blossom blight of Fay Elberta peach in the laboratory 2015

Treatment	Rate/A
Control	---
Fracture	30 fl oz
Quash	3.5 oz
Rhyme	7 fl oz
Fontelis	20 fl oz
Kenja	12.5 fl oz
EXP-1	5 fl oz
EXP-1	4 fl oz
Kenja + IB18121	8.6 + 10.8 fl oz
Kenja + IB18220	6.85 + 4.6 fl oz
Ph-D + Tebucon	6 + 4 oz
Luna Experience	6 fl oz
Luna Sensation	5 fl oz
EXP-2	7 fl oz
EXP-3	7 fl oz
Merivon	5.5 fl oz
Viathon	32 fl oz



For evaluation of the pre-infection activity, closed blossoms were collected in the field, allowed to open, and treated in the laboratory using a hand sprayer. After 17 h blossoms were inoculated with spores of *M. fructicola* (20K/ml). For post-infection activity, blossoms were inoculated, incubated at 22C, and treated after 24 h. Blossoms were evaluated for stamen infections after 4-5 days of incubation at 20 C.

Fig. 4. Efficacy of preharvest treatments with biologicals and fungicides for management of postharvest brown rot of Fay Elberta peach in a field trial at UC Davis 2015



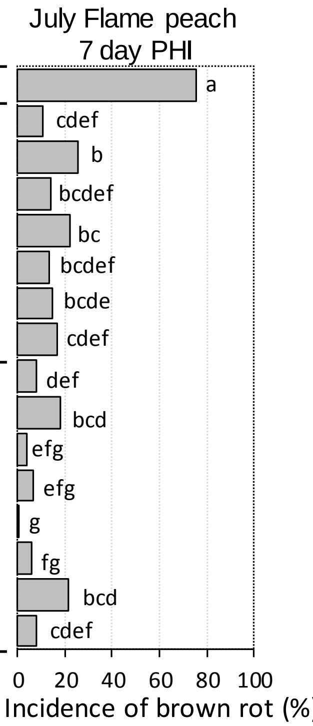
Treatments were applied on 7-6-15 using an air-blast sprayer (100 gal/A). NIS = Nonionic surfactant. Fruit were harvested, spray-inoculated with *M. fructicola* (100,000 spores/ml) and incubated for 10 days at 20-25C.

Treatments were applied on 7-21-15 using an air-blast sprayer (100 gal/A). NIS = Nonionic surfactant. Fruit were harvested, spray-inoculated with *M. fructicola* (100,000 spores/ml) and incubated for 10 days at 20-25C.

Fig. 5. Efficacy of preharvest treatments for management of postharvest brown rot of two peach cultivars in field trials at KARE 2015

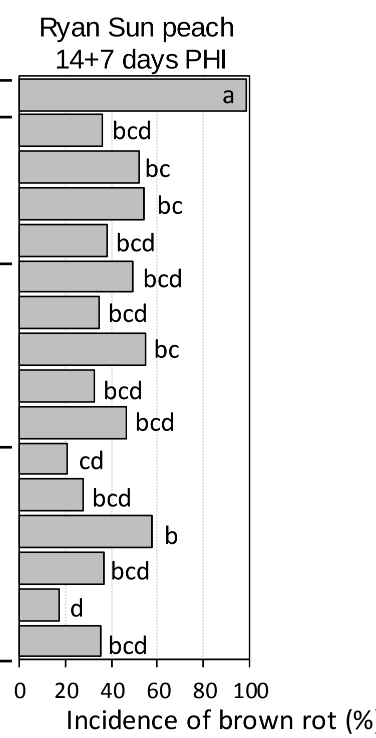
A.

	Treatments	Rate/A
	Control	---
Single	Quash	3.5 oz
	Indar	6 fl oz
	Indar + Breakthru	6 fl oz + 5.25 fl oz
	Kenja	12.5 fl oz
	Fontelis + NIS	20 fl oz
	EXP-1	4 fl oz
	EXP-1	5 fl oz
Pre-mixtures	Luna Experience + NIS	6 fl oz
	Luna Sensation + NIS	5 fl oz
	Merivon	5.5 fl oz
	EXP-2	7 fl oz
	EXP-3	7 fl oz
	EXP-3	8.5 fl oz
	Viathon	32 fl oz
	Viathon	48 fl oz



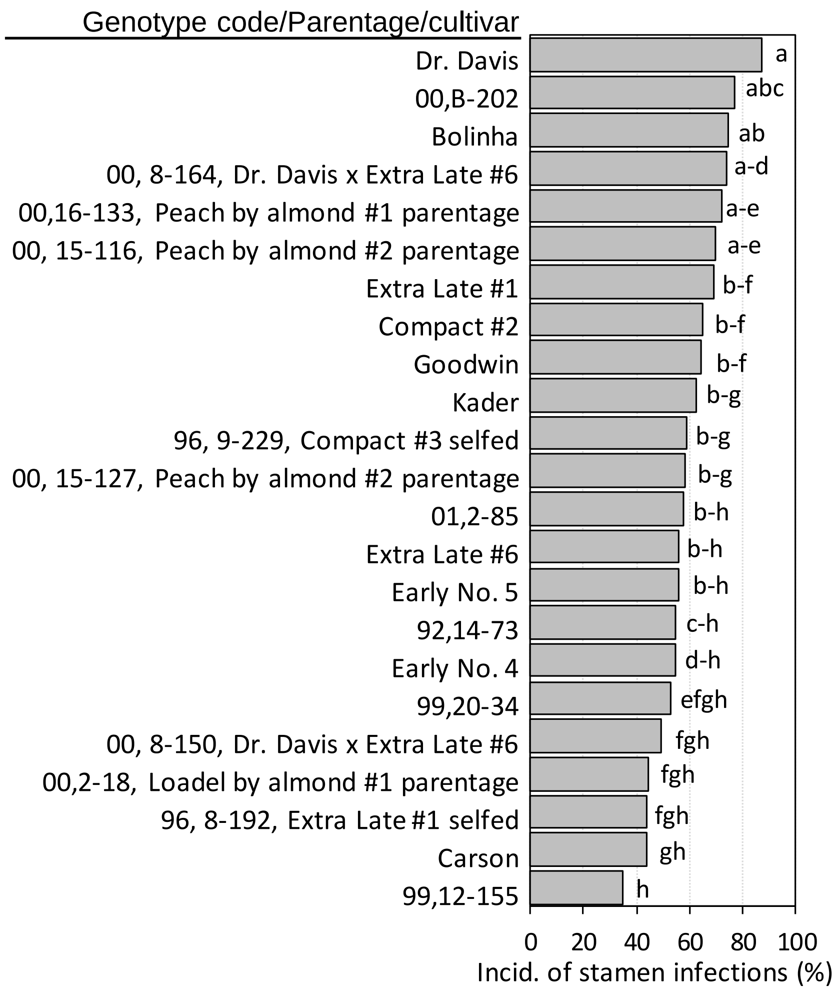
B.

	Treatments	Rate/A
	Control	---
Single	Quash	3.5 oz
	Fontelis + NIS	20 fl oz
	Kenja	12.5 fl oz
	EXP-1	4 fl oz
Mixtures	Ph-D + Tebucon	6 oz + 4 oz
	Kenja + IB18121	8.6 fl oz + 13.7 fl oz
	Kenja + IB18121	8.6 fl oz + 10.8 fl oz
	Kenja + IB18220	9.4 fl oz + 6.34 fl oz
	Kenja + IB18220	6.85 fl oz + 4.6 fl oz
Pre-mixtures	Luna Experience + NIS	6 fl oz
	Luna Sensation + NIS	5 fl oz
	Quadris Top + DyneAmic	14 fl oz + 15 fl oz
	EXP-2	7 fl oz
	EXP-3	7 fl oz
	Merivon	5.5 fl oz



Treatments were applied in the field on 6-12-15 (July Flame) or on 7-28 and 8-4-15 (Ryan Sun) using an air-blast sprayer at 100 gal/A. NIS = Non-ionic surfactant. Fruit were harvested (48 fruit from each of four single-tree replications), spray-inoculated with *M. fructicola* (20,000 spores/ml) and incubated for 7 days at 20C.

Fig. 6. Host susceptibility of standard and advanced cling peach genotypes with almond and wild almond parentage to brown rot blossom blight 2015



Closed blossoms were collected in the field, allowed to open, and inoculated with conidia of *M. fructicola* (20K/ml). Blossoms were evaluated for stamen infections after 5-6 days of incubation at 20 C.