WALNUT BLIGHT CONTROL INVESTIGATIONS TEHAMA 2008

Richard P. Buchner, Steven E. Lindow, James E. Adaskaveg, Carolyn Pickel, Cyndi K. Gilles, Renee Koutsoukis, and Sara Goldman Smith

ABSTRACT

Walnut blight treatments for 2008 were designed to evaluate first spray application timing using the bud tagging technique developed by Steve Lindow. Material testing included Manzate 75 DF, Dithane, Pristine, Kocide 2000, Nu Cop HB and Breakthru. Kernel evaluations were done to investigate the effect of blight sprays on Kernel copper content and bud break was characterized. 2008 was the first year we combined the Codling moth material Cyd-X with blight sprays to evaluate a combined approach to walnut blight and codling moth control. Low disease pressure and low codling moth pressure, in the test location, resulted in inconclusive comparisons.

INTRODUCTION

Farm Advisors Richard Buchner, Bill Olson and UC Berkeley Plant Pathology professor Dr. Milt Schroth, first began experimenting with Manex back in 1993 in Butte and Tehama counties. At that time, copper applications alone were providing very little or no walnut blight control in many walnut orchards. Increasing rates of applied copper or adding iron did not improve disease control. Dr. Schroth identified copper-resistant walnut blight bacteria which was the reason copper alone did not control the disease. Experimental results quickly documented that copper tank-mixed with Manex dramatically improved walnut blight control. The Emergency Registration (Section 18) was approved and walnut growers had an excellent material to protect their crop. Over the years, copper tank-mixed with Manex has consistently provided very good to excellent disease control in the presence of copper-sensitive and copper-resistant walnut blight bacteria. Year after year, Section 18 renewals were obtained allowing walnut growers (depending on county) to use Manex.

For the last several years, Buchner, Adaskaveg and product manufacturers have been working toward full registration of mancozeb, tested as Manzate 75 DF and Dithane 75 DF. Tests show that these products work equally well as Manex, so switching ethylene bis-dithiocarbamate (EBDC) formulations will not compromise walnut blight disease control. Currently all mancozeb labels are awaiting full registration (Section 3) approval and will have walnut on the label. For 2010, we expect full registration for mancozeb completing the transition without affecting disease control. The registration process is moving forward, although somewhat slowly, and apparently requires additional documentation.

Work in 2008 was designed to evaluate Manzate 75 DF efficacy and investigate three rates of Manzate 75 DF (0.5, 1.5 and 2.4 lbs/ac). We tested Pristine as a tank mix and looked at Nu Cop HB. For the first time in our research, the Codling moth material CYD-X was included in blight sprays to evaluate a biological method to take out two pests with one shot. This might be particularly useful if Pheromone puffers need help by reducing first flight Codling Moth. We worked with Steve Lindow to evaluate Breakthru rates and conducted the bud tagging work with Steve to continue the population work on first spray timing. We finished the copper kernel residue research.

For the 2008 season, our test orchard sprinkler system was reconfigured and we lost our over tree simulated rainfall ability. With the low disease pressure year we measured no treatment differences in the 2008 research effort. Our 2009 goal is to reestablish our over tree rainfall simulation and re run the previous year's experiments. Objectives are similar to the 2008 proposal.

OBJECTIVES

1) Complete the work on efficacy of early-season bactericides applied at different phonological stages for disease control (Lindow work using tagged buds).
2) Continue to evaluate 0, 8, 16, 32 and 64 ounces of Breakthru for disease control using Manex and Kocide 3000.
3) Continue to look at the Manex replacement, Manzate 75 DF and evaluate any new available materials. Include copper alone and copper plus Manzate for registration data.
4) Evaluate Kocide 3000 with 3 rates of Manzate.
5) Evaluate walnut bud break phenology and cropping based upon bud break.
6) Evaluate kernel copper content for sprayed and unsprayed trees.

PROCEDURES AND RESULTS

Bactericide application relative to bud break timing is particularly important for good disease control. Bactericides applied very early (when most buds are closed) will not access the pathogen while bactericides applied after the majority of buds have opened are too late to prevent early contamination. Breakthru is used to improve bactericide penetration. Again in 2008, we continued a very ambitious experiment in which we tagged thousands of buds as they opened and applied a single bactericide spray at strategic times relative to bud opening. (Buchner et.al. 2007 Walnut Research Reports).

Colored tags were also used to evaluate bud/shoot fruitfulness. One hundred shoots per tree were tagged when shoots reached "prayer stage" on 4/2/08 (blue), 4/7/08 (white), 4/11/08 (yellow) and 4/15/08 (black). On 6/12/08 tagged shoots were evaluated for nut set. Two replicates were tagged and both trees received four blight sprays to protect against disease. Frost damage on 4/20/08 was not apparent.

Material evaluations (Figure 1) were done without over tree rainfall simulation which resulted in very little walnut blight disease pressure. Water applications using handgun and speed sprayer applications were made with little/no effect on disease incidence (Figure 2). All treatments were applied by handgun to individual trees. Applications were made at 250 psi to simulate a dilute (400 gal/ac) application. Trees were sprayed (5 gal/tree) to thoroughly wet all tissue. Spray applications were made 4/1/08, 4/10/08, 4/21/08 and 5/2/08. Experimental design was a randomized complete block (RCB) with twelve treatments and five replicates.
Copper kernel evaluation used treated and untreated trees within the main plot. Three treatments with five replicates in a RCB design were sampled. At commercial harvest, fifty walnuts were randomly sampled from each test tree, air dried, shelled and kernels transported to a commercial agricultural lab for kernel copper analysis in ppm.

In an effort to combine walnut blight control treatments with codling moth suppression Cyd-X (Cydia promonella granulovirus) was added to every Kocide 2000/Manex blight spray plus one additional treatment on 6/27/08 for the second flight. Canopy counts and harvest codling moth damage were used to evaluate treatment efficacy.

Figure 1. Treatments and rates for the Tehama County walnut blight research.

Treatment	Rate
1. Kocide 3000 + Manex	4 lbs. + 58 oz./Ac.
2. Kocide 3000 + Dithane	4 lbs. + 58 oz./Ac.
3. Kocide 3000 + Manzate	4 lbs. + 2.4 lbs./Ac.
4. Kocide 3000 + Manzate	4 lbs. + 1.5 lbs./Ac.
5. Kocide 3000 + Manzate	4 lbs. + 0.5 lbs./Ac.
6. Kocide 3000	4 lbs./Ac.
7. Pristine	10 oz./Ac.
8. Pristine + Kocide 3000	4 lbs. + 58 oz./Ac.
9. NuCop + Manex	6 qts. + 6 lbs./Ac.
10. Kocide 2000 + Manex + Cyd-X	6 lbs. + 58 oz. + 1.5 oz./Ac.
11. Kocide 2000 + Manex + Cyd-X	6 lbs. + 58 oz. + 3.0 oz./Ac.
12. Untreated Control	—

Data taken:

1) Percent blighted walnuts evaluated 6/12/08 by visually inspecting 700 to 800 walnuts per treated tree for blight symptoms. Counts were made randomly within the tree canopy roughly 6-12 feet above ground.
2) Phytotoxicity was visually rated using a scale of 0-5 where “0” represents no observable phytotoxicity.
3) Disease progression curve by tagging 150 nut pairs on 6 untreated trees under simulated rainfall and visually rating for walnut blight symptoms every 3-4 days.
4) Prayer stage bud development dates by visual inspection of over 1000 buds/shoots per count date.
6) Kernel copper content using an Agricultural lab experienced in analyzing tissue samples.
7) Counts of total nuts (6/12/08) on cohorts of shoots derived from buds that had been tagged at different opening dates.
8) Codling moth damage using midseason canopy counts and harvest damage by shelling 100 walnuts per tree.

Figure 2. Rainfall, Stage of Growth and Spray Timing for the Tehama Walnut Blight Experiment

Date	Rainfall	Water Spray	Event
3/27	—	—	20% bud break
3/29	.01	—	19% bud break
3/31	—	—	30% bud break (first pollen)
4/1	—	—	first blight spray
4/2	—	—	30% prayer
4/3	—	—	32% bud break
4/6	—	—	first flowers
4/8	—	handgun water[1]	—
4/10	—	—	45% bud break (second spray)
4/14	—	handgun water	—
4/15	—	speed sprayer water	—
4/16	—	—	51% bud break
4/20	—	—	full bloom (frost)
4/21	—	—	third spray
4/22	.09	—	—
4/23	.03	handgun water	—
4/24	—	—	48% bud break (1/8 nut size)
4/28	—	handgun water	—
5/2	—	—	fourth spray
5/5	—	—	48% bud break (3/8 nut size)
5/23	.03	—	—
5/24	.08	—	—

[1]Water application by handgun or speed sprayer

RESULTS AND DISCUSSION

With very low walnut blight disease in the 2008 test site, bacterial populations were too low to achieve meaningful comparisons for the large scale bud tagging work. This is an ongoing project and will be included in the 2009 experimental work.

Material evaluations (Figure 3) were also not conclusive due to low walnut blight disease pressure. Although there is no statistical separation, Kocide 3000 plus Manex applications resulted in zero percent walnut blight compared to 0.32% for untreated trees.

Figure 3 Percent walnut blight and treatment phytotoxicity for materials evaluated in the 2008 Tehama Walnut blight experiment.

Treatment	%Blight	Phytotoxicity
1. Kocide 3000 + Manex	0 a[1]	0
2. Kocide 3000 + Dithane	.28 a	0
3. Kocide 3000 + Manzate	.09 a	0
4. Kocide 3000 + Manzate	.54 a	0
5. Kocide 3000 + Manzate	.23 a	0
6. Kocide 3000	.22 a	0
7. Pristine	.16 a	0
8. Pristine + Kocide 3000	.43 a	0
9. NuCop + Manex	.37 a	0
10. Kocide 2000 + Manex + Cyd-X	.11 a	0
11. Kocide 2000 + Manex + Cyd-X	.12 a	0
12. Untreated Control	.32 a	0

[1]Duncan's multiple range test for treatment means at the 5% level.

For the Breakthru rate experiment, results are again inconclusive however the 16 oz./100 gal. rate appeared to result in the lowest walnut blight incidence. Kocide plus Manex applied without Breakthru resulted in 1.35 percent walnut blight compared to 0.15 percent blight for the 16 oz. rate (Figure 4).

Figure 4. Effect on blight control from a single spray applied 4/2/08 (30% prayer) using five rates of Breakthru. Single tree treatments, non replicated.

Treatment	% Blight
Kocide + Manex[1]	1.35
Kocide + Manex + 8 oz/100 gal Breakthru	1.37
Kocide + Manex + 16 oz/100 gal Breakthru	.15
Kocide + Manex + 32 oz/100 gal Breakthru	.56
Kocide + Manex + 64 oz/100 gal Breakthru	.68

[1]Kocide 3000 @ 4 lbs + Manex @ 58 oz/ac.

Shoot nut set counts are shown in figure 5. For both test trees, late prayer stage shoots were less likely to set walnuts suggesting the value of treating early shoots and protecting developing walnuts.

Figure 5. Shoot nut set for four prayer stage dates. 100 shoots tagged at each date, two replicates. Full bloom 4/20/08, nuts counted 6/12/08.

Tree #1

Date Prayer Stage	% shoots no walnuts	% shoots one walnut	% shoots two walnuts	% shoots three walnuts
4/2/08	11.3	32.7	45.9	10.2
4/7/08	9.4	43.8	44.8	2.0
4/11/08	30.0	42.2	27.8	0.0
4/15/08	83.8	10.0	6.2	0.0

Tree #2

Date Prayer Stage	% shoots no walnuts	% shoots one walnut	% shoots two walnuts	% shoots three walnuts
4/2/08	33.3	27.3	29.4	0.0
4/7/08	43.1	27.4	29.5	0.0
4/11/08	59.8	26.4	13.8	0.0
4/15/08	94.0	4.8	1.2	0.0

This is the second year for Kernel copper evaluations for walnuts treated with and without blight sprays (Buchner et.al. Walnut Research Reports 2007). As in the 2007 experiment, applications of copper with or without Manex did not increase kernel copper content compared to untreated trees (Figure 6).

Figure 6. Kernel copper analysis for treated trees with and without copper and Manex. Spray application dates were 4/01/08, 4/10/08, 4/21/08 and 5/2/08.

Treatment	Kernel ppm Cu
Kocide 3000 @ 4 lbs. + 58 oz. Manex/ac	13.12 a[1]
Kocide 3000 @ 4 lbs. /ac	15.14 a
Untreated control	13.88 a

[1]Duncan's multiple range test for treatment means at the 5% level. RCB design, 3 treatments with 5 replicates.

Combining Codling moth treatments with walnut blight sprays may be an effective technique to reduce first flight Codling moth populations. This might be particularly useful in orchards using pheromone releases for mating disruption. Very low Codling moth presence in the 2008 blight plot resulted in no conclusive differences between treatments (Figure 7).

Figure 7. Tehama Codling Moth/Blight Plot 2008. Canopy and Harvest counts are listed in the table as percent damage. Cyd-X is a formulation of *Cydia pomonella granulovirus*.

Treatment	Canopy Count 8/6/08	Harvest (CM)
Kocide 2000 + Manex + 1.5 oz. Cyd-X	.44 a	0
Kocide 2000 + Manex + 3.0 oz. Cyd-X	.14 a	0
Kocide 3000 + Manex	.20 a	0
Kocide 3000	.20 a	0
Control	.29 a	0

Spray dates: 4/1, 4/10, 4/21 (195DD) 5/2 (324DD) and 6/27. Codling Moth biofixs 3/24, 6/23 and 8/7. Five single tree replicates using 400 nuts per tree for canopy counts and 100 nuts per tree shelled for harvest damage evaluation.