WALNUT BLIGHT CONTROL INVESTIGATIONS 2003

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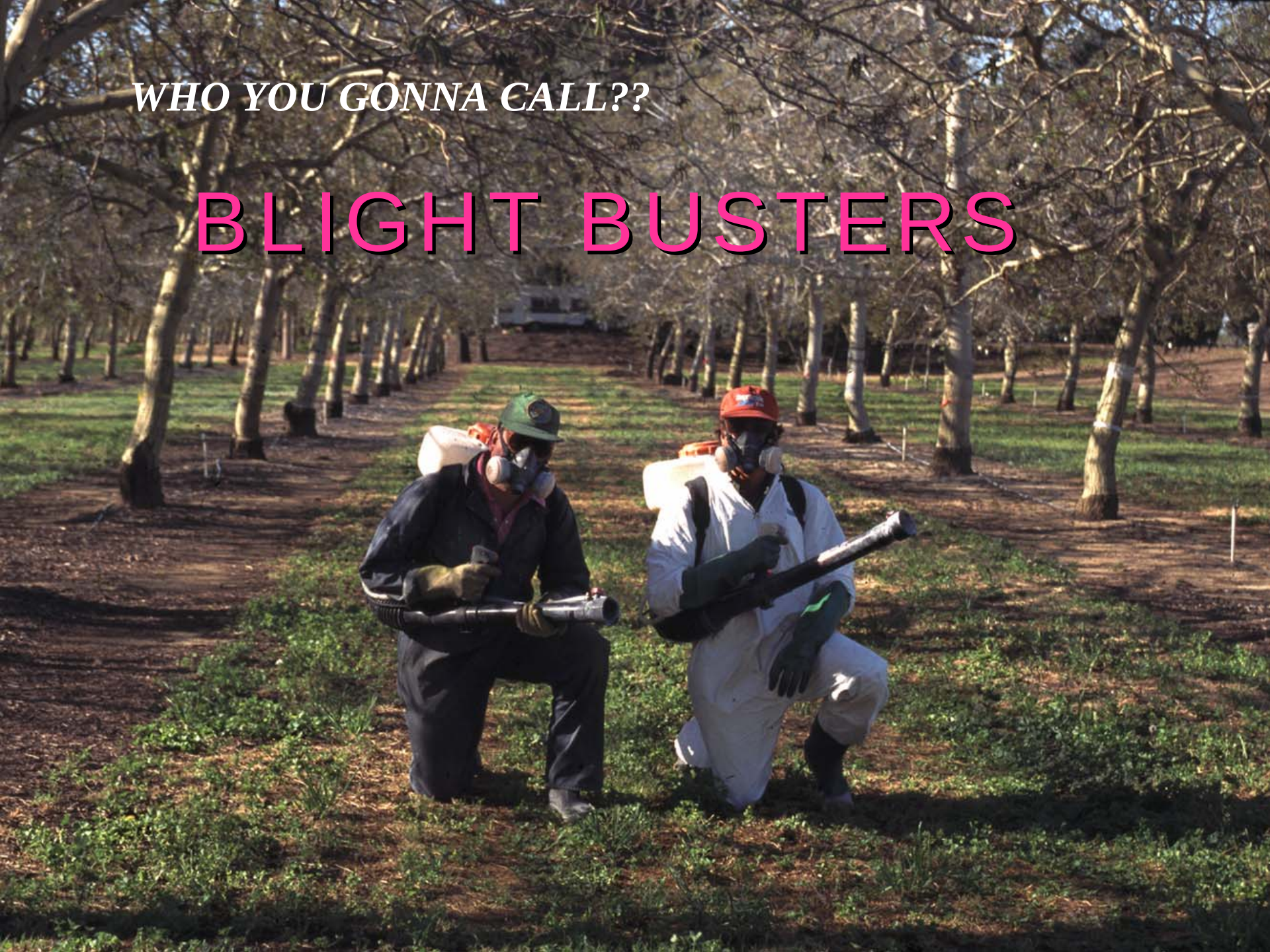
WHO YOU GONNA CALL??
BLIGHT BUSTERS

Susceptibility

- **All cultivars are susceptible**
- **Most severe on early-leafing**
- **As the season progresses, the susceptibility of the nut DECREASES**

Remember:

- **Susceptible tissue must be protected…**
  …BEFORE it rains

Project Highlights 2003

- Rainfall simulators in the 2003 and 2004 blight plots
- Copper/Manex is the material of choice (23% blight vs. 6.72% C+M)
- Reduction in the amount of copper applied (8lbs KOC 101 > 6 lbs. KOC 2000 > 3.5 lbs. GX 569)
- We have found no superior copper product
- Alternating material “BMP” to reduce/eliminate copper runoff
- Reducing the number of applications to reduce/eliminate copper runoff

Build a Blight Generator by Installing Overhead Sprinklers in Test Walnut Orchards

- Tehama Artificial Rain 5/17 and 5/27
- Butte Artificial Rain 4/8, 5/15 and 5/26


0001220
GALLONS
C700
AMCO
Water Meters

Evaluate New Products for Walnut Blight Control. Support Manex Registration (5 comparisons)

- Serenade for walnut blight control
- New materials for walnut blight control
- Commercial copper formulations
- New formulations
- Nordox 75 WG evaluation

Serenade for Walnut Blight Control

Treatment	Canopy[1] % Blight	Ground[2] # blighted nuts	Leaf[3] Phyto
1. Kocide 2000 Pro Tech + Manex	6.72 a[4]	12.60 a	1
2. Kocide 2000 Pro Tech	23.00 b	18.20 a	1
3. Serenade	22.71 b	19.20 a	1
4. Serenade + Kocide 2000	31.28 b	30.60 a	1
5. Control (artificial rain)	34.90 b	20.60 a	1
6. Control (natural conditions)	34.58 b	50.80 b	1

[1]Visual inspection of blighted walnuts within the tree canopy 6-12 feet above ground.

[2]Average number of blighted walnuts per tree on the ground, counted 6/12/03.

[3]Leaf phytotoxicity visually rated using a scale of 1-5 where a rating of 1 represents no observable phytotoxicity.

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

Figure 11. Percent blighted walnuts, blighted walnuts for dropped nut counts and leaf phyto for Serenade comparisons.

New Materials for Walnut Blight Control

Treatment	Canopy[1] % Blight	Ground[2] # blighted nuts	Leaf[3] Phyto
1. Kocide 2000 Pro Tech + Manex	6.72 b	12.60 a[4]	1
2. Kocide 2000 Pro Tech	23.00 a	18.20 a	1
3. DBNPA + Bond (1x)	29.75 a	15.00 a	1
4. DBNPA + Bond (2x)	27.06 a	26.60 a	1
5. Zerotol (1x)	19.87 ab	12.80 a	1
6. Zerotol (2x)	35.11 a	30.20 a	1
7. Control (artificial rain)	34.90 a	20.60 a	1
8. Control (natural conditions)	34.58 a	50.80 b	1

[1]Visual inspection of blighted walnuts within the tree canopy 6-12 feet above ground.

[2]Average number of blighted walnuts per tree on the ground, counted 6/12/03.

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

Figure 12. Blight Damage ratings for DBNPA and Zerotol comparisons.

Commercial Copper Formulations For Walnut Blight Control

Treatment	Canopy[1] % Blight	Ground[2] # blighted nuts	Leaf[3] Phyto
1. Kocide 2000 Pro Tech	23.00 ab[4]	18.20 b[4]	1
2. Kocide 2000 Pro Tech + Manex	6.72 c	12.60 b	1
3. Champ Dry Prill	19.63 bc	14.60 b	1
4. Champ Dry Prill + Manex	9.36 c	10.60 b	1
5. Control (artificial rain)	34.90 a	20.60 b	1
6. Control (natural conditions)	34.58 a	50.80 a	1

[1]Visual inspection of blighted walnuts within the tree canopy 6-12 feet above ground.

[2]Average number of blighted walnuts per tree on the ground, counted 6/12/03.

[3]Leaf phytotoxicity visually rated using a scale of 1-5 where a rating of 1 represents no observable phytotoxicity.

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

Figure 13. Blight Damage ratings for Champ Dry Prill comparisons.

New Copper Formulations for Walnut Blight Control

Treatment	Canopy[1] % Blight	Ground[2] # blighted nuts	Leaf[3] Phyto
1. Kocide 2000 Pro Tech	23.00 ab[4]	18.20 b[4]	1
2. Kocide 2000 Pro Tech + Manex	6.72 c	12.60 b	1
3. GX 569 + Manex (low rate)	4.36 c	17.40 b	1
4. GX 569 + Manex (high rate)	10.65 b	13.20 b	1
5. Control (artificial rain)	34.90 a	20.60 b	1
6. Control (natural conditions)	34.58 a	50.80 a	1

[1]Visual inspection of blighted walnuts within the tree canopy 6-12 feet above ground.

[2]Average number of blighted walnuts per tree on the ground, counted 6/12/03.

[3]Leaf phytotoxicity visually rated using a scale of 1-5 where a rating of 1 represents no observable phytotoxicity.

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

Figure 14. Blight Damage ratings for GX 569 comparisons.

Nordox 75 WG Evaluation

Treatments	Rate/Acre	% Walnut Blight[1]
1. Kocide 2000 + Manex	6 lbs. + 58 oz.	1.75 b
2. Nordox 75 WG + Manex	5 lbs. + 58 oz.	1.68 b
3. Nordox 75 WG + Manex	4 lbs. + 58 oz.	.89 b
4. Untreated Check	—	5.15 a

[1]Means not followed by a common letter are significantly different from one another at the 5% level of significance.

Figure 15. Percent walnut blight for the Nordox comparisons.

Best Management Practices for Walnut Blight Control (2 experiments).

- Best Management Program
- Best Treatment Timing

Best Management Program Alternating Materials

Trtmt #	Treatments	# In-season Sprays	% Blight**	Phyto Rating*	Mixing Prob
1	Inseason: Kocide+Manex	6	0.95 c	1 b	None
2	Inseason: Champ+Manex	6	1.39 c	1 b	None
3	Inseason: Alternate Kocide + Manex	3	2.02 c	1 b	Sig
	Zinc sulfate + hydrated lime	3			
4	Inseason: Alternate Kocide	3	1.65 c	1 b	Sig
	Zinc sulfate + hydrated lime	3			
5	Inseason: Kocide	6	18.08 b	1 b	None
6	Inseason: Serenade + Kocide + Manex (1st week)	1	0.67 c	1b	None
	Kocide+Manex (2nd and 3rd weeks)	2			
	Serenade + Kocide + Manex (4th week)	1			
	Kocide + Manex (5th and 6th weeks)	2			
7	Inseason: Kocide+Zinc sulfate+oil	6	2.94 c	3.4 a	None
8	Untreated Control	0	57.4 a	1 b	None

* Phyto Rating: 1 = None, 2 = Slight, 3 = Moderate, 4 = Heavy, 5 = Extreme

**Treatment means that are not followed by a common letter are significantly different from each other at the 5% level according to Duncan's Multiple Range Test for Mean Separation.

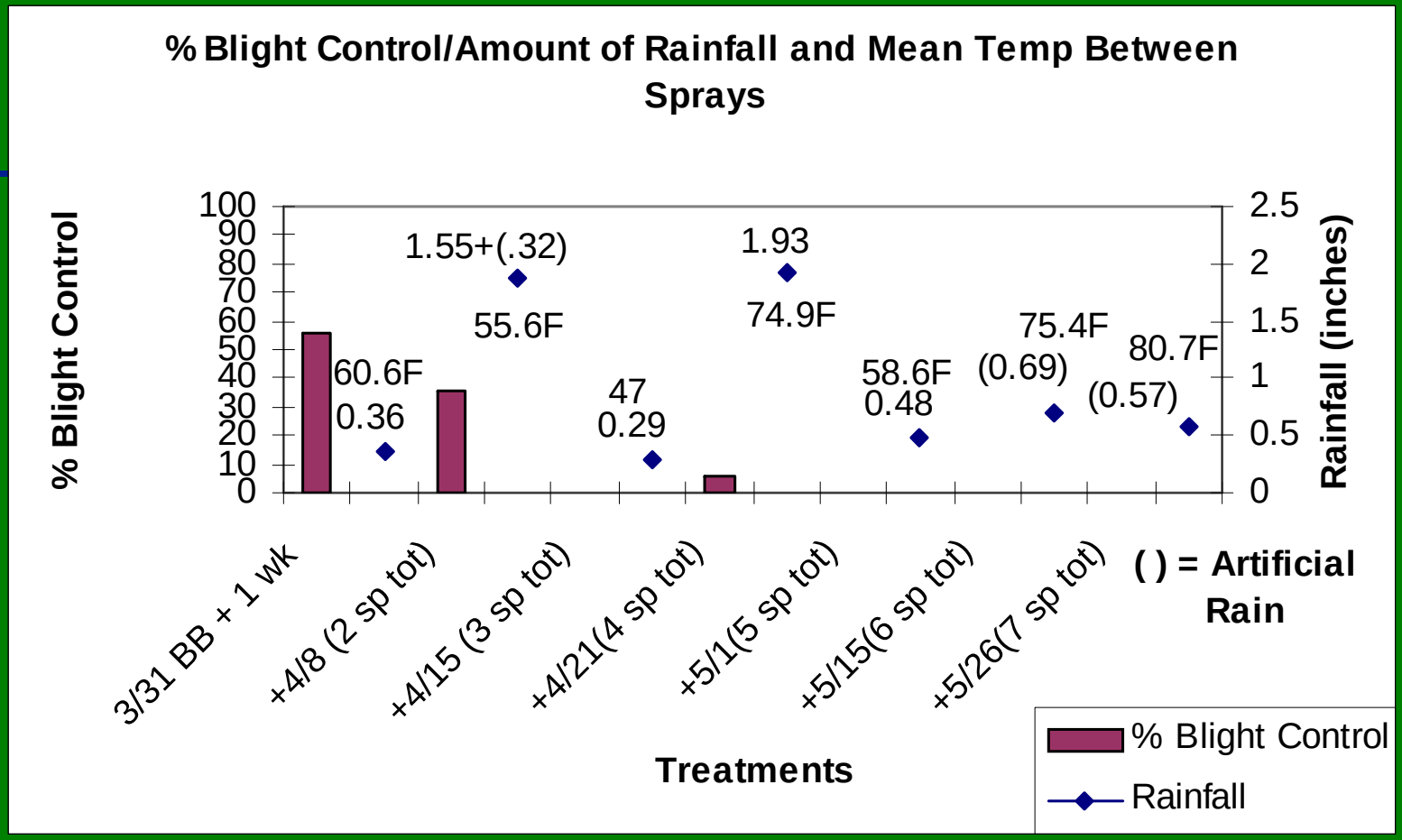
Figure 16. Blight damage evaluations for the Alternating Spray Materials BMP.

Best Treatment Timing

One week after terminal bud break[a]	In-Season Sprays[b]						% Blight[c]
3/31/03	4/8/03	4/15/03	4/21/03	5/1/03	5/15/03	5/26/03	
x	x	x	x	x	x	x	0.95 c
x	x	x	x	x	x		1.24 c
x	x	x	x	x			0.97 c
x	x	x	x				1.14 c
x	x	x					4.7 c
x	x						4.39 c
x							25.46 b
x[b]							24.44 b
	x	x	x	x	x	x	1.1 c
Nontreated							57.4 a

a – Kocide + Manex + Breakthru
b – Kocide + Manex
c - Treatment means that are not followed by a common letter are significantly different from each other at the 5% level according to Duncan's Multiple Range Test for Mean Separation.

Figure 19. Blight damage compared to spray application timing.



*BB = 1 week after terminal Bud Break

Figure 20. Percent blight control, amount of rainfall and mean temperature between sprays.

Evaluation of the Bud Break “Erradicant” Spray Technique

Treatments	% Blight
1. Untreated control	31.15 a[1]
2. Kocide + Manex + 0.2% Breakthru 200 gpa	9.68 bc
3. Kocide + Manex + 0.5% Breakthru 100 gpa	14.73 b
4. Kocide + Manex + 0.5% Breakthru 200 gpa	3.87 c
5. Kocide + Manex _ 0.2% Breakthru 100 gpa	14.13 b
6. Grower standard	0.35 c

[1]Means not followed by a common letter are significantly different from one another at the 5% level of significance.

Figure 24. Blight damage evaluations for the single “erradicant” spray strategy

A Look Back at Effective Products

1990 – Olson et al. Champion and Champ Flowable

1991 – Olson et al. Nordox, Champ Flowable, CT-N and Kocide DF

1992 – Olson/Buchner No Copper Comparisons

1993 – Olson/Buchner Kocide 101 + Manex

1994 – Olson/Buchner Nordox, Kocide 101 + Manex

1995 – Buchner/Olson Kocide 101 + Nordox and Manex, Zinc

1996 – Buchner/Olson Blue Shield, Manex

1997 – Olson/Buchner Zinc Bordeaux, 6 lbs. Kocide 2000 + Manex

1998 – Buchner/Olson Kocide 101/Manex, Nu Cop + Manex

1999, 2000, 2001, 2002 Low Blight Pressure

2003 – Buchner/Olson Nordox 75 WG, Kocide 2000 6 lbs, Champ Dry Prill 5.6 lbs

A Look Back at Non-Effective Products

1991 – Olson et al. Iron Chloride/Iron Oxide

1992 – Schroth, et. al. Iron additions did not improve control

1993 – Olson/Buchner FeCl3 + MgSO4 + CS7 + AG44M

1994 – Olson/Buchner Surfactants increase phyto and not disease control

1995 – Buchner/Olson Terramycin and Streptomycin, NFA

1996 – Buchner/Olson NuFilm P, NuFilm 17 and CS-7, Zinc Phyto

1997 – Olson/Buchner

1998 – Buchner/Olson DTEA, Ziram, Actigard, B694, DBNPA, PHMP, KOC 20/20 and Copper Count N

1999, 2000, 2001, 2002 Low Blight Pressure

2003 – Buchner/Olson DBNPA, Zerotol