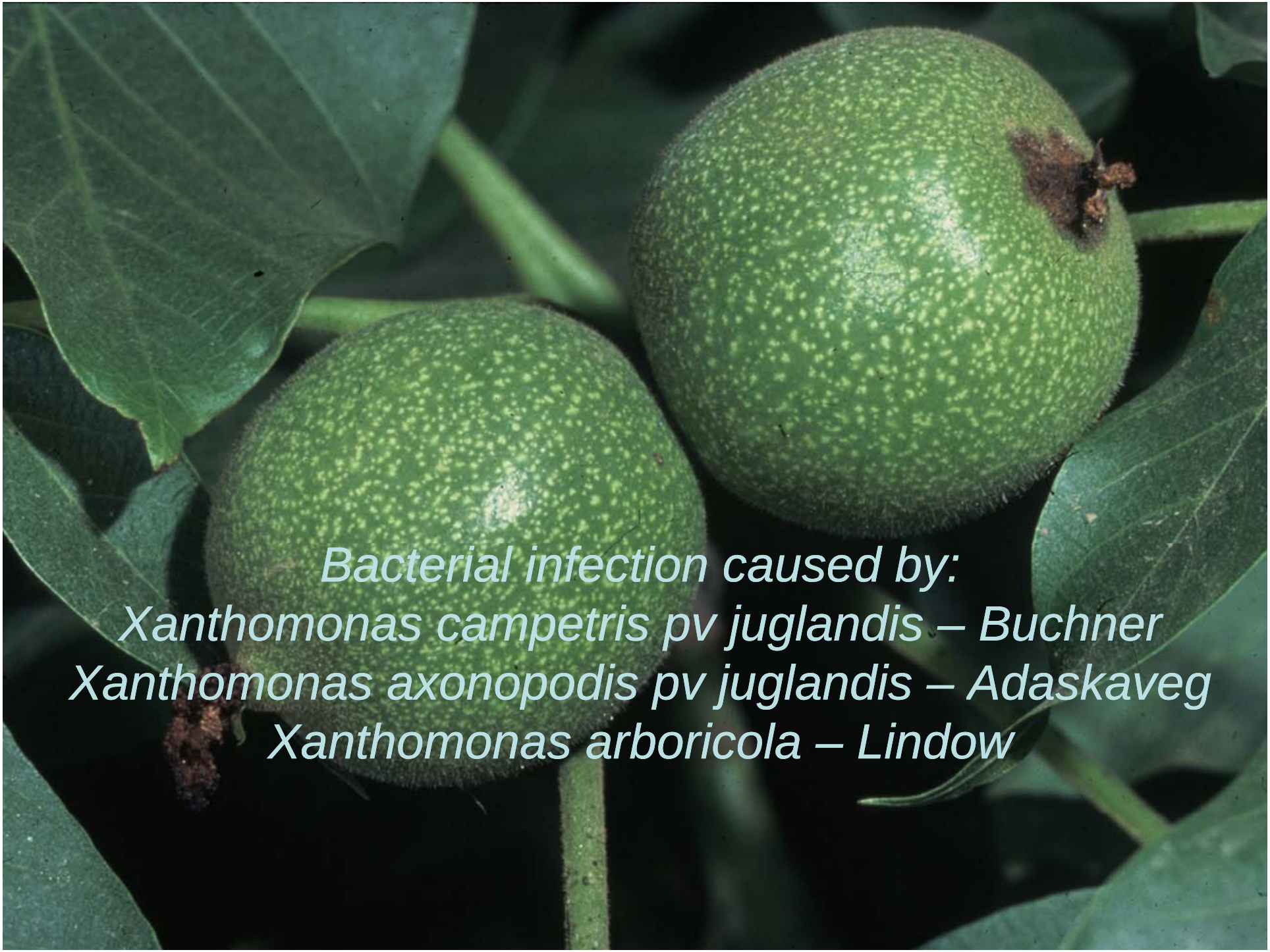
Walnut Blight Management Model for Predicting Treatment and Control

Richard Buchner, Steve Lindow, Jim Adaskaveg, Cyndi Gilles and Renee Koutsoukis

First involved 1992 http://walnutresearch.ucdavis.edu


Bacterial infection caused by:
Xanthomonas campetris pv juglandis – Buchner
Xanthomonas axonopodis pv juglandis – Adaskaveg
Xanthomonas arboricola – Lindow

Material Choice

Any good quality copper works well at the correct label rate – http://walnutresearch.ucdavis.edu

PLUS

Ethylene Bis-dithiocarbamate (EBDC)

Manzate

Section 18 for 2010

Table 1. Comparison of Manex® and Manzate Pro-Stick™

Property	~~*Manex®*~~	*Manzate Pro-Stick ™*
Active Ingredient	Maneb	Mancozeb
Formulation	Flowable - 4 lbs/gal	75% DF
Stability	Stable and consistent	Stable and consistent
Functionality	Easy to measure, handle and mix	Easy to measure, handle and mix
Persistence	High rainfastness and residual activity	High rainfastness and residual activity
Spectrum	Broad - Many fungal and bacterial diseases	Broad - Many fungal and bacterial diseases
Bactericide Treatment	Tank-mixed with a fixed copper*	Tank-mixed with a fixed copper*
Rate (/A)*	58 fl oz	2.4 lb
Application*	Ground/Aerial	Ground/Aerial
UC Bactericide Efficacy Rating	++++	++++
Resistance Potential	Low (Multi-site MOA)	Low (Multi-site MOA)

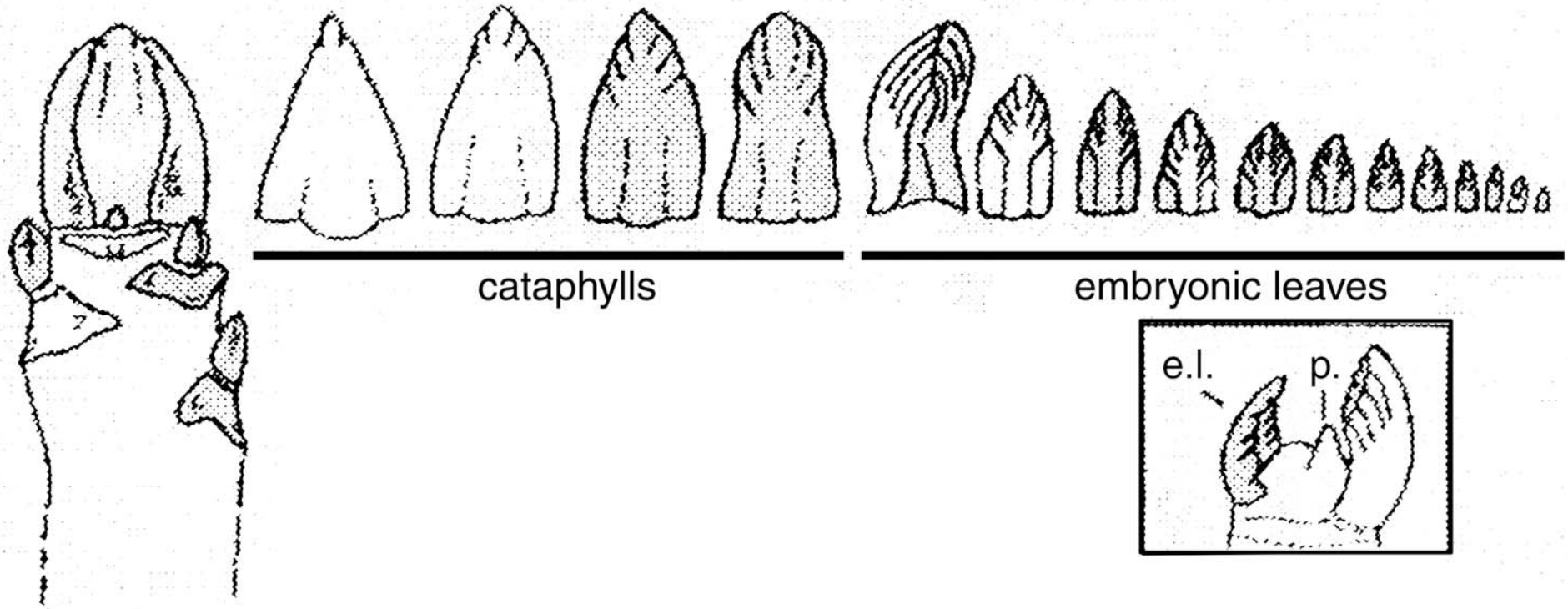
* - Fixed coppers include copper hydroxide, copper oxide, copper oxychloride among other materials. MOA = mode of action. '++++' = excellent.

** - Proposed usage under a Section 18 emergency registration (pending).

*** *-Data courtesy of Professor J. E. Adaskaveg, Univ. of California, Riverside.*

Pathogen + Spray Timing

Lindow et al



Depiction of the plant parts in a dissected walnut bud. Numbered from left to right are the cataphylls and embryonic leaves in a typical walnut bud.

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. Chandler variety.

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

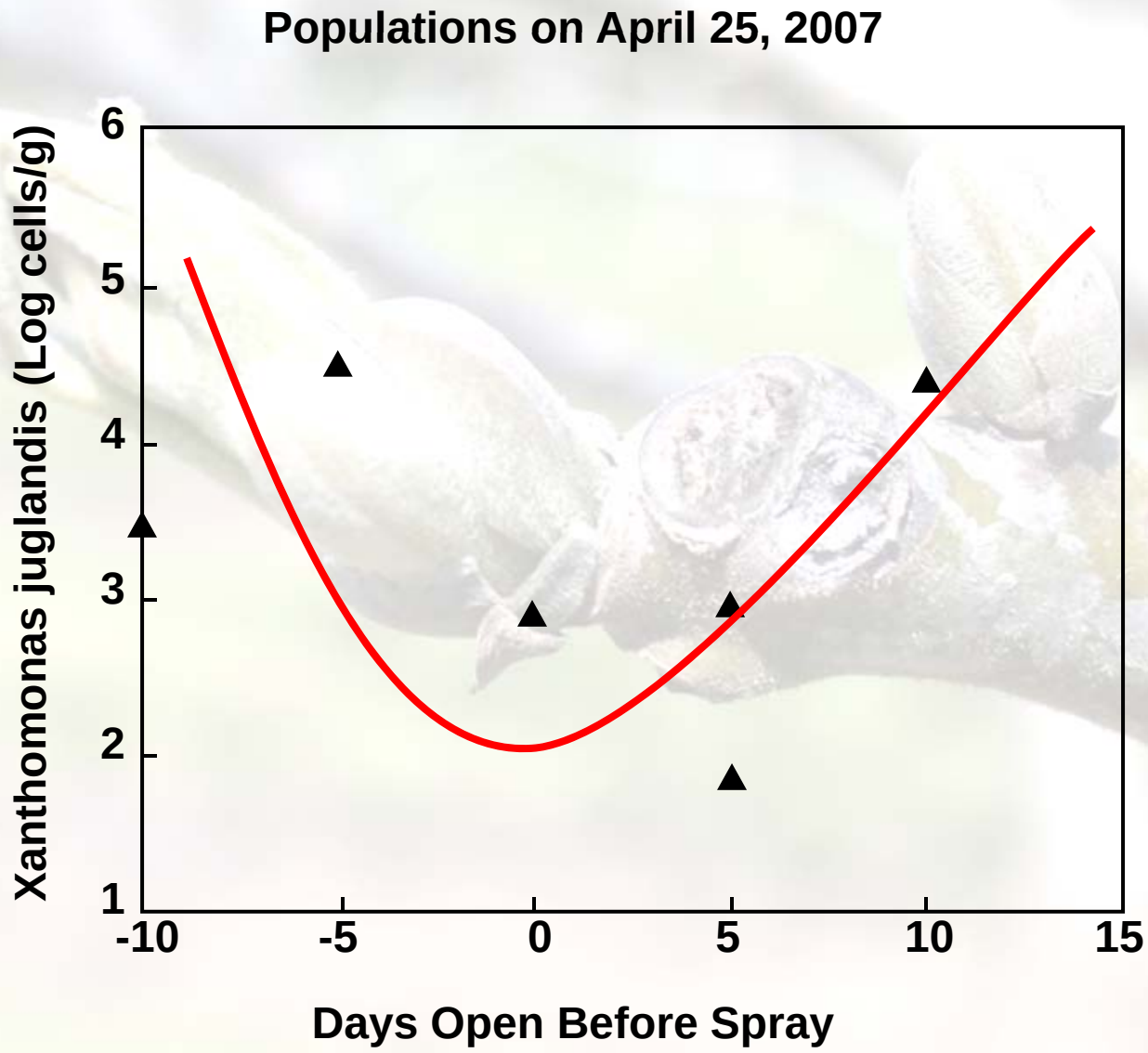
Tree #2

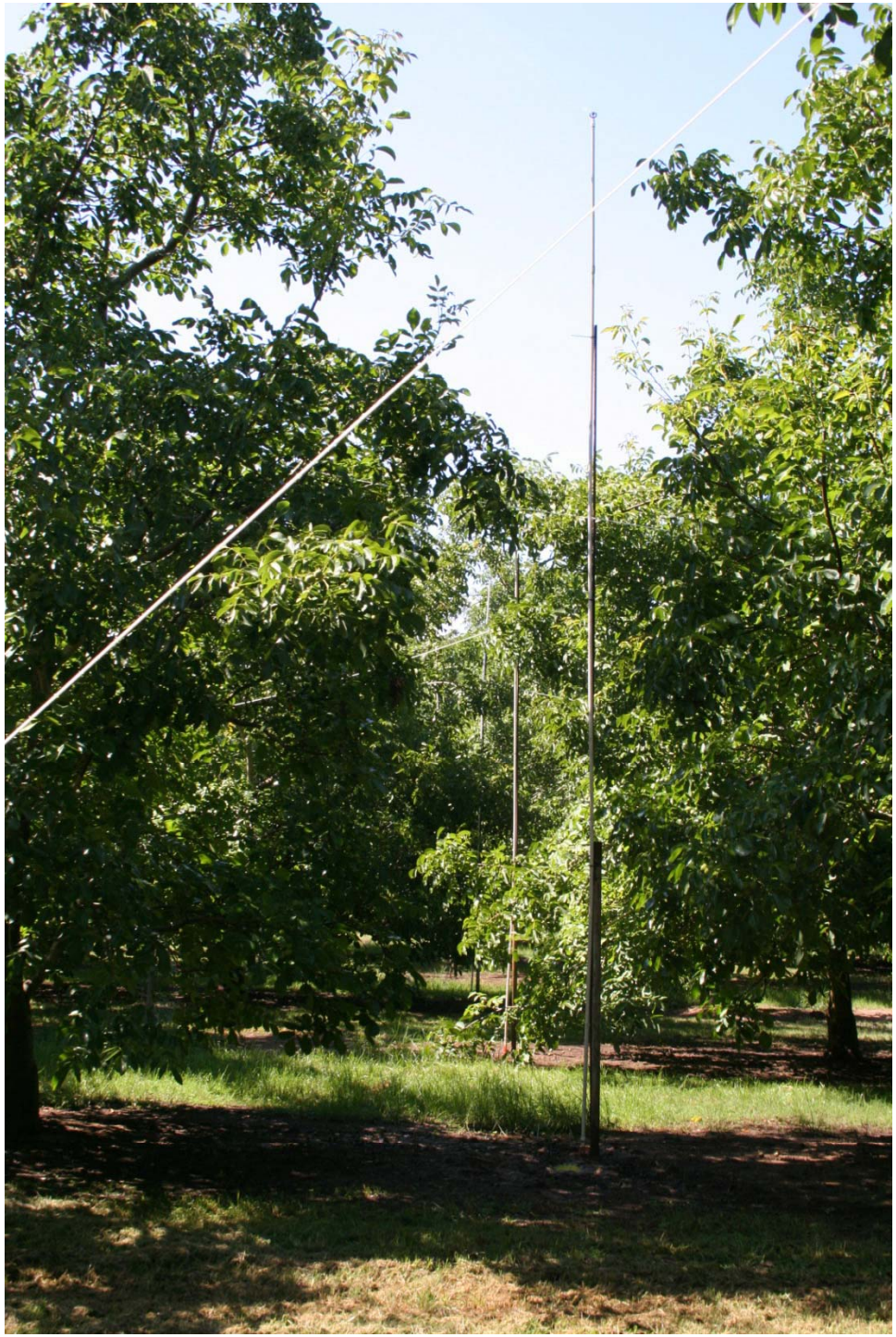
Date Prayer Stage	% shoots no walnuts	% shoots one walnut	% shoots two walnuts	% shoots three walnuts
4/2/08	33.3	27.3	29.4	0.0
4/7/08	43.1	27.4	29.5	0.0
4/11/08	59.8	26.4	13.8	0.0
4/15/08	94.0	4.8	1.2	0.0

Data suggests

Early prayer stage shoots have the greatest chance of being fruitful. So it makes sense to protect the first prayers. Time first spray to 40% prayer stage.

Tagged walnut branch showing a closed bud, prayer stage in the center and a shoot with expanding leaves.


Populations on April 25, 2007
Xanthomonas juglandis (Log cells/g)
6
5
4
3
2
1
-10
-5
0
5
10
15
Days Open Before Spray



Monocyclic – complete only one or part of one, disease cycle in one year (single-cycle pathogens

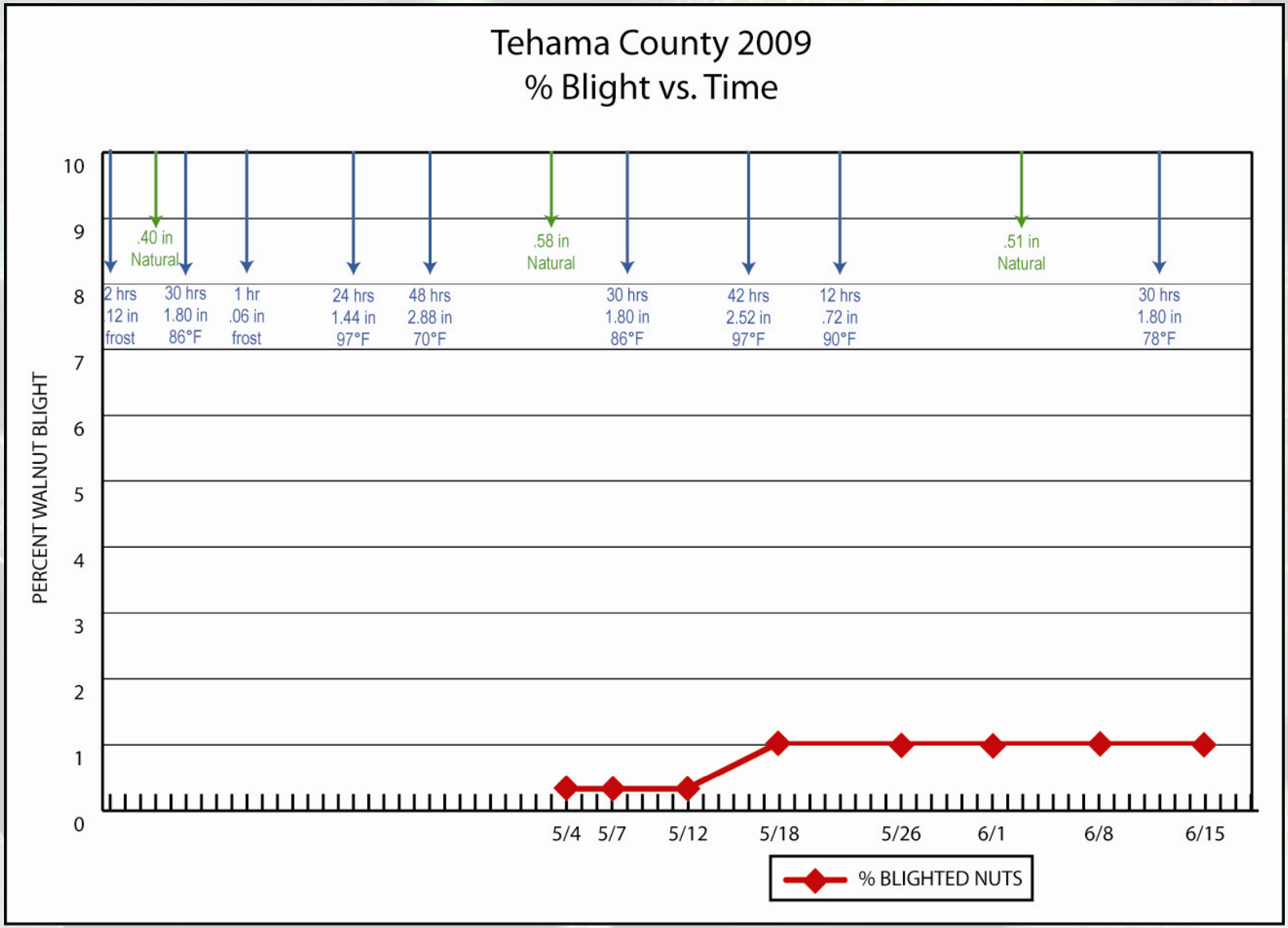
- The primary inoculum is the only inoculum available for the entire season.
- No secondary inoculum.
- Amount of inoculum may increase from year to year.
- Severity is driven by initial inoculum.

Monocyclic
Weather and Phenology for Chandler Walnuts 2009 Tehama County

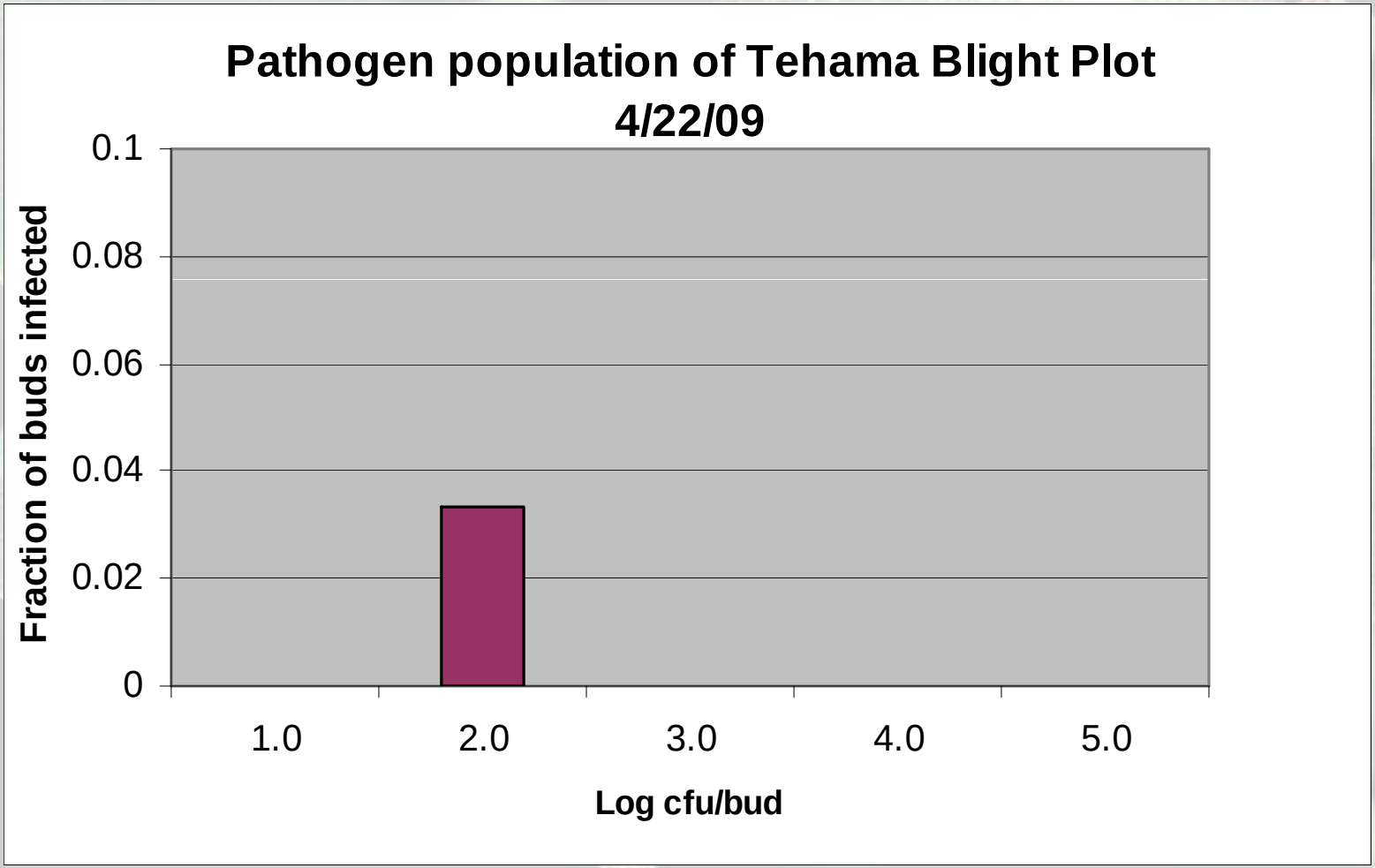
Date	Rainfall	Simulated Rainfall (inches, max temp.)	Event
3/30/09			30% prayer stage
4/3/09			40% prayer stage
4/4/09		2 hours (.12 in)	frost protection
4/7-4/10/09	.40 in		first spray (4/7)
4/9/09		30 hours (1.80 in, 55°F)	catkins gone
4/13/09		1 hour (0.06 in)	first flowers/frost protection
4/17/09			second spray (4/17)
4/18/09			full bloom on first prayers
4/20/09		24 hours (1.44 in, 97°F)	
4/24/09			third spray (4/24)
4/25/09		48 hours (2.88 in, 70°F)	
5/1-5/4/09	.58 in		
5/6/09			fourth spray (5/6)
5/8-5/9/09		30 hours (1.80 in, 86°F)	
5/16-5/18/09		42 hours (2.52 in, 97°F)	
5/21/09			fifth spray (5/21)
5/22/09		12 hours (.72 in, 90°F)	
6/3-6/5/09	.51 in		
6/12/09		30 hours (1.80 in, 78°F)	
6/19/09			blight canopy counts

Monocyclic

Walnut blight symptoms for 300 walnuts tagged on April 28, 2009. Tagged Chandler walnuts were unsprayed and under simulated rainfall.



Monocyclic
Incidence of populations of *Xanthomonas juglandis* on individual shoots of walnut sampled on April 22, 2009.



Polycyclic – can complete many disease cycles per year

- Overwintering inoculum usually low.
- Inoculum can multiply many fold.
- Can cause explosive epidemics.
- Speed and severity is driven by temperature and wetness.

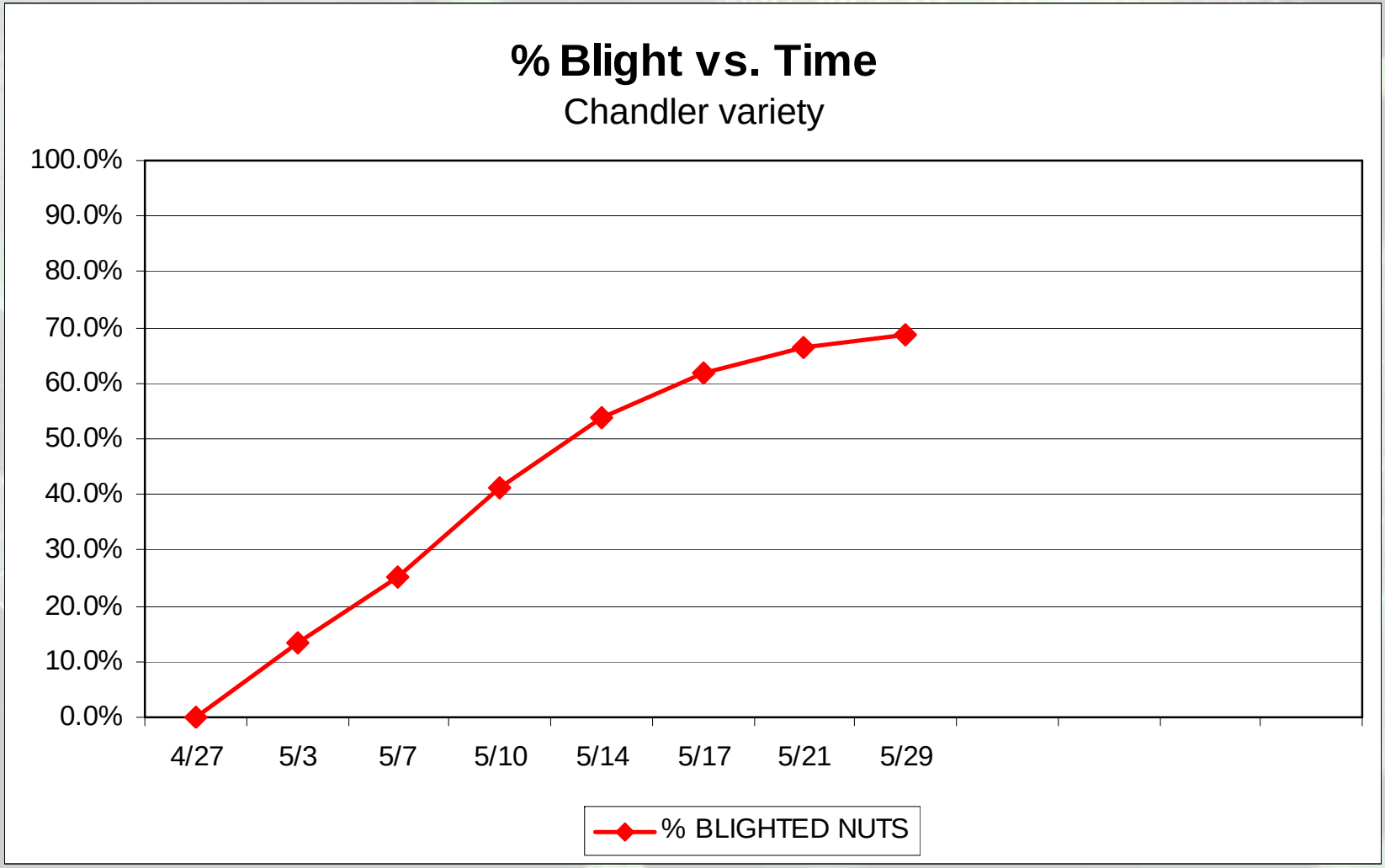
Polycyclic
Rainfall, Stage of Growth and Spray Timing for the Tehama Chandler Walnut Blight Experiment

Date	Rainfall (nat)[1]	Rainfall (sim)[2]	Event
3/20/07	.13 in	—	—
3/23/07	—	—	14% prayer
3/26/07	.11 in	—	—
3/27/07	—	—	41% prayer
3/29/07	—	—	first pollen
3/30/07	—	—	58% prayer, spray #1
3/31/07	—	.72 (10 hrs)	—
4/2/07	—	—	62% prayer
4/4/07	—	.72 (10 hrs)	—
4/5/07	—	—	61% prayer, 1st flowers
4/9/07	—	—	spray #2
4/10/07	—	.72 (10 hrs)	—
4/11/07	—	—	50% prayer, full bloom
4/17/07	.05 in	—	—
4/18/07	—	.11 (1.5 hrs)	spray #3
4/19/07	—	.72 (10 hrs)	—
4/22/07	.11 in	—	—
4/30/07	—	—	spray #4
5/1/07	.12 in	—	—
5/3/07	.33 in	—	—
5/4/07	.02 in	—	—
5/10/07	—	—	spray #5

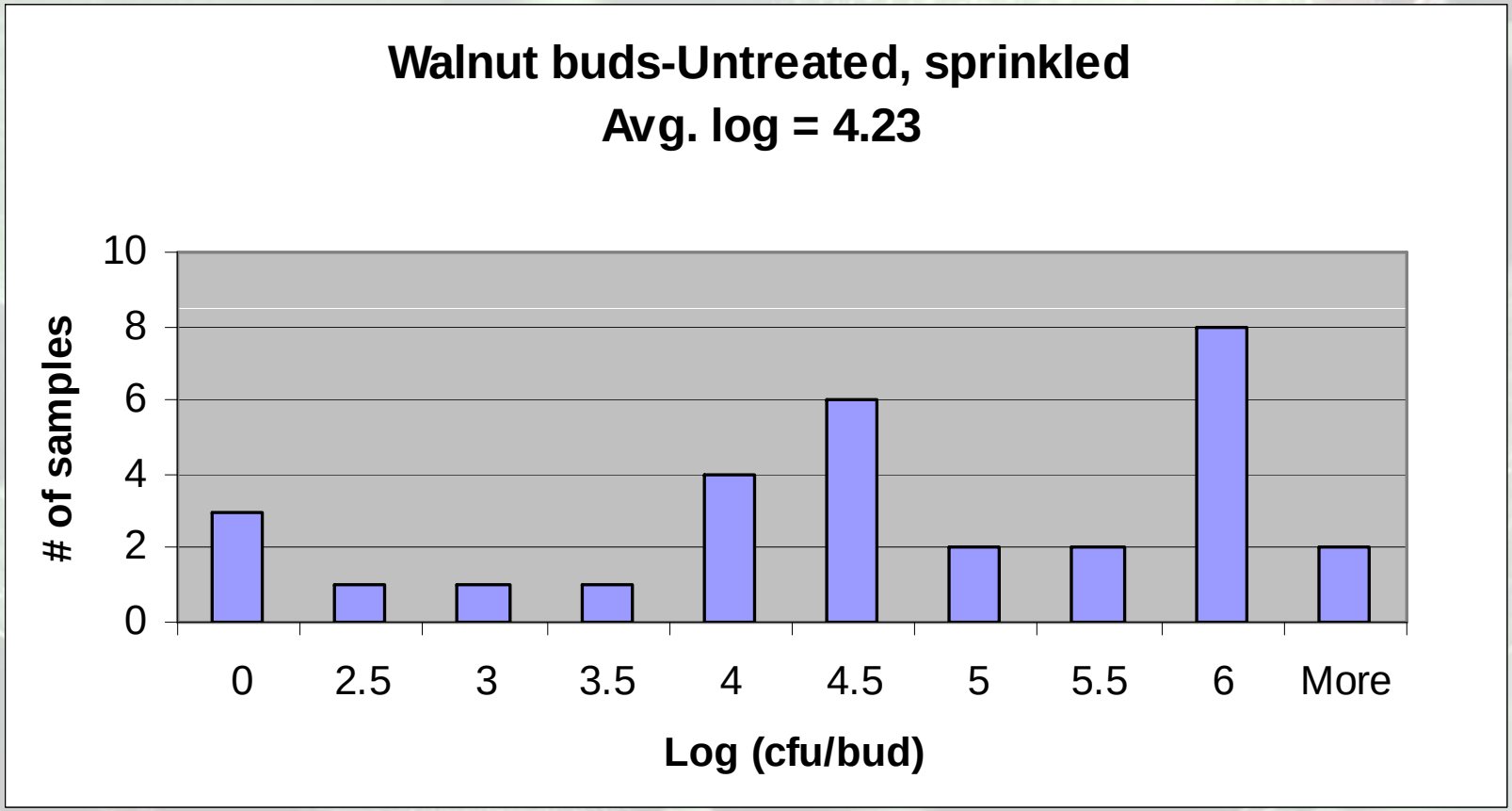
[1]Natural rainfall – (CIMIS) Gerber) 7 events for .90 inches
[2]Simulated rainfall – (overhead sprinklers) 5 events for 2.99 inches

Polycyclic

Blight Symptoms on untreated walnuts under simulated rainfall. Tehama experiment 2007. Comparisons were made under significant disease pressure



Polycyclic


Walnut buds-Untreated, sprinkled
Avg. log = 4.23
# of samples
10
8
6
4
2
0
0
2.5
3
3.5
4
4.5
5
5.5
6
More
Log (cfu/bud)

Tehama Blight Plots

Year	Blight Population	Simulated Rainfall	% Blight
2006	High	Yes	59%
2007	High	Yes	35%
2008	High	No	.32%
2009	Low	Yes	.13%

Chandler variety, Nelson R-30 sprinklers 30 feet above ground.

Xanthocast™ was developed by Dr. Jim Adaskaveg at UC Riverside to predict infection periods for walnut blight. The model utilizes wetness period, wetness duration and temperature from weather stations. Xanthocast™ indices are available between Red Bluff and Davis.

Irrigate.net
Agtelemetry.com

How to Kill Blight in Tehama County

1) First application at 40% prayer stage

   Second 7-10 days later (8 oz. Breakthru or equivalent)

2) Watch weather and treat accordingly

   8 lbs. Kocide 101 – 50% metallic

   6 lbs. Kocide 2000 – 35% metallic

   4 lbs. Kocide 3000 – 30% metallic

   58 oz. ~~Manex~~ / 2.4 lbs. Manzate

3) Full coverage for the first and second

   Watch weather and treat accordingly

4) Use judgment based upon location and disease severity

In the end… www

http://walnutresearch.ucdavis.edu

http://cetehama.ucdavis.edu

Irrigate.net

Agtelemetry.com