

New materials for fire blight control:

How do they work?

What are the risks?

Kasumin 2L

Non-antibiotic programs
for certified organic

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What is Kasumin?

- registered for fire blight control in Sept 2014
- 1st antibiotic registration for a crop in 35 years!
- aminoglycoside antibiotic similar to streptomycin but different mode of action
- kasugamycin is produced by fermenting *Streptomyces kasugaensis*
- inhibits protein synthesis in ribosomes
- there is a potential for resistance development in *E. amylovora* via chromosomal mutation

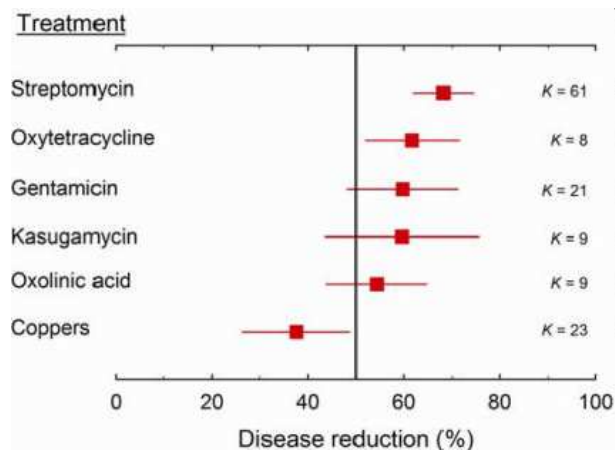
Erwinia spp. are especially sensitive to kasugamycin

Bacterial Pathogens-MIC* (ppm)

- *Acidovorax avenae* >100
- *Escherichia coli* K-12 R5 100[^]
- *Clavibacter michiganensis* 100
- *Erwinia* spp. 20 – 50 (**low MIC**)
- *Pseudomonas* spp. 25 – 100
- *Xanthomonas* spp. >100

*MIC = minimum inhibitory concentration

In some tests Kasumin hasn't looked quite as good as strep



FROM: Ngugi, H. K., Esker, P. D., and Scherm, H. 2011. Meta-analysis to determine the effects of plant disease management measures: Review and case studies on soybean and apple. *Phytopathology* 101:31-41.

Antibiotic resistance in *E. amylovora*

Mechanism (registration)	Antibiotic		
	Strep (late1950s)	Oxytet (early 1970s)	Kasugamycin (2014)
Mutation	<p style="text-align: center;">+</p> <p>One step – field</p> <p><u>Fitness cost</u></p> <p>Yes, slight</p>	<p style="text-align: center;">--</p>	<p style="text-align: center;">+</p> <p>Stepwise – in lab</p> <p><u>Fitness cost</u></p> <p>Yes, moderate(?)</p>

Based on mutation mechanism, risk of fire blight pathogen developing resistance to Kasumin is intermediate compared to strep and oxytet



■ 1189 ■ 1189 -2
■ 1189 -1 ■ 1189 -3

Kasumin-resistant *Ea* causing blight in pear
McGhee & Sundin 2011

Slight potential of phyto with Kasumin with > 3 applications



Hood River 2007

IR-4 residue study

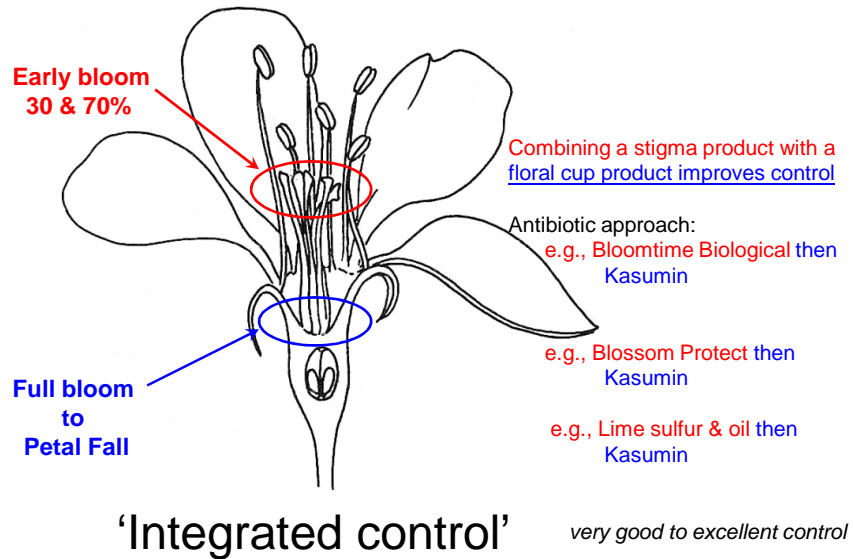
cv. Granny Smith

Applications were made on 4/24, 5/1, 5/8, 5/15.

Phyto observed after 4th application

Photo taken on 6/27
By Joe DeFrancesco

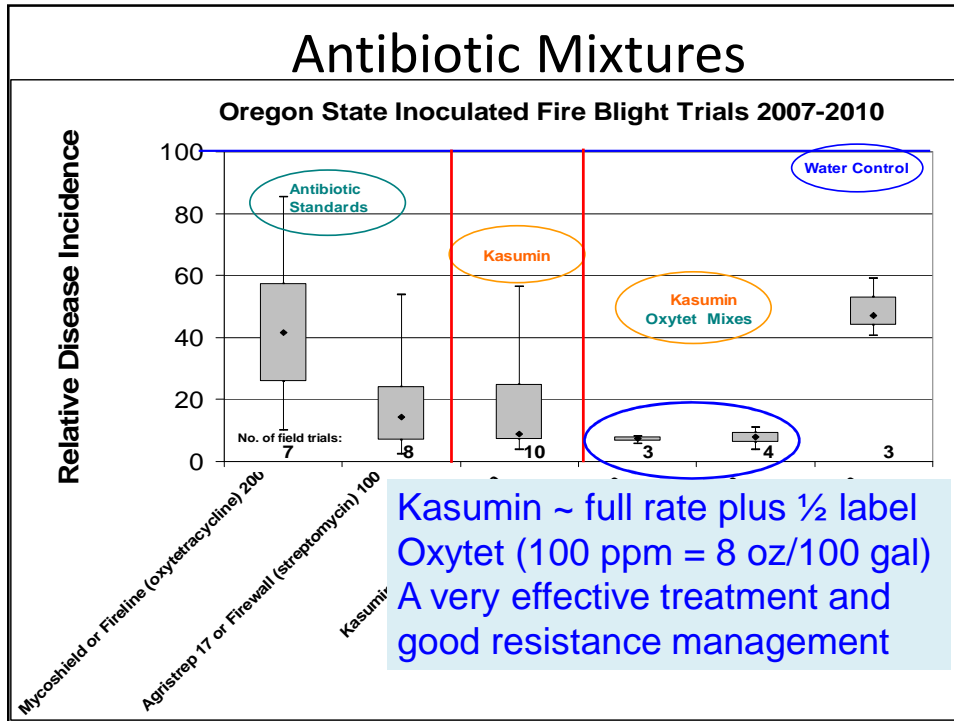
Where does Kasumin fit the program?



Strategies for delaying the development of resistance in target organisms to chemicals

includes:

- apply full dose (max label rate)
 - limits to material use
 - 90 day PHI *
 - no apps after petal fall
 - no more than 2 consecutive apps
 - no more than 4 total apps
 - no alternate row spraying
 - Price material high: ~\$80/A
 - mixture partners
 - oxytet at ½ to full rate
- } On Kasumin label



Think about Questions
on 'Kasumin'

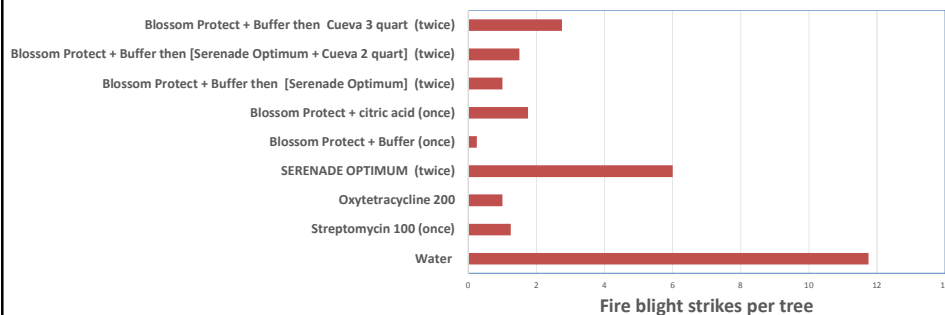
Example non-antibiotic program with considerations for fruit safety:

- 1) Prebloom (just prior to green tip):
Fixed copper sanitation if fire blight was in orchard last year (5 to 6 lb/A)
- 2) Early bloom apple:
Lime sulfur (plus oil) early bloom at 20 and 70% bloom
Reapply biological if LS goes on after biological
- 3) Early bloom pear and apple Blossom Protect:
One full, or two half apps, or two full apps if blight in orchard last year
In apple, Blossom Protect immediately after 2nd LS.
In smooth-skinned pears in wetter areas, russet risk might be unacceptably high
- Bloomtime Biological is an alternative, fruit-safe biological material
- 4) Full bloom to petal fall, depending on cultivar russet risk/fb model risk:
Serenade Optimum every 2 to 5 days (most fruit safe)
Improved control: Mix Serenade Opt with Cueva (2 to 3 qts/A)
Cueva every 3 to 6 days (3 to 4 qts/A) (least fruit safe)

Putting integrated non-antibiotic control to the test:

Replicated, inoculated orchard trials:

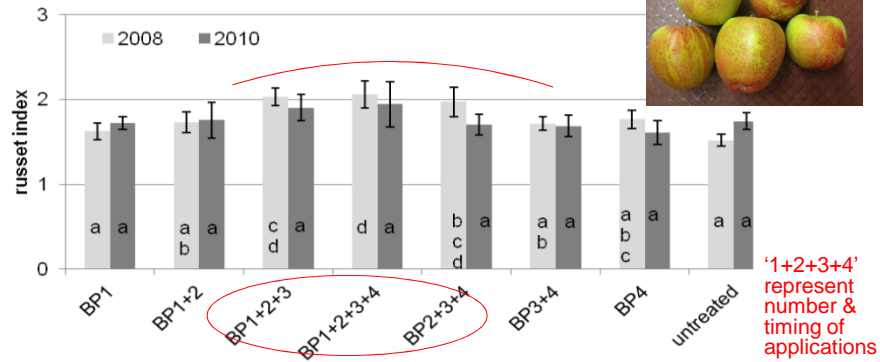
Bartlett Pear 2014 - Corvallis, OR



- In this trial, Blossom Protect (applied once) carried the load
- Corvallis is a wet climate: An amount of russet above control was attributable to Blossom Protect; a bit more to Cueva

Blossom Protect: A potential for fruit russet

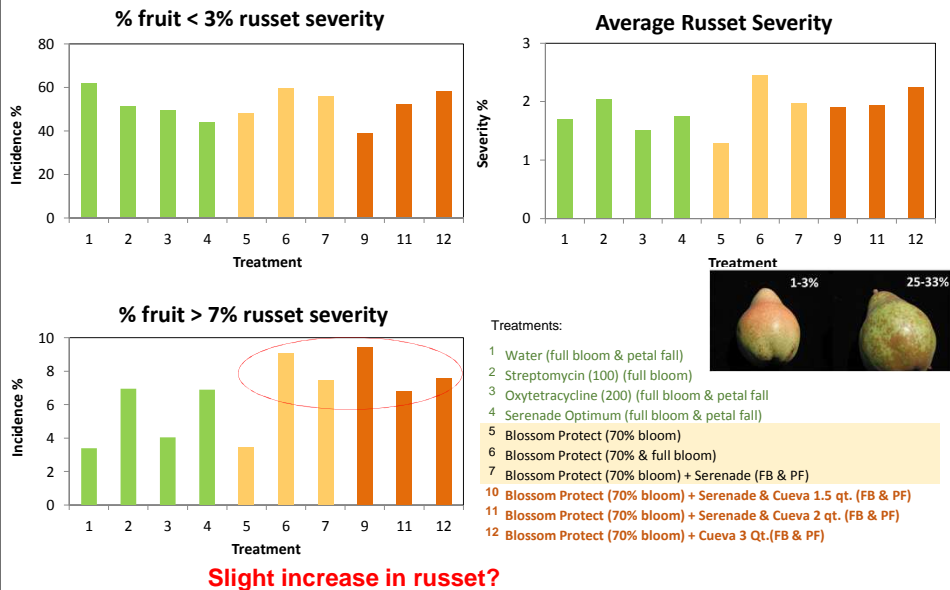
Kunz 2011 – Apples in Germany

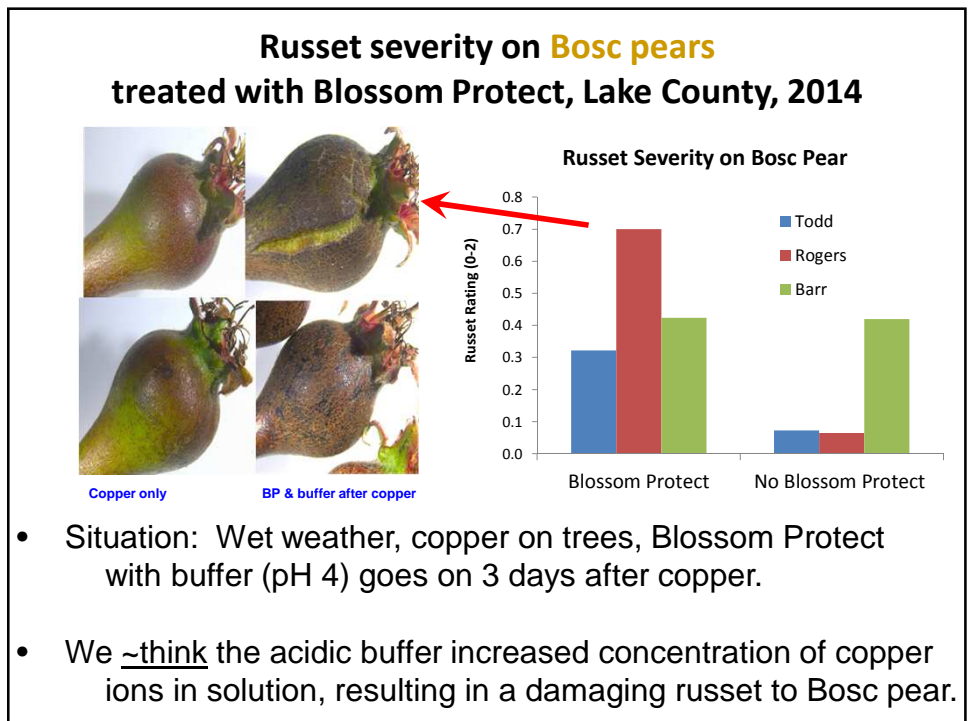
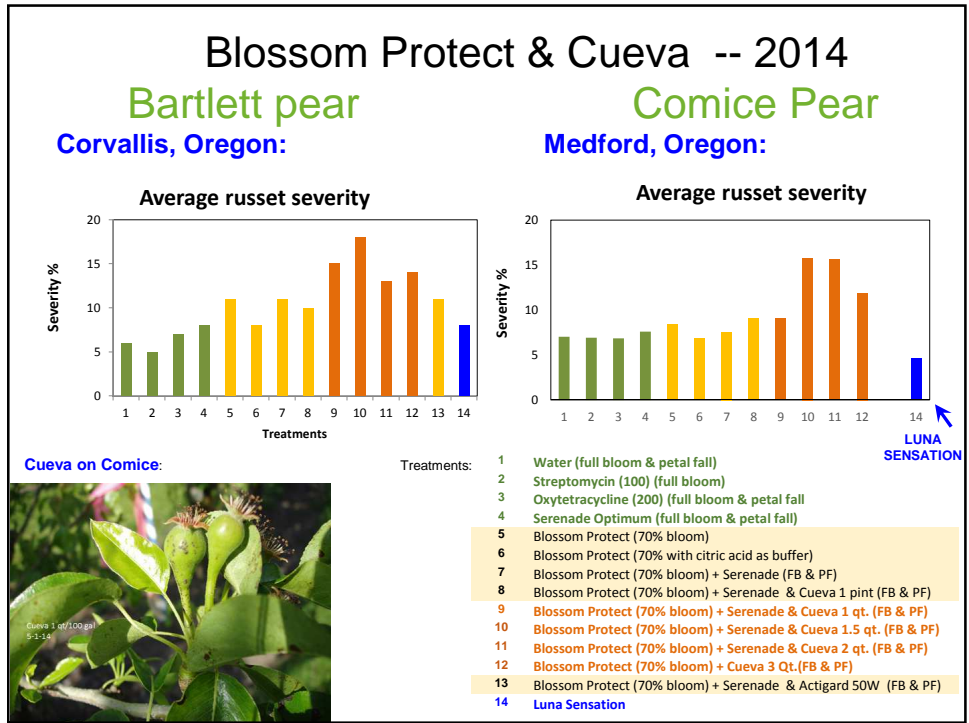


More applications & wetter conditions raise the concern

Pears are more susceptible than apples

Blossom Protect & Cueva on Bartlett pear Kelseyville, Lake County - 2014





Non-antibiotic fire blight control

Cultivar specific recommendations:

Russet-susceptible, smooth skinned pears (d'Anjou, Comice)

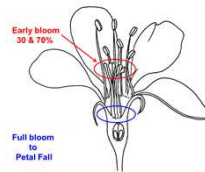
- Avoid Blossom Protect and Cueva
- Utilize Bloomtime Biological and Serenade Optimum

More russet-tolerant, smooth skinned pears (Bartlett)

- In wet climate, russet risk with Cueva is probably unacceptably high. Blossom Protect should be restricted to early/mid-bloom.
- Dry climate, create program to minimize Blossom Protect and Cueva apps. E.g., 1-2 apps. of each is better than 3-4 apps. either alone.

All pear cultivars (including Bosc)

- Sequence copper to follow Blossom Protect (not the other way around!)



Think about questions on
non-antibiotic control

