WASHINGTON STATE UNIVERSITY
TRI-CITIES

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Dhol Herzi
Office of Pest Management Policy
Agricultural Research Service
U.S. Department of Agriculture
1400 Independence Avenue SW
Room 3871-South Bldg., Mail Stop 0315
Washington, DC 20250-0315

The following information is provided to you from the Western Integrated Pest Management Center regarding EPA's questions about the importance of streptomycin and oxytetracycline. This response provides input from the six-state Pacific Northwest region comprised of Alaska, Idaho, Oregon, Montana, Utah, and Washington and is being sent in response to your request to Rick Melnicoe, Western Integrated Pest Management Center Director, May 19, 2005.

Apples and Pears

The most critical use of oxytetracycline and streptomycin in our region has been for the control of fire blight (*Erwinia amylovora*) in apples and pears. You have already received a response from Oregon State University's Dr. Ken Johnson, a copy of which I have attached for your convenience. Many of the people I contacted expressed their agreement with and appreciation for the comments supplied by Dr. Johnson. The information below is from other Extension/IPM experts in our region who wished to expand upon the information provided by Dr. Johnson.

Fire blight has the potential to do severe damage in orchards and if not adequately controlled can destroy trees on dozens or even hundreds of acres. Fire blight is the biggest concern for commercial apple and pear orchards because of the potential for such extensive damage. While fire blight never causes widespread damage in any given year, it threatens damage in some parts of the PNW every year. In bad fire blight years (this being one) this disease causes tens of millions of dollars of orchard damage. Fire blight is now more of a threat in commercial pome fruit production than in years gone by because today's popular apple and pear varieties are more susceptible.

As Dr. Johnson stated, streptomycin use is very important in Oregon and Idaho; however, in Washington the majority of growers depend upon oxytetracycline for fire blight control. In the mid-1970s resistance developed in the majority of the significant pome fruit production

Washington State Pest Management Resource Service • http://wsprs.wsu.edu
2710 University Drive, Richland, WA 99354-1671
509-372-7492 • Fax 509-372-7491

areas in Washington and in some areas in Oregon. It is difficult to overstate the importance of oxytetracycline in apple and pear production in the Pacific Northwest (PNW), in areas where fire blight has developed resistance to streptomycin.

In the areas where streptomycin resistance has developed, for the past 30 years apple and pear growers have depended upon oxytetracycline as the critical tool for the control of fire blight. Over this 30-year period, no evidence of fire blight resistance development has been detected for oxytetracycline. Extension specialists feel that through continued research and careful application oxytetracycline will remain a very effective control.

Because fire blight is so damaging, control measures must provide 90% or better control to be considered effective. Worldwide research has shown that oxytetracycline alternatives (biologicals, other fungicides, and copper compounds) are only 40 to 60% effective. When used properly oxytetracycline is one (albeit critical) part of an overall fire blight control program. Growers use other fungicides, copper, and biological control agents for fire blight suppression, applying oxytetracycline for control at critical times only. Following this prescription, in a bad fire blight year, oxytetracycline is only applied 2 or 3 times (much less than allowed by current labeling). Oxytetracycline is only sprayed in response to an infection period and to be effective the application must be made in a 24-hour window either before or after the event leading to infection. Growers use modeling to determine both whether to use oxytetracycline and then to determine exactly when to make the application.

In Washington fire blight infections usually do not occur during the primary bloom period. Here fire blight is typically a concern during the secondary bloom or in the 3 weeks following the primary bloom. For biological control agents to be effective, they must be applied when there are numerous blossoms or during the orchard's primary bloom. Because of this timing issue biological control agents are much less effective in Washington orchards where the necessary application is during the secondary bloom.

In Oregon and Idaho, where streptomycin resistance is less widespread than in Washington, apple growers depend upon streptomycin as their primary control for fire blight. In Idaho oxytetracycline is used under a Section 18 for fire blight control in areas where resistance has developed. Dr. Krishna Mohan, University of Idaho Plant Pathologist, has stated that streptomycin is critical in Idaho apple production as no other alternative with equivalent efficacy is available. Dr. David Sugar of Oregon State University has likewise emphasized the importance of the use of streptomycin in southern Oregon pome fruit production.

Beans

Streptomycin is commonly used as a seed treatment in beans. Most seed planted for dry bean, snap bean, and bean seed production is treated with streptomycin. This chemical is used to disinfect the seed surface, removing bacterial contaminants that may be picked up at processing facilities from equipment used to process other crops. Streptomycin is applied as part of a seed coating that includes other fungicides and insecticides. Streptomycin used in this manner controls bacteria responsible for many diseases including common bacterial

blight, halo blight, bacterial brown spot, and bacterial wilt. While streptomycin is not used uniformly in bean production in our region, it is a very important tool for growers.

Nursery/Ornamentals

As you may be aware in our region there is no good "one-stop-shopping" source for information for pesticide use on nursery crops and ornamentals. The following information was received from various nursery and tree care businesses whose practices and perspectives vary.

Streptomycin and oxytetracycline are used to combat fire blight in ornamental trees. Tree care professionals do switch to chemicals with different modes of action if resistance is detected, if alternative chemicals are available.

One nursery reported that they had not used either streptomycin or oxytetracycline in over 10 years because of problems with resistance development with bacterial pests other than fire blight. This responder indicated that fire blight wasn't a significant concern for them but in the past they had used these antibiotics for the control of other bacterial pests. The alternative products that they use are copper, BlightBan A506 (*Pseudomonas fluorescens* A506), and Rhapsody (*Bacillus subtilis* QST713). Should they run into resistance, nurserymen would increase the rate used while looking for other solutions. Long term they would look for ways to reduce the disease pressure, eliminate it if possible, and/or look for resistant varieties. As a last resort the nursery would halt the production of the susceptible crop altogether.

A southern Idaho nursery indicated occasional use of streptomycin in rotation with copper compounds for the control of fire blight. In this case the grower indicated that using streptomycin, while not critical, was important as far as having a chemical to use in rotation for resistance management. If they did encounter resistance, their response would be to increase the concentration used (staying within label limits); apply the compound more frequently; and then prune out infected plant parts. As a cultural alternative, the nursery will also move to avoid growing fire blight-susceptible species or cultivars or plants susceptible to other pathogens.

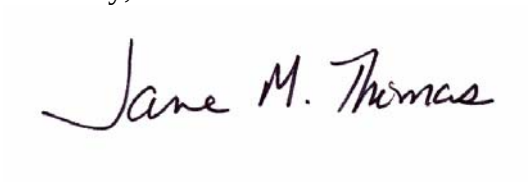
Another nursery reported no use of streptomycin. Rather, they use a dormant copper spray for fire blight control. Their main fire blight concern is with Asian pears and the nurseryman indicated that they would use streptomycin only as a last resort, due to the cost. The nursery also uses pruning as a cultural measure for fire blight control. The contact at this nursery further commented that nurserymen have had few chemical alternatives available for certain pests, particularly those as damaging as fire blight, and his request was that the streptomycin and oxytetracycline uses be retained.

The final nursery contacted stated that they see very little fire blight and they use pruning for control. Infected plant parts are immediately pruned or the entire tree is removed if necessary. Streptomycin is used as a last resort.

Potatoes
Streptomycin is labeled for use as a potato seed piece treatment; however, it is not commonly used in out region.

A contact list is attached should you have further questions. Thank you for giving us this opportunity to provide input into the reregistration process.

Sincerely,



Jane M. Thomas
Pacific Northwest Coalition Comment Coordinator
Washington State Pest Management Resource Service
Washington State University Tri-Cities
2710 University Drive
Richland, WA 99354
phone: 509-372-7493 fax: 509-372-7491
e-mail: jmthomas@tricity.wsu.edu

Jane Thomas

From: Ken Johnson [johnsonk@science.oregonstate.edu]
Sent: Thursday, May 19, 2005 3:39 PM
To: Dhol Herzi; Jane Thomas
Cc: jepsonp@science.oregonstate.edu
Subject: [Fwd: Streptomycin and Oxytetracycline]

This response is from:

Ken Johnson, Professor
Dept. Botany and Plant Pathology
Oregon State University
Corvallis, OR 97331-2902
541-737-5249

Dr. Johnson has 14 research experience on fire blight management.

Answers below pertain to fire blight.

>1. How critical are the chemicals to growers?

They are absolutely critical for fire blight management.

Streptomycin is highly effective against susceptible strains of the pathogen. However, strains of the pathogen resistant to this chemical are common in Washington, California and Oregon. In these states, most pathogen populations are a mix of resistant and susceptible strains. Streptomycin-resistant strains also occur in Michigan, but their distribution is restricted to only a few counties. The Northeast U.S. does not have a streptomycin resistance problem.

Oxytetracycline is the material of choice to combat streptomycin-resistant *Erwinia amylovora*, although it provides only partial control. It has a full registration for pears (grown mostly in the west); WA, CA, OR also receive a regional registration annually (section 24C) for its use on apple. Some oxytet is now being used in apples in Michigan (section 18?).

>2. What are the alternatives for these chemicals (in particular for fire> blight)?

A tremendous amount of research has gone into biological control, with two products now registered and available for fire blight suppression: BlightBan A506 and Serenade. Both materials are partially effective. Several experimental biological treatments are somewhat more effective, though unregistered at this point. Biological products used in an integrated strategy with oxytetracycline (or with strep in the Northeast U.S.) can provide a high level of fire blight suppression. .

Fixed coppers are registered, effective materials for suppression of fire blight but not used widely because of phytotoxicity concerns.

>3. How do growers react to resistant pathogens (i.e., do they use an alternative, apply more product, or use other methods to manage pests)?

This depends on the grower - fire blight is a sporadic outbreak disease, so feedback on products doesn't happen in every orchard in every year. Nonetheless, most growers in the western states (OR, WA, CA) are aware of the streptomycin-resistance problem, and will choose to apply 1) oxytetracycline only, 2) a tank mix of oxytet and strep, or 3) a tank mix of strep and BlightBan A506 followed by oxytet. Weather-based models are used widely for assessing risk of fire blight, and grower adoption of these models is very high. Consequently, most treatments to suppress fire blight are made under forecasts of moderate to high infection risk.

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>Thank you in advance for all your help.
>
>Dhol Herzi
>Office of Pest Management Policy, USDA
>(202) 720-2664
>dherzi@usda.gov

Oxytetracycline/Streptomycin Contact List

Crop:	Last Name:	First Name:	Organization:	Title:	Work Ph:	Email:	State:
apple	Castagnoli	Steve	Oregon State University	Extension Horticulturalist	(541) 386-3343	Steve.Castagnoli@oregonstate.edu	Oregon
apple	Evans	Kent	Utah State University	Plant Pathologist	(435) 797-2504	ckevans@cc.usu.edu	Utah
apple	Johnson	Ken	Oregon State University	Plant Pathologist	(541) 737-5249	johnsonk@science.oregonstate.edu	Oregon
apple	Mohan	Krishna	University of Idaho	Extension Plant Pathologist	(208) 722-6701	kmohan@uidaho.edu	Idaho
apple	Olsen	Jeff	Oregon State University	Extension Horticulturalist	(503) 434-8915	jeff.olsen@oregonstate.edu	Oregon
apple	Pusey	Larry	USDA/ARS	Research Plant Pathologist	(509) 664-2280	pusey@tfrl.ars.usda.gov	Washington
apple	Smith	Tim	Washington State University	Tree Fruit IPM Specialist	(509) 667-6540	smithtj@wsu.edu	Washington
apple	Sugar	David	Oregon State University	Professor	(541) 772-5165	david.sugar@oregonstate.edu	Oregon
apple	Willett	Mike	Northwest Horticultural Council	Vice President for Scientific Affairs	(509) 453-3193	willett@nwhort.org	Multiple
bean seed, dry	Metsker	Ron	Kelly Bean Co		(208) 436-3611		Idaho
bean seed, dry	Miklas	Phil	US Department of Agriculture	Research Plant Geneticist	(509) 786-2226	pmiklas@pars.ars.usda.gov	Washington
bean seed, succulent	Harris	Mike	Seminis Vegetable Seed		(509) 349-2327		Washington
bean seed, succulent	Miklas	Phil	US Department of Agriculture	Research Plant Geneticist	(509) 786-2226	pmiklas@pars.ars.usda.gov	Washington
bean, dry	Evans	Kent	Utah State University	Plant Pathologist	(435) 797-2504	ckevans@cc.usu.edu	Utah
bean, dry	McReynolds	Bob	Oregon State University	Extension Horticulturist	(503) 678-1264	bob.mcreynolds@oregonstate.edu	Oregon
bean, succulent	McReynolds	Bob	Oregon State University	Extension Horticulturist	(503) 678-1264	bob.mcreynolds@oregonstate.edu	Oregon
bean, succulent	Nelson	Stan	Twin City Foods		(360) 629-2111	stann@twincityfoods.com	Washington
nursery & ornamentals	Barney	Dan	University of Idaho	Extension Professor	(208) 263-2323	dbarney@uidaho.edu	Idaho
nursery & ornamentals	Tripepi	Bob	University of Idaho	Research Faculty	(208) 885-6635	btripepi@uidaho.edu	Idaho
nursery & ornamentals	Tuckett	Ron	Monrovia Nursery	Pest Control	(503) 868-7911	rtuckett@monrovia.com	Oregon
nursery & ornamentals	Warehime	Dan	Senske Lawn & Tree Care	Vice President	(509) 736-0754	dwarehime@senske.com	Washington
pear	Castagnoli	Steve	Oregon State University	Extension Horticulturalist	(541) 386-3343	Steve.Castagnoli@oregonstate.edu	Oregon
pear	Evans	Kent	Utah State University	Plant Pathologist	(435) 797-2504	ckevans@cc.usu.edu	Utah
pear	Johnson	Ken	Oregon State University	Plant Pathologist	(541) 737-5249	johnsonk@science.oregonstate.edu	Oregon
pear	Mohan	Krishna	University of Idaho	Extension Plant Pathologist	(208) 722-6701	kmohan@uidaho.edu	Idaho
pear	Olsen	Jeff	Oregon State University	Extension Horticulturalist	(503) 434-8915	jeff.olsen@oregonstate.edu	Oregon
pear	Pusey	Larry	USDA/ARS	Research Plant Pathologist	(509) 664-2280	pusey@tfrl.ars.usda.gov	Washington
pear	Smith	Tim	Washington State University	Tree Fruit IPM Specialist	(509) 667-6540	smithtj@wsu.edu	Washington
pear	Sugar	David	Oregon State University	Professor	(541) 772-5165	david.sugar@oregonstate.edu	Oregon
pear	Willett	Mike	Northwest Horticultural Council	Vice President for Scientific Affairs	(509) 453-3193	willett@nwhort.org	Multiple
potato	Drost	Dan	Utah State University	Vegetable Specialist	(435) 797-2258	dand@ext.usu.edu	Utah
potato	Esplin	Keith	Potato Growers of Idaho	Executive Director	(208) 785-1110	pgike@cableone.net	Idaho
potato	McReynolds	Bob	Oregon State University	Extension Horticulturist	(503) 678-1264	bob.mcreynolds@oregonstate.edu	Oregon
potato	Nolte	Phillip	University of Idaho	Extension Seed Potato Specialist	(208) 529-8376	pnolte@uidaho.edu	Idaho
N/A	Blodgett	Sue	Montana State University	Western IPM Center State Liaisons/Representatives	(406) 994-2402	blodgett@montana.edu	Montana
	Daniels	Catherine	Washington State University		(509) 372-7495	cdaniels@tricity.wsu.edu	Washington
	Deer	Howard	Utah State University		(435) 797-1602	howardd@ext.usu.edu	Utah
	Hirnyck	Ronda	University of Idaho		(208) 364-4046	rhirnyck@uidaho.edu	Idaho
	Jahns	Tom	University of Alaska Fairbanks		(907) 262-5824	fftrj@uaf.edu	Alaska
	Jenkins	Jeff	Oregon State University		(541) 737-5993	jenkinsj@ace.orst.edu	Oregon