Response for Information on Streptomycin and Oxytetracycline Use in California (Apples and Pears)

Date: May 19, 2005

To: Dhol Herzi
Office of Pest Management Policy
USDA

From: Rick Melnicoe
Director, Western Integrated Pest Management Center

Dear Dhol,

Attached is the response on use of Streptomycin and Oxytetracycline for use on apples and pears in CA. I have also attached the CA pesticide use report for 2003 for these two chemicals. Much of these data are incorporated into the response letter. (See below)

Regards,

Rick Melnicoe
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Director, Office of Pesticide Information and Coordination (UC Statewide Pesticide Coordinator)
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Attachments:
Oxytetracycline and Streptomycin Use in California, Apples and Pears (Microsoft Word)
California Pesticide Use Report for 2003 for Streptomycin and Oxytetracycline (Excel)

May 24, 2005

Ms. Dhol Herzi
Office of Pest Management Policy
USDA
1400 Independence Ave. SW
Room 3871-South Bldg., Mail Stop 0315
Washington, DC 20250-3191

RE: Oxytetracycline and Streptomycin Use in California

Dear Dhol,

In response to the following questions you asked in your e-mail of May 19, 2005, I offer the following information for California. I gathered this information from the University of California's Pest Management Guidelines for Apples and Pears, the California Department of Pesticide Regulations Pesticide Use Reporting System for 2003, the California Pest Management Strategic Plan for Pears and the California Crop Profile for Apples. Dr. Jim Adaskaveg, University of California, Riverside plant pathologist also provided information.

1. How critical are the chemicals to growers?

These chemicals are both extremely critical to California growers of apples and pears. Approximately 45 percent of the California apple crop was treated with streptomycin in 2003 and about one percent with oxytetracycline. Approximately 72 percent of the California pear crop was treated with oxytetracycline in 2003 and approximately 64 percent was treated with streptomycin in 2003.

The California Pear Pest Management Strategic Plan listed the development of new techniques and reduced risk products for control of fireblight and pear scab as one of the highest research priorities. The document also listed as a priority maintaining therapeutic use of antibiotics for plant agriculture.

Fireblight is the most important disease of pears. All parts of pear trees can be invaded by the fire blight pathogen. Tissue wilts, blackens, and dies. If infections are not removed, the entire tree may be killed as the disease spreads into the main scaffolds, trunk, and roots. Rain or hail may require immediate respraying of the orchard if temperatures conducive to fire blight development exist. If conditions conducive to fire blight development have occurred and frost conditions develop that are severe enough to cause the pear skin to rupture, retreatment must be done immediately. Varying degrees of bacterial resistance to streptomycin exist in California with the most severe in the Sacramento Valley. Terramycin resistance has never been detected.

Although not as susceptible as pear, fireblight can be a serious disease on some apple varieties. Apple cultivars vary in susceptibility and extent of damage. For example, in Granny Smith, infections are usually limited and do not cause severe structural damage to the tree, whereas Gala and Fuji trees may be devastated. Fireblight development is influenced primarily by seasonal weather. Warm weather, accompanied by rain and hail is ideal for disease development. The climate in most apple growing areas and especially in the Central Valley is conducive to disease development. Fireblight causes blossom clusters to wilt and collapse in late spring. Young tender shoots can also be infected. Blight infections kill fruiting spurs, and it may move into twigs and branches from infected clusters. In some varieties major branches may be killed as cankers expand and girdle limbs. In highly susceptible varieties entire young trees may be lost. Blight injury can reduce yields of highly susceptible varieties up to 25%.

There is some use on ornamental plants reported in the CDPR pesticide use report. These uses are most likely on ornamental pears or apples. These uses are important to protect susceptible ornamental plants from fireblight.

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

Several products are registered for its management on apples and pears, but none provides excellent control. Streptomycin combined or alternating with Blightban (*Pseudomonas fluorescens*) has poor to good efficacy. A great deal of resistance to streptomycin exists in some orchards. Mycoshield (terramycin) works fairly well, but is not as effective as streptomycin. Timing of applications is critical for best results. Alternating streptomycin and Mycoshield, or using them in combination, provides fair to good control. Copper provides fair control of fireblight, but can cause russeting on the fruit. Aliette has provided only very low levels of control in the Sacramento area, but product efficacy ranges from poor to good in the Lake County area. Blight Ban A506 is a naturally occurring bacterial organism, *Pseudomonas fluorescens*. It assists in controlling fireblight, frost injury, and russeting by acting as a competitive exclusion agent. It was the first biological agent for disease control registered, and the pear industry funded a portion of its initial development. Sprayed on the flowers at about 10% bloom, *P. fluorescens* prevents the fireblight organism, *Erwinia amylovora*, and ice-nucleating bacteria from growing on treated plant tissue by out-competing them. It is only about 50% effective however, and must be augmented with other controls. A new product, Bloom time (*Pantoea agglomerans*) is being developed that will be used similarly to Blight Ban A506.

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)?

Varying degrees of bacterial resistance to streptomycin exist in California with the most severe in the Sacramento Valley. Terramycin resistance has never been detected. Thus, terramycin is over-used. Ongoing research has evaluated numerous other materials including new antibiotics (e.g., kasugamycin), new organic-chemistry bactericides (DBNPA – Dow Chemical), and general agricultural oxidizers (e.g., peroxyacetic acid). The former two products were moderately efficacious, similar to terramycin. Evaluations of the biological control *P. agglomerans* also demonstrated that it is efficacious against the disease with a broader temperature range for activity than Blight Ban A506. Still, other materials are needed to provide management tools to prevent resistance from developing to any one strategy.

If you have further questions, please contact me.

Sincerely,

Rick Melnicoe

Rick Melnicoe
Director, Western IPM Center

The production agricultural use of Oxytetracycline and Streptomycin on all crops in California in 2003. The measures of use are described in the accompaning table.

							Lbs AI/ acre treated				Num. Applications per treated field						
Crop or Site	AI	Num. of Fields	% Base Acres Treated	Base Acres Treated	Cum. Acres Treated	Total Lbs AI	Med rate	Min rate	Max rate	Num. apps	Med apps/ field	Min apps/ field	Max apps/ field	Num. WFE apps	Med WFE/ field	Min WFE/ field	Max WFE/ field
PEAR	OXYTETRACYCLINE HYDROCHLORIDE	8	4.40	740	9,694	1,127	0.04	0.03	0.68	73	9.50	5.00	12.00	86.51	12.05	5.00	14.19
APPLE	OXYTETRACYCLINE, CALCIUM COMPLEX	9	0.81	171	317	43	0.08	0.08	0.32	25	2.00	1.00	6.00	14.60	1.00	0.75	3.00
N-OUTDR PLANTS IN CONTAINERS	OXYTETRACYCLINE, CALCIUM COMPLEX	2	0.05	15	15	8	0.58	0.47	0.69	2	1.00	1.00	1.00	1.05	0.53	0.05	1.00
PEAR	OXYTETRACYCLINE, CALCIUM COMPLEX	335	72.54	12,191	48,397	10,158	0.16	0.05	0.39	1,473	4.00	1.00	11.00	1,268.57	3.00	0.48	11.00
APPLE	STREPTOMYCIN	20	3.60	759	1,718	192	0.16	0.03	0.38	42	1.50	1.00	4.00	37.61	1.03	0.94	4.01
N-GRNHS PLANTS IN CONTAINERS	STREPTOMYCIN	1	0.01	0	0	5	22.76	22.76	22.76	2	2.00	2.00	2.00	0.08	0.08	0.08	0.08
N-OUTDR FLOWER	STREPTOMYCIN	2	0.78	109	109	15	0.11	0.11	0.21	11	5.50	1.00	10.00	1.10	0.55	0.43	0.67
N-OUTDR PLANTS IN CONTAINERS	STREPTOMYCIN	9	0.87	280	280	53	0.21	0.01	0.43	59	5.00	1.00	12.00	4.10	0.44	0.02	0.71
N-OUTDR TRANSPLANTS	STREPTOMYCIN	1	0.14	12	12	2	0.21	0.21	0.21	12	12.00	12.00	12.00	0.60	0.60	0.60	0.60
PEAR	STREPTOMYCIN	6	0.66	112	316	64	0.21	0.11	0.21	17	2.50	1.00	5.00	16.09	2.50	1.00	5.00
APPLE	STREPTOMYCIN SULFATE	269	42.01	8,862	21,791	3,530	0.13	0.03	0.40	879	3.00	1.00	10.00	738.67	2.00	0.37	11.00
N-GRNHS FLOWER	STREPTOMYCIN SULFATE	2	1.70	46	49	4	0.11	0.05	0.21	9	4.50	2.00	7.00	2.14	1.07	1.00	1.14
N-GRNHS PLANTS IN CONTAINERS	STREPTOMYCIN SULFATE	45	4.84	112	133	163	0.63	0.11	12.88	193	3.00	1.00	11.00	27.22	0.23	0.01	3.08
N-GRNHS TRANSPLANTS	STREPTOMYCIN SULFATE	22	12.45	111	222	50	0.32	0.05	1.54	105	3.50	1.00	11.00	38.50	1.08	0.10	4.00
N-OUTDR FLOWER	STREPTOMYCIN SULFATE	5	1.69	235	390	53	0.11	0.11	0.42	50	3.00	2.00	4.00	2.52	0.14	0.09	0.39
N-OUTDR PLANTS IN CONTAINERS	STREPTOMYCIN SULFATE	69	3.34	1,074	1,151	294	0.21	0.04	1.27	273	3.00	1.00	13.00	24.98	0.16	0.00	1.90
N-OUTDR TRANSPLANTS	STREPTOMYCIN SULFATE	24	0.55	46	55	18	0.51	0.05	2.08	68	2.00	1.00	9.00	9.56	0.13	0.01	2.00
PEAR	STREPTOMYCIN SULFATE	322	63.56	10,681	39,477	4,334	0.11	0.02	0.32	1,332	4.00	1.00	10.00	1,116.15	3.02	0.35	10.00
RESEARCH COMMODITY	STREPTOMYCIN SULFATE	3	1.15	4	4	1	0.19	0.03	0.77	22	9.00	9.00	9.00	0.80	0.29	0.29	0.29
TOMATO	STREPTOMYCIN SULFATE	4	0.30	116	116	24	0.06	0.06	0.16	4	1.00	1.00	1.00	0.88	0.10	0.07	0.14

Description of all columns used in the pesticide use table

"Num. of Fields" is the number of fields that were treated with an AI.
"% Base Acres Treated" is the percent of acres of crop planted, as calculated from the PUR, that were treated one or more times by each active ingredient (AI).
"Base Acres Treated" is the total number of acres planted that were treated one or more times by each AI.
"Cumulative Acres Treated" is the sum of the acres treated for each application even when the same area was treated more than once.
"Total Lbs AI" is the sum of pounds of each AI used on this crop.
"Med rate" is the median rate of all applications.
"Min rate" is the smallest rate after removing the lowest 2.5% of the rate values.
"Max rate" is the largest rate after removing the highest 2.5% of the rate values.
"Num. apps." is the number of applications of the AI in the crop. Applications of the same AI to the same field within 2 days is counted as one application.
"Med apps/field" is the median number of applications per field, taken over only fields treated with the AI.
"Min apps/field" is the smallest number of applications per treated field after removing the lowest 2.5% of values.
"Max apps/field" is the largest number of applications per treated field after removing the highest 2.5% of values
"Num. WFE apps" is the number of "whole field equivalent (WFE)" applications. A WFE application is the acres treated divided by acres planted in that field.
"Med WFE/ field" is the median number of WFE applications per field, taken over all treated fields
Min WFE/ field" is the smallest number of WFE applications per treated field after removing the lowest 1.0% of values
"Max WFE/ field" is the largest number of WFE applications per treated field after removing the highest 1.0% of values