STREPTOMYCIN

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The following is a brief overview of Streptomycin as requested by the OVGMB.

SUMMARY

Streptomycin is a bactericidal aminoglycoside antibiotic, active against susceptible strains of many gram-negative organisms including the bacterial organisms that cause Bacterial Speck, Spot and Canker in tomatoes. Streptomycin, however, IS NOT REGISTERED for use on tomatoes in Canada.

In research trials, Streptomycin's has shown to be more effective than any of the copper bactericides, or various fungicide combinations with copper. The slight additional benefits of Streptomycin DO NOT outweigh the potential risks to pursue its registration and widespread use of this product.

Bacteria causing diseases in plants develop resistance very quickly with continued use rendering Streptomycin ineffective.

The major resistance to its registration in Canada is the potential for cross resistance to human bacterial diseases which renders this antibiotic ineffective when used to fight human diseases.

The resistance mechanism is known, the method of transfer of this resistance is known, the ease in which the resistance is moved from one bacterial population to another is also known. The potential risk is considered too high to pursue further registrations in Canada.

Streptomycin is however presently registered in Canada as a foliar spray on pears and apples however the application is timed early to reduce any residue concerns on the saleable product. Streptomycin is also registered as a seed treatment again avoiding residue concerns on the edible crop.

Streptomycin applied 30-50 days to harvest do not pose any health risks to the consumer.

The major health risk is to the applicator.

In the US Streptomycin is NOT registered for greenhouse use for seedling tomatoes although the labeling has been misinterpreted by some and material has been used in the past.

The most effective method of controlling bacterial diseases in tomatoes is through the use of clean seed. Additional precautions are directed towards hygiene and water management strategies in the production of tomato transplants in the greenhouse. Once in the field the most effective method of control is the use of copper and BRAVO 500.

DESCRIPTION

Name of Chemical:	Streptomycin Sulphate
Principal Trade Names:	Agri-Mycin 17, Agri-Strep, Plantomycin
Year of Initial Registration (US):	1958
Chemical Family:	Aminoglycaside antibiotic isolated from the bacterium *Streptomyces griseus*
Manufacturer:	Pfizer, Inc.

REGISTERED USES:

United States:	- terrestrial food crop uses on fruit and vegetables - terrestrial nonfood crop uses on tobacco and ornamentals - greenhouse nonfood crop use on ornamentals - 98% of annual production is used on apples, pears and tomatoes	
CANADA	- pears and apples - seed treatments on crucifer crops (rutabagas)	
Application rates:	- terrestrial food crops	25 - 200 ppm
	- terrestrial nonfood crops	50 - 200 ppm

TOXICOLOGICAL CHARACTERISTICS

Streptomycin has been used since the late 1940's to treat bacterial infections in humans. As a result of this use as a human drug, there is an extensive body of toxicology data available on streptomycin. Thus, all toxicological data requirements have been waived for food and non food crop control requirements.

METABOLISM AND PERSISTENCE IN PLANTS AND ANIMALS

EPA has determined that plant and animal metabolism data were not needed for the following reasons:

- metabolism of streptomycin in mammals has already been traced in connection with its use in humans;
- residues are non-detectable (<0.5 ppm) in or on crops when treated according to label use rates and directions;
- large amounts of toxicological data exists;
- most crops are treated at or before transplanting (celery, peppers, potatoes and tomatoes) and pome fruits are treated foliarly but with a 30-day PHI (post harvest interval) for pears and a 50-day PHI for apples and crabapples. (US registrations)
- potential daily exposure to streptomycin as a pesticide is < 0.01% of the daily clinical dosage (1-4 grams/day).

TOLERANCE ASSESSMENT

Tolerance has been established for residues of streptomycin in a variety of raw agricultural commodities at 0.25 ppm.

STREPTOMYCIN RESISTANT MICROORGANISMS

EPA has deferred to the Food and Drug Administration on the issue of development of streptomycin resistant microorganisms.

The dissemination of the streptomycin-resistance transposon Tn 5393 among the phytopathogenic bacteria *Erwinia amylovora*, *Pseudomonas syringae*, and *Xanthomonas campestris* is a powerful illustration of the ability of bacterial populations to evolve resistance through the recruitment of preexisting genes. Tn 5393 encodes the strA-strB aminoglycoside phosphotransferase genes that are also found in humans and animal bacterial pathogens. Tn 5393 is typically plasmid encoded, but may also be chromosomally inserted. The location of Tn 5393 on different plasmids and chromosomes of phytopathogenic bacteria is retrospective evidence of the mobility of the element within and between populations. Gene transfer of Tn 5393 increases the chances for its association with superior genotypes which ultimately contribute to the persistence of the element.

Observations of the dissemination of Tn 5393 are similar to previous observations concerning the dissemination of antibiotic resistance transposons in clinical bacterial pathogens. Tn 5393 is found not only in phytopathogens, but is present in a wide variety of nontarget bacteria even from regions presumably never exposed to streptomycin through human usage. Also current evidence suggests that Tn 5393 has been inserted into indigenous plasmids which are stable, adapted to their host and may encode other gene(s) which are beneficial to host fitness.

The unwitting cooperatively of widely varied bacterial populations through the sharing of plasmid DNA adds to the complexity of the antibiotic resistance problem. Many characteristics of bacterial populations including large population sizes, rapid generation times, and genome plasticity increase the chances for the selection of low-frequency events such as gene transfer and intercellular transportation. The results of ecological and genetic studied coupled with field observations suggest that the carriage of Tn 5393 is not ecologically detrimental to host organisms. The widespread dissemination of this transposon severely impacts the effectiveness of streptomycin in plant disease control.

PRECAUTIONARY STATEMENTS

Some people are allergic to streptomycin resulting in a skin reaction. Do not breath dust or spray mist. Wear dust mask and rubber gloves. Wash thoroughly with soap and water after handling.

ENVIRONMENTAL FATE

- Hydrolysis (water)
- Photodegradation
- Aerobic and anaerobic metabolism
- soil dissipation
- adsorption/desorption