National Organic Standards Board
Crops Subcommittee Petitioned Discussion Document
Kasugamycin
February 2, 2021

The NOSB received a petition for kasugamycin for use as an approved active ingredient in organic crop production at 7 CFR § 205.601. In support of its review, the Crops Subcommittee requested a technical report (TR), which was received January 21, 2021.

Summary and approved legal uses of the substance:

Kasugamycin is an antibiotic that inhibits bacterial protein synthesis and has been approved by the U.S. EPA for control of plant diseases, especially fire blight caused by Erwinia amylovora on apples and pears. The registered formulations are Kasumin 2L and Kasumin 4L containing the active ingredient kasugamycin hydrochloride hydrate. Kasugamycin is obtained by aerobic fermentation by the microorganism Streptomyces kasugaensis. The technical grade active ingredient, kasugamycin hydrochloride hydrate was registered with the EPA in 2014 and a formulation Kasumin 2L containing two percent kasugamycin was registered in 2018. In 2020 Kasumin 4L containing four percent kasugamycin was registered with the EPA. Kasumin 2L and 4L were registered with a number of restrictions including those that prohibit application where animals are grazing or in areas where crops have been fertilized with animal or human waste. Users are also required to follow a resistance management plan. Applications are limited to four per year with California limiting applications to two per year.

Composition:

Kasugamycin is an aminoglycoside antibiotic that is manufactured through fermentation and isolated as hydrochloride. Kasugamycin is a colorless solid at room temperature and is soluble in water. The hydrochloride has relatively low volatility and does not volatilize readily from soil into the air.

Assessing risks to human health and the environment:

Kasugamycin is characterized by the EPA as moderately persistent to persistent. A major source of degradation is aerobic microbial metabolism in soil with a half-life of 43-73 days. About 4% remains after a year. Hydrolysis in water is very slow and metabolites are also persistent (TR 278). Persistence on fruit is low and about half the amount applied to foliage ends up on the soil and non-target surface vegetation. Residues on fruit decrease 10-fold in 27-32 days.

Kasugamycin has low acute toxicity to mammals and is classified EPA Category IV (least toxic, no warning label) for all exposures other than dermal, for which it is classified EPA Category III (next least toxic, requires "Caution" warning on label). It also has low chronic toxicity from rat feeding studies and there was no evidence of carcinogenicity in mice or evidence of chromosome damage.

Normal labeled use of kasugamycin has led to field resistance in several pathogens. Kasugamycin was first used to control diseases of rice in Japan starting in 1965 with rice blast caused by Magnaporthe grisea and resistance was noticed in 1971. Field resistance to Acidovorax sp. occurred in 1990 and to B. glumae in 2001. In Florida, rapid field resistance to bacterial spot of tomato caused Xanthomonas perforans was also seen. In orchards that had been treated at least once with Kasugamycin studies found resistant bacteria in 401 field isolates from apple flowers, leaves and soil samples. Additionally, Erwinia resistance to kasugamycin has been generated in the laboratory. Kasugamycin has not been

evaluated to determine if its use for orchard sprays would lead to kasugamycin-resistant pathogens in animals grazing orchard grass, but spraying orchard grass with streptomycin at concentration levels used for fire blight leads to an increase in antibiotic-resistant human pathogens found in sheep grazing on sprayed grass. (TR 805).

It was reported in the TR (1152) that some level of resistance to kasugamycin with normal (labeled use) has occurred and therefore the Kasumin label requires a resistance management plan. The plan includes use of kasugamycin as part of an IPM program and less than four applications per year (2 in California).

The alternative to kasugamycin is an integrated organic program that attacks fire blight at every point in its life cycle. Cultural controls can be combined with application of fixed copper sprays in dormant and pre-bloom periods, application of lime sulfur for mildew control and thinning of apple blossoms, biological controls such as Blossom Protect during bloom time, and bio-control antagonists such as Serenade later in the blooming period. Other organic procedures are also available to control fire blight, but they are more effective on the West Coast.

Discussion:

Fire blight has grown resistant to every antibiotic used against it and there is good reason to believe it will become resistant to kasugamycin. The NOSB and NOP identified several reasons to stop the use of streptomycin in organic production: resistance is widespread and the USDA, in 2014, stated that the expectation is that antibiotics are not used in organic production. Other antibiotic petitions have been not been approved by the NOSB due to the potential for cross-resistance when used for human health.

Questions:

1. Is the use of kasugamycin necessary for the control of fire blight or are other integrated programs sufficient?
2. Would the use of kasugamycin decrease the need for other synthetic products used in organic agriculture such as coppers and lime sulfur?
3. Is the limitation to 4 applications (2 in California) sufficient to reduce or eliminate the chances for fire blight resistance?
4. If approved, should the use be annotated only for fire blight control in apples and pears?
5. Are there variable results of the efficacy of kasugamycin depending on region where it is used?

Subcommittee Vote:
Motion to accept the discussion document on kasugamycin
Motion by: Rick Greenwood
Seconded by: Steve Ela
Yes: 8 No: 0 Abstain: 0 Absent: 0 Recuse: 0

Approved by Rick Greenwood, Crop Subcommittee Chair, to transmit to NOP February 19, 2021.