Agricultural Experiment Station
Cooperative Extension

37860 West Smith-Enke Road
Maricopa, Arizona 85138
(520) 568-2273
FAX: (520) 568-2556

Telone (1,3-D) Use and Benefits in Arizona Agriculture

Prepared by Alfred Fournier, Randall Norton, Peter C. Ellsworth & Wayne Dixon
Comments submitted by the Arizona Pest Management Center,
University of Arizona

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Summary

- The EPA is seeking public comments in response to published risk assessments for telone, 1,3-dichloropropene (1,3-D), a soil fumigant used to manage nematodes.
- Our goal at this time is to inform the EPA about specific and critical use patterns of telone (1,3-D) on Arizona crops.
- Telone is an efficacious nematicide, and is our most effective treatment against root knot nematode (*Meloidogyne* species) in several crops.
- Telone treatment is fairly expensive, and its use is limited to certain crops, primarily melons (all types), cotton, carrots and roses.
- There are very limited to no alternatives for effective root knot nematode control in these crops.

Telone (1,3-D) Use in Arizona Agriculture

Telone (1,3-D) is registered in several formulations to control nematodes. In Arizona, it is the most effective treatment against root knot nematodes, a key pest. It is applied by soil-injection or subsurface irrigation. Reported uses of telone in Arizona are limited to a few crops, primarily melons (all types), cotton, carrots and roses.

Root knot nematodes (*Meloidogyne* species) are the most widespread and economically important plant parasitic nematode pests of Arizona crops and ornamentals (Olsen 2011). This plant parasitic nematode has a broad host range and affects many commercial plants. The nematodes infect plant roots, causing swelling which is easy to diagnose on examination of the roots, but above ground symptoms of infections, such as wilting, loss of vigor, and yellowing of leaves can resemble other conditions, such as poor irrigation (Olsen 2011, Perry & Ploeg 2010). Infections by root-knot nematode cause decline in the host, and under some conditions, may kill the plant. Infected plants may be stunted and chlorotic, wilt easily, and are not productive (Olsen 2011). For example, if untreated, root knot nematode can cause severe stand loss and yield loss in cotton, and infected melon plants can fail to produce fruit.

Melons
Melons are the third most valuable crop in Arizona agricultural production, after alfalfa hay and lettuce. In 2018, Arizona ranked second in the nation in cantaloupe production, with 16,300 acres of fresh market cantaloupes valued at $86.9 million. In 2017 (most recent data available) Arizona watermelon production was valued at $42.4 million (USDA-NASS 2019).

In terms of acres treated, melons represent the most significant ongoing use of Telone in Arizona. Telone is used for control of root knot nematode on nearly all Arizona acres, based on reports from pest control advisors. Nematode control is critical. At moderate to severe nematode infestation levels, melons will not produce fruit and plants may die off completely. Telone (1,3-D) is the most effect control option. Many of Arizona's production acres are on subsurface drip irrigation. Telone EC is run through drip at a very low rate, 5 to 7 gal/acre, depending on the level of infestation. Growers not using subsurface drip irrigation use soil-injection techniques to deliver chemical to moistened soil and cover over. The application is typically made 2 weeks prior to planting, the same for either seeded melons or transplants.

According to one pest control advisor, Velum Prime (fluopyram) has not yet demonstrated itself as a viable alternative for root knot nematode, though it has been used in some areas, particularly when the application window for Telone has closed. There is concern that it may not have sufficient efficacy under high nematode infestation levels.

Cotton
Arizona often leads the world in cotton yield per acre (>1550 lbs.), nearly twice the U.S. average, contributing 9,000 jobs and $700 million to Arizona's economy in 2011 (anonymous 2012). In 2017, Arizona cotton had a value exceeding $200 million for cotton and cotton seed production combined (USDA-NASS 2019).

Root knot nematode damage can be minor to devastating in cotton, depending on infestation levels. When nematode populations are high, it can cause significant stand loss. Only a small percentage of cotton acres receive treatment. This has to do with the uneven distribution of root knot nematode, which favors moist, well-aerated, sandy soils (Olsen 2011). Because Telone is expensive to apply, applications are limited to specific regions, or even specific fields, where nematode conditions are favorable, or where populations historically recur. In these areas, it is critical to protect emerging plants. Once plants are established, root systems are strong enough to better withstand some nematode pressure, but yield loss is common.

Telone is the primary treatment for control of root knot nematode in cotton. In most cases, Telone II is applied by soil-injection prior to planting (5 gal/ acre). The liquid material is dripped into a trench and equipment closes the soil behind the application. This practice is essential both to ensuring application efficacy and to limiting non-target exposures. For cotton acres on subsurface drip irrigation use rates range from 3 to 5 gal/acre. Researchers are currently developing precision application methods to deliver control agents only where nematodes are present at economic levels.

According to Dr. Randall Norton, University of Arizona Extension Agronomist and Director of the Safford Ag Center, some Arizona cotton growers this year have shifted to Velum Total (a pre-mix of fluopyram and imidacloprid) for nematode control. He has conducted research trials with this compound since 2016 and has found that, under low to moderate pest pressure, it appears to provide effective control of root knot nematode. This product has not yet been tested under high nematode pressure.

Carrots

Root knot nematode is particularly problematic in carrots, as a root crop. Untreated populations of nematodes result in misshapen, unmarketable carrots. According to one pest control advisor, Telone is applied to all carrot acres as a prophylactic treatment. Telone II is applied by soil injection. Following irrigation to 70% moisture, it is shanked into the bed, 14 inches deep, then beds are sealed by a roller. Typical application rates are 7 gal/acre. Planting occurs a week later. There are no viable alternatives for root knot nematode control in carrots.

Roses

Arizona produces 75% of bareroot roses in the United States, an estimated 750 acres annually, with about 25,000 rose bushes per acre. The average annual retail value of Arizona rose production is $255 million, with an estimated $500 million impact on the U.S. economy (personal communication with an industry contact).

Root-knot nematode is an economic pest of roses. Growth is stunted in infested plants, which may wilt and die, particularly under conditions of water stress. Due to the economic value of roses, and the lack of viable rescue treatments once nematode damage has occurred, the entire crop receives prophylactic applications of Telone prior to planting. The majority of Arizona's rose crop is produced from two-year plantings, although one-year plantings are also used. Telone II is applied as a pre-plant soil injection, on the flat (before bedding) with a ripper shank, followed by a roller to seal in the chemical. It is applied under optimal moisture conditions, to improve efficacy. The typical use rate is 20 gal/acre. Bedding occurs one to two weeks after application, and in most cases, planting occurs 30 to 40 days after application. Roses are planted from cuttings, so there is minimal disturbance of the soil during planting.

Apart from Telone, the only other effective option for control of root knot nematode is methyl bromide, which requires plastic, and is not economically feasible for growers.

Who We Are

The Arizona Pest Management Center is host to the University of Arizona's expert IPM scientists including Ph.D. entomologists, weed scientists and plant pathologists with expertise in the strategic tactical use of pesticides within IPM programs that protect economic, environmental and human health interests of stakeholders and the society at large.

Dr. Al Fournier is Associate Director of the APMC / Associate Specialist in Entomology, holds a Ph.D. in Entomology, and has expertise in evaluating adoption and impact of integrated pest management and associated technologies. He works with the Western IPM Center, representing

stakeholders in the desert Southwest states in EPA registration reviews. Dr. Randall Norton, is a University of Arizona Extension Agronomist, Area Agent, and Director of the Safford Agricultural Center. Dr. Peter Ellsworth is Director of the APMC, State IPM Coordinator for Arizona and Professor of Entomology / Extension IPM Specialist with expertise in developing IPM systems in cotton and other crops and measuring implementation and impact of IPM and pest management practices. Mr. Wayne Dixon holds a B.S. in Computer Information Systems and develops tools and data used in IPM research, education and evaluation, including management of the APMC Pesticide Use Database.

These comments are the independent assessment of the authors and the Arizona Pest Management Center as part of our role to contribute federal comments on issues of pest management importance and do not imply endorsement by the University of Arizona or USDA of any products, services, or organizations mentioned, shown, or indirectly implied in this document.

Our Data and Expert Information

Through cooperative agreements with Arizona Department of Agriculture, the Arizona Pest Management Center obtains use of, improves upon, and conducts studies with ADA's Form1080 data. Growers, pest control advisors and applicators complete and submit these forms to the state when required by statute as a record of pesticide use. These data contain information on 100% of custom-applied (i.e., for hire) pesticides in the state of Arizona. Grower self-applied pesticide applications may be under-represented in these data. In addition, the Arizona Pest Management Center is host to scientists in the discipline of IPM, including experts in the usage of this and other compounds in our agricultural systems. We actively solicit input from stakeholders in Arizona including those in the regulated user community, particularly to better understand use patterns, use benefits, and availability and efficacy of alternatives. The comments within are based on the extensive data contained in the Arizona Pest Management Center Pesticide Use Database, collected summary input from stakeholders and the expertise of APMC member faculty.

Through the Crop Pest Losses and Impact Assessment program (WIPMC 2018), partially funded through the Western IPM Center, the Arizona Pest Management Center conducts annual surveys with state-licensed pest control advisors (PCAs), who are the primary pest management decision makers, in consultation with growers. The surveys, conducted at face-to-face meetings, provide detailed information on crop yield losses to specific insect pests, weeds and diseases, control costs, and pesticide use for the key crops, cotton and lettuce. Cotton data have been collected since 1991 and lettuce data since 2005. Data are collected for all of Arizona and neighboring production regions of California, with typical responses representing up to 65% of acres planted in Arizona. These data provide detailed information on shifting pest trends, chemical use and costs, and often compliment and augment information from the APMC Pesticide Use Database, particularly for pesticide uses for which the state does not mandate reporting.

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