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Oxamyl Use in Arizona and New Mexico Crops
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Summary

- EPA is seeking public comments on draft human health and ecological risk assessments for oxamyl, a carbamate insecticide, acaricide, miticide, nematicide, and plant growth regulator. While data gaps exist, there are concerns expressed in EPA's environmental risk assessment about non-target organisms, including terrestrial animals (birds, mammals, terrestrial-phase amphibians, reptiles and bees) and aquatic invertebrates.
- At this time, our goal is to inform EPA about specific uses of oxamyl in our cropping systems and factors already in place that greatly limit its uses in desert southwest agriculture, while also documenting the important, sometimes critical, role that oxamyl plays in our systems.
- Annual surveys of pest control advisors in Arizona confirm that, while Vydate C-LV is not often used in cotton, it is identified as a "go to" chemical for certain pest situations. This includes control of cotton leaf perforator infestations, particularly in Pima cotton and non-Bt upland cotton. Experience has shown that Vydate C-LV has an almost unique capacity to resolve this very difficult pest situation.
- Oxamyl (Vydate C-LV) is a very effective control material for Lygus bug, the number one yield-limiting pest in Arizona cotton, and it remains on our recommendation list for Lygus control. However, its use has greatly diminished since the registration of flonicamid (Carbine) and sulfoxaflor (Transform), two selective chemistries that are very effective for Lygus control. If we were to have a catastrophic loss of Transform (due to continuing registration hurdles) and Carbine, either due to resistance, or other issues, Vydate C-LV would be among the very short list of effective Lygus control products in our system.
- Oxamyl is a key chemistry, and the only effective nematicide registered for use in peppers, against the root knot nematode. In combination with Verticillium wilt, nematodes pose the largest threat of yield loss to Chile peppers. Oxamyl is the cornerstone of their control program.

Oxamyl use in Arizona

Based on data from the Arizona Pest Management Center (APMC) Pesticide Use Database (Fournier et al. 2017), we have relatively few uses of oxamyl across a small number of crops in Arizona since 2008, mainly cotton and melons (including cantaloupes and watermelons). Applications are not reported in these crops every year, and the number of acres treated is very small relative to acres planted for these crops. These represent very specific niche uses.

Table 1: Reported uses of oxamyl. Source: Arizona Pest Management Center Pesticide Use Database.

Crop	Year	Use Reports	Acres Treated
Cotton	2008	4	402
Cotton	2009	6	213.3
Cotton	2012	2	120
Cotton	2014	4	750
Cantaloupe	2010	2	54
Cantaloupe	2011	3	94
Cantaloupe	2012	24	900.1
Melon, Unspecified	2009	3	72
Melon, Unspecified	2011	7	489.9
Melon, Watermelon	2008	2	39.3
Melon, Watermelon	2014	12	268.5

The APMC commented on oxamyl use in Arizona melons in 2009 (available at https://cals.arizona.edu/apmc/docs/Oxamyl_Response_8-20-09.pdf), at which time there was relatively low use in melons, and alternative chemistries seemed to be available for target pests.

Melons

A central Arizona pest control advisor who works in melons confirmed that oxamyl is not used much in melon production here anymore. “One year, when we could not get access to Telone,

and several growers tried oxamyl as an alternative nematicide, but it was not very effective. With the registration of Vellum and Nimitz, we now have much better options for nematode control."

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 2016, cotton was ranked third for production value in Arizona, after lettuce and alfalfa hay, with a combined value of over $162 million for cotton and cotton seed production (USDA-NASS 2017a).

According to Dr. Peter Ellsworth, University of Arizona Extension IPM Specialist with expertise in cotton IPM, oxamyl (Vydate C-LV) is hardly ever used anymore. However, based on an annual survey of cotton pest managers, Vydate is often identified as a "go to" chemical for certain pest situations in cotton. Because these situations are uncommon, the actual, recent use of Vydate C-LV has been quite limited. One such situation is for control of cotton leaf perforator infestations. While rare, these still do occur, especially in Pima cotton and non-Bt upland cotton. Experience has shown that Vydate C-LV has an almost unique capacity to resolve this very difficult pest situation.

Bt cotton remains highly effective on cotton leaf perforator, conferring essentially immunity to this pest. Bt cottons are adopted on the majority of acreages in Arizona. Historical need for Bt cotton has been for pink bollworm control. However, this pest has been functionally eradicated from all of Arizona, the entire southern region of the U.S. and northern region of Mexico. As a result, there has been renewed interest by our growers in non-Bt upland cottons and Pima cotton (*Gossypium barbadense*) in Arizona. This has opened up the possibility for greater need to control for cotton leaf perforator. As well, we cannot ignore the risks of resistance developing to Bt cotton in the cotton leaf perforator, which in the past has demonstrated high capacity to develop resistances to conventional chemistry. Thus, despite exceptionally low usage of this active ingredient presently, there are conditions in place that could lead to greater need for this niche chemical control in cotton.

Before the availability of modern, selective chemistries to control Lygus bug, the number-one yield-reducing insect pest of Arizona cotton, oxamyl (Vydate C-LV) was on the very short list of effective Lygus control products in our system (along with acephate). Figure 1 shows data from efficacy trials, indicating the very good efficacy of Vydate C-LV against Lygus (Ellsworth & Barkley 2005). In recent years, registration of flonicamid (Carbine) and sulfoxaflor (Transform) for management of Lygus in cotton have made these older chemistries nearly disappear from use in our system. If we were to have a catastrophic loss of Transform (due to continuing registration hurdles) and Carbine, either due to resistance, or other issues, Vydate C-LV would be among the very short list of effective Lygus control products in our system. Basically, after these two market leaders, Vydate C-LV and acephate are our only Lygus control materials. Vydate C-LV remains on our recommendation list for Lygus control. But for obvious reasons, Transform and Carbine currently capture nearly 100% of this market for us.

One reason Vydate C-LV is not used often by cotton growers is that it requires posting of applications, a large impediment to its use. For this reason, any additional language on the label guiding Vydate's use in cotton as it relates to bee hazard would have little additional effect on its use here. However, as an entomologist with responsibility for constantly assessing the tool box for insect control, Dr. Ellsworth would not want to see Vydate C-LV simply go away (or not be defended) because a lot of people do not see much use for it any more. There are chemistries that have unique niches for rare circumstances. Vydate is one of these for us.

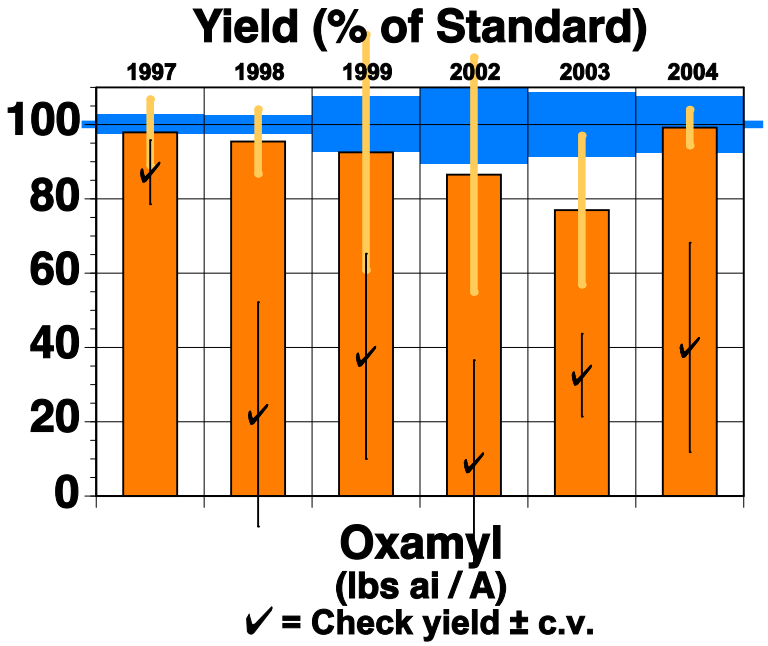

Figure 1. Average lint yields (expressed as % of yield achieved in the standard, acephate @ 1 lb ai / A) ± c.v. for oxamyl (Vydate C-LV at 1 lb ai / A) in replicated Lygus efficacy field trials in Arizona cotton, Maricopa, AZ (Ellsworth & Barkley 2005). Points indicated by a check mark represent the lint yield (as a % of standard) ± c.v. for the untreated check for the associated trial. Blue band indicates the lint yield of the standard (acephate @ 1 lb ai / A), where the width indicates ± c.v. Numbers above bars indicate the year of the trial. Coefficients of variation (c.v.) that are not overlapping likely indicate a significant difference between the two means. N = 4.

Oxamyl use in New Mexico

Chile Peppers

In 2016, New Mexico produced 8,700 acres of Chile peppers valued at over $50.5mil (USDA-NASS 2017b). According to a pest management advisor who works with the NM Chile industry, oxamyl (Vydate) is the Chile pepper industry's primary defense, and only effective control tool against nematodes. Their main production region is on a plateau with sandy soils, a situation in which peppers thrive, and which discourages several weeds and insect pests. However, nematodes are favored by sandy soils, and they have become the biggest yield concern for growers, in connection with Verticillium wilt. Root-knot nematode, *Meloidogyne incognita*, causes damage on peppers worldwide and may be particularly troublesome in warm, sandy soils (Goldberg 2001). Nematodes create microscopic regions of damage in plant roots, which makes

peppers susceptible to Verticillium wilt infection. The causal fungus invades the xylem of the plant and interferes with water transport. As the disease develops, the plant wilts as a result of water stress. Infected plants may recover at night for a few days before permanent wilting and death occur (Goldberg 2010). Longer field rotations of non-host crops are a non-chemical strategy to help mitigate Verticillium. Practical and effective rotation options are limited, although growers continue to research alternative rotations. Verticillium has no effective cure.

The nematode's life cycle is synchronized to the plant's phenology. Nematodes start hatching at the same temperature that peppers begin germinating, at 50-55°F. Nematode damage in the field looks like a wave pattern, with shorter and taller plants. Nematodes stunt the plants but do not kill them, affecting fruit production and yield. Yield loss occurs from a combination of both the nematode and Verticillium. Verticillium symptoms show up after the first fruit load. The plant is under a lot of stress from fruit production and heat, making the plant sick and weak. The vascular system in the plant gets plugged up and the plant becomes a host for Verticillium.

Oxamyl is the only effective chemical control for this nematode on peppers. Vydate is applied at full label rate starting at germination. Up to 3 applications at full rate are used, depending on infestation levels. This is the cornerstone of the control program for this very damaging pest complex. New Mexico Chile pepper growers would face very serious economic losses without oxamyl, unless effective alternative chemistries become available.

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. Peter Ellsworth is Director of the APMC, State IPM and Pesticide 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. Dr. Al Fournier is Associate Director of the APMC / Adjunct 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 serves as a Comment Coordinator for the Western IPM Center, representing stakeholders in the desert Southwest states. 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 Form L-1080 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 compound 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.

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