



Chlorpyrifos Use in Arizona and New Mexico
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Comments submitted by the Arizona Pest Management Center,
University of Arizona

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These comments are submitted in response to EPA's proposed revocation of all food residue tolerances for the insecticide active ingredient chlorpyrifos. Should this revocation proceed as outlined by EPA, all agricultural uses of chlorpyrifos would cease. This report presents use information and comments from agricultural stakeholders and university scientists that document important agricultural uses of this insecticide in Arizona and New Mexico and potential impacts of the loss of chlorpyrifos on Southwestern growers. **These comments are meant to supplement earlier and more comprehensive comments submitted by the Arizona Pest Management Center (APMC) in response to EPA-HQ-OPP-2015-0653-0001 open comment period which closed January 5, 2016** (EPA comment ID# EPA-HQ-OPP-2015-0653-0380, also at <http://cals.arizona.edu/apmc/docs/15EPA-Chlorpyrifos-Use-In-ArizonavF.pdf>). We also wish to reference a comment submitted to this EPA docket in January 2016 by University of Arizona Professor of Entomology and Extension Specialist, Dr. John Palumbo (comment ID: EPA-HQ-OPP-2015-0653-0260).

Summary

While chlorpyrifos use has declined significantly along with other broad-spectrum insecticides over the past two decades, strategic uses remain important as part of integrated pest management (IPM) programs in a variety of crops in the desert southwest. Chlorpyrifos, while not used often on most Arizona crops, remains an important "go-to" product in certain situations. Its broad-spectrum efficacy facilitates control of multiple targets, including less common but destructive pests for which there are few if any alternative active ingredients available. The majority of recent chlorpyrifos use in Arizona is on alfalfa. A large number of acres are treated in years when pest levels are high. It is used against Egyptian alfalfa weevil, the aphid complex, and lepidopteran larvae. This is an important chemistry in alfalfa because it is effective against multiple pests that can occur simultaneously, some of which have few other labeled options. In corn, it is used to control lepidopteran and coleopteran pests, including corn

earworm, armyworms, southwestern cornborer, and corn rootworms. With the advent of a genetically fixed resistance in southwestern corn borer to Cry1F in Bt corn in Arizona, there is a renewed need for chlorpyrifos to kill resistant moths and larvae of this species. In 2016, the invasive sugarcane aphid infested Arizona and California sorghum for the first time, moving west from New Mexico, and leading to devastating losses for growers in many cases. Chlorpyrifos is labelled for use against this invasive pest (as Lorsban 75WG) and may prove to be a critical tool for its management along with Transform (sulfoxaflor), which was granted a Section 18 for use in Arizona in summer 2016. Chlorpyrifos is a go-to chemical for control of the black pecan aphid in Arizona and New Mexico, one of the more damaging aphid species that attacks pecans, causing yield reductions and economic losses. It is highly efficacious against this pest, and in NM is applied as skip-row treatments, which use half the amount of insecticide but provide excellent control. It is an important active ingredient in cole crops, where it is used to control lepidopteran larvae, secondary pests at stand establishment, and the potentially devastating invasive bagrada bug (in rotation with pyrethroids). Prior to its eradication in our region, chlorpyrifos was the most effective chemistry available for control of pink bollworm (PBW) in cotton. Although little chlorpyrifos is used in cotton today, its effectiveness against pink bollworm provides an important rationale for maintaining potential future access should this devastating pest make a comeback.

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. Dr. Ayman Mostafa is an entomologist and Area Extension agent who works in alfalfa and other field crops in central Arizona. Mr. Joshua Sherman is an Area Extension Assistant Agent in Commercial Horticulture who works with pecan producers in Southeastern Arizona. 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 and other southwest states, including members of 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.

Use in Alfalfa

In 2015 Arizona growers harvested 300,000 acres of alfalfa hay valued at over \$405 million, while in New Mexico 115,000 acres were harvested (USDA NASS 2017a,b). According to the APMC Pesticide Use Database, between 2008 and 2015, chlorpyrifos was reported used on over 419,000 acres of alfalfa in Arizona. Based on a December 2016 survey of licensed Arizona pest control advisors (PCAs) (n = 18), 39% indicated that chlorpyrifos was used every year and 33% indicated it was important some years, for control of aphids (including cowpea aphid), alfalfa weevil, lepidopteran larvae (including alfalfa caterpillar and cutworms), and leafhopper. 55% of survey respondents indicated using chlorpyrifos in 2016 on some percent of their acres (ranging from 10% to 100%), and most sprayed it once. According to Dr. Ayman Mostafa, entomologist and Area Extension agent who works in alfalfa and other field crops in central Arizona, chlorpyrifos is extremely important for control of Egyptian alfalfa weevil (EAW), a key defoliating pest in alfalfa. Based on a 2014 and 2015 annual survey of Arizona pest control advisors, Lorsban was the second most commonly used insecticide in alfalfa for EAW management after Steward (indoxacarb). Particularly after the loss of carbofuran (Furadan) registration, chlorpyrifos became increasingly used for control of EAW. Chlorpyrifos is also used to control the alfalfa caterpillar complex during the summer months and for cutworm control. Cutworm populations in 2016 were high in major production regions of Arizona, leading to increased usage of chlorpyrifos. Lorsban is an economical choice for growers and is more efficacious against EAW than pyrethroids, with less negative impact on natural enemies. In years when aphid pressure is heavy, and multiple applications of insecticides are used to control aphids, cross-control of Egyptian alfalfa weevil results in reduced (but still significant in some areas) use of chlorpyrifos against weevil.

Phone interviews with three Arizona PCAs confirmed the importance of chlorpyrifos in alfalfa insect pest management. Chlorpyrifos is very important for control of the aphid complex in alfalfa and also for Egyptian alfalfa weevil, and is effective against both of these key pests. One PCA summarized: "Chlorpyrifos is used quite a bit in alfalfa. It is effective against aphids and

alfalfa weevil, both key pests in this crop. We have limited insecticide options in alfalfa, and this product is important to the industry. For most infestations, chlorpyrifos is used effectively and works well at lower use rates, which makes it very cost-effective.”

Use in Sorghum

In 2015, 125,000 acres of sorghum was harvested in NM and 24,000 acres in AZ, with a combined value exceeding \$18 million (USDA NASS 2017a,b). According to the APMC Pesticide Use Database, between 2008 and 2015, chlorpyrifos was reportedly used on over 17,000 acres of Arizona sorghum. Chlorpyrifos use in all sorghum (for silage and grain) tends to vary by year based on the pest complex, from several hundred acres to over 5,000 acres treated in Arizona over the past decade. In 2016, a new invasive pest, the sugarcane aphid (*Melanaphis sacchari*), had a sudden and devastating impact in Arizona and California sorghum production, invading these states for the first time and leading to complete losses in some fields (Mostafa & Ellsworth 2016). Lorsban 75WG (EPA reg # 62719-301) is labelled for use against aphids, including sugarcane aphid in Arizona, and may prove to be a critical tool for its management along with Transform (sulfoxaflor) which was granted a Section 18 for use in Arizona in summer 2016.

Use in Corn

In 2015, 125,000 acres of corn for grain and silage was harvested in NM and 75,000 acres in AZ with a combined value exceeding \$70 million (USDA NASS 2017a,b). According to the APMC Pesticide Use Database, between 2008 and 2015, chlorpyrifos was reportedly used on over 31,000 acres of corn in Arizona (all types). Like sorghum, chlorpyrifos use in Arizona corn tends to fluctuate year to year according to pest issues. According to one Arizona PCA, “chlorpyrifos is used in corn, primarily in conventional (non-GMO) corn, where it provides excellent worm control. Our key lepidopteran pests include southwestern corn borer, corn earworm and the armyworm complex, any of which can have impacts on both yield and quality.” While non-GMO corn acres make up a minority of Arizona corn, our industry is very concerned about resistances in southwestern corn borer in Bt corn (i.e., to Cry1F) that drastically increase our need for chlorpyrifos in Bt corn. “We have not generally used chlorpyrifos in Bt corn in the past 10 years, but we will start using it in about 4,000 acres of Bt field corn in the coming season for control of Cry1F-resistant southwestern corn borer, corn rootworms and armyworms.” The resistance of southwestern corn borer appears to be complete and fixed genetically in Arizona populations now. This effectively renders “newer” pyramided Bt corns as 1-gene products against southwestern corn borer. This makes control with foliar and especially chemigated chlorpyrifos absolutely critical to our control of existing resistant southwestern corn borers as well as to the mitigation and even prevention of future resistances to Cry1a-based Bt corns. Growers have found much success in the control of corn borers, corn rootworms, and earworms/armyworms through the use of chlorpyrifos in overhead chemigation (i.e., center pivot) systems in Arizona. Pyrethroids delivered in this way are less effective, with poorer spectrum of control, and possibly larger negative impacts on non-target beneficials. Growers in this region are also witnessing loss of efficacy of the clothianidan seed treatment used for corn rootworm control, making these approaches with chlorpyrifos even more important. “Many growers rotate to barley every third year, which helps with rootworm control, but there are some growers who

don't do this, and that is where the control issues have been the most apparent." A third PCA indicated he does not use chlorpyrifos in corn because of concerns that it tends to flare mites.

Use in Pecans

Pecans were the most valuable crop in NM in 2015, with a value of over \$182 million (USDA NASS 2016). Pecan acres in NM were estimated at 41,331 in the 2012 census of agriculture (USDA NASS 2016). In 2016, Arizona has an estimated 25,000 acres of pecans (Joshua Sherman, personal communication) valued at \$54 million (USDA NASS 2017a). According to the APMC Pesticide Use Database, between 2008 and 2015, chlorpyrifos was reportedly used on over 13,000 acres of pecans in Arizona.

According to Dr. Brad Lewis, Assistant Professor and Insect IPM Specialist with New Mexico State University, chlorpyrifos (Lorsban) is primarily used against black pecan aphid. It is highly efficacious. It allows for the effective use of skip-row applications, which use half the amount of material, but are still very effective. There are alternative chemistries, but Lorsban tends to offer more reliable, consistent results. The available reduced risk materials are good, but can be less effective under some circumstances, such as when there is a lot of honeydew on the leaf. Because it is a contact insecticide, chlorpyrifos works well under these conditions, whereas most reduced risk materials are systemic and less able to penetrate into the plant. Apart from black pea aphid, chlorpyrifos is no longer used as a primary material for aphid control. While most NM growers have moved away from older pesticides, for the reasons noted above, chlorpyrifos remains an important tool and part of ongoing resistance management programs in pecans. To date in NM, we have seen no resistance issues to this product. [*Note: Brad Lewis will be submitting independent comments to this docket.*]

Joshua Sherman, Area Assistant Extension Agent, Commercial Horticulture, University of Arizona, works extensively with pecan producers in Southeastern Arizona. He indicates that chlorpyrifos is a go-to product for control of the black pecan aphid, which is the more damaging of aphid species that attack pecans. It causes chlorosis and lowers photosynthesis, leading to potential yield reductions and economic losses. Chlorpyrifos is also used on the orchard floor to control fire ants for worker safety reasons. In addition, Mr. Sherman has been approached by members of the grape industry in Arizona to consider a special local needs registration of chlorpyrifos for control of ants on the ground in grapes, another industry that is growing rapidly in Arizona.

According to one PCA in Southeastern Arizona: "As a representative of the pecan industry, I must state the importance of chlorpyrifos. It is a valuable tool registered against many pests, including ants on orchard floor, black and yellow aphids. Black aphids are still very susceptible to chlorpyrifos. Importantly, Lorsban 75WG is one of the few aerial labels available in pecans. We do not use aerial sprays every year, but they are an important option to maintain in certain situations. I am also concerned about the potential for new invasive pests in Arizona pecans. For this reason, it is important to maintain chlorpyrifos, an effective and economical broad spectrum material." Two other PCAs concurred that chlorpyrifos is important for aphid control. It is particularly important for larger orchards, where it is not always economically feasible to

depend entirely on newer, more expensive chemistries or on ground application equipment. Chlorpyrifos is used in rotation with other products for resistance management. It provides effective knock-down relative to some of the other options, which is important for aphids to prevent major outbreaks from getting out-of-hand.

Use in Cole Crops

As noted by University of Arizona Professor of Entomology and Extension Specialist, Dr. John Palumbo in comments previous submitted to EPA on this docket (comment ID: EPA-HQ-OPP-2015-0653-0260), chlorpyrifos remains an important component in IPM programs for cole crops, where it is used to control lepidopterous larvae, secondary pests at stand establishment, and the invasive bagrada bug (*Bagrada hilaris*), in rotation with pyrethroids. If not controlled, bagrada bugs have the potential to reduce stands and yields by more than 50%. The broad spectrum of control and short residual period for chlorpyrifos make it an important tool, and in rotation with more selective chemistries, a critical part of resistance management programs in these crops.

Use in Cotton

Chlorpyrifos use in Arizona cotton in has greatly declined in recent years to nearly zero. There are a number of effective alternative chemistries for key cotton pests, including many reduced risk materials. However, as noted in our prior comments (EPA comment ID# EPA-HQ-OPP-2015-0653-0380), chlorpyrifos was previously a key active ingredient for the control of pink bollworm (PBW), a major economic pest of cotton which has been functionally eradicated in AZ and surrounding regions. Bt cotton technology and a regional PBW eradication program represent a combined investment of over \$130 million that could be at risk if this invasive pest were to return and we did not have in place the most effective tool for its control: chlorpyrifos.

References

Mostafa A.M., P.C. Ellsworth. 2016. Sugarcane Aphid: A New Threat to Sorghum in Arizona. Blog entry. University of Arizona Cooperative

Extension. <https://arizonaag.com/2016/08/30/sugarcane-aphid-a-new-threat-to-sorghum-in-arizona/>

USDA NASS 2016. 2015 New Mexico Agricultural Statistics (New Mexico Annual Bulletin). United States Department of Agriculture, National Agricultural Statistics Service.

https://www.nass.usda.gov/Statistics_by_State/New_Mexico/Publications/Annual_Statistical_Bulletin/2015/2015_NM_Ag_Statistics.pdf

USDA NASS 2017a. 2015 State Agricultural Overview: Arizona. United States Department of Agriculture, National Agricultural Statistics Service.

https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=ARIZONA

USDA NASS 2017b. 2015 State Agricultural Overview: New Mexico. United States Department of Agriculture, National Agricultural Statistics Service.

https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=NEW%20MEXICO