Docket No. EPA–HQ–OPP–2009–0432
Thiodicarb Use In Arizona
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The Arizona Pest Management Center (APMC) located at the University of Arizona works directly with producers and the Arizona Department of Agriculture to maintain a pesticide use database that spans nearly 20 years. Full use reporting is not required by the state; however, the nature of how and what is sprayed is such that many insecticides are reported to the state and captured in this database. For example, all custom-applied pesticides must be reported. The database is currently being developed into a product that can be easily queried to answer questions of regulatory, market, research and educational significance. It is not yet complete; however, we have examined 20 years worth of pesticide usage for thiodicarb with special attention to a more recent period of use (2001–2004). No uses were reported in 2005–2008 for any crop, the most recent data to which we have access.

Thiodicarb has not been used in any crop in recent years as more alternatives have become available. However, this should not diminish the niche role it could play in certain crops at certain times, especially in the ovicidal and larvicidal control of a number of lepidopteran pests. Table 1 shows the general usage patterns for thiodicarb in Arizona. Figure 1 shows the pattern of usage over 19 years in cotton in Arizona. The decline is dramatic and exceeds any decline in cotton acreage through this period. It mostly represents the decreased dependence on many foliar insecticides for lepidopteran control, because of the widespread adoption of Bt cotton that currently stands at ca. 98%. However, the state is in the process of eradicating the pink bollworm, our principal cotton lepidopteran pest. If fully successful, our state may see the return of significant acreages of non-Bt upland and Pima cottons. If this does occur, there could be more need for lepidopteran active insecticides of all kinds. Furthermore, while most uses target lepidopteran pests, some do target whiteflies, Lygus bugs (a mirid), and flea beetles (Table 1).

The use pattern would seem to indicate that when thiodicarb is used, it is rarely used more than once and never near the seasonal label limits. Thus there is no modal interval between uses of thiodicarb. Because of the range of crops on which thiodicarb is used in Arizona, there is no specific season of use, i.e., the product could potentially be used any time throughout the year. We are unaware of any ecological or human health incidents associated with thiodicarb usage in Arizona. Because usage is so low (<1% of all insecticide uses by crop, see Table 1), it is possible we are unable to measure or detect small, but very important, uses for minor crops. As a niche product, a curtailed label (i.e., one with lower seasonal limits, or somewhat lower maximum use rates) would be a preferred alternative to losing a label altogether.

Broad patterns in insecticide usage in Arizona crops have undergone a large change over the last decade. Cotton is sprayed at historically low levels, averaging just 1.5 foliar sprays to control all arthropod pests season-long (2006–2009, Ellsworth, unpubl. data; Ellsworth et al. 2007). Of these, at least half the sprays are selective or partially selective, reduced-risk chemistries. The role of broader spectrum insecticides in cotton in Arizona has declined drastically. However, we should not make the mistake of thinking that they are no longer needed, especially where there are significant needs to protect yield and quality late in the season (e.g., from honeydew producing insects like whiteflies, aphids, & mealybugs). Furthermore, we are under constant threat of new pest introductions or new pest situations in Arizona. Just in the last year, we have seen infestations of Bagrada stink bug in cole crops, brown stink bug in cotton, and Asian citrus psyllid in citrus. Some of these may require broad-spectrum insecticides, because selective compounds may not be available or effective.

The trend in our vegetable crops pesticide usage has also undergone rapid change. All quoted text that follows is from a recently published scientific paper by Drs. John Palumbo and Steve Castle in Pest Management Science (2009).

> *"Overall, the use of newer, selective compounds over the past decade in desert produce crops has certainly reduced the risk of exposure to toxic insecticide residues for consumers and farm workers….Perhaps the most telling sign has been the overall reduction in the number of foliar spray applications made to desert lettuce crops over the years, [where] in the 1980s, an average of 12 – 15 sprays were applied to lettuce annually…. in 1996, growers applied an average of nine foliar insecticide applications to lettuce. Most recently, … a range of 4 – 7 foliar sprays were applied to lettuce crops in 2007."*
>
> *"These data suggest that overall usage of the broadly toxic chemistries on head lettuce has declined steadily over the past 5 years, but, more importantly, since 1996 the usage of organophosphates and carbamates on desert head lettuce alone has declined significantly. In contrast, the use of the selective insecticides on lettuce has increased almost twofold over this same 14 year period.*

In addition, our most recent history (2009) shows a major shift in insecticide use patterns in desert head lettuce. Our most broad-spectrum chemistries (endosulfan, acephate, diazinon, and dimethoate) have decreased by over 50% (see 'Table 1' excerpted from Palumbo & Castle, 2009, and showing thiodicarb usage for certain years since 1996).

> *"Results from the 2009 University of Arizona pest management workshop estimated that, for the first time, these broadly toxic compounds were actually applied to fewer acres of desert head lettuce than the selective insecticides (Palumbo JC, unpublished data)."*

These broad changes are favorable to the industry; however, we should not remove products that prove to be otherwise safe and effective just because they are less frequently used today. Their role as a broad-spectrum insecticide may be currently important for niche uses in minor crops and very important in the future as a defense against new and emerging pest threats.

References

Ellsworth, P.C., A. Fournier & T.D. Smith. 2007 (rev. 3/09). Based on Ellsworth, P.C. and J.S. Jones. 2000. Arizona Cotton Insect Losses. Publ. No. AZ1183. University of Arizona, College of Agriculture and Life Sciences, Cooperative Extension, Tucson, Arizona. URL: *http://cals.arizona.edu/crops/cotton/insects/cil/cil*.

Palumbo J.C. & Castle S.J. 2009. IPM for fresh-market lettuce production in the desert southwest: the produce paradox. *Pest Management Science* 65: 1311-1320. Available online: *http://www3.interscience.wiley.com/cgi-bin/fulltext/122653066/HTMLSTART*.

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Table 1. Thiodicarb use patterns in Arizona crops, 2001–2004. Source: APMC Pesticide Use Database.

Crops	Total Thiodicarb Applications	Fields Sprayed with Insecticides	Total Acreage	Comments	Target Pests
Broccoli	5	0.045%	163.67	2001–2003 only	Armyworm Armyworm, Beet Bemisia Whitefly Worm, Unknown
Cabbage	3	0.082%	86.74	2001 only	Armyworm Looper, Cabbage Bemisia Whitefly
Cotton	7	0.021%	983.30	2002–2004 only	Bollworm/Budworm Lygus Worm, Unknown
Lettuce, Head	4	0.004%	181.36	2001 & 2003 only	Armyworm Looper, Cabbage
Spinach	3	0.046%	26.40	2001 only	Armyworm Beetle, Flea Looper, Cabbage Moth, Diamondback
Swiss Chard	4	0.705%	48.00	2001 & 2003 only	Armyworm Beetle, Flea Looper, Cabbage Moth, Diamondback
Total	26	0.017%	1489		

Other crops sprayed prior to 2001: Celery, Endive/Escarole, Greens, Romaine & other Lettuces, Parsley, & Wheat.

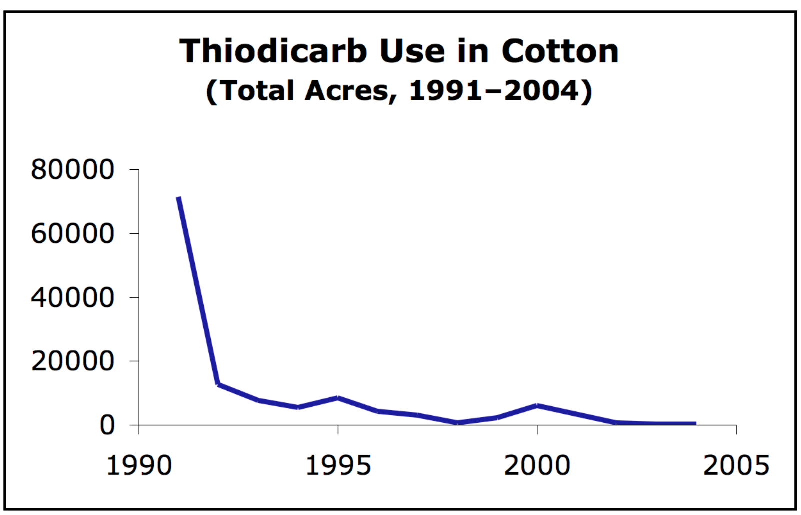

Figure 1. Total Acres sprayed with thiodicarb for cotton in Arizona, 1991–2004. Source: APMC Pesticide Use Database.

Table 1. Estimated usage of broadly toxic (organophospahtes, carbamates, cylodienes and pyrethroids) and selective (reduced- and low-risk) insecticide chemistries on head lettuce in Arizona, based on NASS and PCA surveys[18,25]

	Estimated number of head lettuce acres treated *(total acres in production)*					
Insecticides	1996 *(55 000)*	2005 *(50 000)*	2006 *(48 000)*	2007 *(45 500)*	2008 *(46 000)*	2009 *(46 000)*
Broadly toxic chemistries						
Pyrethroids	256 960	182 030	169 894	148 376	150 739	147 726
Methomyl	207 900	45 150	48 114	30 986	22 523	16 555
Thiodicarb	23 595	0	0	0	0	0
Endosulfan	36 630	17 760	17 566	20 020	16 480	8 118
Acephate	27 720	9 433	6 376	11 386	14 128	9 396
Diazinon	10 285	15 800	21 758	9 646	12 150	5 075
Dimethoate	56 760	14 656	8 050	3 829	3 487	0
Total usage	*619 850*	*284 829*	*271 758*	*224 243*	*219 507*	*186 870*
Selective chemistries						
Bacillus thuringiensis	74 250	1 125	288	0	0	0
Abamectin	11 495	0	0	0	0	0
Imidacloprid	11 550	36 443	40 488	22 818	29 973	19 890
Emamectin benzoate	–	4 483	11 928	16 124	10 670	6 989
Methoxyfenozide	–	32 728	33 926	28 494	27 141	16 740
Spinosad/spinoteram	–	114 438	103 144	82 257	98 382	85 590
Indoxacarb	–	6 363	10 609	8 395	9 994	2 475
Pymetrozine	–	7 508	3 755	1 081	432	0
Acetamiprid	–	–	10 654	19 963	9 118	1 238
Spiromesifen	–	–	1 272	1 145	2 800	585
Flonicamid	–	–	–	10 385	17 738	3 420
Spirotetramat	–	–	–	–	–	33 953
Chlorantraniliprole	–	–	–	–	–	16 509
Flubendiamide	–	–	–	–	–	4 500
Total usage	*97 295*	*203 088*	*216 064*	*190 662*	*206 248*	*191 889*

Above table from Palumbo & Castle 2009. Pest Management Science 65: 1311-1320.