Insecticide Usage on Desert Lettuce, 2015-16

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Introduction: The development of accurate data on insecticide usage is important to the assessment of IPM programs in Arizona. A reliable estimate of insecticide use patterns is one of our most objective tools for assessing changes in management practices. This information allows us to build relevant databases for measuring user behaviors and adoption of new IPM technologies. For PCAs, it can translate their efforts into economic terms for their clientele and confirms their value to the lettuce industry by showing the importance of their cost-effective management in desert lettuce production. This summary provides estimates of insecticide use trends on lettuce over the past 10 years.

Methods: Growers and PCAs attended a Head Lettuce Insect Losses and Impact Assessment Workshops in Yuma on April 20, 2016 and completed surveys in a guided process. The workshops were conducted in an interactive manner where participants were given a presentation that established the incentives for participation, explained the crop insect loss system, and further walked the participants through the estimation process. This summary presents results from the insecticide use surveys for lettuce produced in Yuma County, AZ and Imperial County, CA.
The data were generated by requesting that PCAs estimate the use frequency of various products and the percentage of treated acres for each product. Estimates of total treated acreage were generated using the acreage reported from each survey participant. This data has allowed us to track changes in insecticide use patterns over time in greater detail in both fall and spring lettuce.

Summary: A total of 22 surveys were completed in the 2016 workshop, representing an estimated total of 28,650 fall acres and 29,920 spring lettuce acres from Yuma and neighboring Imperial County (Bard/ Winterhaven). In general, the most commonly used insecticides in fall and spring lettuce correspond directly to the key pests that typically occur during these growing periods.

When compared by class of chemistry using the IRAC mode of action classification system, the pyrethroids applied both as foliar sprays and through sprinkler chemigation were the most commonly used insecticide class in fall and spring lettuce (Tables 1 and 2).The reason for this is quite evident: pyrethroids are one of the few inexpensive and safe broad spectrum insecticides still available for use in tank-mixtures for effective control of flea beetles, crickets, plant bugs and some Lep larvae (looper and earworm). Over the past 12 years, pyrethroid usage has remained consistently high (Fig 5).

The overall use of OP/carbamates continues to decline. However, Lannate (methomyl) usage was up on spring lettuce this season due to heavy thrips pressure, where along with acephate remain important rotational alternatives for Radiant (Fig 5 and 6). Their usage for Lep control has been being displaced primarily by several reduced-risk chemistries.

The spinosyns remain the second most commonly used class of insecticides, where greater than 95% of the lettuce acreage was treated with Radiant or Success in 2015-16 (Table 1 and 2). Their use against both lepidopterous larvae (Figure 1) and thrips (Figure 5) has remained steady over the past 12 years, averaging over 2 sprays per treated acre (Tables 1 and 2). Foliar uses of the Diamides (Coragen, Voliam Xpress, Vetica, Belt) were the third most commonly chemistry used in fall lettuce (Table 1). Since they were first registered in 2008, PCAs have steadily incorporated this new chemical class into their Lepidopterous larvae management programs (Fig 1). The use of Belt increased significantly this season, whereas soil uses of Coragen increased slightly (Fig 2). Exirel and Verimark were used for the first time in the fall of 2015 on about 5% of the acerage (Fig 2).

Use of the tetramic acid chemistry (Movento) on fall lettuce declined in 2015, but increased on spring lettuce (Figure 4) where it is an important tool for aphid management. Another important class of chemistry used in fall and spring lettuce are the neonicotinoids driven primarily by soil-applied imidacloprid for whiteflies and aphids (Figures 3 and 4). The usage of imidacloprid on both fall and spring lettuce has increased markedly since 2009 and is used on about 80% of the fall and spring acreage (Table 3-4), albeit at top of the label rates (0.375 lb AI/ac). Foliar neonicotinoid usage also decreased last season, whereas Sivanto (butenolide) usage increased slightly. Sequoia (sulfoxamine) usage was down in spring 2016 due to the recent cancellation of the label. Torac usage was up significantly last spring for thrips management (Fig 5).

From an IPM perspective, the local produce industry has made great strides in minimizing environmental impacts in lettuce production by continuing to incorporate the newer reduced-risk insecticides into their insect management programs. To date there have been no been no major incidents of field failures or measurable lack of insect susceptibility with these compounds due largely to the judicious usage of the key products. This has occurred due to the availability of multiple modes of actions with cost-effective activity against most key pests, and the conscientious efforts of PCAs to alternate application of these chemistries during the crop season. Although the broad spectrum, consumer–friendly pyrethroids were by far the predominant chemistry applied to lettuce, for the sixth season in a row, PCAs treated a greater percentage of their acreage with selective, reduced-risk products than with the broadly toxic, OP and Carbamate chemistries (Fig 6 and 7).

In conclusion, selective, reduced risk insecticides will continue to play an increasing role in management of insect pests in desert lettuce. As new active ingredients become available, the industries reliance on broadly toxic compounds will likely decline. The availability of new modes of action with activity against western flower thrips would certainly reduce the industries reliance on OPs and carbamates. However, because of the intensive pest spectrum that PCAs face in the desert coupled with the demands for high quality lettuce, there will still be a need for broad spectrum products like the pyrethroids.

Table 1. The top insecticide chemistries used on Fall Lettuce, 2015

Chemistry	Fall Lettuce, 2015				
	IRAC group	% PCA's Using Products	% treated acres	No. applications	Treated [1] acres
Pyrethroids - Foliar	3A	100	98.1	3.3	98,047
Spinosyns	5	100	98.1	2.2	61,440
Diamides- Foliar	28	95.2	100	1	32,462
Neonicotinoids -Soil	4A	100	84.3	1	23,984
Pyrethroids - Chemigation	3A	90.5	70.3	1	20,000
Carbamates	1A	76.2	40.1	1.2	13,690
Chitin Synthesis inhibitor	16	61.9	41.8	1.1	11,892
Avermectins	6	57.1	37.6	1	10,697
Ecdysone agonists	18	42.9	18	1	5,121
Diamides -Soil	28	33.3	17.4	1	4,950
Organophosphates	1B	14.3	12.9	1.1	4,165
Neonicotinoids -Foliar	4A	38.1	8.8	1	3,894
Tetramic acids	23	38.1	13	1.1	4,068
Chordotonal organ modulators	29	19	7.1	1	2,020
Butenolides	4D	4.8	1.8	1	512
METI	21	4.8	0.2	1	57
Sulfoxamine	4C	0	0	0	0
JH mimic	7	0	0	0	0
Selective feeding blocker	9	0	0	0	0
Na channel blockers	22	0	0	0	0

*[1] Total acres treated estimated by multiplying: % acres treated * number of times treated * acreage estimated by participating PCAs in the 2016 survey.*

Table 2. The top insecticide chemistries used on Spring Lettuce, 2016

Chemistry	IRAC group	% PCA's Using Products	% treated acres	No. applications	Treated [1] acres
	Spring Lettuce, 2016				
Pyrethroids - Foliar	3A	100	98.1	3.2	96,877
Spinosyns	5	100	95.1	2.3	65,465
Carbamates	1A	100	67.1	1.2	23,810
Neonicotinoids -Soil	4A	100	78.9	1	23,331
Diamides- Foliar	28	76.2	100	1	16,293
Tetramic acids	23	95.2	48.9	1.1	15,906
METI	21	28.6	24	1.3	9,226
Ecdysone agonists	18	33.3	25.7	1	7,599
Pyrethroids - Chemigation	3A	61.9	24.3	1	7,186
Organophosphates	1B	23.8	20.3	1	6,003
Chitin Synthesis inhibitor	16	38.1	20.6	1	6,091
Neonicotinoid -Foliar	4A	28.6	19.8	1	5,884
Chordotonal organ modulators	29	52.4	11.1	1.3	4,267
Diamides -Soil	28	14.3	11.8	1	3,489
Avermectins	6	42.9	10.7	1	3,164
Sulfoxamine	4C	14.3	2.6	1	769
Butenolides	4D	9.5	2.1	1	621
Selective feeding blocker	9	0	0	0	0
Na channel blocker	22	0	0	0	0
JH mimic	7	0	0	0	0

[1] *Total acres treated estimated by multiplying: % acres treated * number of times treated * acreage estimated by participating PCAs in the 2016 survey.*

Table 3. The top 15 insecticides applied to fall lettuce, 2015

		Fall Lettuce, 2015				
	Insecticide Product	**IRAC group**	**% PCA's Using Product**	**% treated acres**	**No. applications**	**Treated[1] acres**
1	**Pyrethroids -** Foliar	3A	100	98.1	3.3	98,047
2	**Radiant**	5	100	98.0	2.2	61,338
3	**Imidacloprid**-Soil	4A	100	94.3	1	23,983
4	**Pyrethroids -** Chemigation	3A	90.5	70.3	1	20,000
5	**Lannate** (methomyl)	1A	76.2	40.1	1.2	13,690
6	**Vetica**	28+16	61.9	41.8	1	11,892
7	**Proclaim**	6	57.1	37.6	1	10,697
8	**Belt**	28	57.1	27.3	1	7,767
9	**Coragen** - Foliar	28	52.4	22.8	1	6,487
10	**Intrepid**	18	42.9	18.0	1	5,121
11	**Voliam Xpress**	28+3A	66.7	16.9	1	4,808
12	**Coragen** - Soil	28	33.3	14.2	1	4,040
13	**Orthene** (acephate)	1B	14.3	8.7	1.2	2,970
14	**Beleaf**	29	19	7.1	1	2,020
15	**Assail**	4A	28.6	5.9	1.1	1,846

[1] *Total acres treated estimated by multiplying: % acres treated * number of times treated * acreage estimated by participating PCAs in the 2016 survey.*

Table 4. The top 15 insecticides applied to spring lettuce, 2016

		Spring Lettuce, 2016				
	Insecticide Product	**IRAC group**	**% PCA's Using Products**	**% treated acres**	**No. applications**	**Treated [1] acres**
1	**Pyrethroids -** Foliar	3A	100	98.1	3.2	96,877
2	**Radiant**	5	100	95.3	2.3	64,814
3	**Lannate**	1A	100	67.1	1.2	23,810
4	**Imidacloprid**-Soil	4A	100	78.9	1	23,331
5	**Movento**	23	95.2	48.9	1.1	15,906
6	**Torac**	21	28.6	24.0	1.3	9,226
7	**Intrepid**	18	33.3	25.7	1	7,599
8	**Pyrethroids -** Chemigation	3A	61.9	24.3	1	7,186
9	**Vetica**	28+16	37.1	20.6	1	6,091
10	**Belt**	28	57.1	16.3	1	4,820
11	**Beleaf**	29	52.4	11.1	1.3	4,267
12	**Assail**	4A	23.8	14.2	1	4,199
13	**Orthene** (acephate)	1B	19.1	13.0	1	3,844
14	**Proclaim**	6	42.9	10.7	1	3,164
15	**Voliam Xpress**	28+3A	19.1	9.1	1	2,691

*[1] Total acres treated estimated by multiplying: % acres treated * number of times treated * acreage estimated by participating PCAs in the 2016 survey.*

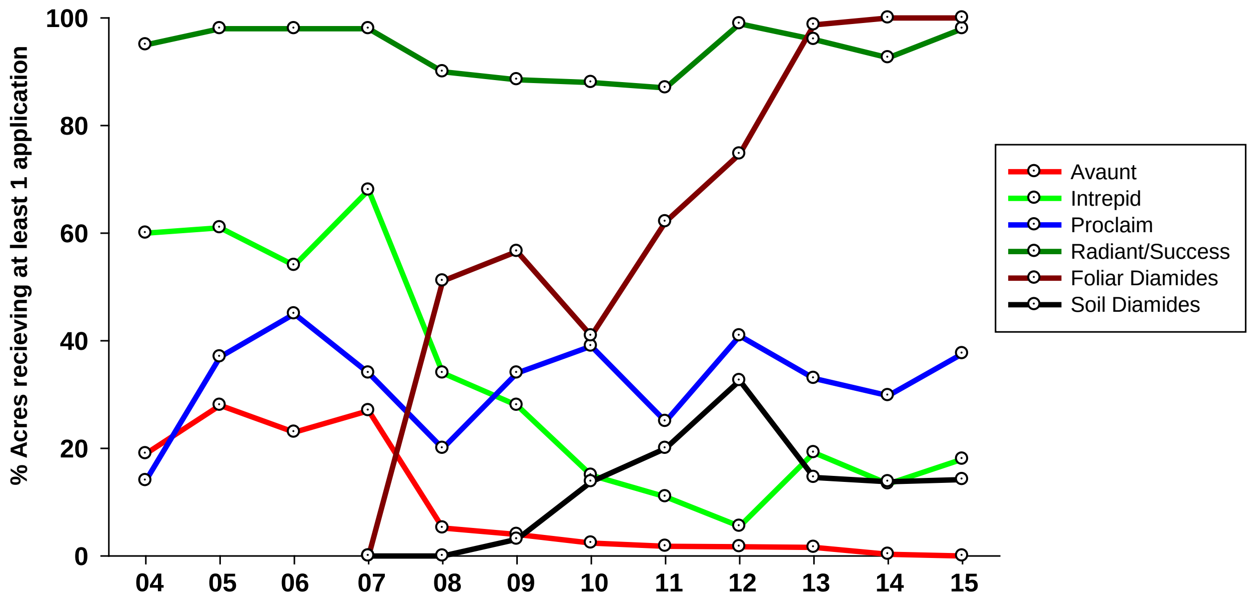

Figure 1. Trends in insecticide use for control of Lepidopterous larvae in fall lettuce, 2004-2015

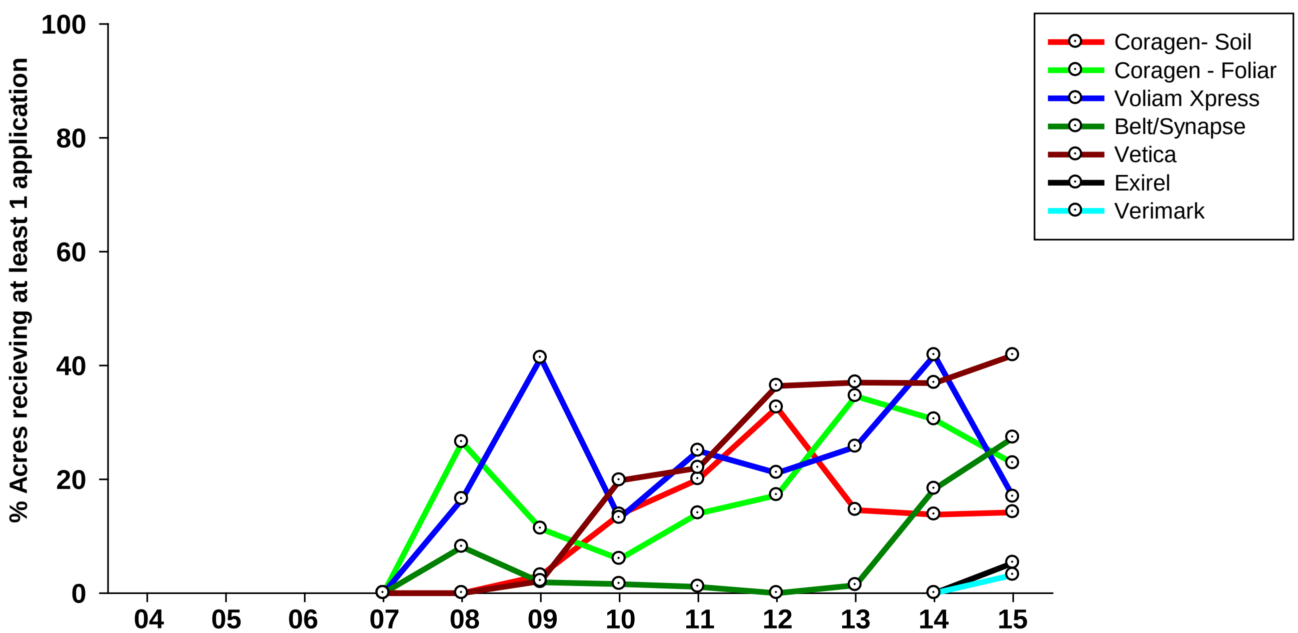

Figure 2. Trends in Diamide insecticide use for control of Lepidopterous larvae in fall lettuce, 2004-2015

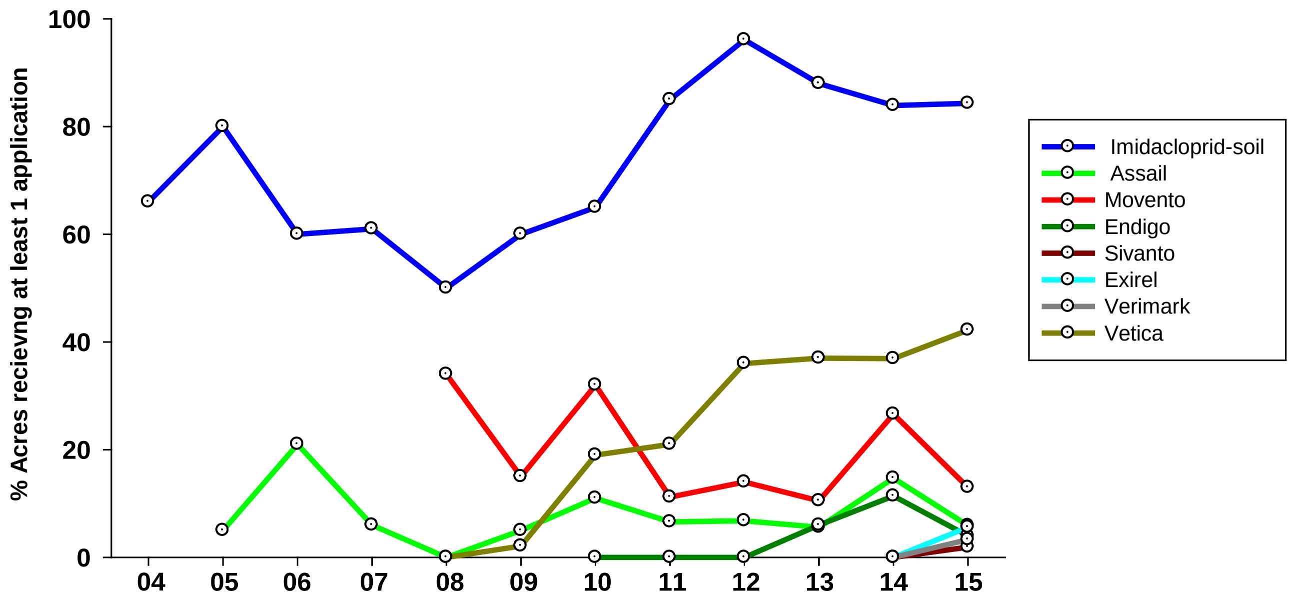

Figure 3. Trends in insecticide use for control of *Bemisia* whiteflies in fall lettuce, 2004-2015

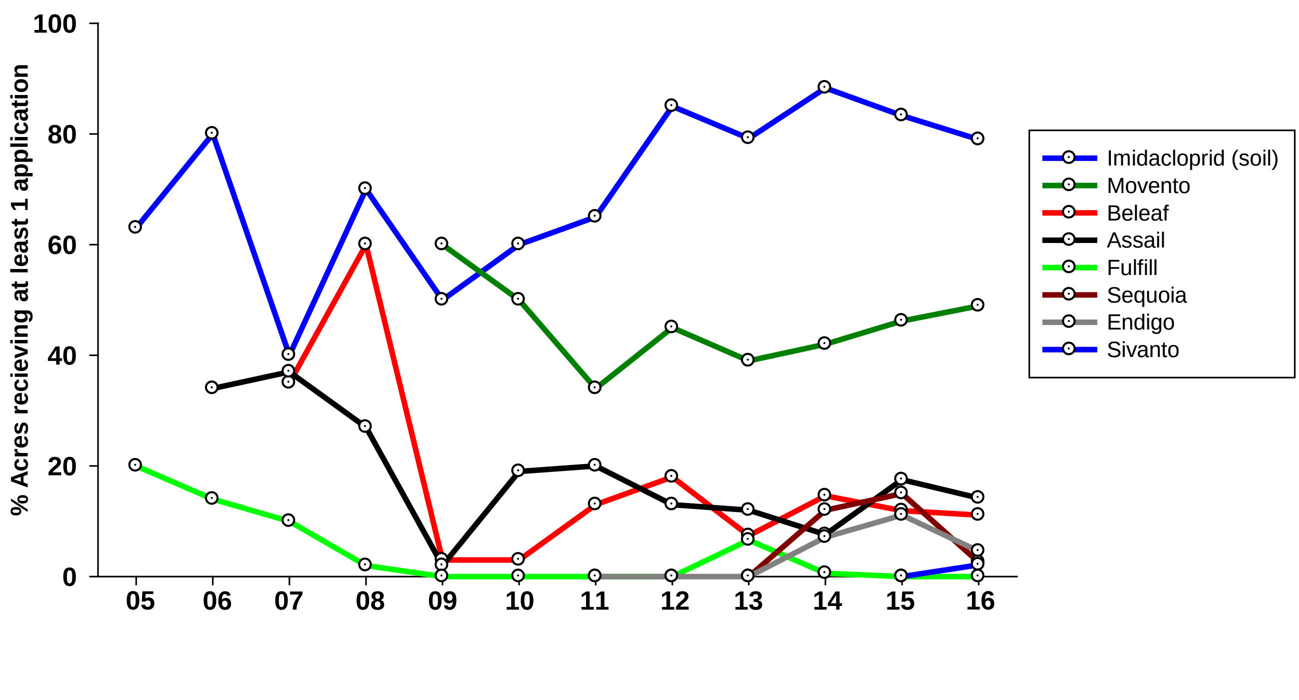

Figure 4. Trends in insecticide use for control of aphids in spring lettuce, 2005-2016

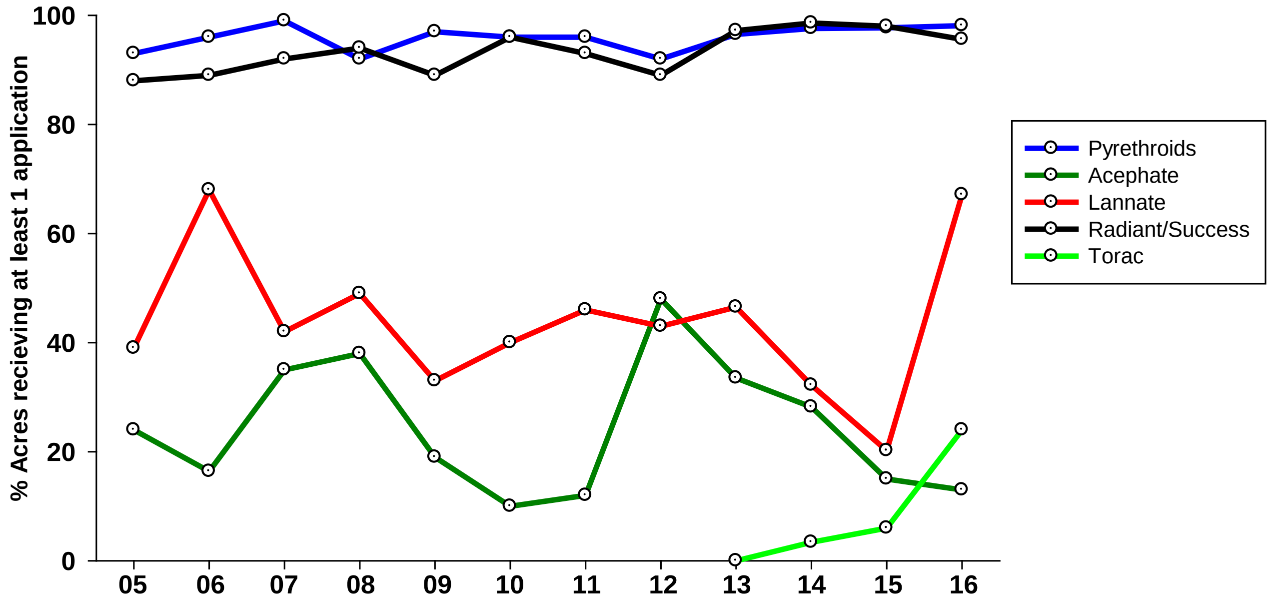

Figure 5. Trends in insecticide use for control of western flower thrips in spring lettuce, 2005-2016.

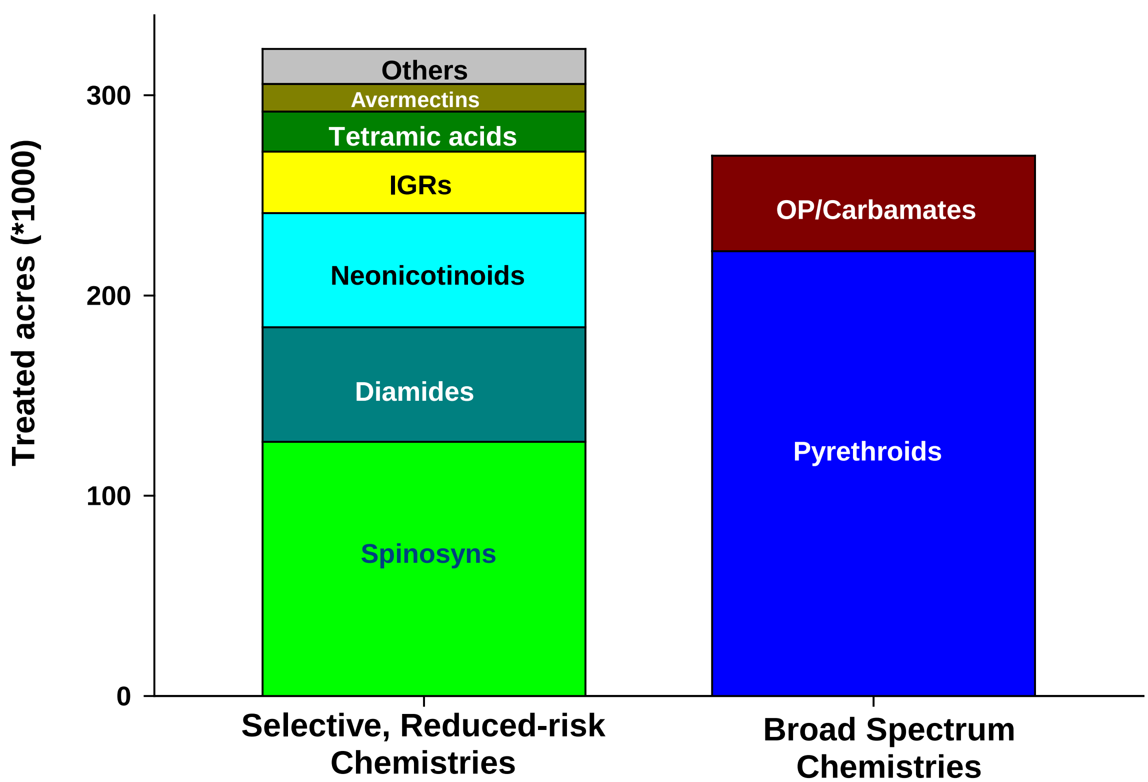

Figure 6. Estimates of total insecticide use for insect control on Lettuce, 2015-2016

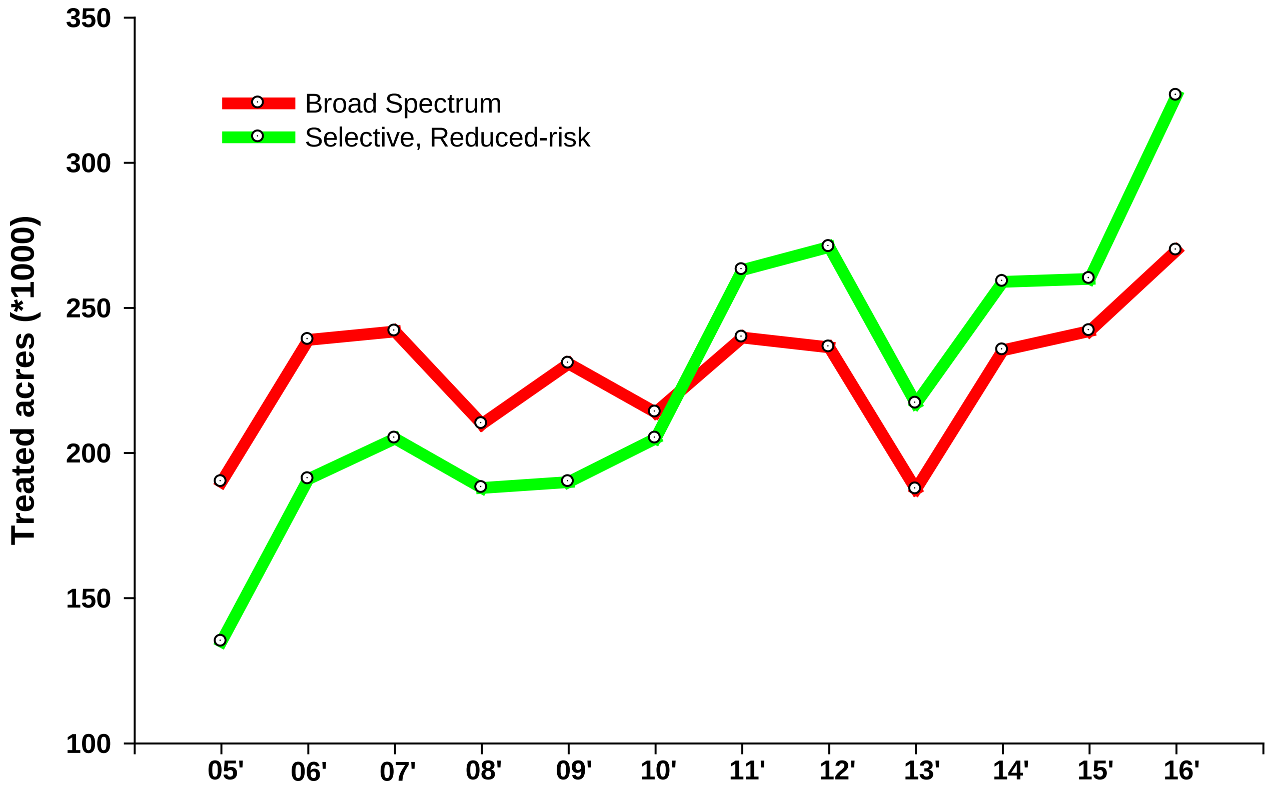

Figure 7. Relative estimates of acreage treated with broad spectrum and selective, reduced -risk insecticides on desert lettuce, 2005-2016. *Note: Treated acreage for each year was estimated by multiplying: % acres treated * number of times treated * acreage estimated by participating PCAs in that year's survey.*