

# Impact of the Bagrada Bug on Desert Cole Crops: A Survey of PCA/Growers in 2010 and 2011

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The Bagrada bug, *Bagrada hilaris*, became a major pest of cole crops in the fall on 2010. Widespread infestations were reported throughout the desert growing areas in September and October where stand losses and yield/quality reductions to broccoli, cauliflower, cabbage and other *Brassica* crops were considered economically significant in some growing areas. In an attempt to document the impact of these outbreaks on desert production, we surveyed Growers/PCAs from Yuma and Imperial Valley in 2010 and 2011 to estimate the severity of Bagrada bug infestations on direct-seeded and transplanted cole crops. PCAs and growers were anonymously asked to estimate the acreage where *Bagrada* populations were present, and of those acres, what percentage required insecticide treatments and how often. In addition, they were asked to estimate, on average, percent stand losses and plant injury caused by *Bagrada* infestations. Finally, PCAs and growers were asked to list the insecticide products they found to be effective in controlling Bagrada adults when applied as either chemigations or foliar sprays. A copy of the survey questionnaire is found in the Appendix of this report. A total of 17 questionnaires were completed by Growers/PCAs in 2010 representing a total of 9310 acres of direct seeded crops (e.g., broccoli) and 4610 acres of transplanted crops (e.g., cauliflower) crops. In the 2011 survey at total of 13 questionnaires were completed representing 6210 acres of direct seeded crops and 3450 acres of transplanted crops. One additional source of information used in this report was insecticide use data for Brassica crops in Arizona developed from the 1080 database maintained by the University of Arizona, Pest Management Center. Total acreage of *Brassica* crops (broccoli, cabbages, cauliflower and kale) treated with several active ingredients From Aug through October in 2009, 2010 and 2011 were summarized from 1080's submitted to the AZ Department of Agriculture.

## Summary

### Direct-seeded Crops:

Based on PCA estimates, Bagrada bugs were present on fewer acres in 2011, and the percentage of acres treated for *Bagrada* was down slightly compared to 2010. This is consistent with the later arrival of adults into the Yuma and Imperial Valleys in 2011. Averaged across both years, PCAs / growers reported treating direct-seeded crops for Bagrada bugs on a higher percentage of acres than where they reported that Bagrada bugs were present (Table 1). This is not surprising given the preventative nature of controlling *Bagrada* infestations necessary to reduce stand losses This is likely reflected as well by the large number of acres chemigated (74.5%) on an average of 1.6 times. However, once sprinkler pipe was removed from the field, the survey suggests that management for *Bagrada* remained intensive where 88.5 % of the reported acres were sprayed an average of 2.3 times. When the number of chemigations and foliar sprays are combined over both years, almost 4 insecticides applications were made to control this pest.

Consequently, *Bagrada* infestations at stand establishment were estimated to cause, on average, 4.4% stand loss where in some cases losses exceeded 20% (Table 2). Stand losses to *Bagrada* were lower in 2011. Feeding injury, defined as the plants with multiple heads, forked terminals, and/or blind terminals resulting from Bagrada feeding, was also higher in 2010 on direct-seeded crops compared to this year. On average, PCAs / growers estimated that Bagrada bugs caused feeding injury to plants in 6.1% of the

acreage they managed, even with the intensive insecticide spraying. In some cases, this injury was estimated to exceed 50%. These reported losses are consistent with losses measured in trials conducted at the Yuma Ag Center in 2010.

**Transplanted Crops:** In contrast, growers/PCAs reported treating a smaller percentage of transplanted acres for *Bagrada* than direct-seeded crops. Fewer acres were chemigated (66.3%) and slightly fewer times (1.4) (Table 1). Once sprinkler irrigation pipe was removed from the field, the survey suggests that management for *Bagrada* was also less intensive where about 83.2% of the acres were sprayed an average of 2 times. Averaged across both years, growers/PCAs treated for *Bagrada* on transplants 3.3 times. Relative to direct-seeded crops, stand losses were lower in transplanted crops. On average *Bagrada* infestations were estimated to cause 2.3% stand loss, and losses did not exceed 10% (Table 2). The lower % stand losses in transplanted crops suggests that newly transplanted crops are more better able to withstand feeding without injury during stand establishment. Similarly, on average, grower/PCAs estimated that *Bagrada* bugs caused feeding injury to plants in > 4% of the acreage they managed and in some cases, this injury was estimated to exceed 20%. This suggests to some extent that feeding injury occurring in cole crops may be more important on very young seedlings (i.e., cotyledon-1 leaf plants).

#### **Effective Insecticides:**

Grower/PCAs reported using pyrethroids almost exclusively to control *Bagrada* bugs through chemigation (Figure 1). Among the insecticide active ingredients (AI) reported as effective, bifenthrin (Brigade, Sniper, Hero and Discipline) was the most commonly reported, followed by lambda-cyhalothrin (Warrior II, Lambda-Cy) and zeta-cypermethrin (Mustang, Hero). Several other other pyrethroids were reported as being effective, but used by relatively fewer PCAs. One PCA reported using Alias in 2010. In general, comments provided on the survey suggested that pyrethroid chemigations appeared to provide effective knockdown control of adults, but re-application was often necessary after 2-3 days.

In contrast a much broader array of AIs were reported for use against *Bagrada* when applied as foliar sprays (Figure 2). The pyrethroids were the most commonly reported AIs used for effective *Bagrada* adult control with foliar spray applications. Bifenthrin was the to be most commonly used AI, followed by lambda cyhalothin, zeta-cypermethrin, and esfenvaluate. Among the alternative chemistries used, dinotefurnon, methomyl and chlorpyrifos were reported to be effective against *Bagrada* adults by several PCAs, and a number of neonicotinoids, and pyrethroids were reported less frequently. These results are consistent with efficacy trials conducted at Yuma Ag Center where products that have contact activity ( i.e., Pyrethroids, OP/Carbamates) have provided the most effective control against *Bagrada* adults on both direct-seeded and transplanted cole crops.

#### **Insecticide Usage – 1080 database:**

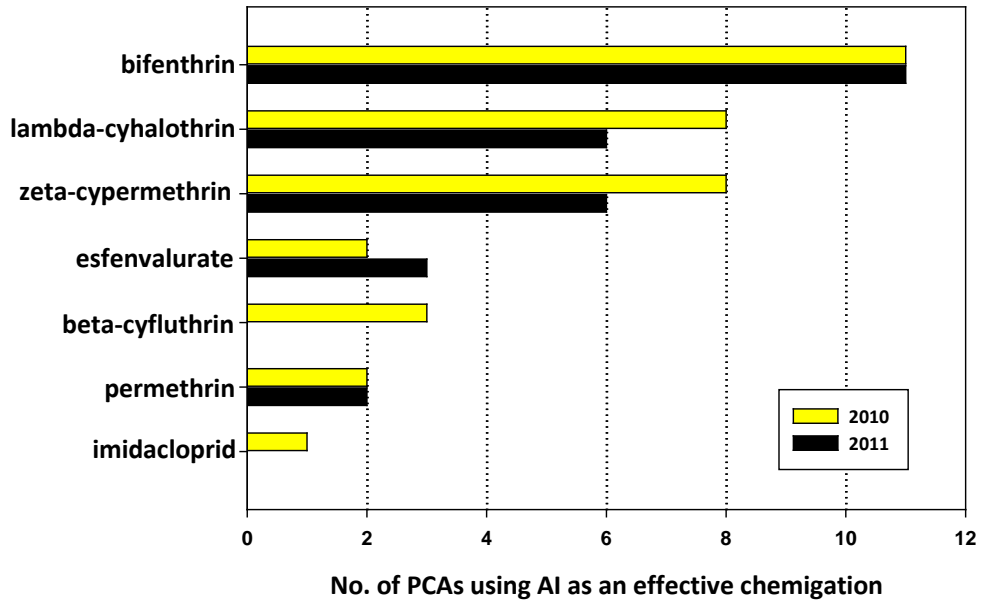
Results from the 1080 database shows that reported insecticide usage on Arizona cole crops is consistent with the information provided by PCAs in the surveys. Based on the usage data, the pyrethroids were treated on a higher number of acres than any other chemical class. Among the pyrethroids, bifenthrin was treated on more acres than any other pyrethroids. The neonicotinoids (dinotefuron) and organophosphates (chlorpyrifos) was the next most commonly used chemical classes used to treat broccoli. The 1080 data also shows that in 2009 only 22,392 acres of cole crops were treated from Aug-Oct in Arizona. However, since the outbreaks of the *Bagrada* bug in 2010, insecticide usage on cole crops acreage has increased by almost 2 fold. This is largely due to the increased use of pyrethroids, whereas OP/carbamate usage has remains about the same. It should be noted that the sharp increase in dinotefuron usage is likely due to whitefly management as well.

**Table 1.** Impact of Bagrada bug on desert cole crops based on chemical control.

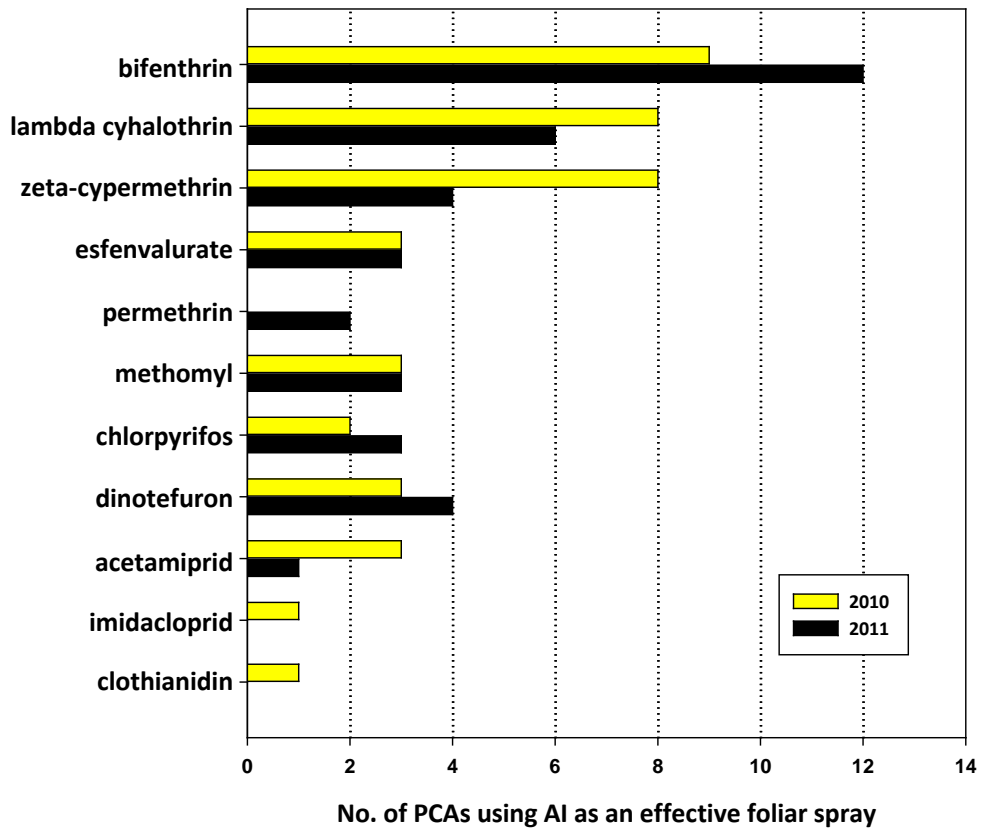
<b>Chemical Control for <i>Bagrada</i></b>	<b>Direct-seeded</b>			<b>Transplanted</b>		
	<b>2010</b>	<b>2011</b>	<b>Avg.</b>	<b>2010</b>	<b>2011</b>	<b>Avg.</b>
% acres where <i>Bagrada</i> present	95.8	87.6	91.7	94.4	87.0	90.7
% acres treated with insecticide	95.8	91.3	93.6	88.3	84.3	86.3
% acres chemigated	73.8	75.2	74.5	60.6	72.0	66.3
Avg. no. of chemigations applied	1.6	1.6	1.6	1.4	1.3	1.4
% acres sprayed with insecticide	90.0	87.0	88.5	85.6	80.8	83.2
Avg. no. of sprays applied	2.7	1.8	2.3	2.1	1.8	2.0
Total no. insecticide applications	4.3	3.4	3.9	3.5	3.1	3.3

**Table 2.** Impact of Bagrada bug on desert cole crops based on feeding injury.

<b>Impact of Bagrada on Crops</b>	<b>Direct-seeded</b>			<b>Transplanted</b>		
	<b>2010</b>	<b>2011</b>	<b>Avg.</b>	<b>2010</b>	<b>2011</b>	<b>Avg.</b>
Avg. % stand loss due to Bagrada	6.3	2.5	4.4	3.1	1.5	2.3
Worst case (% stand loss)	18.7	17.4	18.1	6.8	6.3	6.6
Avg. % plant injury to Bagrada	8.0	4.2	6.1	4.6	3.9	4.3
Worst case (% plant injury)	18.1	11.1	14.6	9.8	11.0	10.4



**Figure 1.** Insecticide AIs reported as effective against *Bagrada* bug adult infestations when applied as chemigations on cole crops in Yuma and Imperial Valley in 2010-2011.



**Figure 2.** Insecticide AI s reported as effective against *Bagrada* bug adult infestations when applied as foliar sprays on cole crops in Yuma and Imperial Valley in 2010-2011.

**Table 3.** Insecticide use by active ingredient (AI) on *Brassica* crops grown in Arizona during Aug – Oct in 2009, 2010, and 2011. *Source: Arizona Pest Management Center 1080 database.*

Active Ingredient	Treated acres		
	2009	2010	2011
<b>Pyrethroids</b>			
bifenthrin	7,026.9	16,235.7	13,465.2
zeta-cypermethrin	5,204.1	10,272.7	5,084.4
esfenvalerate	3,909.7	4,492.2	6,608.5
lambda-cyhalothrin	2,618.2	2,480.7	6,617.0
permethrin	145.2	2,128.9	860.1
cypermethrin	200.4	604.5	1,504.2
cyfluthrin	524.5	521.0	375.7
beta-cyfluthrin	102.8	228.0	186.9
fenpropathrin	0.0	24.5	182.4
<b>Total</b>	<b>19,731.8</b>	<b>36,988.2</b>	<b>34,884.4</b>
<b>OP/Carbamates</b>			
methomyl	379.5	339.4	530.3
chlorpyrifos	1,801.7	2,207.4	1,986.1
<b>Total</b>	<b>2,181.2</b>	<b>2,546.8</b>	<b>2,516.4</b>
<b>Neonicotinoids</b>			
acetamiprid	42.4	971.9	505.3
dinotefuran	436.6	1,687.5	3,857.4
<b>Total</b>	<b>479.0</b>	<b>2,659.4</b>	<b>4,362.7</b>
<b>Total Treated Acres</b>	<b>22,392.1</b>	<b>42,194.4</b>	<b>41,763.5</b>

Appendix

**2010-2011 Bagrada Bug Survey**

		<i>Brassica / Cole Crops</i>	
		<b>Direct-seeded</b> <i>(e.g. Broccoli)</i>	<b>Transplanted</b> <i>(e.g. cauliflower)</i>
1	<b>Number of acres scouted in Fall 2010</b> <i>(August thru November)</i>		
2	<b>% Acres where Bagrada bugs were present</b> <i>(August thru November)</i>		
3	<b>% Acres Treated for Bagrada bugs</b> <i>(August thru November)</i>		
4	<b>% Acres Chemigated for Bagrada bugs</b> <i>(August thru November)</i>		
5	<b>Avg. No. of Chemigations applied</b>		
6	<b>% Acres sprayed (air or ground) for Bagrada bugs</b>		
7	<b>Avg. No. of Sprays applied</b>		
8	<b>Avg. % stand loss due to Bagrada bugs</b>		
9	<b>Worst case (% stand loss)</b>		
10	<b>Avg. % plant injury due to Bagrada bugs</b> <i>(multiple heads/forked terminals/ blind plants)</i>		
11	<b>Worst case (% plant injury)</b> <i>(multiple heads/forked terminals/ blind plants)</i>		

12 **Which insecticides did you find to be most effective?**  
*Please list as many as you like, include tank-mixtures when appropriate.*

**Chemigation:** \_\_\_\_\_

**Foliar sprays:** \_\_\_\_\_