

# Impact of the Bagrada Bug on Desert Cole Crops from 2010 - 2012: A Survey of PCA and Growers

John C. Palumbo, Yuma Agricultural Center



The Bagrada bug, *Bagrada hilaris*, became a major pest of cole crops in the fall on 2010. Widespread infestations of this invasive stinkbug pest were reported throughout the desert growing areas in September and October of that year where stand losses and yield/quality reductions to broccoli, cauliflower, cabbage and other *Brassica* crops were considered economically significant. In an attempt to document these impacts, we have surveyed produce growers and PCAs from Yuma, Imperial Valley and central Arizona on an annual basis since 2010 to estimate the intensity of chemical management and 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 and cabbage) crops. In the 2011 survey a total of 13 questionnaires were completed representing 6210 acres of direct seeded crops and 3450 acres of transplanted crops. In the 2012 survey a total of 19 questionnaires were completed representing 6290 acres of direct seeded crops and 4595 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 key insecticide active ingredients from Aug through November in 2009, 2010, 2011 and 2012 were summarized from 1080's submitted to the AZ Department of Agriculture.

## Summary

### Impact Based of Bagrada Bug Based on Insecticidal Control

After 3 years since the initial outbreak, the Bagrada bug remains an important pest of desert cole crops. Based on population dynamics studies of adults infesting untreated broccoli plants at the Yuma Ag Center, adults infestations in 2012 were comparable to the outbreaks that we observed in 2010 (Fig 1). Based on PCA estimates from the surveys, Bagrada bugs have occurred on greater than 85% of the direct seeded and transplanted cole crop acreage over the past 3 seasons (Table 1). Similarly, almost all of these infested acres were treated with insecticides to control the pest. Averaged across all 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 and plant injury. This is likely reflected as well by the large number of acres chemigated (78.5%) on an average of 1.6 times since the initial outbreaks. However, once sprinkler pipe was removed from the field, the survey reports

that management for *Bagrada* remained intensive where about 88% of the reported acres were sprayed an average of 2.3 times in direct seeded-crops and over 83% of transplanted crops were sprayed almost 2 times. When the number of chemigations and foliar sprays are combined over all three years, almost 4 insecticides applications were made to control this pest.

### **Impact Based of Bagrada Bug Based on Insecticidal Control**

Damage from *Bagrada* bug infestations at stand establishment in both direct-seeded and transplanted crops has decreased by more than 50% since the initial outbreaks in 2010 (Table 2). Stand losses in 2012 were only slightly greater than what was reported in 2011 even though population densities were much greater this past fall (Fig 1). Feeding injury, defined as plants with multiple heads, forked terminals, and/or blind terminals resulting from *Bagrada* feeding, was also higher in 2010 compared to the past two seasons. Stand losses and plant injury were consistently lower in transplanted crops and suggests that newly, hardened transplants are better able to withstand feeding injury during stand establishment and that injury occurring in cole crops may be more important on very young seedlings (i.e., cotyledon-2 leaf plants). These reported losses are consistent with stand losses and plant injury measured in trials conducted at the Yuma Ag Center over the past three years. Overall, the reduction in stand losses and plant injury since the initial outbreaks is likely a result of PCA awareness of the pest's damage potential and better timing and use of chemigation treatments and foliar spray applications, as well as proper selection of effective products.

### **Effective Insecticides:**

Grower/PCAs reported using pyrethroids almost exclusively to control *Bagrada* bugs through chemigation (Figure 2). Among the insecticide active ingredients (AI) reported as effective, bifenthrin (Brigade, Sniper, Hero and Discipline) was the most commonly reported, followed by zeta-cypermethrin (Mustang, Hero) and lambda-cyhalothrin (Warrior II, Lambda-Cy). Several other pyrethroids were reported as being effective, but used by relatively fewer PCAs. One PCA reported using Alias in 2010, but since then no other classes of chemistry have been reported for chemigation. In general, comments provided on the survey suggested that pyrethroid chemigations appeared to provide effective knockdown control of adults, but under heavy *Bagrada* bug pressure 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 3). The pyrethroids were the most commonly reported AIs used for effective *Bagrada* adult control with foliar spray applications. Bifenthrin was the most commonly used AI, followed by lambda cyhalothin, zeta-cypermethrin, and esfenvaluate. Among the alternative chemistries used, dinotefuron, 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. Reports of neonicotinoid usage for *Bagrada* control has decreased since 2010. 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.

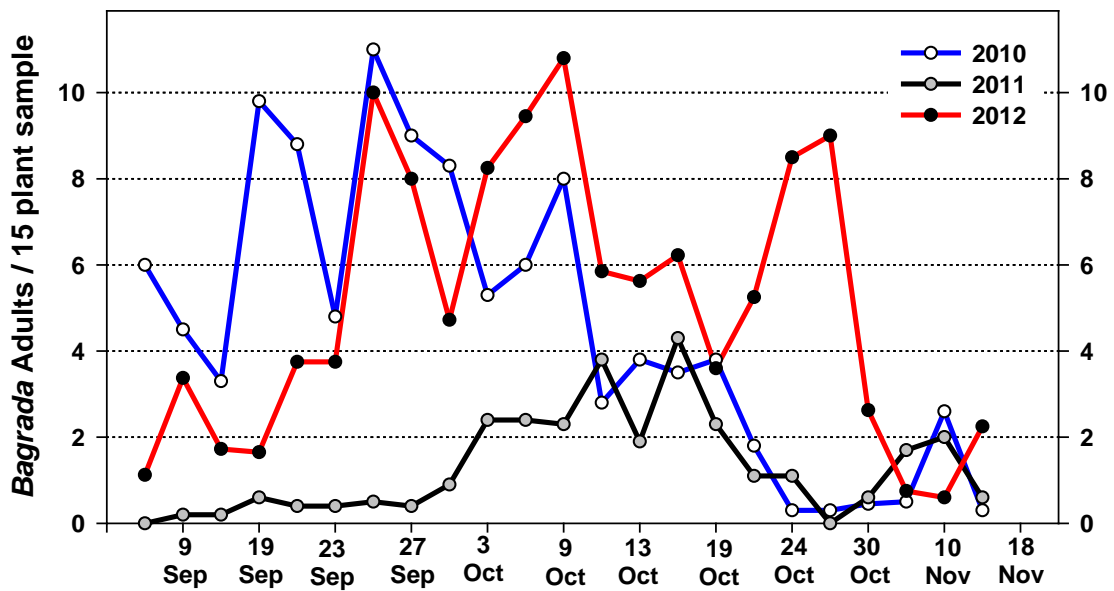
### **Insecticide Usage – 1080 database:**

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 (Table 3). Among the pyrethroids, bifenthrin and lambda cyhalothrin were treated on more acres than all other pyrethroids since 2010. The neonicotinoids (dinotefuron) and organophosphates (chlorpyrifos) was the next most commonly used chemical classes used to treat broccoli. However, 2012 use of both clorpyrifos and methomyl increased compared to 2011, and dinotefuron usage declined during the same time. The 1080 data also shows that in 2009 there were 48,436 acres of cole crops treated with these classes of insecticide from Aug-Nov. in

Arizona. However, since the outbreaks of the Bagrada bug in 2010, insecticide usage on cole crops acreage has increased, and was particularly high in 2012 where 76,127 acres were treated – about a 40% increase. In 2012, over 8,000 more acres were treated than in 2010 even though infestations were somewhat comparable in both years. This is not surprising as the cabbage looper and whitefly pressure experienced this past fall was higher than in the past few years in the Yuma area.

**Acknowledgement**

*Special thanks go out to all the PCAs and growers who took time away from their busy schedules to participate in these surveys over the past three years. Without you, this data would not exist. Thanks to Wayne Dixon, Al Fournier and Peter Ellsworth at the UA- Arizona Pest Management Center for providing the summarized 1080 pesticide use data shown in this report.*



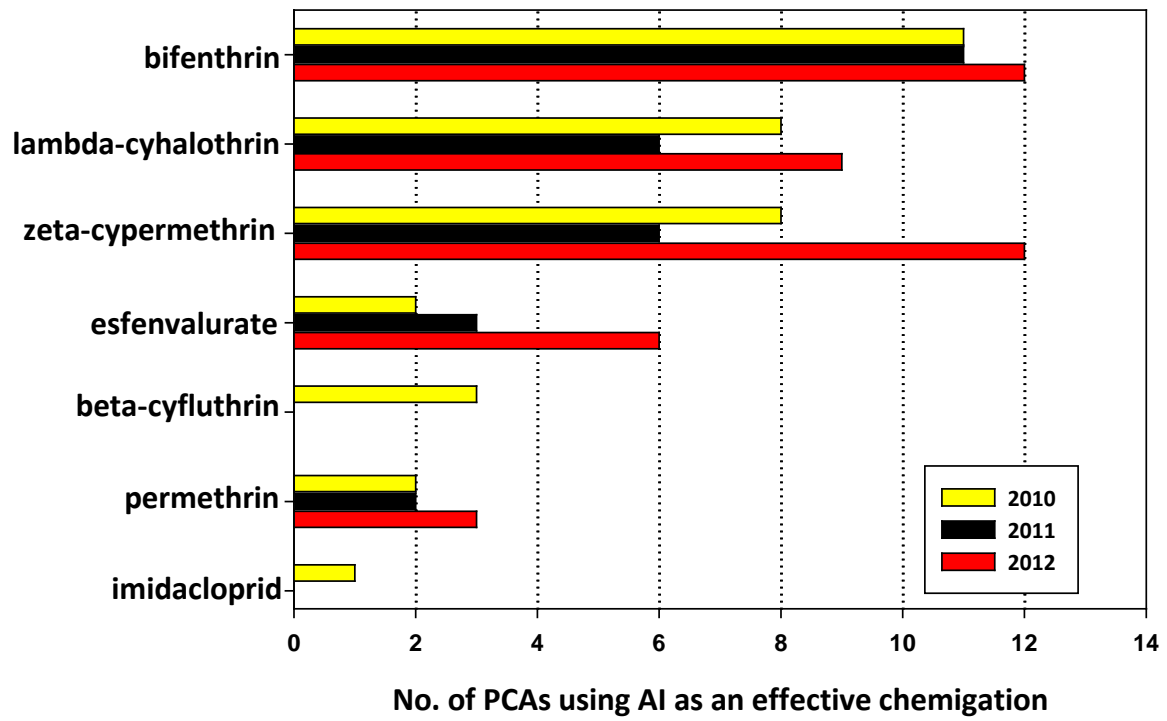
**Figure 1.** Bagrada Bug Abundance (Adults/15 Plants) in non-treated Broccoli Plots at the Yuma Agricultural Center, from September through November, 2010-2012

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

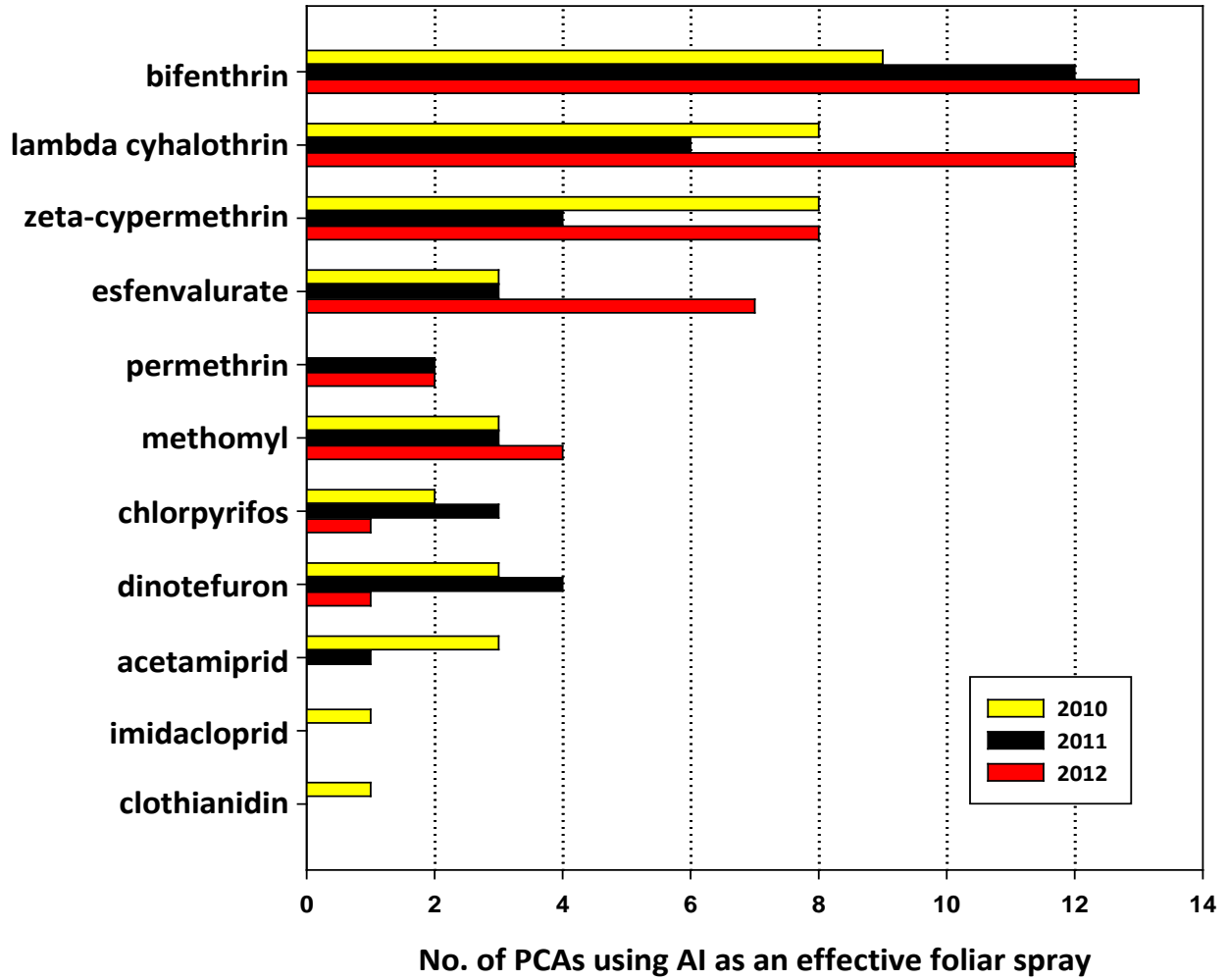
<b>Chemical Control for <i>Bagrada</i></b>	<b>Direct-seeded</b>			<b>Transplanted</b>		
	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Total acres reported	9310	6210	6290	4610	3450	4595
% acres where <i>Bagrada</i> present	95.8	87.6	87.2	94.4	87.0	86.7
% acres treated with insecticide	95.8	91.3	87.4	88.3	84.3	84.4
% acres chemigated	73.8	75.2	85.5	60.6	72.0	65.1
Avg. no. of chemigations applied	1.6	1.6	1.6	1.4	1.3	1.2
% acres sprayed with insecticide	90.0	87.0	86.8	85.6	80.8	82.8
Avg. no. of sprays applied	2.7	1.8	2.5	2.1	1.8	1.8
Total no. insecticide applications	4.3	3.4	4.1	3.5	3.1	3.0

**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>2012</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Avg. % stand loss due to Bagrada	6.3	2.5	2.8	3.1	1.5	1.4
Worst case (% stand loss)	18.7	17.4	10.	6.8	6.3	2.6
Avg. % plant injury to Bagrada	8.0	4.2	3.2	4.6	3.9	2.1
Worst case (% plant injury)	18.1	11.1	7.2	9.8	11.0	3.6



**Figure 2.** Insecticide AIs reported as effective against *Bagrada* bug adult infestations when applied as chemigations on cole crops in Yuma and Imperial Valley in 2010-2012.



**Figure 3.** 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 chemistry and active ingredient on *Brassica* crops grown in Arizona during Aug – Nov in 2009, 2010, 2011 and 2012.

Source: Arizona Pest Management Center 1080 database.

Active Ingredient	Treated acres			
	2009	2010	2011	2012
<b>Pyrethroids</b>				
bifenthrin	17011	24220	19090	22015
zeta-cypermethrin	10343	15427	9378	7933
lambda-cyhalothin	4929	4939	11874	17173
esfenvalurate	7423	7430	8956	9122
permethrin	227	2442	1700	5461
cypermethrin	200	605	1852	1187
cyfluthrin	1030	1158	754	323
beta-cyfluthrin	827	1104	502	135
fenpropathrin	0	25	211	1370
<b>Total</b>	<b>41,990.0</b>	<b>57,350.0</b>	<b>54,317.0</b>	<b>64,719.0</b>
<b>OP/Carbamate</b>				
methomyl	2872	1599	1898	3353
chlorpyrifos	3095	4203	2481	2775
<b>Total</b>	<b>5,967.0</b>	<b>5,802.0</b>	<b>4,379.0</b>	<b>6,128.0</b>
<b>Neonicotinoids</b>				
acetamiprid	455	3392	1461	2539
dinotefuran	627	2195	3465	2741
<b>Total</b>	<b>479.0</b>	<b>5,587.0</b>	<b>4,926.0</b>	<b>5,280.0</b>
<b>Total Treated Acres</b>	<b>48,436.0</b>	<b>68,739.0</b>	<b>63,622.0</b>	<b>76,127.0</b>

Appendix

**2010-2012 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:** \_\_\_\_\_