

Efficacy of Insecticides to Diamondback Moth in Cabbage in Yuma County

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Abstract

Commercial and experimental insecticides were evaluated for their ability to control diamondback moth (DBM) on green cabbage in Yuma, AZ. At early to mid-heading, all the insecticides evaluated appeared to offer similar control. However, on large, full sized cabbage, Asana, Alert, Lannate, Success and S-1812 offered the best DBM control, while Lorsban, Proclaim and Intrepid appeared weak. Unlike other areas of the U.S., DBM in Yuma still appears to be highly sensitive to a wide range of insecticide chemistries.

Introduction

In many areas around the world, diamondback moth (*Plutella xylostella*) is the most serious pest encountered in cabbage and other cole crops. In the U.S. in Hawaii, California, Texas and Florida, diamondback moths have developed resistance to a number of insecticides including pyrethroids, organophosphates, carbamates and B.t.s. Section 18 registrations of new chemistries such as Proclaim (emamectin benzoate) and Success (spinosad), have had to be issued in these states to control this pest.

In Yuma County, cabbage has traditionally been a minor vegetable crop comprising approximately 2,250 acres annually. However, there is a significant potential for increasing cabbage acreage due to increased consumer demand for prepackaged or value added salads and slaws. There are a number of insect pests which infest cabbage in the Yuma area, including: aphids, thrips, beet armyworm (*Spodoptera exigua*), cabbage looper (*Trichoplusia ni*) and diamondback (DBM). Of these pests, DBM has been the least numerous. However, during the past three years, diamondback moth has increasingly become more abundant and damaging. Because of the minor importance of this pest in past years, there is no data available regarding efficacy of insecticides. The purpose of this study was to evaluate the efficacy of commercial available and experimental insecticides to DBM in cabbage. When in sufficient numbers, data on cabbage looper was also collected.

Materials and Methods

Green cabbage, 'Zenith' was direct seeded into double rows on 42-in beds on 19 November 1998 at the Yuma Valley Agricultural Center, Yuma, AZ. Plots were 4 beds X 50 ft, bordered on each side by 2 blank beds and on each end by 5 ft alleys. The test was a randomized complete block design, with 4 replicates. Treatments included four commercially available insecticides, Asana XL (esfenvalerate), Lannate SP (methomyl), Lorsban 50W (chlorpyrifos) and Success (spinosad); and five experimental insecticides, Alert 2 SC (chlorfenapyr), Avaunt 30WG (indoxacarb), Intrepid 80 WP (methoxyfenozide), Proclaim 5SG (emamectin benzoate) and S-1812 4EC. All treatments included the non-ionic surfactant Kinetic at 0.1% v/v.

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Treatments were sprayed using a tractor mounted sprayer. The boom covered 4 rows, with 3 hollow cone TXV-4 nozzles per row, one centered over the bed and two on angled drops on each side of the bed. The sprayer was calibrated to deliver 20 gallons per acre at 40 psi. The tractor traveled at 3 mph. Treatments were applied on 15 Feb, 3 Mar, and 27 Apr.

Insect densities were estimated by counting the number of small (1st and 2nd instar) and large (3rd, 4th and 5th instar) larvae from 10 plants per plot. Evaluations were made at 6 to 9 DAT (days after treatment). All data were analyzed using a ANOVA, and an F protected ($P < 0.05$) LSD for means separation.

Results and Discussion

Since our evaluations were made 6 to 9 DAT, the most relevant comparisons among treatments are those based on large larvae, since this stage would have predominantly been small larvae at the time of application. DBMs were low throughout much of the season but began to increase in number in February. On 24 Feb, 9 DAT (1st application), all the insecticides contained fewer large larvae than the untreated which was averaging 8.25 larvae per 10 plants (Table 1). We could not detect any differences among insecticide treatments. Similar results were observed following the second application. All the treatments evaluated contained fewer large DBM larvae than the untreated, but slight differences were detected among insecticides. Asana XL was the only treatment where no large larvae were collected, and contained significantly fewer larvae than S-1812.

From mid-March until when the crop should have been harvested in early April, DBM larvae were not at treatable levels. In attempt to obtain more data, the crop was allowed to continue to grow. In late April, although the heads had hardened beyond fresh market acceptability, DBM populations increased dramatically. At 7 days following the third application, the untreated plots were averaging 52 DBM larvae per 10 plants. At this time, neither Intrepid, Lorsban or Proclaim contained significantly fewer large DBM larvae than the untreated. Alert, Asana, and Lannate appeared to be superior treatments, followed by Avaunt, S-1812 and Success. A similar trend was noted for small larvae, except Lorsban contained fewer larvae than the untreated. Coverage difficulties and the large DBM populations, no doubt contributed to the differences in product performance late in this trial relative to earlier evaluations.

The results from this trial suggests that unlike many other areas of the world, DBM in Yuma are highly sensitive to a wide range of old and new insecticide chemistries.

In addition to DBM, cabbage loopers were abundant in late April. At 7 DAT on 3 May, cabbage loopers were averaging 6 larvae per 10 plants. Only Alert, Asana, Avaunt and Intrepid contained significantly fewer large cabbage loopers than the untreated.

Table 1. Mean number of diamondback moth and cabbage looper larvae per 10 cabbage plants treated with insecticides.

		Diamondback Moths						Cabbage Looper	
		24 Feb (9 DAT)		9 Mar (6 DAT)		3 May (7 DAT)		3 May (7 DAT)	
Plant stage →		early heading		4-6 inch heads		harvest + 17 days			
Insecticide	Rate	Sm.. Larvae	Lg. Larvae	Sm.. Larvae	Lg. Larvae	Sm.. Larvae	Lg. Larvae	Sm.. Larvae	Lg. Larvae
Alert	0.15 lbs-ai/A	0.50 a	2.25 b	1.75 a	0.75 bc	0.50 ef	4.75 d	0.00 d	0.25 cd
Asana	9.6 oz/A	0.00 a	1.25 b	0.50 a	0.00 c	0.00 f	2.25 d	0.25 cd	0.00 d
Avaunt	0.065 lbs-ai/A	0.25 a	1.50 b	1.75 a	0.50 bc	4.50 bc	8.75 bcd	1.25 bc	0.25 cd
Intrepid	0.1 lbs-ai/A	1.00 a	2.75 b	2.25 a	0.75 bc	8.25 ab	22.75 ab	2.50 ab	0.75 bcd
Lannate	1.0 lbs/A	1.00 a	2.50 b	0.00 a	0.75 bc	1.00 def	4.25 d	0.75 bcd	2.75 abc
Lorsban	2.0 lbs/A	0.00 a	0.75 b	0.00 a	0.25 bc	2.75 bcd	11.00 abc	0.50 cd	1.25 abcd
Proclaim	0.0075 lbs-ai/A	0.75 a	2.00 b	0.75 a	0.50 bc	9.75 abc	16.75 ab	0.75 bcd	1.25 abcd
S-1812	0.15 lbs-ai/A	0.75 a	2.00 b	3.50 a	1.25 b	2.25 cde	5.75 cd	3.00 a	3.50 ab
Success	4 oz/A	0.00 a	0.25 b	1.50 a	0.25 bc	3.75 bcd	4.50 cd	0.25 cd	1.25 abcd
Untreated		0.25 a	8.25 a	2.75 a	5.50 a	16.50 a	35.50 a	2.00 ab	4.00 a

Means in a column followed by the same letter are not significantly different; ANOVA, F protected LSD ($P < 0.05$).