



Guidelines for Diamondback Moth Management in Fall Cole Crops

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These guidelines were prepared in response to the diamondback moth (DBM) outbreaks that occurred in Arizona in 2016-17. The recommendations provided below are based on our field observations and results from numerous lab and field research trials. These guidelines are intended to serve as a reference for PCAs in preparing management programs for the upcoming fall produce season, that includes scouting for DBM and controlling the pest with insecticides. Listed below are recommendations for effectively managing DBM during the fall on transplanted Cole crops:

- **Communicate with nursery before transplanting**

PCAs and growers should stay in close contact with the nursery facility producing transplants. Before the transplants are delivered to the field, PCAs should ask whether there are any issues with DBM or other pests during production. In addition, it may be important to know what insecticides have been used in the nursery to control insects.

- **Inspect trays prior to transplanting**

Upon arrival to the field, PCAs/growers should inspect several plants from numerous trays for the presence of DBM eggs, larvae, and feeding damage.

- **Verimark Transplant Drench as a preventative management option.**

Growers should consider having the nursery treat transplants with Verimark (cyazypyr) 48-72 before transplanting. Assuming the rate (13.5 oz/ac) is applied correctly to the trays, you should expect about 30 days of systemic control of DBM, beet armyworm and cabbage looper after transplanting. You should also expect 45-50 days of systemic whitefly control. For resistance management purposes, do not apply Exirel (foliar formulation of cyazypyr) or any other diamide insecticide for 60 days following the application of Verimark to minimize selection pressure of the diamide chemistry on both Lepids and whiteflies

- **Scout fields thoroughly for eggs/mines/larvae**

Once the transplants begin to grow, or when direct seedling crops begin to produce true leaves, scouting for the presence of eggs/larvae/damage is very important (Figures 1-4). When eggs are found, mining by 1st instar larvae can be anticipated with 3-4 days, and larvae feeding on leaf tissue should be expected shortly thereafter.

- **Initiate foliar insecticide control early.**

Spray timing is important. When DBM larvae begin to show up on fall crops, insecticide sprays should be initiated quickly to prevent DBM from colonizing and establishing on the crop. For Verimark treated transplants, PCAs should be especially careful to monitor crops after 25 days in anticipation of larval activity.

- **Avoid using Chlorantraniliprole**

DBM populations last season were resistant to chlorantraniliprole (Coragen, Besiege, Durivo) and until we have a better understanding of the resistance status of populations in 2017-2018, PCAs should avoid applying this compound for DBM on cole crops.

- **Rotate Modes of Action (Table 1)**

Based on extensive testing last spring, PCAs have several effective options from which to control DBM (Table 1). Products active on larvae (larvicides) include: Radiant, Entrust, Proclaim, Avaunt, Exirel, Minecto Pro, Dibrom, Verimark, *Bacillus thuringiensis*, *aizawaiii* (Xentari). Products with good adult activity (adulticides) include: Lannate, Lorsban, Dibrom. We strongly suggest for resistance management purposes that modes of

action be rotated where an alternative product is applied on each subsequent spray to eliminate consecutive uses of the same MOA. We also recommend that larvicides not be tank-mixed, but do suggest tank mixing an adulticide with a larvicide when moths are present.

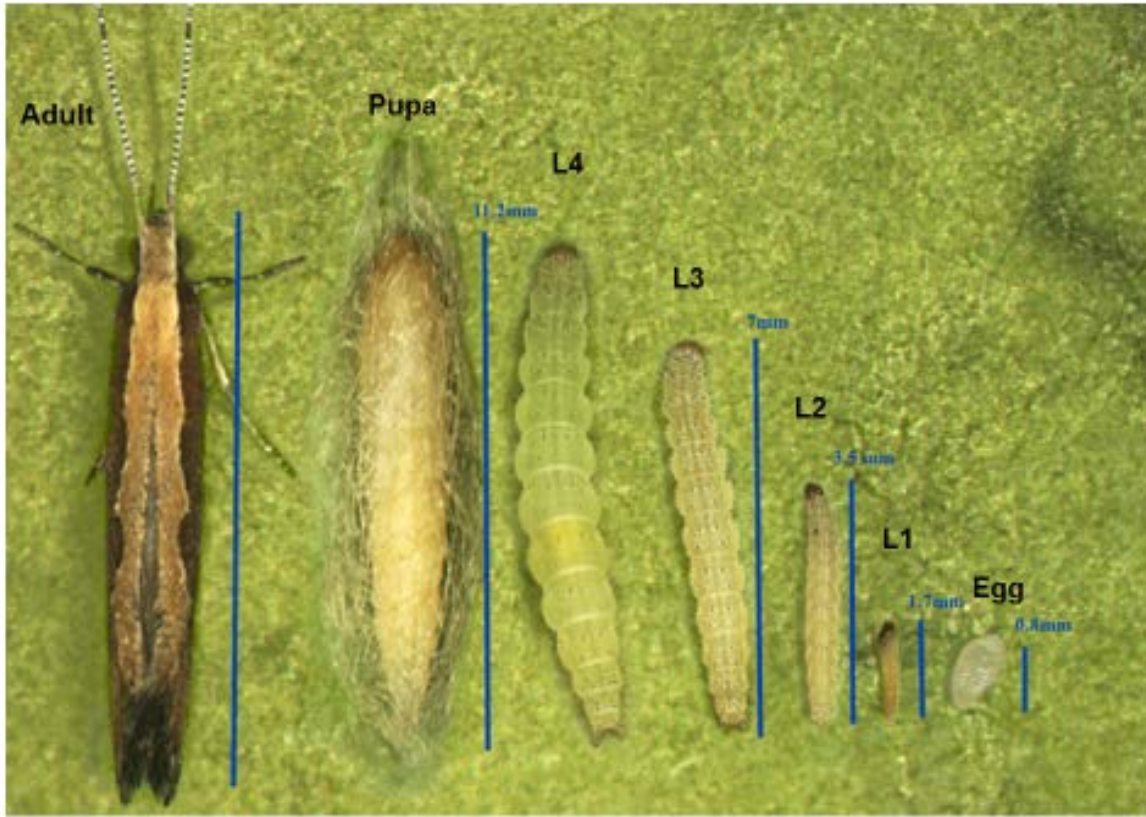
- **Maximize insecticide application whenever possible**

Use only recommended products and rates necessary to accomplish desired control. Whenever possible, apply insecticides by ground sprays to optimize spray deposition and coverage. An adjuvant should always be used with foliar insecticide applications on Cole crops to assist in spray atomization and penetration, and to provide uniform deposition of spray droplets on foliage.

Table 1. Insecticide recommendations for Diamondback moth on desert Cole crops

Product	IRAC MOA	DBM Larvae	DBM Adults	Comments*
Lannate	1A	••	•••	Provided excellent adult activity via direct contact; larval activity was inconsistent in field trials. Stay at higher rates 0.8-1.0 lbs AI/ac
Lorsban Adv.	1B	••	•••	Provided excellent adult activity via direct contact; larval activity was inconsistent in field trials. Stay at top of the label rate.
Dibrom	1B	•••	•••	Provide both adult and larval activity last season. Short residual product. Use at the 2 pints / acre rate.
Malathion	1B	•	••	Based on lab bioassay provided fair adult activity. Did not provide consistent control of larvae in field.
Pyrethroids	3	•	•	Did not provide acceptable adult or larval control last season both in lab and field. The DBM population was likely resistant to the MOA.
Assail	4A	•	••	Listed on label as providing DBM suppression. Research results and PCA survey suggest that Assail is marginal against adults at best.
Radiant/Entrust	5	•••	••	Provided consistent control of larvae last season, and had fair to good contact activity against adults in lab bioassays. Use at 5-7 oz rates.
Proclaim	6	•••	•	Provided consistent control of larvae last season, and had inconsistent contact activity against adults in lab bioassays. Use at high rates.
Bt (<i>Xentari</i>)	11B	•••	•	Provided consistent control of larvae last season at 1.5 lbs. Does not have activity against adults.
Intrepid	18A	••	•	Based on PCA comments, provided fair activity against larvae last year, and has no contact activity against adults.
Avaunt	22	•••	•	Provided consistent control of larvae last season at 3.5 oz. Did not assay against adults but would not expect activity.
Coragen	28	•	•	Larval populations throughout the state were resistant to chlorantraniliprole. Has poor contact activity.
Voliam Xpress	28+3	•	•	Larval populations throughout the state were resistant to chlorantraniliprole. Has poor contact activity.
Exirel, Minecto	28	•••	•	Provided consistent control of larvae last season at 15-20 oz (Exirel). Did not assay adults, but would not expect activity against adults.
Verimark	28	•••	•	Provided control of larvae last season when applied as a transplant drench at 13.5 oz/ac.
•••	Good residual control (7-10 d)		* Efficacy based on lab and field research, and PCA comments form 2016- 2017.	
••	Marginal residual control (4-6 d)			
•	Poor residual control (1-3 d)			

Figure 1. DBM Lifestages



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Figure 2. DBM egg on seedling cauliflower plant



Figure 3. 1st instar DBM larva mining in the leaf tissue



Figure 4. Second-fourth instar larvae and damage on lower side of cauliflower leaf.

