

Diamondback Moth in Virginia

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Introduction

The Diamondback moth (DBM), *Plutella xylostella* (L.), is considered to be the most destructive insect pest of crucifer crops worldwide. DBM larvae feed on leaves of crucifer crops such as cabbage, broccoli, cauliflower, collards, kale, kohlrabi, Chinese cabbage, and Brussels sprouts. All plant growth stages from seedling to head are susceptible to attack. DBM larvae can reach high densities and cause substantial defoliation as well as contamination and malformation of heads in cabbage, broccoli, and cauliflower. The absence and reduction of effective natural enemies, especially parasitoids, as well as insecticide resistance, contribute to the status of DBM as a pest.



Fig. 1. Diamondback moth eggs.

Identification

Egg. Eggs are oval, somewhat flattened, approximately 0.4 mm long, 0.2 mm wide, and yellow to pale green. They typically are deposited singly or in small groups of two to eight eggs on leaves or other parts of the plant (Fig. 1). The junction of leaf veins on the upper surface of leaves tends to be an attractive oviposition site. Eggs hatch in approximately five to six days under normal field conditions.

Larva. Larvae develop through four instars and typically require from nine to 30 days to complete development. The early instars are tiny, colorless to

yellow, and have a dark head capsule (Fig. 2). Mid-to later instars are green (Fig. 3). The body bears relatively few hairs. When disturbed, larvae often wriggle violently moving backward and spin down from the plant on a strand of silk.

Pupa. Pupation occurs in a loose silk cocoon usually formed on the lower or outer leaves. The pupa is yellow to green and approximately 7 to 9 mm long. The pupal stage requires from five to 15 days to complete development (Fig. 4).



Fig. 2 & 3. Diamondback moth neonate larva and late-stage larva.



Fig. 4. Diamondback moth pupa.

Adult. The DBM adult is a 6 mm long, slender, grayish-brown moth with pronounced antennae (Fig. 5). The moth is marked with a broad cream or light-brown band along its back that is sometimes constricted to form one or more light-colored diamonds on the back, which is the basis for the common name of this moth. Adults can live for seven or eight weeks, but the usual life span is around two weeks. Mating occurs on the day of emergence. A single female usually lays from 18 to 356 eggs.

Natural Control

A high percentage of DBM are killed during periods of heavy precipitation from disease and dislodging from



Fig. 5. Diamondback moth adult.

the plant. Predators, entomopathogens, and parasitoids attack all stages of DBM. Predator species include: ladybug larvae and adults, spiders, predatory bugs, and lacewing larvae. Two parasitic wasps, *Diadegma insulare* (Fig. 6) and *Oomyzus sokolowskii* (Fig. 7) are the two most important species attacking DBM larvae in Virginia. The *D. insulare* cocoon appears in the silken cocoon of DBM, but is black compared with the DBM cocoon, which is green or yellow.

Monitoring

Sampling usually involves visually inspecting plants for DBM and other lepidopteran larvae. It is recommended to sample approximately 50 plants per field once or twice a week. A control measure is recommended if 20 percent or more of the plants are infested by DBM or other lepidopteran larvae. For cabbage and broccoli, once the head is formed, a control measure is recommended if 5 percent or more of the plants are infested.

Chemical Control

In recent years, DBM has developed resistance to many different insecticides, depending on the region. In Virginia, DBM has tolerance to insecticides in the carbamate, organophosphate, and pyrethroid classes. Numerous other more lepidopteran-specific insecticides are available that effectively control DBM and other lepidopteran pests in crucifers. Among



Fig. 6. *Diadegma insulare*, a parasitoid of DBM larvae.



Fig. 7. *Oomyzus sokolowskii*, a parasitoid of DBM larvae.

these insecticides are *Bacillus thuringiensis* (Bt) formulations, spinosad, indoxacarb, methoxyfenozide, tebufenozide, and avermectins. Rotation of insecticide groups and the use of the aforementioned narrow-spectrum insecticides are suggested to reduce resistance and to conserve natural enemies. Consult the current edition of the *Commercial Vegetable Production Recommendations*, Virginia Cooperative Extension publication 456-020, for specific information on insecticides recommended for control of DBM in crucifer crops. The addition of a spreader-sticker in the spray improves control.

References

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