Diamondback Moth: *Plutella xylostella*
Monitoring Protocol

Host plants:
Plants belong to the family Brassicaceae such as canola, mustard, broccoli, cauliflower, cabbage.

Identification, Life cycle and Damage:

Adults: Adult moths are approximately 12 mm long, with a 18-20 mm wing span (Figure 1). They are grey or brownish with white marks on the inner margin of the forewing. Their name is derived from a series of diamond shaped figures formed by these white marks when the wings are folded at rest.

Eggs: Eggs are oval, yellowish-white and tiny. They are laid on the leaf surface the leaf surface singly or in small groups (Figure 2).

Figure 1: Adult- 16 days

Figure 2: Eggs- 5-6 days

Figure 3: Larva- 10-30 days

Figure 4: Pupa- 7-14 days

Larvae: Diamondback moth has four larval stages. The first stage is a leaf miner and lives inside the leaf tissue. Damage by young larvae is characterized by small mines and holes in the leaves and surface stripping on the underside of leaves. Older larvae are yellowish green to green caterpillars. They are small (about 12 mm long when full grown) compared to other caterpillars on Brassica crops. The larva is wider in the middle and tapering at both ends with two prolegs on the last segment forming a distinctive V-shape at the posterior

end (Figure 3). They feed on leaves, flowers, young pods and surface tissues of stems and mature pods. Damaged seeds do not fill properly and the pods are susceptible to early shattering. There are at least three generations per year and all stages may be found on the plant at the same time.

Generally, the second-generation larvae cause significant yield loss when flowering and early poding stages are heavily infested.

Pupae: Pupation takes place in delicate, whitish, mesh cocoons attached to the plant (Figure 4). Initially, the pupae are light green but as they mature they become brown.

Monitoring

Diamondback moth can overwinter as adults, but not in significant numbers. Moths carried into Canada from the US on northerly winds **in early May or June** largely determines the infestation level. Size of the spring immigration, availability of food plants for the first generation larvae and weather conditions influence the abundance of the insect. Most of the crops will not have emerged by the time moths arrive, so that many eggs are laid on Brassica weeds and volunteer canola. Cool cloudy weather reduces moth flight activity and the longer the inclement weather persists, the females die before egg laying is completed. Rainfall reduces the larval survival.

The primary goal of the monitoring program is to determine when diamondback moth populations arrive, and in what numbers.

Pheromone Traps for Adult Monitoring- Delta Trap:
The pheromones produced by female diamondback moths to attract male moths are artificially synthesized and used in the monitoring program.

Timing:
The traps containing pheromone lures are to be placed in the field starting **last week of April**, before the fields are seeded. Traps should be checked and the number of diamondback moths should be counted **once a week over a six-week period**. If a late influx of diamondback moths appears, the diamondback moth traps may be left out for a period **longer than six weeks.**

Trap Assembly:
1. Fold open the trap to form a tent shape (Figure 5).
   Insert the wires through the holes in the top of the trap as in Figure 6. Bend the wires to secure them to the trap.
2. Insert the T-shaped plastic attachment on the lure (rubber stopper containing pheromone) through the middle hole in the top of the trap (Figure 7). The rubber stopper containing the pheromone should hang from the top of the trap.
3. Unfold the sticky insert and place in the bottom of the trap (Figure 8).
4. Press in the front and back flaps until they clip into the slits in the sides of the trap. This will secure the sticky bottom in place. Additionally, paper clips may be used to attach the sticky card to avoid wind damage.
5. T-bars can be inserted into hollow metal poles, which are hammered into ground so there is a horizontal surface to hang the traps.
6. The wire that extends from the top of the diamondback moth trap can be wrapped around one of the horizontal ends of the T-shaped bar to secure the trap in place.
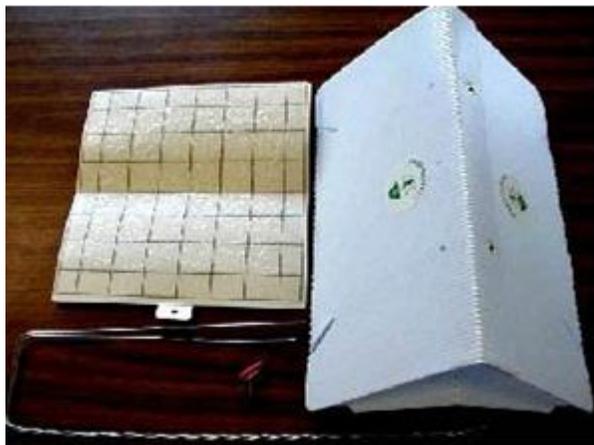
Figure 5**: Delta trap**

Figure 6: Insert the wire hanger

Figure 7: Insert the pheromone

Figure 8: Slide the sticky card into position

Traps catch most moths when placed 50 cm above ground level or at canopy height.
If more than one trap is being placed in a field, **leave at least 100 meters between traps**.
Generally, two traps are placed per field. **Do not handle the lures with your bare hands**.
Please wear rubber or latex gloves if handling the lures. Store lures below 0⁰C.
Pheromone lures for the diamondback moth traps should be replaced after eight weeks of use.

If there are only a few moths on the insert of the diamondback moth traps when they are checked, these moths can be removed from the sticky surface (Figure 9) with tweezers and the insert reused. If the insert is heavily covered with insects or dirt, the sticky surface will not retain moths for future monitoring so it should be replaced with a new insert.

Figure 9: Sticky insert

Larval Monitoring:

Once the diamondback moth is present in the area, it is important to monitor individual canola fields for larvae. Remove the plants in an area measuring 0.1 m^2 (about 12" square), beat them on to a clean surface and count the number of larvae dislodged from the plant. Repeat this procedure at least in five locations in the field to get an accurate count.

Economic threshold for diamondback moth in canola at the advanced pod stage is 20 to 30 larvae/ 0.1 m^2 (approximately 2-3 larvae per plant).
Economic threshold for canola or mustard in the early **flowering stage is not available. However, insecticide applications are likely required at larval densities of 10 to 15 larvae/ 0.1 m^2 (approximately 1-2 larvae per plant).**