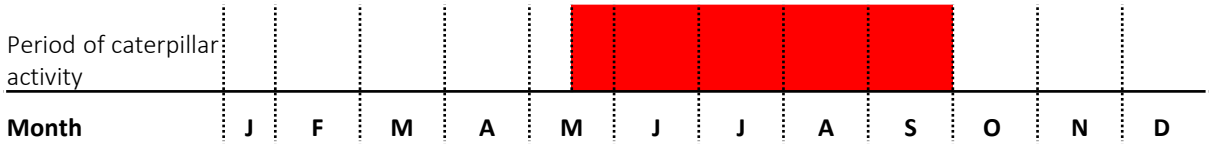
Caterpillars in Cole Crops

A BC Small-Scale Farmer's IPM Guide- *Guide series, March 2021*

There are three main species of caterpillars affecting cole crops in British Columbia: the imported cabbageworm (*Pieris rapae)*, the cabbage looper (*Trichoplusia ni),* and the diamondback moth (*Plutella xylostella)*. Larvae feed on the foliage and heads of cole crops, which creates holes that affect the quality of the crop, and sometimes results in stunted plants. Caterpillars also produce a significant quantity of excrement (frass), which can become a crop contaminant. This manual contains integrated pest management (IPM) guidelines geared towards small-scale production, but they are applicable to any operation wanting to improve pest identification, monitoring and management.

Lifecycle & Identification



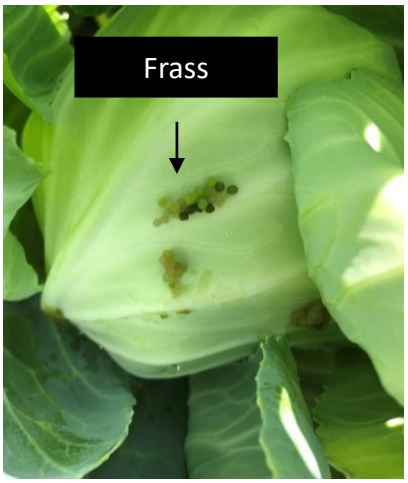
Imported cabbageworm

Cabbage looper

Diamondback

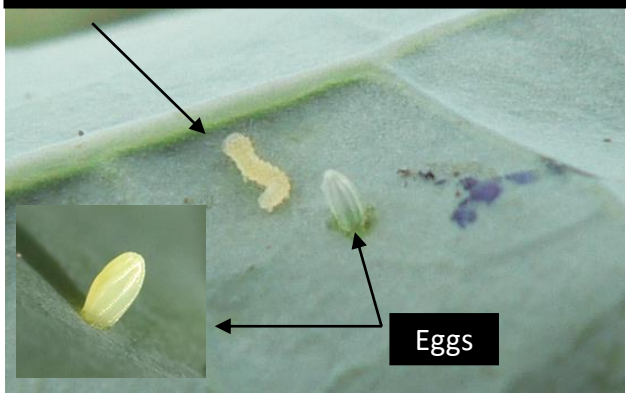
Damage

- Irregular holes.
- Frass (excrement).
- Stunted plants.



Imported cabbageworm *(Pieris rapae)*

Newly hatched larva



Medium larva

Butterfly

Pupa

Generations and overwintering:
The imported cabbageworm has up to three generations per year and overwinter as pupa.

Key identification features:
Larva is sluggish and velvety.

Egg (0.5 mm X 1 mm):
- Cream to yellow and bullet shaped.
- Laid singly on bottom of leaves.
- Takes 3-7 days to hatch.

Larva (up to 3 cm):
- Yellow to green and velvety.
- Yellow line along the center of the back.
- Pupate in about two weeks.

Butterfly (up to 6.5 cm wingspan):
- Yellowish/white with black spots on wings.
- Most active during the day.
- Lays up to 300 eggs.

Pupa (2 cm in length):
- Green, spiky, and firm.
- Takes about two weeks for the butterfly to emerge from pupa.

Cabbage looper (*Trichoplusia ni)*

Egg

Mature larva

Moth

Pupa

Generations and overwintering: The cabbage looper has two to three generations per year. It is not known to overwinter in British Columbia, but instead is thought to migrate from the south.

Key identification features: The larva walks in a looping manner, where the rear legs are pulled up to the front legs causing the body to arch. This is because of a gap between the rear legs and front legs.

Egg (0.6 mm diameter):

- White and round.
- Singly laid on upper or lower sides of leaves.
- Takes 3-5 days to hatch.

Larva (3-4 cm at maturity):

- Green with a white stripe along each side and two stripes down the middle.
- Pupate in about two weeks.

Moth (up to 3.8 cm wingspan):

- Mottled-brown with small silver marks.
- Active at night.
- Lay up to 350 eggs.

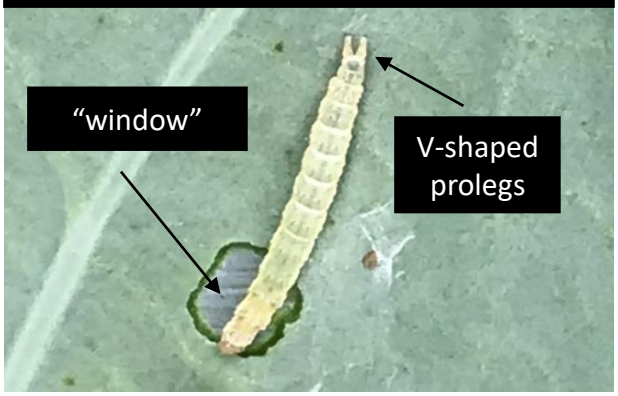
Pupa (2 cm in length):

- Reddish-brown pupa in a white cocoon.
- Takes one to two weeks for the moth to emerge from pupa.

Diamondback moth (*Plutella xylostella*)

Egg

Mature larva



Moth

Pupa

Generations and overwintering: The diamondback moth has two to four generations per year. It is not known to overwinter in British Columbia, but instead is thought to migrate from the south.

Key identification features: The larva has V-shaped prolegs, violently wiggles, falls, and hangs on a thread when disturbed, and sometimes leaves a membrane on one side of the leaf when feeding to form "windows".

Egg (0.4 mm X 0.3 mm):
- Yellow, minute and scale-like.
- Often laid in groups on leaves or stems.
- Takes 5-10 days to hatch.

Larva (1 cm at maturity):
- Cream to light green.
- Distinctive V-shaped prolegs (rear).
- Pupate in two weeks.

Moth (6 mm long):
- Small and slender.
- Brown with three diamond-shaped spots on the back.
- Lay up to 300 eggs.

Pupa (up to 9 mm in length):
- Small, oval-shaped.
- Found within a gauze-like white cocoon.
- Emerges in one to two weeks.

How to Monitor

Monitoring period and frequency

- Monitor once a week from transplant stage up until harvest.

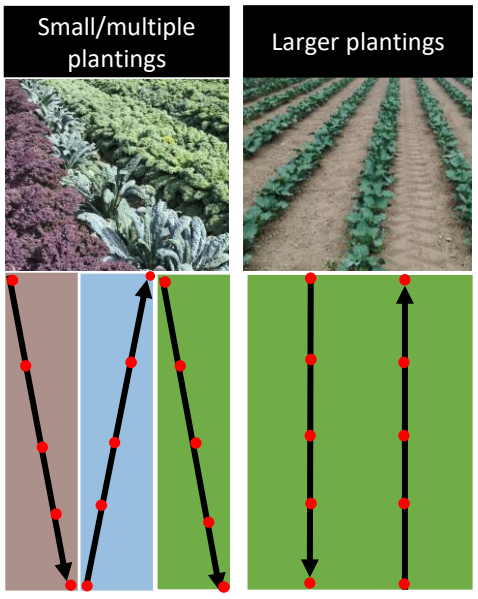
Method

- Make **one to two passes** through each planting.
- A pass involves starting at the end of a row, sampling the first set of plants, then walking down the row, sampling plants at regular intervals to obtain a minimum of **five samples per planting.**
- At each sample, thoroughly inspect **five plants (when plants are not touching) or three plants (when plants are touching)** for a total minimum of 15-25 plants per pass per planting.
- The growing tip (middle of the plant) and the upper and underside of all leaves should be inspected carefully.
- Some samples should be taken on field edges but most should be taken inside the field.

Record

- Use a printout of the data sheet template provided in this guide.
- Record the number of plants with one or more caterpillar larvae in each sample.
- Larvae are recorded as minute/small and medium/large.
- Larvae are recorded by species: diamondback (D), imported cabbage worm (I) and looper (L).
- Number of eggs (E) and pupae (P) are recorded for each species.
- Eggs and pupae are not used to calculate the percentage of infestation but they are good indicators of the stage of development the population is at. Expect to see larvae in three to five days if eggs are mostly seen.
- Calculate % of infestation for each planting:

$$\frac{\text{\# of plants with 1 or more larvae}}{\text{\# of plants sampled}} \times 100$$



Quick method

Step 1. Randomly select and inspect about 25 plants. Inspect each plant until one caterpillar is found or all leaves were inspected and no caterpillars were found.

Step 2. Record the number of plants with one or more caterpillars, the size of the larvae, and the species.

Step 3. Calculate the percentage of plants with one or more caterpillars in each planting and compare to thresholds.

Size range by species

Loopers/Imported	Diamondback
minute = < 3mm	minute = < 1mm
small = 3-10mm	small = 1-3mm
medium = 10-20mm	medium = 3-7mm
large = > 20mm	large = > 7mm

When to Act

Threshold

The level at which action should be taken to avoid economic loss varies with the crop stage:

- Transplant: 10% infestation.
- Transplant – establishment: 10-15% infestation.
- Before heading: 20-30% infestation.
- Heading – harvest: cabbage 10-15%; cauliflower, broccoli and kale 5-10%.

Timing of management

- Spray when threshold is reached rather than on a pre-set schedule.
- Minute to small larvae should be targeted for sprays.
- If many eggs are found, wait a few days before spraying to allow for more larvae to emerge, as sprays are not effective on eggs.

Damage is increasing but no larvae are found?

Cutworms could be the cause. They are mostly active at night and different management actions are required.

How to Manage

Biological control

- Help the establishment of natural enemies such as parasitoid wasps and predators.
- Plants such as alyssum attract natural enemies and provide pollen and nectar. These can help natural enemies establish earlier in the field, and can be direct seeded or planted along field edges to provide habitat. Other plants attractive to natural enemies include phacelia, yarrow, coreopsis, dill, and rhudbeckia.
- Avoid broad spectrum insecticides to allow natural enemies to propagate.

Alyssum

Cultural control

- **Manage weeds** in and around the field. Controlling weeds will reduce habitats and overwintering sites.
- Incorporate plant debris as soon as a planting is harvested.

Physical control

- A properly secured row cover (e.g. anchor edges with sandbags), put in place right after seedling or transplanting, will prevent adult moths/butterflies from laying eggs and prevent pest establishment on the crop.
- The row cover may need to be removed when conditions are too hot or plants are too big. When the row cover is removed, transition to other management methods (e.g. sprays) if needed.

Chemical control

- Registered pesticides used in **organic production** for management of caterpillars in cole crops include the active ingredient Spinosad, *Bacillus thuringiensis, and Autographa californica* Nucleopolyhedrovirus. Spinosad can also be used for crucifer flea beetles and thrips, providing an opportunity for multi-pest control if strategically timed. Always check with your organic certification body before using any pesticide products.
- Most products should target minute to small larvae. Keep in mind that caterpillars develop quickly in hot weather.
- Please refer to the **BC Vegetable Production Guide** for current organic and conventional spray options for caterpillars in cole crops.
- Products should be rotated for resistance management.
- Always read the label prior to applying any pesticide products.

References and Links:

BC Production Guide – Cole crops
https://www2.gov.bc.ca/gov/content/industry/agriservice-bc/production-guides/vegetables/cole-crops
Ontario Crop IPM– Brassica insects
http://www.omafra.gov.on.ca/IPM/english/brassicas/insects/index.html

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Caterpillars in Cole Crops Data Sheet Template

Date	Planting ID	# plants/ sample	Sample #	# eggs/pupae			# Min/small larvae			# Med/large larvae			# plants with 1+ larvae	% Infestation	Comment
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