

# Insect Pests of Rapeseed and Mustard in North Dakota

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Mustard for the condiment market is grown on about 30,000-40,000 acres in northern counties of North Dakota. This acreage has been relatively stable over the past few seasons. Rapeseed, however, is a relatively new crop in North Dakota, with interest in it having been stimulated by recent rapid expansion in Canada. In North Dakota rapeseed acreage may approach 40,000 acres and there are indications that this could increase in future seasons.

Mustard grown in North Dakota is used in the condiment industry in the production of table mustard, salad dressings, and pickles. The principal species grown for seed and processing in the United States is yellow mustard, *Brassica hirta* (Moench). Brown mustard and oriental mustard, both varieties of *Brassica juncea* (L.), are also grown in small acreages for the export market.

The word rape comes from the Latin "rapum," meaning turnip. Two *Brassica* species are considered rapeseed: *Brassica napus* (L.) and *Brassica campestris* (L.). *B. napus* includes both the Argentine type rapeseed, as well as the rutabaga. *B. campestris* includes the Polish type rapeseed and the turnip. One line of each of these *Brassica* species has been selected for seed production and one for fleshy root development.

Canola, a term of Canadian origin, is now generally applied to

modern rapeseed varieties known as "double low," in reference to their very low erucic acid and glucosinolate content. Canola varieties of rapeseed were first produced in Canada, and the name was registered by the Western Canadian Oilseed Crushers Association. Canola is usually recognized as any variety of rapeseed whose seed contains less than 5% erucic acid and 3 mg/g normally measured glucosinolates.

Increased acreage of mustard and rapeseed has led to an increas-

ed awareness of the insect problems associated with these crops. Both crops are closely related and therefore share the same insect problems. The most troublesome and recurring insect pests of both mustard and rapeseed are flea beetles. Field observations indicate that flea beetles tend to prefer rapeseed over mustard. In some seasons the diamond-back moth can be a later season problem in both crops and can cause serious damage if not detected early.

## INSECT PESTS OF MUSTARD AND RAPESEED

**Flea Beetles** - *Phyllotreta cruciferae* (Goeze) - crucifer flea beetle  
- *Phyllotreta striolata* (F.) - striped flea beetle  
- *Psylliodes punctulata* (Melsheimer) - hop flea beetle

Flea beetles are tiny insects with enlarged femora (thighs) on the hind legs and they have the habit of jumping quickly when disturbed. As many as six species of *Phyllotreta* and *Psylliodes* may be present in rapeseed and mustard, but the three illustrated are those most frequently encountered as pest insects. These insects are present in most areas of North Dakota, having their life cycle associated with the many wild members of the mustard fami-

ly. These beetles are often abundantly present in areas where mustard or rapeseed are planted as crops.

*Phyllotreta cruciferae* (Goeze) (Fig. 1), known as the crucifer flea beetle, is 2-2.5 mm long and black with a bluish sheen. The pronotum (neck) and elytra (back) will usually appear to be different colors. *Phyllotreta striolata* (Fabricius) (Fig. 2), or striped flea beetle, is similar in size and shape to the

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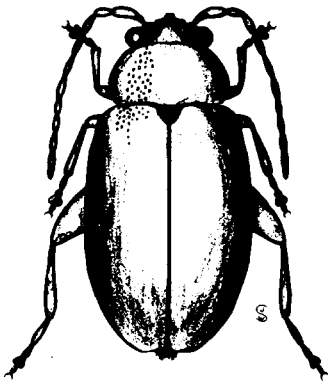


Figure 1. Adult crucifer flea beetle, *P. cruciferae*

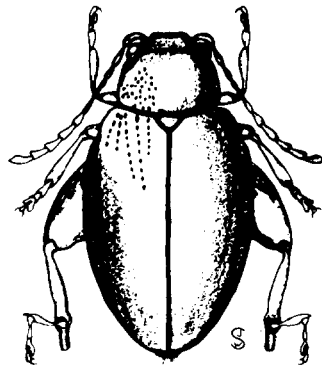


Figure 3. Adult hop-flea beetle, *P. punctulata*

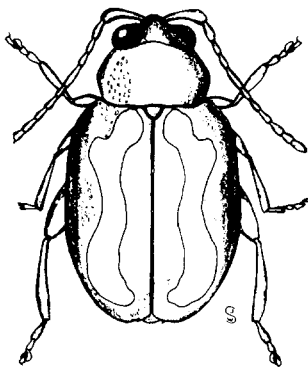
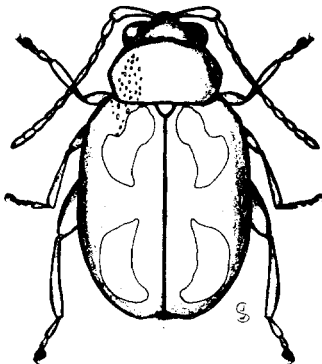


Figure 2. Adult striped flea beetle, *P. striolata*

crucifer flea beetle, but is black with yellow markings. *Psylliodes punctulata* (Melsheimer) (Fig. 3), or hop flea beetle, is larger, 3-3.5 mm long, and black with a slight bronze luster. The hop flea beetle is only occasionally abundant enough to be a serious pest.

## Life History

Each of these flea beetle species normally has a single

generation per year, but under certain favorable environmental conditions, the possibility exists for *P. cruciferae* to have two generations a year. The adult beetle overwinters hidden under bark of trees, in grass clumps, in leaf litter and refuse, underneath hedges, in refuse heaps and straw piles, in haystacks, and occasionally in the stubble of rapeseed or mustard fields. The overwintered beetles become active in the early spring and on warm days may fly considerable distances in search of plants on which to feed. The first food sources encountered by these beetles in the spring are perennial wild mustards or newly emerged rapeseed and mustard seedlings.

The adult beetles mate and lay their eggs in the soil during May or early June and the adult population begins to decrease in late June. Eggs hatch in a few days and the larvae feed on the roots of plants in the mustard family and pupate by mid-July. Adults begin emerging in late July and early August. These adults feed for a few weeks on any green rapeseed, mustard or wild mustard still present, and as temperatures decrease, begin moving into their overwintering habitats during late August and September.

## Flea Beetle Damage

The most serious damage to rapeseed and mustard crops by

flea beetles is caused by the early season feeding of overwintered beetles on newly emerged seedlings during May and June. The beetles feed on the cotyledons and first true leaves, causing the typical shot-holed appearance to the leaves. Seedlings severely damaged by beetles may die, and less seriously damaged plants may suffer a reduction in growth, vigor and stamina. Hot, sunny weather is conducive to high feeding activity, while cool, damp weather may cause damaged seedlings to wilt and die, and partial or complete crop loss can result. In some instances the infestation of a field can occur as a creeping infestation moving from plant to plant across a field; in other instances the entire field may become quickly infested. Once a crop advances beyond the seedling stage, serious damage usually does not occur since vigorously growing mustard or rapeseed plantings can outgrow the beetle defoliation until the overwintered adult beetle population has begun to decrease. No effects on plant vigor have been noted from the feeding of the larvae on the plant roots.

Occasionally in August large numbers of newly emerged adults will move onto semi-mature rape crops and devour the epidermis of the stems, leaves and pods, and may stunt the growth of the pod. Most seasons the crop will be sufficiently advanced to escape late season flea beetle damage.

## Control

Cultural methods will help reduce plant losses caused by flea beetles. A firm seed bed that is well tilled and adequately fertilized will help plants outgrow beetle damage during the susceptible early season stages.

A few flea beetles or scattered shot-holing in leaves of a seedling crop are not necessarily cause for alarm. However, if flea beetles are numerous on plants and feeding holes are present in most cotyledons, immediate control is

likely required. The key to flea beetle control is frequent monitoring of seedling fields during this very susceptible stage. A planting time treatment of a granular insecticide has proven highly effective for early season flea beetle control on rapeseed in Canada. Furadan CR-10 has been granted a North Dakota state label for flea beetle control in rape that applies to seed that will be exported to Canada. See recommendation chart for rates and restrictions.

Later season feeding which causes slight pod damage in the maturing crop seldom warrants control. However, if there are signs that pod damage is steadily increasing and becoming more widespread, controls may be necessary to avoid small seeds and shattering.

For more information on insecticides registered for flea beetle control, see the control recommendations chart at the end of this circular.



Figure 4. Adult diamondback moth, *Plutella xylostella* (L.)

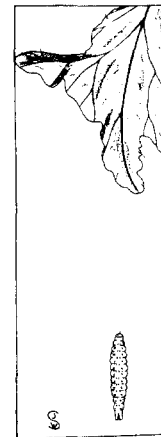


Figure 5. Larva of the diamondback moth hanging from silken thread.

plant. When diamondback moths are extremely numerous, these cocoons may be present in dozens or hundreds on the pods of maturing plants. The moth (Fig. 4) is small, less than 1/2 inch in length and drab brown in color, with a pattern of lighter brown or tan forming a series of diamond-shaped figures on the wings when the moth is at rest. The moth's most active flight period is in the evening.

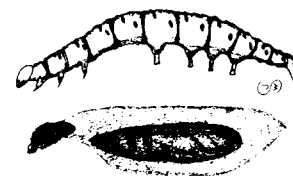


Figure 6. Larva and pupa of the diamondback moth.

## Diamondback Moth

– *Plutella xylostella* (L.)

The diamondback moth is most frequently detected when it is in the larval or caterpillar stage (Figs. 5 and 6). A full grown larva is approximately 1/2 inch in length, smooth and pale green in color. The female moth lays her eggs on the upper surface of leaves, and, after hatching, the larva burrows into the leaf and spends the first few days of its life mining through the leaf tissue. Later larval instars move out onto the leaf surface and feed on the leaves, flowers and pods. When disturbed, the caterpillar will move backward rapidly, lashing the body, and it may even drop from the plant, spinning a silken strand as it falls and remain hanging several inches below the leaf (Fig. 5). The pupal stage is spent in an open lacework cocoon (Fig. 6) spun anywhere on the

## Life History

It is believed that the diamondback moth does not overwinter in North Dakota but that each year moths from more southern latitudes migrate into the state on the prevailing winds. Because of this, the number of moths that arrive varies greatly from year to year. The dispersing moths frequently arrive before emergence of the rapeseed and mustard crops, and their eggs are laid in weed mustard and volunteer rapeseed. Usually the second generation is present when the crop is susceptible to damage, about the last week in July when blooming and early podding are at their peak. The third generation is unlikely to affect any but very unusually late fields.

## Diamondback Larvae Damage

The amount of foliage consumed by diamondback larvae causes

little yield reduction. The main damage is from chewing and peeling the epidermis (skin) off filling and maturing pods. The seeds under peeled areas do not fill properly, and damaged or undersized seed may cause extreme yield reductions in varieties grown for oil content. Severe damage appears as an abnormal whitening of the pods, as opposed to the yellowing and browning of normally ripening pods.

## Control

Canadian research indicates that a population of 20 diamondback moth larvae on plants in a 1 sq. ft. area warrants control. See the insecticide recommendations chart at the end of this circular for materials registered on mustard and rapeseed.

## OTHER INSECTS IN MUSTARD AND RAPESEED

There are several other insects that are encountered in rapeseed and mustard fields which rarely, if ever, become numerous enough to warrant chemical control. The cost of an effective insecticide treatment will almost always outweigh any benefits from removing these incidental pests from the field. In many cases, control of diamond-back moth and flea beetles will control the incidental pest insects present in the field at the time of application. In instances when these incidental insects become threatening, consult the recommendations chart for control measures.

The imported cabbage butterfly, *Pieris rapae* (L.), will frequently lay its eggs in mustard and rapeseed fields. The larva of this insect (Fig. 7) is commonly referred to as the cabbageworm, but will feed on mustard or rapeseed leaves. Cabbageworms have seldom been reported as pests since their numbers are usually quite low, and their damage potential is uncertain since they have not been observed feeding on pods.

Looper caterpillars, such as the cabbage (Fig. 8) and alfalfa loopers, are so called because they move similarly to measuring worms or inch worms. Some

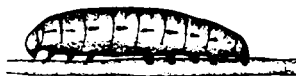


Figure 7. Larva of the imported cabbage butterfly.



Figure 8. Larva of the cabbage looper.

loopers, such as the alfalfa looper, may become numerous about the time the crop is blooming and forming pods and be present in large enough numbers to cause damage.

Cutworms and webworms may become pests in fields where volunteer species such as lambs quarters and sweet clover grow. Feeding on foliage has never been shown to cause significant damage, but the bertha armyworm, *Mamestra configurata* (Walker), and the beet webworm, *Loxostege sticticalis* (L.) will peel the epidermis from the pods, resulting in in-

complete seed filling, or they may even devour the pods. Damage to these pests can occur when populations invade from adjacent weedy areas. Both these insects can be controlled by insecticides listed in the recommendations chart.

Aphids (Fig. 9) are common in rapeseed and mustard fields, but only the ones that form clusters on the flower stalks of rapeseed cause any damage. Control measures are nearly always more costly than the yield reductions caused by these pests, and sprays also result in destroying beneficial insect predators such as ladybird beetles, lacewings, and syrphid flies.

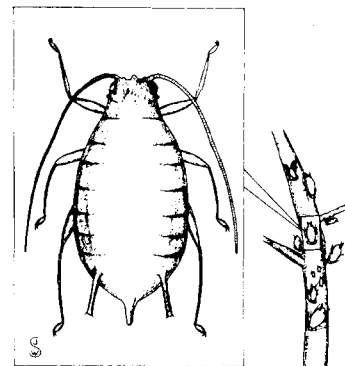


Figure 9. Aphids on stem of rapeseed.

## BEEES IN RAPESEED AND MUSTARD

During flowering, honey bees will be visiting rapeseed and mustard fields in abundant numbers. These visiting pollinators are essential to seed set. To prevent serious pollinator losses, the following precautions should be heeded:

- 1) Treat only if necessary. Blanket treatments or scheduled spraying for pest preven-

tion may do more harm than good.

- 2) Timing of insecticide application:
  - a. Never spray a crop in bloom unless it is absolutely necessary.
  - b. If spraying a crop in bloom is necessary, do the spraying when there will be minimal bee activity in the fields, preferably during the evening hours when-

ever possible. During most summer evenings, honeybees leave fields by 8:00 p.m. and do not begin to return until 8:00 a.m. or later.

- 3) Modify control programs according to weather:
  - a. Cold temperatures prolong the residual of insecticide while warm temperatures break down insecticides more rapidly.

- b. Warm temperatures in late afternoon, early evening or early morning can "hold" bees in blooming fields for longer than normal periods.
- c. Pay attention to wind direction and velocity as this relates to beeyard locations in proximity to fields that are to be sprayed with insecticide.

4. Applicators who are unsure of where beehives are located should find out by:
- Consulting with farmer-customers.
  - To obtain information on the location of beeyards in your area contact the state apiculturist at the North Dakota Department of Agriculture in Bismarck - Phone (701) 224-4997.

Allow one to two weeks for maps to be received. Pollination sites are not shown on these maps.

5. When spraying in close proximity to beeyard locations and the hives cannot (for one reason or another) be moved or covered, use a drift reducing additive such as Nalco-Trol to minimize insecticide drift to the hives.

## MUSTARD

Insecticide	Dosage (Actual Toxicant)	Insects Controlled (As listed on label)	Remarks
Carbaryl (Sevin)	½-1 lb./Acre	Flea Beetles	Do not use within 14 days of harvest.
	1-2 lbs./Acre	Armyworms Imported Cabbageworms	
Malathion	1¼ lbs./Acre	Aphids Flea Beetles Cabbage Loopers Imported Cabbageworms	Do not use within 7 days of harvest.

## RAPESEED

Insecticide	Dosage (Actual Toxicant)	Insects Controlled (As listed on label)	Remarks
Ethyl parathion**	½ lb./Acre	Diamondback Moth Flea Beetles Armyworms Imported Cabbageworms	Apply by aerial application only using a minimum of 3 gallons of water per acre. Do not apply within 25 days of harvest. Fields treated with parathion are to be posted with warning signs and not entered for a 48 hour period after application.
Methyl parathion**	½ lb./Acre	Flea Beetles Aphids Cabbageworms Armyworms (up to 3rd instar)	
Thiodan**	¾ lb./Acre	Aphids Cabbage Loopers Imported Cabbageworms	Use in sufficient water for thorough coverage (minimum of 3 gallons per acre). Do not apply after flowering. Do not exceed 2 applications per season. Workers entering treated areas within 24 hours of application should wear protective clothing.
Furadan CR-10**	2.5 lbs. of formulated product/Acre	Flea Beetles	Apply as a planting time application. Furadan CR-10 is to be mixed with the seed to be applied at the rate of 2½ lbs. per acre. This treatment provides early season control of flea beetles. This product may be used <b>only</b> on rapeseed intended for export to Canada.

\*EPA has classified this insecticide as a restricted use pesticide. Restricted use pesticides are to be applied by certified pesticide applicators only.

\*\*This product is registered under state label in North Dakota.

