North Dakota State University
**NDSU Extension Service**
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*For use in 2004 only*



# SOYBEAN INSECTS

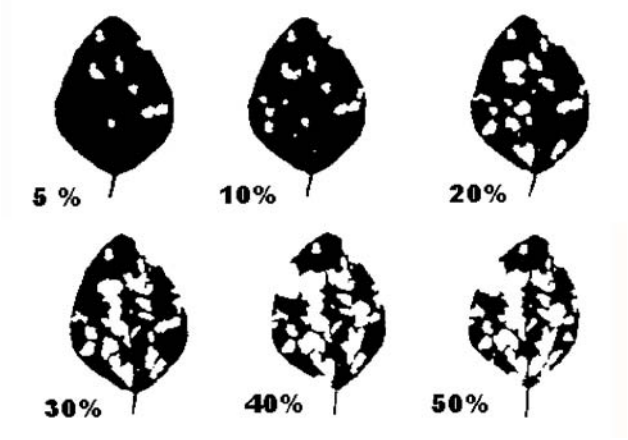
**Estimating Damage**
In soybeans, field scouting to assess insect populations is based on either the number of insects per foot of row, insects per plant, or the level of defoliation.

Insects per foot of row is determined by shaking plants over the inter-row space, on which a strip of cloth has been laid. Count the total number of insect pests per foot of row that fall on the cloth. If sampling a narrow row or drilled soybeans, the use of a "Texas vertical beat sheet" should be considered. The vertical beat sheet is made from a piece of galvanized metal flashing or similar stiff material, 36 inches wide, 32 inches tall and crimped at the bottom to form a collecting trough 4 inches wide. Place the device next to the row and shake the plants against the vertical surface. Insects dislodged from plants collect in the trough where they can be counted or collected.

Percent defoliation is determined by estimating the amount of leaf loss based on visual inspection of randomly selected plants.

The growth stage of the soybean plant is important. Under most conditions, moderate defoliation early in the season has little effect on final bean yield. As plants reach the flowering and pod filling stages, then defoliation poses a greater threat to yield. For example, research indicates that the soybean plant can sustain a 35 percent leaf loss prior to the pre-bloom period. From pod-set to maturity, the plant can tolerate only a 20 percent defoliation level.

## Soybean Defoliation Levels




## ARMYWORMS

Armyworms are greenish-brown with longitudinal stripes. Full grown larvae are smooth, striped and almost hairless. Armyworms feed for three to four weeks. When full grown, larvae are 1½ to 2 inches in length. Armyworm larvae have six growth stages, or instars. The armyworms final instar lasts about 10 days and they consume large amounts of plant material during that time.

Armyworms are inactive during the day, resting under plant trash, clumps of grass or lodged plants. They feed at night or on cloudy days, crawling up on plants and consuming foliage. Due to their habit of feeding at night, armyworms may go undetected until significant damage has occurred.

Armyworms do not overwinter in the region. The moths migrate from southern states in late spring and early summer. This helps explain the sporadic infestations that occur. When moths arrive, they prefer to lay their eggs in moist, shady areas, usually where grasses have lodged. Infestations that develop within soybean fields are often due to grassy weed problems.

Armyworms are more of a problem in small grains and corn. Damage to soybeans can occur when the armyworms usual host plants become exhausted due to feeding or dry conditions. When their food is depleted in the hatching site, the armyworms may move in large numbers, or "armies", eating and destroying plants or crops in their path.

**Threshold:**

Control of armyworms is recommended when 25 to 30% of the foliage is destroyed or if significant injury to pods is evident. Most often in soybeans, infestations are due to migrating armyworms. Under these circumstances, treatment of a couple of swaths ahead of the migrating armyworms to establish a barrier strip is suggested to prevent further migration and injury.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Baythroid *RUP* | 0.025 - 0.044 | 1.6 - 2.8 fl oz | Do not apply within 45 days of harvest. Maximum number of applications of 4 per season. |

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| carbaryl (Sevin) | 1 to 1.5 | rate varies by formulation | Do not apply within 21 days of harvest or 14 days of grazing or harvest for forage. |
| Lorsban 4E *RUP* | 0.5 to 0.75 | 1 to 1.5 pts | Do not apply within 28 days of harvest. Do not graze or feed forage to dairy or meat animals within 14 days after application. Do not feed straw from treated soybeans to meat or dairy animals within 28 days after application. |
| Mustang *RUP* | 0.35 to 0.05 | 3.0 to 4.3 fl oz | Do not apply within 21 days of harvest for soybeans. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. |
| Scout X-TRA *RUP* | 0.016 to 0.024 | 2.28 to 3.41 fl oz | Do not apply within 21 days of harvest for soybeans. Optimum gallons: Use a minimum of 3 to 5 gal water/acre for aerial application and 5 gal water/acre for ground application. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 27 fl oz/acre on soybeans in 1 growing season. |
| Tracer (spinosad) | 0.047 - 0.062 | 1.5 - 2 fl oz | Do not apply within 28 days of harvest. Do not feed treated forage or hay to meat or dairy animals. |
| Warrior *RUP* | 0.015 to 0.025 | 1.92 to 3.2 fl oz | Do not apply within 45 days of harvest. For control of first and second instars only. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. When applying by air, apply in a minimum of 2 gallons of water per acre. |

*RUP* - Restricted use pesticide

## CUTWORMS

Several cutworm species affect regional crops. The Dingy cutworm, *Feltia jaculifera*, overwinters as a partially grown larva and is one of the first cutworm species to cause problems during crop emergence from early to mid-May. The moth of the dingy cutworm is known to lay her eggs on sunflower heads from mid-July through September. Soybeans and other crops following sunflowers in rotation are at greatest risk of injury by this cutworm. Other cutworms, the red-backed, *Exoa ochregaster*, and the darksided, *Exoa messoria*, overwinter as eggs which hatch in mid to late May. Eggs are laid in the fall and survive in weedy, wet, and reduced tillage areas. Feeding injury by these cutworms normally occurs in late May to early June.

Most damage by cutworms occurs when soybean plants are in the early stage of development. Damage consists of young plants being chewed off slightly below or at ground level. Some cutworm feeding injury may occur on foliage. Cutworms primarily feed at night. When checking soybean fields for cutworms during the day, dig down into soil an inch or two around recently damaged plants; there you can find the gray to gray-brown larva.

**Threshold:**
Economic thresholds for cutworm treatment decisions are not well established. Treatment guidelines used over the years include when one cutworm or more is found per 3 feet of row and the larvae are small (<3/4 inch long). Another guideline is when 20% of plants are cut or when gaps of 1 foot or more exist in the plant row. When making a final decision, consider that surviving soybeans are able to compensate for early stand reductions because of the plants long growth period.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.03 to 0.05 | 5.8 to 9.6 fl oz | Do not apply within 21 days of harvest. Do not feed or graze livestock on treated plants. |
| Baythroid *RUP* | 0.013 - 0.025 | 0.8 - 1.6 fl oz | Do not apply within 45 days of harvest. Maximum number of applications of 4 per season. |
| carbaryl (Sevin) | 1 to 1.5 | rate varies by formulation | Do not apply within 21 days of harvest or 14 days of grazing or harvest for forage. For cutworm control, this product is effective against species which feed on the upper portions of the plants. |
| Lorsban 4E *RUP* | 0.5 to 1 | 1 to 2 pts | Rotary hoe after application if soil is dry for several days. Restrictions same as for armyworm. |
| Mustang *RUP* | 0.16 to 0.05 | 1.4 to 4.3 fl oz | Do not apply within 21 days of harvest for soybeans. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. |

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| permethrin<br>Pounce 3.2 EC<br>*RUP* | 0.05 to 0.1 | 2 to 4 fl oz | Do not apply within 60 days of harvest. Do not graze or feed soybean forage or hay. Apply a minimum of 1 gal of finished spray per acre by air or 5 gals by ground. |
| Scout X-TRA<br>*RUP* | 0.016 to 0.024 | 2.28 to 3.41 fl oz | Do not apply within 21 days of harvest for soybeans. Optimum gallonage: Use a minimum of 3 to 5 gal water/acre for aerial application and 5 gal water/acre for ground application. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 27 fl oz/acre on soybeans in 1 growing season. |
| Warrior<br>*RUP* | 0.015 to 0.025 | 1.92 to 3.2 fl oz | Do not apply within 45 days of harvest. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. When applying by air, apply in a minimum of 2 gallons of water per acre. |

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## FOLIAGE FEEDING CATERPILLARS

**Green Cloverworm, Cabbage Looper, Velvetbean Caterpillar, Thistle Caterpillar, and Alfalfa Webworm**

Populations of these caterpillars have been negligible in North Dakota and little treatment to control them has been required. Sampling for these insects is accomplished through the use of a drop cloth or a vertical beat sheet, placed between two rows of plants. The larvae are dislodged from the plants and counted on the cloth or collection tray to arrive at an estimate of the number per row feet.

***Green cloverworm:*** These caterpillars are green with two, narrow, white stripes down the side. When mature, the worms are 1 ¼ inches long. These caterpillars have only three pairs of fleshy prolegs on the abdomen, plus a pair of prolegs on the back segment. When moving, the worms move by arching the middle of the body, or “looping”. Young worms scrape leaf tissue creating a transparent skin, or "window", on the leaf surface. Older cloverworms eat holes in the leaves.

***Cabbage looper:*** These caterpillars are light to dark green with lighter colored stripes, along the side and on the top, running the length of the body. When mature, the worms are 1 ½ inches long. These caterpillars have only two pairs of fleshy prolegs on the abdomen, plus the pair on the back tip. When moving, the caterpillars move by arching the middle of the body, or “looping”. These worms feed on leaves in the interior and lower portion of the plant. As defoliation occurs, worms feed higher in the plant. Feeding injury is similar to the cloverworm.

***Velvetbean caterpillar:*** This insect does not overwinter in the region, instead, moths migrate from southern locations. These caterpillars have dark lines bordered by lighter colored, narrower, lines running the length of the body. The background color ranges from a pale yellow-green to brown or black. These larvae have four pairs of fleshy prolegs to distinguish them from the cloverworm and the looper. Young velvetbean caterpillars feed on the underside of leaves in the upper portion of the plant. Older larvae consume the entire leaf, except for the leaf veins.

***Thistle caterpillar:*** This insect is the larva of the butterfly known as the Painted Lady. This butterfly does not overwinter in the region, but migrates from southern locations each spring. These caterpillars are brown to black in color with yellow stripes along each side of the body. They are covered with spiny-hairs that give the caterpillar a prickly appearance. Full grown larvae are about 1 ½ inches long. The caterpillars feed on the leaves, webbing them together at the feeding site.

***Alfalfa webworm:*** These larvae are 1 inch when full grown. They are greenish to nearly black with a light stripe that runs down the middle of the back. There are three dark spots, each with hairs, on the side of each segment. These larvae feed for about 3+ weeks. Infestations are characterized by light webbing over the leaves. Beneath the web is where the larvae feed, consuming the leaves. These larvae move very rapidly, forward or backward, when disturbed.

**Threshold**:

Control of these different caterpillars is normally not warranted until greater than 30% of the foliage is destroyed prior to bloom, or when 20% of the foliage is destroyed after bloom, pod set or fill has been reached. This usually requires an average infestation of 4 to 8 larvae per row foot.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL<br>*RUP* | 0.015 to 0.03 | 2.9 to 5.8 fl oz | Do not apply within 21 days of harvest. Do not feed or graze livestock on treated vines. Recommended application rates for Cabbage looper are slightly higher at 5.8 to 9.6 fl oz. |
| Baythroid<br>*RUP* | 0.025 - 0.044 | 1.6 - 2.8 fl oz | Do not apply within 45 days of harvest. Maximum number of applications of 4 per season. |
| carbaryl (Sevin) | 0.5 to 1.5 | rate varies by formulation | Do not apply within 21 days of harvest or 14 days of grazing or harvest for forage. |

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Lannate LV<br>*RUP* | 0.11 to 0.45 | 0.4 to 1.5 pts | Do not apply within 14 days of harvest. Do not make more than 3 applications per crop. |
| Lorsban 4E<br>*RUP* | 0.25 to 0.5 | 0.5 to 1 pt | Do not apply within 28 days of harvest nor apply last treatment closer than 14 days apart. Do not graze or feed treated forage to meat or dairy animals. |
| Mustang<br>*RUP* | 0.35 to 0.05 | 3.0 to 4.3 fl oz | Do not apply within 21 days of harvest for soybeans. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. |
| Penncap-M<br>*RUP* | 0.5 | 2 pts. | Do not apply within 20 days of harvest or grazing. Do not apply more than twice per season. Do not enter treated fields within 48 hours after application. Fields must be posted. |
| permethrin<br>Pounce 3.2 EC<br>Ambush<br>*RUP* | 0.05 to 0.1 | <br>2 to 4 fl oz<br>3.2 to 6.4 fl oz | Do not apply within 60 days of harvest. Do not graze or feed soybean forage or hay. For Pounce, apply a minimum of 1 gal of finished spray per acre by air or 5 gals by ground. For Ambush, apply a minimum of 2 gals of finished spray/a by air or 10 gals by ground. |
| Scout X-TRA<br>*RUP* | 0.012 to 0.016 | 1.7 to 2.28 fl oz | Do not apply within 21 days of harvest. Optimum gallonage: Use a minimum of 3-5 gal water/a for aerial and 5 gal water/a for ground application. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 27 fl oz/a on soybeans in 1 growing season. |
| Tracer (spinosad) | 0.031 - 0.062 | 1 - 2 fl oz | Do not apply within 28 days of harvest. Do not feed treated forage or hay to meat or dairy animals. |
| Warrior<br>*RUP* | 0.015 to 0.025 | 1.92 to 3.2 fl oz | Do not apply within 45 days of harvest. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. When applying by air, apply in a minimum of 2 gallons of water per acre. |

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## GRASSHOPPERS

In the northern plains, grasshopper egg hatch normally begins in late April to early May. Most grasshoppers emerge from eggs deposited in uncultivated ground. Soybean growers should expect to find grasshoppers feeding first along bean field margins adjacent to non-crop sites where the nymphs are hatching. Later infestations may develop when grasshopper adults migrate from harvested small grain fields. Grasshoppers will feed upon leaves and pods, chewing holes in them. A result of these migrations is soybean fields becoming sites for significant egg laying.

**Threshold:**

Grasshopper control is advised whenever 50 or more small nymphs per square yard can be found in adjacent, non-crop areas, or when 30 or more nymphs per square yard can be found within the field. When 20 or more adults per square yard are found in field margins or 8 to 14 adults per square yard are occurring in the crop, treatment would be justified.

Many of the grasshopper infestations in soybeans will be the heaviest on the field margins. Treating these areas may lessen the total numbers of grasshoppers successfully entering a field.

Soybeans are most sensitive to defoliation during pod development (Growth stages R4 to R6). During this time, plants can only tolerate up to 20% defoliation. Of greater concern, would be direct feeding damage to pods and seeds. Grasshoppers are able to chew directly through the pod walls and damage seed directly. If more than 5 to 10% of the pods are injured by grasshoppers, an insecticide application would be recommended.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL<br>*RUP* | 0.03 to 0.05 | 5.8 to 9.6 fl oz | Do not apply within 21 days of harvest. Do not feed or graze livestock on treated plants. A **reduced rate** has been issued as a state 2 (ee) label. These lower rates are for control of first and second stage grasshoppers, ONLY. The reduced rate application has a range of 3.9 - 5.8 fl oz. |

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Baythroid *RUP* | 0.033 - 0.044 | 2.1 - 2.8 fl oz | Do not apply within 45 days of harvest. Maximum number of applications of 4 per season. |
| carbaryl (Sevin) | 1 to 1.5 | rate varies by formulation | Do not apply within 21 days of harvest or 14 days of grazing or harvest for forage. Recommended use rates vary according the age of the grasshoppers. |
| dimethoate (Digon 400, Dimethoate 400) | 0.5 | 1 pt | Do not harvest within 21 days of last application. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried. |
| Furadan 4F *RUP* | 0.125 to 0.25 | 0.25 to 0.5 pt | Do not make more than 2 foliar applications per season. Do not apply within 21 days of harvest. Do not graze or feed foliar treated forage to livestock or cut for silage or hay. Minimum gallonage requirements: 20 gals of finished spray per acre with ground equip, 1 ½ gals per acre with aircraft. |
| Lorsban 4E *RUP* | 0.25 to 0.5 | 0.5 to 1 pt | Low rate effective on 1st and 2nd instar nymphs. Do not apply last treatment within 28 days of harvest nor apply last treatment closer than 14 days apart. Do not graze or feed treated forage to meat or dairy animals. |
| Mustang *RUP* | 0.04 to 0.05 | 3.4 to 4.3 fl oz | Do not apply within 21 days of harvest for soybeans. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. |
| Penncap-M *RUP* | 0.5 to 0.75 | 2 to 3 pts | Do not apply within 20 days of harvest or grazing. Do not apply more than twice per season. Do not enter treated fields within 48 hours after application. Fields must be posted. |
| Scout X-TRA *RUP* | 0.016 to 0.024 | 2.28 to 3.4 fl oz | Do not apply within 21 days of harvest. Optimum gallonage: Use a minimum of 3-5 gal water/acre for aerial application and 5 gal water/acre for ground application. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 27 fl oz/acre on soybeans in 1 growing season. |
| Warrior *RUP* | 0.025 to 0.03 | 3.2 to 3.84 fl oz | Do not apply within 45 days of harvest. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. When applying by air, apply in a minimum of 2 gallons of water per acre. |

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## BEAN LEAF BEETLE

This beetle can vary in color from yellow to reddish brown, and may have three to four black spots with a black border on the wing covers. Adults emerge from overwintering, moving into bean fields as the seedlings emerge. The white larvae develop in the soil, feeding on the roots and nodules. New adults emerging in August feed on foliage and pods. Feeding injury to leaves appears as small round holes between the leaf veins. Injury to pods appears as lesions similar in size and shape to leaf feeding holes. The injury to pods results in secondary infections by fungi and bacteria, causing rotting and discoloration.

**Threshold**:

Due to low incidence of this insect in North Dakota, no local control guidelines have been developed. Based on information from other regions where these insects are a common pest, use a sweep net to determine if bean leaf beetles are present. Treatment would be recommended when 3 to 7 beetles per sweep are found.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.03 to 0.05 | 5.8 to 9.6 fl oz | Do not apply within 21 days of harvest. Do not feed or graze livestock on treated vines. |
| Baythroid *RUP* | 0.025 - 0.044 | 1.6 - 2.8 fl oz | Do not apply within 45 days of harvest. Maximum number of applications of 4 per season. |

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| carbaryl (Sevin) | 0.5 to 1.5 | rate varies by formulation | Do not apply within 21 days of harvest or 14 days of grazing or harvest for forage. |
| dimethoate (Digon 400, Dimethoate 400) | 0.5 | 1 pt | Do not harvest within 21 days of last application. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried. |
| Lannate LV *RUP* | 0.23 to 0.45 | 0.75 to 1.5 pts | Do not apply within 14 days of harvest. Do not make more than 3 applications per crop. |
| Lorsban 4E *RUP* | 0.5 to 1 | 1 to 2 pts | Do not apply last treatment within 28 days of harvest nor apply last treatment closer than 14 days apart. Do not graze or feed treated forage to meat or dairy animals. |
| Mustang *RUP* | 0.35 to 0.05 | 3.0 to 4.3 fl oz | Do not apply within 21 days of harvest for soybeans. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. |
| Penncap-M *RUP* | 0.5 to 0.75 | 2 to 3 pts. | Do not apply within 20 days of harvest or grazing. Do not apply more than twice per season. Do not enter treated fields within 48 hours after application. Fields must be posted. |
| permethrin<br>Pounce 3.2 EC<br>Ambush *RUP* | 0.05 to 0.1 | <br>2 to 4 fl oz<br>3.2 to 6.4 fl oz | Do not apply within 60 days of harvest. Do not graze or feed soybean forage or hay. For Pounce, apply a minimum of 1 gal of finished spray per acre by air or 5 gals by ground. For Ambush, apply a minimum of 2 gals of finished spray per acre by air or 10 gals by ground. |
| Warrior *RUP* | 0.015 to 0.025 | 1.92 to 3.2 fl oz | Do not apply within 45 days of harvest. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. When applying by air, apply in a minimum of 2 gallons of water per acre. |

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## POTATO LEAFHOPPER

The adult is wedge-shaped and pale green in color. Adults are very active, jumping or flying when disturbed. Nymphs are wingless. Both adults and nymphs run backwards or sideways rapidly when disturbed. Nymphs feed on the underside of the leaf, usually completing their growth on the leaves near where they hatched. Large numbers of adults may appear early in the season, but their presence is dependent on migration from the eastern US.

Soybeans with moderate to dense pubescence, or plant hairs, are tolerant to leafhopper infestations. The short plant hairs form a barrier that discourages leafhoppers from feeding and ovipositing eggs on plant tissue. When feeding does occur, damage by leafhoppers is referred to as hopper-burn. Foliage becomes dwarfed, crinkled, and curled. Small triangular brown areas appear at the tips of leaves, gradually spreading around the entire leaf margin. Potential damage to soybeans by potato leafhopper is not fully understood. Damage would be more likely when drier growing conditions occur.

**Threshold:**
The threshold for basing spray decisions is when an average of 5 leafhoppers per plant are found in the vegetative stages, and 9 leafhoppers per plant in early bloom stages.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.015 to 0.03 | 2.9 to 5.8 fl oz | Do not apply within 21 days of harvest. Do not feed or graze livestock on treated vines. |
| Baythroid *RUP* | 0.013 - 0.025 | 0.8 - 1.6 fl oz | Do not apply within 45 days of harvest. Maximum number of applications of 4 per season. |
| carbaryl (Sevin) | 1 | rate varies by formulation | Do not apply within 21 days of harvest or 14 days of grazing or harvest for forage. |
| dimethoate (Digon 400, Dimethoate 400) | 0.5 | 1 pt | Do not harvest within 21 days of last application. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried. |

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Mustang<br>*RUP* | 0.35 to 0.05 | 3.0 to 4.3 fl oz | Do not apply within 21 days of harvest for soybeans. Do not graze or harvest treated soybean forage, straw, or hay for livestock feed. |
| Penncap-M<br>*RUP* | 0.5 to 0.75 | 2 to 3 pts. | Do not apply within 20 days of harvest or grazing. Do not apply more than twice per season. Do not enter treated fields within 48 hours after application. Fields must be posted. |
| permethrin<br>Pounce 3.2 EC<br>Ambush<br>*RUP* | 0.05 to 0.1 | <br>2 to 4 fl oz<br>3.2 to 6.4 fl oz | Do not apply within 60 days of harvest. Do not graze or feed soybean forage or hay. For Pounce, apply a minimum of 1 gal of finished spray per acre by air or 5 gals by ground. For Ambush, apply a minimum of 2 gals of finished spray per acre by air or 10 gals by ground. |
| Scout X-TRA<br>*RUP* | 0.012 to 0.016 | 1.7 to 2.28 fl oz | Do not apply within 21 days of harvest. Optimum gallonage: Use a minimum of 3-5 gal water/acre for aerial application and 5 gal water/acre for ground application. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Do not apply more than 27 fl oz/acre on soybeans in 1 growing season. |
| Warrior<br>*RUP* | 0.015 to 0.025 | 1.92 to 3.2 fl oz | Do not apply within 45 days of harvest. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. When applying by air, apply in a minimum of 2 gallons of water per acre. |

*RUP* - Restricted use pesticide

## SOYBEAN APHID

A new aphid pest feeding on soybeans was found in the midwestern states of Michigan, Illinois, Wisconsin, Iowa, and Minnesota in late July and early August of 2000. It was confirmed that this aphid was the **soybean aphid**, *Aphis glycines*, an aphid native to Asia but never reported in the United States prior to this discovery. Soybean aphid was found in North Dakota in August, 2001. The aphid is generally established in the eastern half of the state, but there are still many questions about the populations levels surviving through the winter.

The soybean aphid is light yellow with black cornicles ("tail-pipes") and a pale colored cauda (tail projection). As with other aphids, the soybean aphid is small, about the size of a pinhead. Nymphs are smaller.

Aphids suck fluid from plants. When infestations are large, infested leaves are wilted or curled. The aphids excrete honeydew, a sweet substance that accumulates on surfaces of lower leaves and promotes the growth of sooty mold. This aphid colonizes tender leaves and branches from seedling to blooming. Later, as the growing point slows, the aphids slow their reproductive rate, move down to the middle and lower part of the plant, and feed on the undersides of leaves. Towards the end of the season the colonies begin to rapidly increase in number, again. These increases are followed by a migration to the overwintering, alternate host, buckthorn. Future observations will lead to a better understanding of what soybean aphid will do in the US.

**Threshold**:

Currently, the guidelines for making soybean aphid treatment decisions are:

- Begin scouting soybean fields at the V3 to V4 stage to determine if soybean aphids are present in fields. No treatment is recommended at this time and is discouraged so insecticides do not reduce the presence of predators and parasites.
- The critical growth stage for making most soybean aphid treatment decisions appears to be the late vegetative to early reproductive stages (V*n* to R3). Assessing aphid populations at this time is critical. Conclusions from 2001- 2003 management programs found that the best results from an aphid treatment occurred from mid-July to early-August.
- **Treatment** to manage soybean aphid would be **recommended** at **growth stages R1 to R4** when aphids are abundant on most plants **(*guideline: aphids number 25 or more per sampled leaflet* OR *250 total aphids per plant*)**.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | INSECTICIDE |
|---|---|---|---|
| Asana XL<br>*RUP* | 0.03 to 0.05 | 5.8 to 9.6 fl oz | Do not apply within 21 days of harvest. Do not feed or graze livestock on treated plants. |
| Furadan 4F<br>*RUP* | 0.25 to 0.5 | 4 to 8 fl oz | Do not apply within 21 days of harvest. Apply in sufficient water for thorough coverage (minimum gallons: air - 2 gal/acre, ground - 20 gal/acre). |

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | INSECTICIDE |
|---|---|---|---|
| Lorsban 4E *RUP* | 0.5 to 1.0 | 1 to 2 pts | Do not apply within 28 days of harvest. Do not graze or feed forage to dairy or meat animals within 14 days after application. Do not feed straw from treated soybeans to meat or dairy animals within 28 days after application. |
| Mustang *RUP* | 0.035 to 0.05 | 3.0 to 4.3 fl oz | Do not apply within 21 days of harvest. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. Use a minimum of 2 gal finished spray by air or 10 gal finished spray by ground. |
| Penncap-M *RUP* | 0.25 to 0.75 | 1 to 3 pts | Do not apply within 20 days of harvest. Do not make more than two applications per season. |
| Pounce *RUP* | 0.1 to 0.2 | 4 to 8 fl oz | Do not apply within 60 days of harvest. Do not feed or graze livestock on treated plants. |
| Warrior *RUP* | 0.015 to 0.025 | 1.92 to 3.2 fl oz | Do not apply within 45 days of harvest. For control of first and second instars only. Do not graze or harvest treated soybean forage, straw or hay for livestock feed. When applying by air, apply in a minimum of 2 gallons of water per acre. |

*RUP* - Restricted use pesticide

## SEEDCORN MAGGOT

Seedcorn maggot attack soybean seed, preventing sprouting or weakening the seedlings. The yellowish white maggot is found burrowing in the seed, emerging stem, or the cotyledon leaves. Damage to the seedlings results in a condition called “snakeheads”, or plants without cotyledon leaves.

The adult flies emerge in spring when soil temperatures reach 50º. They deposit eggs in soil where there is abundant organic matter and decaying crop residue, or on the seed or seedling. Injury from seedcorn maggots is usually most severe during wet, cold springs and in fields with high organic matter soils. When cool, wet conditions occur during planting, the slow emergence of the seedling extends the period of time it is vulnerable to feeding by the maggot.

**Threshold**:

When conditions are wet and cool, or when planting into high crop residue conditions, seed treatments provide the best defense against injury. For additional information on seed treatments, refer to page 7.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| lindane | see specific labels for rates | | Products currently available are: Grain Guard Plus®, Seedmate Lindane 25®, and Sorghum Guard®. Lindane treated seed must not be used for, or mixed with, food or animal feed, or processed for oil. |
| permethrin | see specific labels for rates | | Products currently available are: Assault 25®, Barracuda®, and Kernel Guard Supreme®. Treated seed must not be used for, or mixed with, food or animal feed, or processed for oil. |

## SPIDER MITES

Mites are small and magnification is required to see them. A quick sampling procedure to determine whether mites are present is to hold a piece of white paper below leaves then slap them to dislodge the mites. The mites appear as tiny dust specks, however, they will move after being knocked off the leaf. Feeding damage by mites first appears as small yellow spots ("stipples"). As feeding activity increases, leaves become yellow, bronzed, brown, and eventually shed from the plant.

Mites usually become a problem when hot, dry weather occurs. These environmental conditions stress the plant, whether mites are present or not. If conditions continue, treating for mites is no guarantee plants will recover. In addition, products labeled for mite control often do not give adequate control and the population of mites may rebound quickly to pretreatment levels or higher. When rain and humidity are present, natural reductions in mite populations occur due to infection by a fungal pathogen. Conditions that are good for the development of the pathogen are temperatures cooler than 85 , with at least 90% R.H. for 12 to 24 hours.

**Threshold**:
Deciding whether to treat is difficult. There is no economic threshold that has clearly been defined. Kansas State University suggests that treatments may be beneficial if significant pod or seed filling remain and leaves have not already yellowed. Plants that lose 50% of their foliage during bloom and pod set will stop producing flowering structures until favorable growing conditions resume or lost leaf area is replaced. If mite injury is evident within the interior of the field, and hot, dry conditions continue, the potential exists for economic populations throughout the field in 1 to 2 weeks.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| dimethoate (Digon 400, Dimethoate 400) | 0.5 | 1 pt | Do not harvest within 21 days of last application. Do not feed or graze within 5 days of last application. Do not enter treated fields without protective clothing until sprays have dried. |
| Lorsban 4E *RUP* | 0.25 to 0.5 | 0.5 to 1 pt | Do not apply last treatment within 28 days of harvest nor apply last treatment closer than 14 days apart. Do not graze or feed treated forage to meat or dairy animals. |

*RUP* - Restricted use pesticide

# CANOLA INSECTS

## FLEA BEETLES

Flea beetles are the most serious pest of canola in North Dakota. The adult beetles feed on the emerging cotyledon and first true leaves of the young plant. Feeding injury can result in plant death and significant stand loss, especially during hot, dry weather.

Flea beetles overwinter as adults. They become active when temperatures reach 58°F. The beetles fly to canola, rapeseed, and other mustards, moving into fields just as the seedlings emerge. The feeding injury appears as holes or small pits in the cotyledons and leaves. Injury can range from a few shot holes to destruction of the entire plant. Flea beetles feed most actively when the weather is sunny, warm, and dry. Beetle activity is less when weather conditions are cool and damp. When warm, dry conditions exist and feeding injury is occurring, the plant can be stressed quickly. Cool, damp conditions can reduce the feeding intensity of the beetles and aid plant growth to the point where they can withstand the feeding damage. Once the crop is beyond the seedling stage and the first true leaves are fully expanded, serious damage usually does not occur. By mid-June, adult beetles decrease in number.

**Flea Beetle Management:**

**Early Planting** . . . The early planting and establishment of canola can prevent significant injury to young plants by flea beetles migrating to fields after the first true leaves are fully expanded.

**Seed Treatment** . . . Gaucho®, Helix®, Poncho®, and Prosper® are for use by commercial seed treaters.

**Foliar Treatment** . . . Fields should be checked daily for the presence of flea beetles while canola plants are at risk. The treatment threshold is when injury is approaching 25% and beetles are present. Foliar treatments must be made quickly. The weakness of foliar control strategies is the inability to cover large number of acres quickly when feeding pressure is high, and residual protection by the insecticides is short, allowing for reinfestation to occur.

## CUTWORMS

Most damage by cutworms occurs during seedling stage. Army cutworm feeding as early as late April has caused problems in recent years for canola growers in southwestern North Dakota. Cutworm damage consists of young plants being chewed off slightly below or at ground level. Some cutworm feeding injury may occur on foliage. Cutworms primarily feed at night. When checking canola fields for cutworms during the day, dig down into soil an inch or two around recently damaged plants; there you can find the gray to gray-brown larva.

**Threshold**:

Treatment is warranted when one cutworm or more is found per 3 feet of row and the larvae are small (<3/4 inch long).

## DIAMONDBACK MOTH

Diamondback moths move to canola, rapeseed, and other mustard hosts in late spring and early summer. The first eggs are laid on the lower leaves. The small, greenish larvae make tiny, irregular holes in the leaves. Moths of later generations lay eggs higher on the plant. These hatching larvae feed first on leaves, moving later to buds, flowers, and developing seedpods. Foliar damage by diamondback moth larvae looks bad, but significant yield losses are not common. Damage would be much worse when plants are under drought or heat stress.

**Threshold:**

Treat when larval counts reach 25 to 30 per square foot, or 1 to 2 larvae per plant, and there is significant evidence of damage to flowers and/or pods.

## BERTHA ARMYWORMS

The Bertha armyworm attacks many kinds of broad leaf plants including canola, flax, and beans. Areas of North Dakota where this insect may be found include the north central counties of Bottineau, Rollette, Towner, and neighboring areas. The larvae are pale green when they first hatch. These larvae feed on the leaves. Older larvae reach a length of 3/4 to 1 inch and will be velvety brown to black with a yellowish band along each side of the body. As leaves dry, these larvae begin feeding on seeds and flowers which are more succulent. The greatest risk of crop injury occurs in August as the worms approach full growth. In Canada, where this insect is a more frequent pest, early seeded canola often has been swathed prior to the occurrence of significant feeding injury.

**Threshold**:

Thresholds would be 18 to 22 larvae per square yard, as long as leaf feeding is the extent of the damage observed. Thresholds may be adjusted lower if larvae are found feeding on maturing seed pods.

## GRASSHOPPERS

**Thresholds:**

Grasshopper control is advised whenever 20 or more adults per square yard are found in field margins or 8 to 14 adults per square yard are occurring in the crop. (For more information on infestation ratings, see the discussion under Grasshoppers in Small Grain Insects).

**Insecticides registered for controlling insects in Canola**

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Capture 2 EC<br>*RUP* | 0.033 - 0.04 | 1.3 - 2.6 fl oz | Do not apply within 35 days of harvest. For flea beetles, reduced rate is issued as a state 2 (ee) label. Apply in a minimum of 2 gals. of finished spray per acre by air or in a minimum of 10 gals. per acre by ground. When applying by air, 1 to 2 quarts of emulsified oil may be substituted for 1 to 2 qts of water in the finished spray. |
| clothianidin<br>Poncho<br><br>Prosper<br>(fungicide premix) | | 3.84 - 10.23 fl oz per 100 lbs of seed<br><br>19.2 - 25.6 fl oz per 100 lbs of seed | For use in commercial seed treaters only. Not for use in hopper-box, slurry-box or other seed treatment applications at, or immediately before, planting. Provides protection from flea beetle feeding injury. Rates can be varied depending on assessment of flea beetle risk based on population size observed. |
| Gaucho 600<br>(Imidacloprid) | | 10.24 - 25.6 fl oz per hundredweight of seed | Primarily for use in commercial seed treaters. Canola seed may be treated as an end-use seed treatment on agricultural establishments at, or immediately before planting, using a liquid or slurry treatment device. Provides protection from flea beetle feeding injury. Rates can be varied depending on assessment of flea beetle risk based on population size observed. |
| thiamethoxam<br>Helix<br>(10.3 % active)<br><br>Helix Xtra<br>(20.7% active) | | 23 fl oz per hundredweight of seed | For use in commercial seed treaters only. The formulations vary by the concentration of insecticide. Provides protection from flea beetle feeding injury. Helix contains 3 fungicides to protect against seed-borne blackleg, seed-borne *Alternaria*, and the seedling disease complex disease. There is a 30 day plant back restriction. |
| Methyl parathion 4EC<br>*RUP* | 0.5 | 1 pt | Apply using a minimum of 3 GPA. Do not apply within 25 days of harvest. Do not enter treated fields within 48 hours after application. Fields must be posted. |
| Warrior<br>*RUP* | 0.015 - 0.03 | 1.92 - 3.84 fl oz | Do not apply within 7 days of harvest. When applying by air, apply in a minimum of 2 gals water/acre. |

*RUP* - Restricted use pesticide

# MUSTARD INSECTS

Yellow mustard (*Sinapis alba*) is the most common type grown in North Dakota; small acreages of brown and Oriental (Brassica juncea) are also being grown. These mustards are grown for the seed and used as a condiment. Insects that affect canola may also affect mustard grown for seed. Fortunately, these insects have not caused serious problems for mustard seed on an annual basis.

## FLEA BEETLES

Mustard grown for seed has generally not been at risk to significant flea beetle feeding injury. However, circumstances can develop that put mustard seedlings at greater risk.

This crop has demonstrated greater tolerance to flea beetle feeding and is less attractive to the beetles when canola is available. However, if delays in emergence *(cold soils, mid-May snows, etc.)* of all mustards occurs, particularly canola, mustard plants may also be vulnerable. If canola is not available to attract beetles, mustard plants may attract beetles in large numbers and put the crop at greater risk to stand loss. Once the crop advances beyond the seedling stage, serious damage usually does not occur, since vigorously growing mustard can outgrow the beetle defoliation. No major effects on plant vigor have been noted from the feeding of the larvae on plant roots.

Insecticides are not generally available for use in mustard seed production. Insecticides for mustard greens are numerous, but are not permitted for use in mustard seed. Insecticides labeled for canola are not approved for use in mustard grown for seed. It is hoped that efforts underway to address insecticide availability for this crop will be successful.

In December 2003, the insecticide **seed treatment** Gaucho 600 was labeled for use on mustard grown for seed. As with canola, mustard seed growers now have an insecticide option that can provide some early season protection from flea beetle feeding, but they must plan on this approach as they acquire planting seed in the winter.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Gaucho 600 (Imidacloprid) | | 10.24 - 25.6 fl oz per hundredweight of seed | For use in commercial seed treaters only. The label does **NOT** allow for use in hopper-box, slurry-box or other seed treatment applications at, or immediately before, planting for mustard. Provides protection from flea beetle feeding injury. Rates can be varied depending on assessment of flea beetle risk based on population size observed. |

*RUP* - Restricted use pesticide

# SUNFLOWER INSECTS

## BANDED SUNFLOWER MOTH

Banded sunflower moths (BSM) were a major concern in recent seasons. Heavy infestations occurred in the southeast quarter of the state in 2001 and 2002, large moth flights were observed and treated by producers.

BSM begin to emerge form the soil about mid-July. Peak activity normally occurs about the last week of July or the first week of August. Moths fly from last years field to the current year's field. At this time moths congregate around field margins. The moths move to fields during the bud stage, with a preference for the mid-bud stage. Eggs are laid on the back of the bud and the outside of the bracts. The newly hatched larvae move from these sites to the face of the flower and begin feeding on bracts and florets.

In the past, the procedure for determining infestation potential is based on surveying for moths in the field early in the morning or evening. Count the number of moths found on 20 plants from each of 5 sites in the field. Observing moth activity around field margins was used by many growers and consultants during 2000.

In 1995, a new sampling strategy based on scouting for adult moth during daylight hours was published in the extension bulletin E823 - Banded Sunflower Moth. Please obtain a copy of this publication for complete details for determining the economic threshold, scouting, and timing of treatments based on this method.

**Threshold:**

When 1 moth for every 2 plants inspected can be found, treatments should be considered. Because the moths initially congregate around field margins prior to flowering, treatment of the field margins has reduced the adult population.

The **banded moth**, **seed weevil**, and the **Lygus bug** have all impacted quality of **confection sunflowers** the past three to four seasons. It is recommended at this time, that **sunflowers grown for these markets be treated a minimum of two times**, once at early flowering and again 5 to 7 days later. With this type of program, a window of protection should be provided to minimize impact from all three of these seed damaging insect pests.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Do not apply within 28 days of harvest. |
| Baythroid *RUP* | 0.031 - 0.044 | 2.0 - 2.8 fl oz | Do not apply within 30 days of harvest. |
| Furadan 4F *RUP* | 0.5 | 1 pt | Do not apply within 28 days of harvest. |
| Lorsban 4E *RUP* | 0.5 - 0.75 | 1 - 1.5 pts | Do not apply within 42 days of harvest. Do not allow livestock to graze in treated areas. |
| Scout X-TRA *RUP* | 0.014 - 0.0164 | 2 - 2.33 fl oz | Do not apply within 21 days of harvest. |
| Warrior *RUP* | 0.02 - 0.03 | 2.56 - 3.84 fl oz | Do not apply within 45 days of harvest. |

*RUP* **-** Restricted use pesticide

## SUNFLOWER MOTH

The sunflower moth migrates to North Dakota from southern states. Because of the migratory nature of the insect, it has not been a major problem in North Dakota in recent years. This grayish-tan moth moves into fields in early bloom. It deposits its eggs on the face of the flower. Damage is similar to that caused by the banded moth. The same monitoring strategies are recommended for sunflower moth as those for the banded moth.

**Threshold:**
When 1 to 2 moths are found for every 5 plants inspected, treatments should be considered.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Do not apply within 28 days of harvest. |
| Baythroid *RUP* | 0.031 - 0.044 | 2.0 - 2.8 fl oz | Do not apply within 30 days of harvest. |
| Endosulfan 3EC (Phaser, Thiodan) | 1 | 1.33 qts | Make first application at early bloom; 1 - 2 repeat applications may be necessary at 4 to 7 day intervals. No preharvest interval. Do not enter treated fields within 48 hours after application. Fields must be posted. |
| Furadan 4F *RUP* | 0.5 | 1 pt | Do not re-enter treated fields within 14 days of application without wearing protective clothing. Do not harvest within 28 days of last application. |
| Lorsban 4E *RUP* | 0.5 - 0.75 | 1 - 1.5 pts | Do not apply within 42 days of harvest. Do not allow livestock to graze in treated areas. Do not apply more than 9 pints per acre per season. |
| Methyl parathion 4EC *RUP* | 1 | 2 pts | First application at onset of bloom. Make no more than 3 applications at 5 day intervals. Do not apply within 30 days of harvest. Do not feed seeds to birds. Do not enter treated fields within 48 hours of methyl parathion or 3 days ethyl parathion. Fields must be posted. |
| Scout X-TRA *RUP* | 0.014 - 0.0164 | 2 - 2.33 fl oz | Do not apply within 21 days of harvest. |
| Warrior *RUP* | 0.02 - 0.03 | 2.56 - 3.84 fl oz | Do not apply within 45 days of harvest. |

*RUP* - Restricted use pesticide

## SUNFLOWER SEED WEEVIL

The red sunflower seed weevil begins to emerge in early July and continues until mid-August. Peak emergence occurs in late July. Start counting adult seed weevils when the yellow ray petals are just beginning to show. Counts should continue until the economic threshold level has been reached or most plants have reached 70 percent pollen shed. A plant that has reached 70 percent pollen shed has few seeds still suitable for red seed weevil egg laying. Fields where most plants are at the 70 percent pollen shed stage should no longer be susceptible to further significant damage.

When sampling, use the X pattern and begin counting at least 70 to 100 feet into the field to avoid field margin effects. Count the number of weevils on five plants at each site for a total of 25 plants. The ideal plant stage for treatment is when most individual plants are at 40 percent pollen shed. However, we recommend that treatment be considered when three out of 10 plants are just beginning to shed pollen.

**Threshold:**

**Oilseed Sunflower** . . . The threshold can be calculated using the following formula.

$$\textbf{Threshold (Weevils per head)} = \frac{\textbf{Cost of Insecticide Treatment}}{\textbf{(Market Price x 21.5) (0.000022 x Plant Population + 0.18)}}$$

*example for calculating threshold*: **Price for Oilseed Sunflowers =** $0.12

| Plant Population | Treatment Cost ($) | | | | | |
|---|---|---|---|---|---|---|
| | 6.00 | 7.00 | 8.00 | 9.00 | 10.00 | 11.00 |
| 17,000 | 4 | 5 | 6 | 6 | 7 | 8 |
| 18,000 | 4 | 5 | 5 | 6 | 7 | 7 |
| 19,000 | 4 | 5 | 5 | 6 | 6 | 7 |
| 20,000 | 4 | 4 | 5 | 6 | 6 | 7 |
| 21,000 | 4 | 4 | 5 | 5 | 6 | 7 |
| 22,000 | 4 | 4 | 5 | 5 | 6 | 6 |
| 23,000 | 3 | 4 | 5 | 5 | 6 | 6 |
| 24,000 | 3 | 4 | 4 | 5 | 5 | 6 |
| 25,000 | 3 | 4 | 4 | 5 | 5 | 6 |

**Estimation of absolute red sunflower seed weevil adults when sampling using a commercial formulation of mosquito repellent.**

| Number counted in the field | Absolute number | Number counted in the field | Absolute number | Number counted in the field | Absolute number |
|---|---|---|---|---|---|
| 1 | 1.4 | 7 | 12.4 | 13 | 23.1 |
| 2 | 2.9 | 8 | 14.2 | 14 | 24.9 |
| 3 | 4.4 | 9 | 16.0 | 15 | 26.6 |
| 4 | 5.8 | 10 | 17.8 | 16 | 29.3 |
| 5 | 7.3 | 11 | 19.5 | 17 | 31.1 |
| 6 | 10.7 | 12 | 21.3 | 18 | 32.9 |

**Confection or Hulling Sunflower Market** . . . red sunflower seed weevil control on confection sunflower is based on a need to keep seed damage below 3 or 4 percent due to industry standards. Treatment is recommended when 1 to 2 weevils are found per plant.

The **banded moth**, **seed weevil**, and the **Lygus bug** have all impacted quality of these sunflowers the past three to four seasons. It is recommended at this time that **sunflowers grown for these markets be treated a minimum of two times**, once at early flowering and again 5 to 7 days later. With this type of program, a window of protection should be provided to minimize impact from all three of these seed damaging insect pests.

Growers should plan treatment schedules early. When flowers begin blooming across the region, competition for access to aerial applicators increases.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Do not apply within 28 days of harvest. |
| Baythroid *RUP* | 0.031 - 0.044 | 2.0 - 2.8 fl oz | Do not apply within 30 days of harvest. |
| Furadan 4F *RUP* | 0.5 | 1 pt | Do not re-enter treated fields within 14 days of application without wearing protective clothing. Do not harvest crop within 28 days of application. |

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Lorsban 4E *RUP* | 0.5 - 0.75 | 1 - 1.5 pts | Do not apply within 42 days of harvest. Do not allow livestock to graze in treated areas. |
| Methyl parathion 4EC *RUP* | 1 | 2 pts | Do not apply within 30 days of harvest. Do not feed seeds to birds. Do not enter treated fields within 48 hours after application. Fields must be posted. |
| Scout X-TRA *RUP* | 0.014 - 0.0164 | 2 - 2.33 fl oz | Do not apply within 21 days of harvest. |
| Warrior *RUP* | 0.02 - 0.03 | 2.56 - 3.84 fl oz | Do not apply within 45 days of harvest. |

*RUP* - Restricted use pesticide

## SUNFLOWER MIDGE

The midge is a small fly, 3/32 inch in length, that is tan colored. The midge emerges in early July. They prefer to lay eggs on developing buds, 1 to 2 inches in diameter. The cream to yellowish-orange larvae feed on bract tissue at first and later on the flowers and seeds. When populations are low and feeding is confined to the bracts, damage results in little economic loss. At higher populations, seed production is reduced or prevented. This type of injury appears as twisted and gnarled flowers. Often, infestations will be limited to field margins. When populations are large, damage may extend into the field and significant field losses may be observed. Historically, infestations and losses have increased with increased sunflower production. Also, environmental conditions contribute to midge outbreaks. Good soil moisture in the month of June promotes survival and emergence of midge.

**Threshold:**

There are no effective chemical controls currently recognized for this pest. The best management strategy has been **rotation** to crops other than sunflower in the vicinity of large infestations. Staggering **planting dates** to promote different budding periods between fields, aids in reducing risk of damage to all fields in the same geographic areas. Sunflower hybrids have recently been evaluated for their tolerance to sunflower midge. **Selecting hybrids** for their ability to tolerate infestations should be considered when choosing seed for the upcoming season. Contact your Agricultural Extension Agent for information which summarizes the midge tolerance ratings for evaluated hybrids.

## LYGUS BUG / TARNISHED PLANT BUG

Concerns have been raised during the past three seasons about damage to **confection sunflower seeds**. The damage has been named “kernel brown spot” because of the dark spot on the kernel. All evidence suggests the problem is due to feeding by Lygus on the developing seed.

Lygus are noted for being a pest of seed production to many crops. Their feeding preference is meristematic tissue, embryonic tissue, or new growth of any kind. Lygus insert their mouthparts into the host, start a "pre-digestion pump" to inject saliva and start digestion, then suck the fluid into the stomach. This is where the seed injury originates. The saliva is toxic to plant tissue, helping reduce the plant fluid into a digestible source. The result in sunflower seeds is the brown to black spot resulting from tissue death at that feeding site.

There is still much to learn about Lygus and sunflowers in the region. In the mean time, to minimize the damage which result in a quality reduction, a general approach to protecting sunflower from Lygus and other seed feeding insects is being recommended.

Sunflower is susceptible to Lygus damage during flowering, from anthesis through seed hardening. A number of insecticides labeled for controlling head feeding insects in sunflower are available. Of these, the organophosphate (Lorsban, Methyl Parathion, Parathion) and pyrethroid (Asana XL, Baythroid, Scout X-Tra, Warrior) insecticides are labeled for control of Lygus on numerous other crops. Lygus can be treated at the same time confection sunflower is treated for other insects, such as the seed weevil and banded sunflower moth.

**Treatment Guideline:**

**Confection** . . . Currently, NDSU Entomologists are suggesting two treatments are needed to sufficiently protect confection sunflower heads from insect feeding: One application at the onset of pollen shed, or approximately 10% bloom, followed by a second treatment 7 days later. This program should adequately control insects on confection sunflower throughout flowering, minimizing the potential feeding damage.

**Oilseed** sunflower are not believed to be at risk to damage from Lygus feeding at this time.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Lorsban 4E *RUP* | 0.5 - 1.0 | 1 - 2 pts | Do not apply within 42 days of harvest. Do not allow livestock to graze in treated areas. |

*RUP* **-** Restricted use pesticide

## SUNFLOWER STEM WEEVIL

The sunflower stem weevil can cause serious stalk breakage. This occurs when 25 to 30 larvae are present in a stalk, weakening the stalk when larvae make their overwintering cells in the stalk's base. Breakage is most likely to occur during drought stress or high winds.

The sunflower stem weevil is 3/16 inches in length, and grayish-brown with varying shaped white spots on the wing covers. The weevils emerge in mid to late June. Eggs are deposited in epidermal tissue of the stem. If controls are directed at the adults in order to minimize egg laying, treatments should be initiated during the first few days in July. About 50% of the eggs will be deposited by this weevil by mid-July.

Scouting for these insects is difficult due to their size, coloration, and habit of "playing dead". Examine 5 plants each at 5 locations and keep record of the number of weevils found. Approach plants carefully to avoid alarming the weevils, causing them to drop to the ground. Scout from late June to mid-July.

**Threshold:**

Treat for sunflower stem weevils when scouting determines that an average of 1 adult per three plants is found.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Do not apply within 28 days of harvest. |
| Baythroid *RUP* | 0.025 - 0.0375 | 1.6 - 2.4 fl oz | Do not apply within 30 days of harvest. |
| carbaryl (Sevin) | 1 - 2 | rate varies by formulation | Do not apply within 60 days of harvest. Do not allow livestock to graze on treated forage. |
| Furadan 4F *RUP* | 0.5 | 1 pt | Restrictions same as indicated in seed weevil section. |
| Lorsban 4E *RUP* | 0.5 | 1 pt | Treat about 5 to 7 days after adult stem weevils begin to appear. Do not apply within 42 days of harvest. Do not allow livestock to graze in treated areas. Do not apply more than 9 pints per acre per season. |
| Scout X-TRA *RUP* | 0.014 - 0.0164 | 2 - 2.33 fl oz | Do not apply within 21 days of harvest. |
| Warrior *RUP* | 0.02 - 0.03 | 2.56 - 3.84 fl oz | Do not apply within 45 days of harvest. |

*RUP* - Restricted use pesticide

## SUNFLOWER BEETLE

Sunflower beetles begin feeding shortly after they emerge from overwintering. Emergence starts in mid-May. Most feeding by the adults is concentrated on the true leaves. When beetles are numerous, as in 1994 and 1995, fields may be severely defoliated. Adults quickly begin laying pale yellow eggs singly on stems and the underside of leaves. Eggs hatch in about 8 days. The pale green, humpbacked larvae begin feeding, eating holes throughout the leaf. Larvae do not feed during the day, resting in the plant tops where they are easily observed.

**Threshold:**

**Adults** . . . Treatment is recommended when scouting determines that an average of 1 to 2 beetles per plant can be found throughout the field.

**Larvae** . . . When an average of 10 to 15 larvae per plant is found, defoliation levels of 25 to 30% would be expected. Treatment is suggested when damage levels reach this point and most larvae are 1/4 inch in size.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.015 - 0.03 | 2.9 - 5.8 fl oz | Do not apply within 28 days of harvest. A **reduced rate** has been issued as a state 2 (ee) label. These lower rates are for control of SF beetle larvae ONLY. The reduced rate application has a range of 1.45 - 5.8 fl oz. |
| Baythroid *RUP* | 0.0125 - 0.025 | 0.8 - 1.6 fl oz | Do not apply within 30 days of harvest. |
| carbaryl (Sevin) | 1.5 - 2 | rate varies by formulation | Do not apply within 60 days of harvest. Do not allow livestock to graze on treated forage. |
| Furadan 4F *RUP* | 0.125 - 0.5 | 0.25 - 1 pt | Restrictions same as indicated in seed weevil section. |

| INSECTICIDE | | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|---|
| Lorsban 4E | *RUP* | 0.5 - 0.75 | 1 - 1.5 pts | Do not apply within 42 days of harvest. Do not allow livestock to graze in treated areas. |
| Scout X-TRA | *RUP* | 0.005 - 0.01 | 0.71 - 1.42 fl oz | Do not apply within 21 days of harvest. |
| Warrior | *RUP* | 0.01 - 0.02 | 1.28 - 2.56 fl oz | Do not apply within 45 days of harvest. |

*RUP* - Restricted use pesticide

## CUTWORMS

Most damage by cutworms occurs when plants are in the early stage of development. Damage consists of young plants being chewed off slightly below or at ground level. Some cutworm feeding injury may occur on foliage. Cutworms primarily feed at night. When checking fields for cutworms during the day, dig down into soil an inch or two around recently damaged plants; there you can find the gray to gray-brown larva.

**Threshold:**

Treatment is warranted when one cutworm or more is found per square foot or there is a 25 to 30% stand reduction observed.

| INSECTICIDE | | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|---|
| Asana XL | *RUP* | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Do not apply within 28 days of harvest. |
| Baythroid | *RUP* | 0.0125 - 0.025 | 0.8 - 1.6 fl oz | Do not apply within 30 days of harvest. |
| Lorsban 4E<br><br>Lorsban 15 G | *RUP* | 1 - 2 | 2 - 4 pts<br><br>8 oz/1,000 ft of row (band at planting) | If ground is dry, cloddy or crusty at time of treatment, worms may be protected from the spray and effectiveness may be reduced. If such conditions exist, shallow cultivation using a rotary hoe or equivalent equipment before or soon after treatment may improve control. Restrictions same as for stem weevil and sunflower moth control. |
| carbaryl<br>Sevin 20% Bait<br>Sevin XLR | | 1 - 2 | <br>20 - 40 lbs<br>1.5 qts | Broadcast applications may be made with either aerial or ground equipment. Do not apply within 60 days of harvest. Do not allow animals to graze on treated crops. |
| Warrior | *RUP* | 0.01 - 0.02 | 1.28 - 2.56 fl oz | Do not apply within 45 days of harvest. |

*RUP* - Restricted use pesticide

## GRASSHOPPERS

In the northern plains, grasshopper egg hatch normally begins in late April to early May. Most grasshoppers emerge from eggs deposited in uncultivated ground. Sunflower growers should expect to find grasshopper feeding first along field margins adjacent to these sites. Later infestations may develop when grasshopper adults migrate from harvested small grain fields.

**Threshold:**

Grasshopper control is advised whenever 20 or more adults per square yard are found in field margins or 8 to 14 adults per square yard are occurring in the crop. (For more information on infestation ratings, see the discussion under Grasshoppers in Small Grain Insects).

| INSECTICIDE | | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|---|
| Asana XL | *RUP* | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Do not apply within 28 days of harvest. A **reduced rate** has been issued as a state 2 (ee) label. These lower rates are for control of first and second stage grasshoppers, ONLY. The reduced rate application has a range of 3.9 - 5.8 fl oz. |
| Baythroid | *RUP* | 0.031 - 0.044 | 2.0 - 2.8 fl oz | Do not apply within 30 days of harvest. |
| Furadan 4F | *RUP* | 0.125 - 0.5 | 0.25 - 1 pt | Restrictions same as listed in seed weevil section. |
| Lorsban 4E | *RUP* | 0.5 | 1 pt | Do not apply within 42 days of harvest. Do not allow livestock to graze in treated areas. Do not apply more than 9 pints per acre per season. |

| INSECTICIDE | | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|---|
| 6-3-methyl parathion | *RUP* | 1 | 0.88 pt | Do not apply within 30 days of harvesting, pasturing, cutting or foraging. Do not apply more than 3 times at 5 day intervals per season. Do not feed seeds to birds. Do not enter treated fields for 48 hours after application. Fields must be posted. |
| carbaryl (Sevin) | | 0.5 - 1.5 | rate varies by formulation | Do not apply within 60 days of harvest. Do not allow animals to graze on treated crops. |
| Scout X-TRA | *RUP* | 0.014 - 0.0164 | 2.0 - 2.33 fl oz | Do not apply within 21 days of harvest. |
| Warrior | *RUP* | 0.02 - 0.03 | 2.56 - 3.84 fl oz | Do not apply within 45 days of harvest. Warrior may be used in bordering, non-crop areas that are not hayed or grazed (24 c label). |

*RUP* - Restricted use pesticide

## WIREWORMS

Currently the only insecticide registered for wireworm in sunflower that provides seedling protection is thiamethoxam. To decide whether wireworms are a potential problem, refer to the discussion in the corn insects section.

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Cruiser (thiamethoxam) | refer to recommended label rate | | Follow all applicable directions, restrictions and precautions on the EPA registered label. |

# FLAX INSECTS

Flax may be infested from the time of emergence to maturity by various insect pests. Fields should be examined regularly and controls applied when infestations reach the economic threshold. The following species are potentially damaging but often occur in too low a number to cause economic loss.

## GRASSHOPPERS

Grasshoppers have been the **number one threat to North Dakota flax** in recent years. Young grasshoppers may attack young plants and cause damage. However, more damage is done to the crop before harvest by the older, larger grasshoppers. They can quickly cause large numbers of bolls to drop by chewing through the more succulent portions of the stem below the bolls. Growers need to be aware of grasshopper activity in the vicinity of flax fields well before adult migration begins in July. Because of the limited availability of insecticides to control insects in flax, attempts to reduce grasshopper populations in neighboring crops and non-crop areas is advisable.

## CUTWORMS

Two subterranean species of cutworms, the redbacked, *Euxoa ochrogaster*, and the pale western, *Agrotis orthogonia*, attack flax. The adult moths of these species lay eggs on the soil surface in weedy summer fallow fields during late summer. These eggs overwinter and the young larvae feed on flax seedlings in the spring. Cutworms usually remain below ground, cut off the young plants near the soil surface and draw them down where they are eaten. An average population of 10 cutworms per square yard can cause a 10% reduction in the yield of flax, and control should be considered.

## ARMY CUTWORM

Larvae of the army cutworm, *Euxoa auxiliaris*, damage flax and many other crops by feeding on foliage in the spring, and to a lesser degree, in the fall. It can be an important pest in southwestern North Dakota. Populations of 9 per square yard can cause significant damage.

## BERTHA ARMYWORM

The bertha armyworm, *Mamestra configurata*, was a regular pest of flax before canola and mustard were grown on the Prairies. However, since their widespread introduction, the bertha armyworm rarely causes economic damage to weed-free flax fields. If bertha armyworm-infested canola fields are swathed and green flax fields are nearby, the flax can suffer significant damage from invading larvae. When abundant, bertha armyworms cause serious damage by chewing through the stems below the bolls causing them to drop to the ground. Young bertha larvae are green but larger larvae are usually velvet-black.

## ASTER LEAFHOPPER

The aster leafhopper, *Macrosteles quadrilineatus*, can damage flax. This insects feeds by sucking juices from the flax plants. More importantly, aster leafhoppers can carry the aster yellows mycoplasm and the crinkle virus, and can infect the plants with these diseases while feeding. The damage from these insects is most serious on late-seeded crops.

## WIREWORMS

Wireworms, although often serious pests of cereal grains in the seedling stage, seldom damage flax.

**Insecticides Registered for controlling insects in Flax**

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| carbaryl (Sevin) | 0.5 - 1.5 | rate varies by formulation | Do not apply within 42 days of harvest for seed or straw. Do not apply more than a total of 3 lbs of active ingredient per acre per crop. |

# PULSE CROP INSECTS

## FIELD PEA

In North Dakota, there have been few insects that have been of economic importance in field pea.

## PEA APHID

The most common insect pest found in field pea is the pea aphid. They are small, about 1/8+ inch long, and pale green. In North Dakota, aphids usually do not reach economic levels in field pea. Aphid populations are usually kept low by heavy rains or by beneficial insects such as parasitic wasps and predators such as lady bird beetle and lacewings.

**Threshold:**

Canadian entomologists suggest the following guideline. An insecticide application may be needed if there are more than 10 aphids found on a plant during the period between formation of the 10th node and appearance of the first flower. Population estimates should be calculated by averaging the counts taken from at least five separate areas of the field. To avoid reoccurrence of the problem after spraying, delay application of insecticide until late flowering. One application per season should give satisfactory control.

## LYGUS BUG

The lygus bug or "tarnished plant bug" has been documented as a serious pest of many fruit and vegetable crops, but has not yet been demonstrated to cause significant problems in North Dakota field pea. Lygus bugs feed preferentially on meristematic tissue or developing reproductive tissue. Damage to flower buds or developing seeds occurs in other legume crops. It was suspected that Lygus feeding caused a problem referred to as “chalk spot”. It is a chalky white spot which may appear on the cotyledons of some legumes. It affects the appearance of the seed, lowering the grade and marketability. In 1996, chalk spot was a major concern in the North Dakota pea crop; however, no evidence was found that lygus bug caused the damage. The probable cause was pea being harvested at too high a moisture content. Peas harvested at high moisture levels are susceptible to bruising when harvested or handled roughly, resulting in damage similar to chalk spot.

**Threshold:**

None has been determined for the region.

## GRASSHOPPERS

Grasshoppers are usually not a major problem in pea. Pea is not typically a preferred host, but grasshoppers can cause damage to field pea, especially during the flower to pod-filling stages.

**Threshold:**

As with many crops, grasshopper control is advised whenever 20 or more adults per square yard are found in field margins or 8 to 14 adults per square yard are occurring in the crop.

**Insecticides approved for use in Field Pea**

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Do not apply within 21 days of harvest. |
| carbaryl (Sevin) | 0.5 - 1.5 | rate varies by formulation | Do not apply within 21 days of harvest. Do not apply within 14 days of graze or harvest for forage. |
| dimethoate (Digon 400, Dimethoate 400) | 0.125 - 0.5 | 0.33 - 1 pt | Labeled for aphid control. Peas may be harvested mechanically on day of application. Do not feed or graze hay within 21 days of last application. Do not make more than one application per season. |
| Lannate LV<br>Lannate SP<br>*RUP* | 0.45 - 0.9 | 1.5 - 3 pts<br>0.5 - 1 lb | Do not apply within 1day of harvest. Of the three insects listed above, the label only includes pea aphid. |
| Mustang<br>*RUP* | 0.04 - 0.05 | 3.4 - 4.3 fl oz | Do not apply within 21 days of harvest. Label includes aphid, grasshopper, and plant bugs. |

*RUP* **-** Restricted use pesticide

# LENTIL

In North Dakota, lentil generally has not suffered enough damage by insects to warrant insecticide application. Some insects that have potential to damage lentil include aphids, grasshoppers, lygus bugs, thrips, seedcorn maggots, and wireworms.

## PEA APHID

The most common insect pest found in lentil is the pea aphid. They are small, about 1/8+ inch long, and pale green. In North Dakota, aphids usually do not reach economic levels in field pea. Aphids have many natural enemies, including lady bird beetles, parasitic wasps, lacewings, and syrphid flies, but chemical control may be necessary if these insects do not keep aphids at subeconomic levels. Insecticide treatment for pea aphid control should be considered (1) when an economic threshold of 30–40 aphids are collected per 180 sweep of a 38 cm (15 inch) diameter insect net, (2) when few natural enemies are present, and (3) when aphid numbers do not decline over a 2-day period (Homan et al. 1991).

## LYGUS BUG / TARNISHED PLANT BUG

Lygus bug feeding on the immature reproductive structures of lentils causes seed and pod abortion, as well as a serious seed-quality problem known as "chalk spot". This problem has been reported for lentil in the Pacific Northwest production areas, but has not been seen as a significant problem in North Dakota. Lygus bugs feed with piercing, sucking mouthparts and inject toxic saliva into the immature seed. This forms a depression around the feeding area and leaves a chalky blemish. Monitor adult lygus bug populations during blooming and podding by using a sweep net, making 25 180 sweeps in at least 5 randomly selected places in a field.

**Threshold:**

Insecticide treatment is recommended when 7 - 10 adults are collected per 25 sweeps.

## GRASSHOPPERS

Grasshoppers are a potential problem in lentil. Lentil crops are less tolerant to grasshopper feeding than some other pulse crops. In lentils, grasshoppers pose the greatest threat from the bud stage through early pod development. Damage on lentil plants is often not highly visible because grasshoppers do not normally prefer lentil foliage. However, grasshoppers will consume flower buds and especially early pods of lentil plants. This can result in yield loss and a delay in maturity due to delayed pod set.

**Threshold:**

Scout fields from the early bud stage through pod development. Research conducted by Agriculture and Agri-Food Canada at Saskatoon found that 2 grasshoppers per square yard, feeding on lentil flowers or pods, can reduce yields enough to warrant insecticide treatment.

**Insecticides approved for use in Lentil**

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Label includes aphid, grasshopper, and other insects. Do not apply within 21 days of harvest. Do not feed or graze livestock on treated crop. |
| Baythroid *RUP* | 0.038 - 0.05 | 2.4 - 3.2 fl oz | Label includes lygus bug, cutworms, and others. Do not apply within 7 days of harvest. Do not feed or graze livestock on treated crop. |
| carbaryl (Sevin) | 0.5 - 1.5 | rate varies by formulation | Labeled for grasshoppers, lygus suppression, and other insects. Do not apply within 21 days of harvest. Do not apply within 14 days of graze or harvest for forage. |
| dimethoate (Digon 400, Dimethoate 400) | 0.125 - 0.5 | 0.33 - 1 pt | Labeled for aphid control. Peas may be harvested mechanically on day of application. Do not feed or graze hay within 21 days of last application. Do not make more than one application per season. |
| Malathion 57 EC | 0.625 - 1.25 | 1 - 2 pts | Labeled for aphid control. Do not apply within 3 days of harvest. Do not graze or feed treated crop foliage to livestock. |
| Mustang *RUP* | 0.04 - 0.05 | 3.4 - 4.3 fl oz | Do not apply within 21 days of harvest. Label includes aphid, grasshopper, and plant bugs. |

*RUP* **-** Restricted use pesticide

# CHICKPEA / GARBANZO BEAN

Chickpea stems, leaves and seed pods are covered with small, hair-like glandular structures that secrete malic and oxalic acids. The secretions discourage insects from feeding on the plants. Therefore, insect problems on chickpeas have been minimal and insecticide applications generally have not been necessary. Several viral diseases that are transmitted by aphids have occasionally been reported in chickpea fields from the states of Washington and Idaho. Potential insect pests of chickpea include seedcorn maggots, cutworms, lygus bugs, and wireworms.

**Insecticides approved for use in Chickpea**

| INSECTICIDE | DOSAGE IN LB AI/ACRE | PRODUCT PER ACRE | RESTRICTIONS ON USE |
|---|---|---|---|
| Asana XL *RUP* | 0.03 - 0.05 | 5.8 - 9.6 fl oz | Label includes aphid, grasshopper, and other insects. Do not apply within 21 days of harvest. Do not feed or graze livestock on treated crop. |
| Baythroid *RUP* | 0.038 - 0.05 | 2.4 - 3.2 fl oz | Label includes lygus bug, cutworms, and others. Do not apply within 7 days of harvest. Do not feed or graze livestock on treated crop. |
| dimethoate (Digon 400, Dimethoate 400) | 0.25 - 0.5 | 0.5 - 1 pt | Labeled for aphid control. Peas may be harvested mechanically on day of application. Do not feed treated plants to livestock. Label includes aphids, grasshoppers, leafhoppers, and lygus bugs. |
| Lannate LV<br>Lannate SP *RUP* | 0.45 - 0.9 | 1.5 - 3 pts<br>0.5 - 1 lb | Do not apply within 1day of harvest. Of the three insects mentioned above, the label only includes cutworms. |
| Mustang *RUP* | 0.035 - 0.05 | 3.0 - 4.3 fl oz | Do not apply within 21 days of harvest. Label includes aphids, cutworms, armyworms, grasshoppers, and plant bugs. |
| Spintor 2SC | 0.062 - 0.094 | 4 - 6 fl oz | Do not apply within 28 days of harvest. Do not feed forage or hay to meat or dairy animals. Label includes armyworms, and European corn borer. |

*RUP* **-** Restricted use pesticide