

## BEAN INSECTS (DRY EDIBLE )

Other resources available through NDSU Extension Service:

Publications	A602	Dry Bean Production Handbook
	Extension Report #13	Dry Bean Grower Survey
	NCR Extension Pub #198	Recognition and Management of Dry Bean Production Problems

### LEAFHOPPERS

#### Leafhopper Management:

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 will run backwards or sideways rapidly. Large numbers of adults may appear early in the season. Nymphs usually complete their growth on the leaf where they hatched, feeding on the underside of the leaf. 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.

#### Leafhopper Threshold:

The threshold for basing spray decisions is when an average of one leafhopper per trifoliate leaf is found. Do not let infestations and damage progress to the point that yellowing of foliage is easily detected.

### APHIDS

#### Aphid Management:

The bean aphid has not been a major pest in North Dakota, though it can be found. It is nearly black in color and 1/8 inch long. They feed along stems and the underside of leaves. Infestations may result in a buildup of honeydew on leaf surfaces, promoting the growth of a black "sooty" fungus. No economic threshold guidelines for control have been established for North Dakota.

#### Insecticides Registered for Leafhopper and Aphid Management in Dry Beans

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>acephate</b> Acephate E 75 WP Acephate 75% Orthene Address Acephate 97UP	0.5 - 1	0.66 - 1.33 lbs	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2.67 lbs (2 lbs ai) per acre per season. Repeat at 3-7 day spray intervals for low - high rates (respectively) to maintain control.
<b>acephate</b> Orthene 97		0.5 - 1 lb (8 to 16 fl oz)	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2 1/8 lbs per acre per season. Repeat at 7-10 day spray intervals as necessary to maintain control.
<b>beta-cyfluthrin</b> Baythroid XL <i>RUP</i>	0.025	3.2 fl oz for Pea aphid (suppression)	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
	0.0065 - 0.0125	0.8 - 1.6 fl oz for Leafhoppers	
<b>bifenthrin + zeta-cypermethrin</b> Hero <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 fl oz	PHI = 3 days. Do not apply more than 0.266 lb ai per acre per season. Do not make applications less than 5 days apart.
<b>bifenthrin</b> Fanfare 2EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.2 lb active (12.8 fl oz) per acre per season. Do not make applications less than 7 days apart.
<b>bifenthrin</b> Brigade 2EC Sniper <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.3 lb active (19.2 fl oz) per acre per season to beans. Do not make applications less than 7 days apart.
<b>cyfluthrin</b> Tombstone Tombstone Helios <i>RUP</i>	0.050	3.2 fl oz for Pea aphid (suppression)	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
	0.013 - 0.025	0.8 - 1.6 fl oz for Leafhoppers	

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>dimethoate</b> Digon 400, Dimethoate 400 Dimethoate 2.67 EC	0.38 - 0.75	¾ - 1½ pt	No preharvest interval. Do not feed vines. To protect bees, do not apply if crop or weeds are in bloom. Do not enter treated fields without protective clothing until sprays have dried.
<b>disulfoton</b> Di-Syston G <i>RUP</i>	1	6 oz/1,000 ft of row any row spacing	Band treatment at planting only. Avoid direct contact with seed. Preharvest interval, 60 days.
<b>esfenvalerate</b> Adjourn Asana XL <i>RUP</i>	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days. Do not apply more than 0.2 lb a.i. per acre per season. Do not feed or graze livestock on treated vines.
<b>gamma-cyhalothrin</b> Proaxis <i>RUP</i>	0.01 - 0.015	2.56 - 3.84 fl oz	PHI = 21 days. Do not graze or feed treated vines to livestock.
<b>imidacloprid</b> Attendant 600 Senator 600	refer to recommended label rate	1.6 - 3.2 fl oz per cwt of seed	Apply as a commercial seed treatment only. Follow all applicable directions, restrictions and precautions on the EPA registered label.
<b>imidacloprid</b> Enhance AW	refer to recommended label rate	5 oz per 100 lbs of seed	Apply as an on-farm seed treatment at planting time. Do not graze or feed livestock on treated area for 60 days after planting. Follow all applicable directions, restrictions and precautions on the EPA registered label. For early season protection against aphid infestations.
<b>imidacloprid</b> Admire Pro	0.25 - 0.38	7.0 - 10.5 fl oz	PHI = 21 days. Maximum of 10.5 fl oz per acre per season. Apply using one of the following methods: 1) Chemigation into root zone, 2) In-furrow spray at planting directed on or below seed; 3) In a narrow (2" or less) surface band over seed-line during planting incorporating to a depth of 1 to 1.5' with sufficient irrigation within 24 hours following applications, 4) In a narrow band directly below the eventual seed row in a bedding operation 7 or fewer days before planting, or 5) As a post-seeding drench, transplant drench or hill drench.
<b>imidacloprid</b> Mana Alias 4F	0.25 - 0.38	8.0 - 12.0 fl oz	PHI = 21 days. Maximum amount allowed per season 12 fl oz/acre/season. Apply using one of the following methods: 1) Chemigation into root zone, 2) In-furrow spray at planting directed on or below seed; 3) In a narrow (2" or less) surface band over seed-line during planting incorporating to a depth of 1 to 1.5' with sufficient irrigation within 24 hours following applications, 4) In a narrow band directly below the eventual seed row in a bedding operation 7 or fewer days before planting, or 5) As a post-seeding drench, transplant drench or hill drench.
<b>imidacloprid</b> Mana Alias 4F	0.044	1.4 fl oz	PHI = 7 days. Minimum interval between applications = 5 days. Maximum of 4.2 fl oz per acre (0.13 lb ai per acre) allowed per crop season.
<b>imidacloprid</b> Nuprid 1.6F	0.048	3.8 fl oz	PHI = 7 days. Minimum interval between applications = 7 days. Maximum amount allowed per season 10.5 fl oz/acre/season. May be applied through properly calibrated ground, aerial or chemigation application equipment. Not for use on crops grown for seed unless allowed by state-specific supplemental labeling.

<b>INSECTICIDE</b>	<b>DOSAGE IN LB AI/ACRE</b>	<b>PRODUCT PER ACRE</b>	<b>RESTRICTIONS ON USE</b>
<b>imidacloprid</b> Nuprid 2F	0.25 - 0.38	16.0 - 24.0 fl oz	PHI = 21 days. Maximum amount allowed per season 24 fl oz/acre/season. Apply using one of the following methods: 1) Chemigation into root zone, 2) In-furrow spray at planting directed on or below seed; 3) In a narrow (2" or less) surface band over seed-line during planting incorporating to a depth of 1 to 1.5' with sufficient irrigation within 24 hours following applications, 4) In a narrow band directly below the eventual seed row in a bedding operation 7 or fewer days before planting, or 5) As a post-seeding drench, transplant drench or hill drench.
<b>lambda-cyhalothrin</b> Lambda-Cy Silencer Grizzly Z	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days for dried shelled legumes. Do not apply more than 0.12 lb ai per acre per season. Do not graze livestock in treated area or harvest vines for forage or hay.
<i>RUP</i>			
<b>lambda-cyhalothrin</b> Kaiso	0.02 - 0.03	1.33 - 2 fl oz	
<i>RUP</i>			
<b>lambda-cyhalothrin</b> Warrior II	0.02 - 0.03	1.28 - 1.92 fl oz	
<i>RUP</i>			
<b>malathion</b> Malathion 57EC	1.25 - 1.56	2 - 2.5 pts	PHI = 1 day.
<b>methomyl</b> Lannate LV	0.225 - 0.9	0.75 - 3 pts	PHI = 14 days from cutting. Do not apply more than 4.5 lb ai/acre per crop or make more than 10 applications per crop.
<i>RUP</i>			
<b>methyl parathion</b> PennCap-M	0.5	2 pts	PHI = 15 days. Read label for bee precautions. Do not enter treated fields within 48 hours after application.
<i>RUP</i>			
<b>phorate</b> Thimet 20 G	0.9 - 1.4 oz AI/1,000 ft of row	4.5 - 7.0 oz/1,000 ft of row - minimum 30-inch spacing	Band treatment at planting only. Avoid direct contact with seed. Preharvest interval, 60 days.
<i>RUP</i>			
<b>zeta-cypermethrin</b> Mustang Max Mustang Max EC Respect	Aphids 0.02 0- 0.025  Leafhoppers 0.017 - 0.025	Aphids 3.2 - 4 fl oz  Leafhoppers 2.72 - 4 fl oz	PHI = 21 days. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 5 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

*RUP* - Restricted use pesticide

## ARMYWORMS

Armyworms are more of a problem in small grains and corn. Damage to dry beans can occur when their usual host plants become depleted. They are inactive during the day, resting under plant trash, clumps of grass or lodged plants. They feed at night by crawling up on plants and consuming foliage.

### Threshold:

Control of armyworms is recommended when 25% to 30% of the foliage is destroyed or if significant injury to pods is evident.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>acephate</b> Acephate E 75 WP Acephate 75% Orthene Address Acephate 97UP	0.75 - 1	1 - 1.33 lbs	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2.67 lbs (2 lbs ai) per acre per season. Repeat at 3-7 day spray intervals for low - high rates (respectively) to maintain control.
<b>acephate</b> Orthene 97		0.75 - 1 lb (12 to 16 fl oz)	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2 1/8 lbs per acre per season. Repeat at 7-10 day spray intervals as necessary to maintain control.
<b>Bacillus thuringiensis ssp. kurstaki</b> DiPel DF (for organic production)		1 - 2 lb	No preharvest interval. Worker Restricted Entry Interval (REI) is 4 hours. Treat when larvae are young (early instars) before crop is damaged. Larvae must be actively feeding on treated, exposed plant surfaces. Under heavy pest population pressure, use the higher label rates, shorten the spray interval (3-14 days), and/or raise spray volume to improve spray coverage.
<b>beta-cyfluthrin</b> Baythroid XL  <i>RUP</i>	0.019 - 0.025	2.4 - 3.2 fl oz	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>bifenthrin + zeta-cypermethrin</b> Hero  <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 fl oz	PHI = 3 days. Do not apply more than 0.266 lb ai per acre per season. Do not make applications less than 5 days apart.
<b>bifenthrin</b> Fanfare 2EC  <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.2 lb active (12.8 fl oz) per acre per season. Do not make applications less than 7 days apart.
<b>bifenthrin</b> Brigade 2EC Sniper  <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.3 lb active (19.2 fl oz) per acre per season to beans. Do not make applications less than 7 days apart.
<b>bifenthrin</b> Capture LFR  <i>RUP</i>	0.04 - 0.08  0.0023 - 0.0046 lb active per 1000 linear feet of row	3.4 - 6.8 fl oz  0.2 - 0.39 fl oz per 1000 linear feet of row	Apply as a 5-7 inch band over the row on the soil surface, a 5-7 inch band over the open furrow (T-band), in-furrow with the seed, or broadcast over the entire acre on the soil surface. Do not apply more than 0.1 lb ai per acre per season as an at-plant application. Do not apply more than 0.3 lb ai per acre per season including at-plant plus foliar application of other bifenthrin products.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>carbaryl</b> Sevin	1 - 2	varies by formulation	No preharvest interval.
<b>cyfluthrin</b> Tombstone Tombstone Helios	0.038 - 0.050	2.4 - 3.2 fl oz	PHI = 7 days. Maximum of 6.4fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
	<i>RUP</i>		
<b>gamma-cyhalothrin</b> Proaxis	0.01 - 0.015	2.56 - 3.84 fl oz	PHI = 21 days. Do not graze or feed treated vines to livestock.
	<i>RUP</i>		
<b>lambda-cyhalothrin</b> Lambda-Cy Silencer Grizzly Z	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days for dried shelled legumes. Do not apply more than 0.12 lb ai per acre per season. Do not graze livestock in treated area or harvest vines for forage or hay.
	<i>RUP</i>		
<b>lambda-cyhalothrin</b> Kaiso	0.02 - 0.03	1.33 - 2 fl oz	
	<i>RUP</i>		
<b>lambda-cyhalothrin</b> Warrior II	0.02 - 0.03	1.28 - 1.92 fl oz	
	<i>RUP</i>		
<b>methomyl</b> Lannate LV	0.45 - 0.9	1.5 - 3 pts	PHI = 14 days from cutting. Do not apply more than 4.5 lb ai/acre per crop or make more than 10 applications per crop.
	<i>RUP</i>		
<b>spinosad (microbial)</b> Success	0.063 - 0.094	4 - 6 fl oz	PHI = 28 days. Do not apply more than a total of 12 fl oz per acre per season.. <b>For control of armyworms, corn borer, loopers, leafminers and thrips only.</b> Treat when pests appear, targeting eggs at hatch or small larvae. Use a higher rate in the rate range for larger larvae or moderate to severe infestations.
<b>spinetoram</b> Radiant SC	0.031 - 0.063	4 - 8 fl oz	PHI = 28 days. Do not apply more than 12 fl oz (0.094 lb ai) spinetoram per acre per season. Do not make more than 6 applications per season. Do not make applications less than 4 days apart.
<b>zeta-cypermethrin</b> Mustang Max Mustang Max EC Respect	0.02 0- 0.025	3.2 - 4 fl oz	PHI = 21 days. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 5 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.
	<i>RUP</i>		

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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 and 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 July feed on foliage and pods. 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. University of Missouri entomologists suggest treatment when 40% to 70% of the bean plants show feeding injury on one or more of the pods/plant.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>acephate</b> Acephate E 75 WP Acephate 75% Orthene Address Acephate 97UP	0.5 - 1	0.66 - 1.33 lbs	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2.67 lbs (2 lbs ai) per acre per season. Repeat at 3-7 day spray intervals for low - high rates (respectively) to maintain control.
<b>acephate</b> Orthene 97		0.5 - 1 lb (8 to 16 fl oz)	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2 1/8 lbs per acre per season. Repeat at 7-10 day spray intervals as necessary to maintain control.
<b>beta-cyfluthrin</b> Baythroid XL <i>RUP</i>	0.019 - 0.025	2.4 - 3.2 fl oz	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>bifenthrin</b> Fanfare 2EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.2 lb active (12.8 fl oz) per acre per season. Do not make applications less than 7 days apart.
<b>bifenthrin</b> Brigade 2EC Sniper <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.3 lb active (19.2 fl oz) per acre per season to beans. Do not make applications less than 7 days apart.
<b>bifenthrin + zeta-cypermethrin</b> Hero <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 fl oz	PHI = 3 days. Do not apply more than 0.266 lb ai per acre per season. Do not make applications less than 5 days apart.
<b>carbaryl</b> Sevin	1	varies by formulation	No preharvest interval.
<b>cyfluthrin</b> Tombstone Tombstone Helios <i>RUP</i>	0.038 - 0.050	2.4 - 3.2 fl oz	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>dimethoate</b> Digon 400, Dimethoate 400, Dimethoate 2.67 EC	0.38 - 0.75	3/4 - 1 1/2 pt	No preharvest interval. Do not feed vines. To protect bees, do not apply if crop or weeds are in bloom. Do not enter treated fields without protective clothing until sprays have dried.
<b>gamma-cyhalothrin</b> Proaxis <i>RUP</i>	0.01 - 0.015	2.56 - 3.84 fl oz	PHI = 21 days. Do not graze or feed treated vines to livestock.
<b>lambda-cyhalothrin</b> Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days for dried shelled legumes. Do not apply more than 0.12 lb ai per acre per season. Do not graze livestock in treated area or harvest vines for forage or hay.
<b>lambda-cyhalothrin</b> Kaiso <i>RUP</i>	0.02 - 0.03	1.33 - 2 fl oz	

<b>INSECTICIDE</b>	<b>DOSAGE IN LB AI/ACRE</b>	<b>PRODUCT PER ACRE</b>	<b>RESTRICTIONS ON USE</b>
<b>lambda-cyhalothrin</b> Warrior II <i>RUP</i>	0.02 - 0.03	1.28 - 1.92 fl oz	
<b>imidacloprid</b> Attendant 600 Senator 600	refer to recommended label rate	1.6 - 3.2 fl oz per cwt of seed	Apply as a commercial seed treatment only. To suppress the spread of certain viruses by bean leaf beetle (control of overwintering population). Follow all applicable directions, restrictions and precautions on the EPA registered label.
<b>imidacloprid</b> Enhance AW	refer to recommended label rate	5 oz per 100 lbs of seed	Apply as an on-farm seed treatment at planting time. Do not graze or feed livestock on treated area for 60 days after planting. Follow all applicable directions, restrictions and precautions on the EPA registered label. For early season protection against bean leaf beetle infestations.
<b>zeta-cypermethrin</b> Mustang Max Mustang Max EC Respect <i>RUP</i>	0.017- 0.025	2.72 - 4 fl oz	PHI = 21 days. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 5 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

*RUP* - Restricted use pesticide

## CUTWORMS

Most damage by cutworms occurs when bean 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 bean 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).

<b>INSECTICIDE</b>	<b>DOSAGE IN LB AI/ACRE</b>	<b>PRODUCT PER ACRE</b>	<b>RESTRICTIONS ON USE</b>
<b>acephate</b> Acephate E 75 WP Acephate 75% Orthene Address Acephate 97UP	0.5 - 1	0.66 - 1.33 lbs	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2.67 lbs (2 lbs ai) per acre per season. Repeat at 3-7 day spray intervals for low - high rates (respectively) to maintain control.
<b>acephate</b> Orthene 97		0.5 - 1 lb (8 to 16 fl oz)	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2 1/8 lbs per acre per season. Repeat at 7-10 day spray intervals as necessary to maintain control.
<b>beta-cyfluthrin</b> Baythroid XL <i>RUP</i>	0.0065 - 0.0125	0.8 - 1.6 fl oz	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>bifenthrin</b> Fanfare 2EC <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.2 lb active (12.8 fl oz) per acre per season. Do not make applications less than 7 days apart.
<b>bifenthrin</b> Brigade 2EC Sniper <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.3 lb active (19.2 fl oz) per acre per season to beans. Do not make applications less than 7 days apart.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>bifenthrin</b> Capture LFR <i>RUP</i>	0.04 - 0.08  0.0023 - 0.0046 lb active per 1000 linear feet of row	3.4 - 6.8 fl oz  0.20 - 0.39 fl oz per 1000 linear feet of row	Apply as a 5-7 inch band over the row on the soil surface (best for cutworm control), a 5-7 inch band over the open furrow (T-band), in-furrow with the seed, or broadcast over the entire acre on the soil surface. Do not apply more than 0.1 lb ai per acre per season as an at-plant application. Do not apply more than 0.3 lb ai per acre per season including at-plant plus foliar application of other bifenthrin products.
<b>bifenthrin + zeta-cypermethrin</b> Hero <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 fl oz	PHI = 3 days. Do not apply more than 0.266 lb ai per acre per season. Do not make applications less than 5 days apart.
<b>carbaryl</b> Sevin	1 - 2	varies by formulation	No preharvest interval.
<b>cyfluthrin</b> Tombstone Tombstone Helios <i>RUP</i>	0.013 - 0.025	0.8 - 1.6 fl oz	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>esfenvalerate</b> Adjourn Asana XL <i>RUP</i>	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days. Do not apply more than 0.2 lb a.i. per acre per season. Do not feed or graze livestock on treated vines.
<b>gamma-cyhalothrin</b> Proaxis <i>RUP</i>	0.0075 - 0.0125	1.92 - 3.2 fl oz	PHI = 21 days. Do not graze or feed treated vines to livestock.
<b>lambda-cyhalothrin</b> Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days for dried shelled legumes. Do not apply more than 0.12 lb ai per acre per season. Do not graze livestock in treated area or harvest vines for forage or hay.
<b>lambda-cyhalothrin</b> Kaiso <i>RUP</i>	0.015 - 0.025	1 - 1.67 fl oz	
<b>lambda-cyhalothrin</b> Warrior II <i>RUP</i>	0.015 - 0.025	0.96 - 1.60 fl oz	
<b>methomyl</b> Lannate LV <i>RUP</i>	0.45 - 0.9	1.5 pts	PHI = 14 days from cutting. Do not apply more than 4.5 lb ai/acre per crop or make more than 10 applications per crop.
<b>zeta-cypermethrin</b> Mustang Max Mustang Max EC Respect <i>RUP</i>	0.008- 0.025	1.28 - 4 fl oz	PHI = 21 days. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Use 4 fl oz per acre rate for in-furrow, band, or T-band treatments. Do not make applications less than 5 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

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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. The exception was the 2001 growing season when many of these caterpillars affected bean fields. 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 the pair on the back tip. 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 clover worms 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 on 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 for foliage feeding caterpillars:

Control of these different caterpillars is normally not warranted until greater than 30% of the foliage is destroyed. This usually requires an average infestation of 10 to 15 larvae per row foot.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>acephate</b> Acephate E 75 WP Acephate 75% Orthene Address Acephate 97UP	0.5 - 1	0.66 - 1.33 lbs	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2.67 lbs (2 lbs ai) per acre per season. Repeat at 3-7 day spray intervals for low - high rates (respectively) to maintain control.
<b>acephate</b> Orthene 97		0.5 - 1 lb (8 to 16 fl oz)	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2 ½ lbs per acre per season. Repeat at 7-10 day spray intervals as necessary to maintain control.
<b>Bacillus thuringiensis ssp. kurstaki</b> DiPel DF (for organic production)		½ - 1 lb	No preharvest interval. Worker Restricted Entry Interval (REI) is 4 hours. Treat when larvae are young (early instars) before crop is damaged. Larvae must be actively feeding on treated, exposed plant surfaces. Under heavy pest population pressure, use the higher label rates, shorten the spray interval (3-14 days), and /or raise spray volume to improve spray coverage.
<b>beta-cyfluthrin</b> Baythroid XL  <i>RUP</i>	0.019 - 0.025	2.4 - 3.2 fl oz	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>bifenthrin</b> Fanfare 2EC  <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.2 lb active (12.8 fl oz) per acre per season. Do not make applications less than 7 days apart.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>bifenthrin</b> Brigade 2EC Sniper <i>RUP</i>	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.3 lb active (19.2 fl oz) per acre per season to beans. Do not make applications less than 7 days apart.
<b>bifenthrin + zeta-cypermethrin</b> Hero <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 fl oz	PHI = 3 days. Do not apply more than 0.266 lb ai per acre per season. Do not make applications less than 5 days apart.
<b>cyfluthrin</b> Tombstone Tombstone Helios <i>RUP</i>	0.038 - 0.050	2.4 - 3.2 fl oz	PHI = 7 days. Maximum of 6.4fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>esfenvalerate</b> Adjourn Asana XL <i>RUP</i>	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days. Do not apply more than 0.2 lb a.i. per acre per season. Do not feed or graze livestock on treated vines.
<b>gamma-cyhalothrin</b> Proaxis <i>RUP</i>	0.01 - 0.015	2.56 - 3.84 fl oz	PHI = 21 days. Do not graze or feed treated vines to livestock.
<b>lambda-cyhalothrin</b> Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.015 - 0.025	1.92 - 3.2 fl oz	PHI = 21 days for dried shelled legumes. Do not apply more than 0.12 lb ai per acre per season. Do not graze livestock in treated area or harvest vines for forage or hay.
<b>lambda-cyhalothrin</b> Kaiso <i>RUP</i>	0.015 - 0.025	1 - 1.67 fl oz	
<b>lambda-cyhalothrin</b> Warrior II <i>RUP</i>	0.015 - 0.025	0.96 - 1.60 fl oz	
<b>malathion</b> Malathion ULV	0.6	8 fl oz	Preharvest interval 1 day.
<b>methyl parathion</b> PennCap-M <i>RUP</i>	0.5	2 pts	PHI = 15 days. Read label for bee precautions. Do not enter treated fields within 48 hours after application.
<b>spinosad (microbial)</b> Success	0.063 - 0.094	4 - 6 fl oz	PHI = 28 days. Do not apply more than a total of 12 fl oz per acre per season.. <b>For control of armyworms, corn borer, loopers, leafminers and thrips only.</b> Treat when pests appear, targeting eggs at hatch or small larvae. Use a higher rate in the rate range for larger larvae or moderate to severe infestations.
<b>spinetoram</b> Radiant SC	0.031 - 0.063	4 - 8 fl oz	PHI = 28 days. Do not apply more than 12 fl oz (0.094 lb ai) spinetoram per acre per season. Do not make more than 6 applications per season. Do not make applications less than 4 days apart.
<b>zeta-cypermethrin</b> Mustang Max Mustang Max EC Respect <i>RUP</i>	0.017- 0.025	2.72 - 4 fl oz	PHI = 21 days. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 5 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

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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. Bean growers should expect to find grasshoppers feeding first along bean field margins adjacent to these sites. Later infestations may develop when grasshopper adults migrate from harvested small grain fields. Grasshoppers will attack leaves and pods, creating holes. Due to these migrations, bean fields become sites for significant egg laying.

**Thresholds: Infestation Ratings:** Threatening is considered the action threshold for grasshoppers. Since it is difficult to estimate the number of grasshoppers per square yard when population densities are high, pest managers can use four 180-degree sweeps with a 15-inch sweep net, which is equivalent to the number of adult (or nymph) grasshoppers per square yard.

Rating	Nymphs (young hoppers) per square yard		Adults per square yard	
	Margin	Field	Margin	Field
Light	25-35	15-23	10-20	3-7
Threatening	50-75	30-45	21-40	8-14
Severe	100-150	60-90	41-80	15-28
Very Severe	200+	120	80+	28+

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>acephate</b> Acephate E 75 WP Acephate 75% Orthene Address Acephate 97UP	0.25 - 0.5	0.33 - 0.66 lbs	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2.67 lbs (2 lbs ai) per acre per season. Repeat at 3-7 day spray intervals for low - high rates (respectively) to maintain control.
<b>acephate</b> Orthene 97		0.25 - 0.5 lb (4 to 8 fl oz)	PHI = 14 days. Do not feed treated vines to livestock. Do not apply more than 2½ lbs per acre per season. Repeat at 7-10 day spray intervals as necessary to maintain control.
<b>beta-cyfluthrin</b> Baythroid XL <i>RUP</i>	0.019 - 0.025	2.4 - 3.2 fl oz	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>bifenthrin</b> Fanfare 2EC <i>RUP</i>	0.025 - 0.10	1.6 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.2 lb active (12.8 fl oz) per acre per season. Do not make applications less than 7 days apart.
<b>bifenthrin</b> Brigade 2EC Sniper <i>RUP</i>	0.025 - 0.10	1.6 - 6.4 fl oz	PHI = 14 days. Do not apply more than 0.3 lb active (19.2 fl oz) per acre per season to beans. Do not make applications less than 7 days apart.
<b>bifenthrin + zeta-cypermethrin</b> Hero <i>RUP</i>	0.04 - 0.10	4.0 - 10.3 fl oz	PHI = 3 days. Do not apply more than 0.266 lb ai per acre per season. Do not make applications less than 5 days apart.
<b>carbaryl</b> Sevin	1 - 1.5	rate varies by formulation	No preharvest interval. Treat when 8 or more grasshoppers per square yard occur in the field.
<b>cyfluthrin</b> Tombstone Tombstone Helios <i>RUP</i>	0.038 - 0.050	2.4 - 3.2 fl oz	PHI = 7 days. Maximum of 6.4 fl oz per acre per season. Maximum of 3.2 fl oz per acre between 14-day interval. Minimum application volume is 10 GPA by ground and 2 GPA by air. Do not feed treated vines or hay to livestock.
<b>esfenvalerate</b> Asana XL <i>RUP</i>	0.02 - 0.03  0.03 - 0.05	Low Rate: 3.9 - 5.8 fl oz  High Rate: 5.8-9.6 fl oz	PHI = 21 days. A <b>reduced rate</b> 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. Asana XL may be used in bordering, non-crop areas not hayed or grazed. The higher rates are for control of grasshopper nymphs larger than 2 <sup>nd</sup> instar.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>gamma-cyhalothrin</b> Proaxis <i>RUP</i>	0.01 - 0.015	2.56 - 3.84 fl oz	PHI = 21 days. Do not graze or feed treated vines to livestock. Proaxis may be used in bordering, non-crop areas that are not hayed or grazed.
<b>lambda-cyhalothrin</b> Lambda-Cy Silencer Grizzly Z <i>RUP</i>	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days for dried shelled legumes. Do not apply more than 0.12 lb ai per acre per season. Do not graze livestock in treated area or harvest vines for forage or hay.
<b>lambda-cyhalothrin</b> Kaiso <i>RUP</i>	0.02 - 0.03	1.33 - 2 fl oz	
<b>lambda-cyhalothrin</b> Warrior II <i>RUP</i>	0.02 - 0.03	1.28 - 1.92 fl oz	
<b>zeta-cypermethrin</b> Mustang Max Mustang Max EC Respect <i>RUP</i>	0.02 - 0.025	3.2 - 4 fl oz	PHI = 21 days. Do not apply more than 0.15 lb AI per acre per season including at-planting plus foliar applications. Do not make applications less than 5 days apart. Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

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## SEEDCORN MAGGOT

Seed corn maggot attack bean seed, preventing sprouting or weakening seedlings. The yellowish white maggot is found burrowing in the seed or emerging stem. The adult flies emerge in spring when soil temperatures reach 50° F. They deposit eggs in soil where there is abundant organic matter and decaying crop residue, or on the seed or seedling. Seed corn maggots are usually most severe in wet, cold seasons and on high organic matter soils.

### Thresholds:

When conditions are wet and cool or planting into high crop residue conditions, seed treatments will provide the best defense against injury. Please see the seed treatment section in the introduction for more information.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>bifenthrin</b> Capture LFR <i>RUP</i>	0.04 - 0.08	3.4 - 6.8 fl oz	Do not apply more than 0.1 lb ai per acre per season as an at-plant application. Do not apply more than 0.3 pound active per acre per season including at-plant plus foliar applications of other bifenthrin products. Apply as a 5-7 inch band over the open furrow (T-band), or in-furrow with the seed.
<b>chlorpyrifos</b> Lorsban 30 F  Lorsban 50-SL	0.0023 - 0.0046 pounds active per 1000 linear feet of row	2.75 fl oz/100 lbs seed  2.0 fl oz/100 lbs seed	Product is applied as a slurry treatment. Lorsban treated seed must not be used for or mixed with food or animal feed, or processed for oil. <b>For Use by Commercial Seed Treaters Only.</b>
<b>phorate</b> Thimet 20 G <i>RUP</i>		4.5 - 7.0 oz/1,000 ft of row	Do not place granules in direct contact with seed. Do not feed bean foliage within 60 days of harvest.

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## WIREWORMS

Wireworms are most likely to be problems when dry beans follows pasture or grassland. Infestations often are found in coarse textured soils (sandy loam) where moisture is abundant, perhaps in low spots of fields.

### Thresholds:

There is no easy way to estimate wireworm infestations. Two methods are currently used.

**Soil Sampling** . . . Sample 20, well spaced, 1 square foot sites to a depth of 4 to 6 inches for every 40 acres being planted. If an average of 1 wireworm per square foot is found, treatment would be justified.

**Solar Baiting** . . . In September, establish bait stations for 2 to 3 weeks before freeze. Place bait stations randomly through the field, but representing all areas of the field. There should be 10 - 12 stations per 40 acre field. Place one cup wheat and one cup shelled corn in a 4- to 6-inch deep hole. Cover grain with soil and then an 18-inch square piece of clear plastic. Dig up the grain. If an average of one or more wireworm larvae are found per station, treatment would be justified.

**Seed Treatment** . . . Please the seed treatment section in the introduction for more information.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
<b>bifenthrin</b> Capture LFR	0.04 - 0.08	3.4 - 6.8 fl oz	Do not apply more than 0.1 lb ai per acre per season as an at-plant application. Do not apply more than 0.3 pound active per acre per season including at-plant plus foliar applications of other bifenthrin products. Apply as a 5-7 inch band over the open furrow (T-band), or in-furrow with the seed.
<i>RUP</i>	0.0023 - 0.0046 pounds active per 1000 linear feet of row	0.20 - 0.39 fl oz per 1000 linear feet of row	
<b>imidacloprid</b> Attendant 600 Senator 600	refer to recommended label rate	1.6 - 3.2 fl oz per cwt of seed	Apply as a commercial seed treatment only. Follow all applicable directions, restrictions and precautions on the EPA registered label.
<b>imidacloprid</b> Enhance AW	refer to recommended label rate	5 oz per 100 lbs of seed	Apply as an on-farm seed treatment at planting time. Do not graze or feed livestock on treated area for 60 days after planting. Follow all applicable directions, restrictions and precautions on the EPA registered label.

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