Integrated Pest Management of Insect Pests in Pulse Crops Lentil & Chickpea

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Insect Pests of Pulse Crops

- Lentils
  - Cutworms
  - Grasshoppers
  - Lygus bugs
  - Pea aphids

- Chickpeas
  - Grasshoppers
Cutworm Identification

◆ Adult

- Very robust
- Brown or black moths showing various spots or stripes in shades of gray, brown, black or white.
Cutworm Identification

- Larvae
  - stout, smooth, soft-bodied, plump caterpillars
  - Brown to tan to pink, green or gray and black
If you are unfamiliar with the major groupings of moths, it is strongly recommended that you narrow your choice to family by using the keys or moth families portions of this website, otherwise you will be potentially dealing with hundreds of names and pictures.

The photo gallery is divided into five sections. Section I is a gallery of moth images, each image is linked to an information page for that species. Section II is a gallery of larvae, again each is linked to an information page. Section III is a roster of species information pages completed as part of Moths of North Dakota. Each name is a link to its information page. Section IV allows one to jump to a particular portion of the gallery, and Section V is a roster of common and economically important moths, again with links to their particular information pages.
Moths of North Dakota

*Noctuidae: Noctuinae: Agrotini*

**Euxoa auxiliaris** (Grote 1873)

**Common name:** Army cutworm

**Hodges #:** 10731.

**Identification:** Rfw 19.1 mm, a polychromic species—see illustrations, fw narrower than most other cutworm moths (wing shape similar to 10924), antemedial line ‘zig-zag’ extending as far out on A₁+₂ as tip of claviform spot; hw under good light with pink reflection as in 10915; male harpe very short and rounded, sacculus extension angled upward and spatulate at apex.

**Similar species:** 10723, 10730, 10801.

**Distribution:** northern Canada to northern Mexico and from the Pacific coast to the Great Lakes region, Missouri, and Texas.

**Hosts:** Larvae are cutworms on a variety of crops and are economically important on varieties of wheat, oats, and barley. Natural hosts are members of the Poaceae—grasses.

**Note:** This species is migratory, flying into the Rockies in early summer and aestivating at high elevations, moving back on to the plains in fall for egg laying.

http://www.ndsu.nodak.edu/ndsu/ndmoths/10731.htm

1/30/2006
Life Cycle of Cutworm

One generation per year

Spring

Overwinter as partial mature larvae or eggs

May-June

Late summer / Fall

July - August
Cutworm Damage

- Larvae = Chewing mouthparts
- Cut off shoots below or above ground
- Destroy more of plant than eat
- Injury plants in 4 major ways:
  - Solitary surface cutworms
    - Black, Bronzed, Clay-backed, Dingy cutworms
  - Climbing species
    - Variegated, spotted, W-marked cutworms
  - Subterranean species
    - Pale western and glassy cutworms
  - “Marching” in great numbers
    - Army cutworms
Field Scouting & Economic Threshold

- Pheromone traps for adults
  - Army cutworm
  - Pale Western cutworm
  - Black cutworm
  - Western bean cutworm

- Field sampling for larvae
  - Trowel
  - Dig under soil and freshly cut plants
  - Active feeding at night

- Economic Threshold in lentils
  - 2 to 3 cutworms per square meter
Insecticide Recommendations

Lentils

Pyrethroids:
- Esfenvalerate - Asana XL*
- Beta-cyfluthrin - Baythroid XL*
- Bifenthrin – Capture*, Brigade*, Sniper*
- Cyfluthrin – Tombstone*, Tombstone Helios*, Renounce*
- Zeta-cypermethrin – Mustang Max*
- Gamma-cyhalothrin – Proaxis*
- Lambda-cyhalothrin – Taiga Z*, Lambda-Cy*, Warrior*, Silencer*

Always Read Labels.

* Restricted use pesticide

Labeled for use on Cutworms in ND
Insecticide Recommendations
(continued)

Lentils

Carbamates:
  Carbaryl (Sevin)

Botanical Insecticide:
  Azadirachtin – Azatin XL, Aza-Direct

Labeled for use on Cutworms in ND

Always Read Labels.

* Restricted use pesticide
Common Grasshoppers

Red-legged grasshopper

Differential grasshopper

Two-striped grasshopper
Young Grasshoppers or Nymphs

- Look like adults
- Smaller than adults
- Wing pad instead of wings
- 5-6 nymphal stages or instars
- 4th or 5th instars present, hatch is winding down
Grasshopper Life Cycle

EARLY SPRING
SCOUT NOW!

1st Instar

Grasshoppers molt 5 times

2nd Instar

3rd Instar

Eggs hatch

4th Instar

Surviving females lay eggs

5th Instar

Grasshopper Life Cycle

6th Instar ADULT
May - June

July - August

August - Sept
Grasshoppers

- Eggs are laid in the fall;
- Embryos develop while temperatures are favorable . . . There are wide ranges of development;
- This makes it difficult to predict hatch.

Lilac as an indicator:
10 days after common lilac flowered, 75% of grasshoppers were first stage
Grasshopper Egg Laying

Start in late July through fall
Each female = 8-25 egg masses

Each egg pod = 20-120 eggs
How Grasshopper Outbreak Develop?

- Weather dependant
  - hot, dry summers and warm falls

- Several years of gradual increase
  - LOW YEAR = 1 GH per square yard
  - FAVORABLE YEAR = 2 GH per square yard
  - ANOTHER YEAR = 4 GH per square yard
  - ANOTHER YEAR = 8 GH per square yard
  - ONE MORE = 24+ GH per square yard

!!OUTBREAK!!
How Temperature Affects Grasshoppers

- **High temperature in summer-fall**
  - Early maturity
  - Long egg laying period

- **Warm spring**
  - Early hatch, followed by:
    - <70°F - No feeding, high mortality
    - Warm and dry - Good start for hoppers
How Rainfall Affects Grasshoppers

- Cloudy, wet weather for 1+ weeks
  - Promotes fungal pathogens

- Heavy rains during emergence
  - Kills young grasshoppers
    - Embeds young in soil
    - Physically wash them away + drown

- Extreme drought
  - Poor egg hatch
  - Hoppers starve from lack of food
  - Low egg production by adults
Grasshopper Damage

- Chewing mouthparts
  - Lentils:
    - Do not prefer lentil foliage
    - Consume flower buds and early pods
    - Flower bud and pod feeding cause yield loss
  - Chickpeas:
    - Glandular hairs on chickpea leaves/pods contain malic acid, which deters insect attack

- High populations and scarce food plants
  - Migrate --- “Migratory Locusts”
  - “Eat almost any plant they come upon”
Grasshopper - Economic Thresholds

- **Lentils**
  - 2 adults per square yard from early bud stage through pod development

- **Chickpeas**
  - No threshold
  - Not a preferred host, like cereal grains
Cultural Techniques

- Early seeding
  - Established, vigorously growing plants can tolerate more damage than younger plants
  - Risk of late season migration of adult grasshoppers is less
  - Not option for late-seeded crops
    - sunflower
    - dry beans
    - safflower

- Early harvest
Crop Rotation

- Crops should not be planted in fields with severe egg infestations
- Attractive fields = late season crops
  - dry beans
  - soybeans
  - sunflower
  - flax
  - corn
Impact of Tillage

- Little value to destroy eggs directly
- Early spring tillage before egg hatch
  - Starve nymphs
- Late summer tillage
  - Destroys vegetation making area less attractive for feeding and egg laying
Insecticide Recommendations

Labeled for Grasshopper Control in ND

Pyrethroids:
- Esfenvalerate - Asana XL*
- Beta-cyfluthrin - Baythroid XL*
- Bifenthrin – Capture*, Brigade*, Sniper*
- Cyfluthrin – Tombstone*, Tombstone Helios*, Renounce*
- Zeta-cypermethrin – Mustang Max*
- Gamma-cyhalothrin – Proaxis*
- Lambda-cyhalothrin – Taiga Z*, Lambda-Cy*, Warrior*, Silencer*

Always Read Labels.

* Restricted use pesticide
Insecticide Recommendations (continued)

Lentils

Carbamates:
- Carbaryl (Sevin)

Botanical Insecticides:
- Pyrethrin - Evergreen

Always Read Labels.

* Restricted use pesticide

Labeled for Grasshopper Control in ND
Insecticide Recommendations

Chickpeas

Pyrethroids:
- Esfenvalerate - Asana XL*, Adjourn*
- Beta-cyfluthrin - Baythroid XL*
- Bifenthrin – Capture*, Bridage*, Sniper*
- Cyfluthrin – Tombstone*, Tombstone Helios*, Renounce*
- Zeta-cypermethrin – Mustang Max*

Always Read Labels.

* Restricted use pesticide
Chickpeas

Insecticide Recommendations (continued)

Pyrethroids (continued)
- Gamma-cyhalothrin – Proaxis*
- Lambda-cyhalothrin – Taiga Z*, Lambda-Cy*, Warrior*
- Zeta-cypermethrin + bifenthrin – Hero

Organophosphates:
- Acephate - Orthene
- Dimethoate - Dimate 4 EC, Digon 400, Dimethoate 400, ...

* Restricted use pesticide

Always Read Labels.
Lygus Bug on Pea and Lentils

- Small (1/4 inch), cryptically colored insects
- Distinctive yellow triangle or “V”
- Pale green to reddish-brown
- Immatures (Nymphs) look like aphids
- Adult overwinter
- Feed on over 385 crops and weeds
Lygus Bug

- Moves from alfalfa, CRP, roadside that are being hayed or cut or other crops (canola, sunflower)
- Adults enter lentils at bloom stage to feed and lay eggs
- Piercing-sucking mouth parts
- Older nymphs and adults suck out the contents of developing seeds and inject a toxic saliva into plant
- Hot, dry weather increases populations
Lygus Bug Damage on Lentils

- Chalk spot
- Pitted depression
- Downgraded to lower grade
- Deteriorate faster in storage
- Reduced germination
- Damage caused by adult and nymph life stages
Chalk Spot on Lentils

Damaged Lentils
### Grades, Grade Requirements, and Grade Designations

<table>
<thead>
<tr>
<th>Grading Factors</th>
<th>U.S. Grade 1</th>
<th>U.S. Grade 2</th>
<th>U.S. Grade 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pea damaged ( chalk spot)</td>
<td>1.0</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Lentils defective*</td>
<td>2.0</td>
<td>3.5</td>
<td>5.0</td>
</tr>
</tbody>
</table>

* Includes weevil-damaged and heat-damaged lentils.
Lentil damage by Lygus Bug at various insect development stages

Feeding Injury in Lentils exposed to Lygus bugs at various pod development stages

Lygus Bug Monitoring
Economic Thresholds

- **When to Monitor fields**
  - Sweep fields during bloom-pod
  - Warm, sunny 2-6 PM
  - 5 locations in the field
  - 25 - 180 degree sweeps with the net in the canopy. (Not just the top of the canopy with net.)

- **Economic Threshold =**
  7-10 Lygus bugs/25 sweeps
2003 Adult Lygus bug Counts in Lentils
McKenzie County, Keene, Jellsted farm

Trap In field  Trap Edge  Sweeps  Visual

6/18  7/15  7/22  7/29  8/5  8/12  8/19

Trap In field  Trap Edge  Sweeps  Visual
Insecticide Recommendations

Labeled for Lygus bug Control in ND

Lentils

Pyrethroids:

- Beta-cyfluthrin - Baythroid XL*
- Cyfluthrin – Tombstone*, Tombstone Helios*, Renounce*
- Gamma-cyhalothrin – Proaxis*
- Lambda-cyhalothrin – Taiga Z*, Lambda-Cy*, Warrior*, Silencer*

Always Read Labels.

* Restricted use pesticide
Lentils

Carbamates:
  Carbaryl (Sevin)

Organophosphates:
  Dimethoate (Digon 400, Dimate 4EC, Dimethoate 400, ...)

Neonicotinoid:
  Imidacloprid – Nuprid 2F

Always Read Labels.

* Restricted use pesticide

Labeled for Lygus bug Control in ND
Pea Aphid

- Common insect pest in lentils
- **Description**
  - Small, about $\frac{1}{8}$ inch long
  - Pale green
- **Damage**
  - Aborted flowers
  - Reduced seed formation and seed size
  - Reduced yield
Pea Aphid in Lentils
Economic Thresholds

Insecticide treatment for pea aphid control should be considered when:

- 30-40 aphids are collected per 180° sweep of a 15-inch diameter sweep net
- When few natural enemies are present
- When aphid numbers do not decline over a 2-day period
IPM - Pea Aphid

- Natural control with predators & parasitoids
  - Ladybird beetles
  - Lacewings
  - Syrphid flies
  - Parasitoids

- Wet weather favor epizootics outbreaks
  - Fungal diseases
  - Heavy rains
Ladybird Beetles - Aphid Predators
Parasitic Wasps

Lay eggs in the aphid

“mummy” . . . empty shell of aphid after parasite leaves
Natural Controls for Aphids

- Fungal diseases
- Epizootics outbreaks can decline aphid populations!
Insecticide Recommendations

Labeled for Aphid Control in ND

Lentils

Pyrethroids:
- Esfenvalerate - Asana XL*
- Beta-cyfluthrin - Baythroid XL*
- Cyfluthrin – Tombstone*, Tombstone Helios*, Renounce*
- Zeta-cypermethrin – Mustang Max*
- Gamma-cyhalothrin – Proaxis*
- Lambda-cyhalothrin – Taiga Z*, Lambda-Cy*, Warrior*

* Restricted use pesticide

Always Read Labels.
Insecticide Recommendations (continued)

Lentils

Organophosphates:
- Dimethoate (Digon 400, Dimethoate 400, ...)
- Malathion 57 EC

Neonicotinoid:
- Imidacloprid – Nuprid 2F

Botanical Insecticide:
- Azadirachtin – Aza-Direct, Ecozin

Always Read Labels.

*L Restricted use pesticide