Forage Crops and Livestock
Weed Control in Forages
Mark Loux and Mark Sulc
Dept. Horticulture and Crop Science, Ohio State University Extension

Outline
- Impacts of weeds in forages
- The most effective weed control strategy in forages
- Biology of weeds affecting forages
- Pre-establishment weed control
- Weed control during forage establishment
- Weed control in established stands
- Control of problem weeds
- Weed management in permanent grass pastures/hayfields

Impact of Weeds in Forages
- May limit stand establishment
- Reduce yield (but not necessarily)
- Increase drying time
- Generally reduce quality and palatability
- Feed value of weeds varies
  - weeds with woody stems or stalks have low feed value (50% of alfalfa value)
  - Some are toxic to animals
  - Harbor insects and pathogens

Healthy Forage Stands Compete with Weeds
- P & K fertility & pH>6.0
- Proper seedbed prep
- Timely seeding
- Variety selection
- Use quality seed
- Proper seeding rate
- Insect control
- Good cutting management

Weed Biology
- Winter annuals (e.g. common chickweed, downy brome)
  - Emerge in August through October (some in early spring)
  - Apply herbicides in mid-to late fall
- Summer annuals (e.g. foxtail, ragweeds)
  - Apply herbicides in early summer after most emerged
  - Best control when less than 6 to 8 inches tall (1-3 inches best) and actively growing (not under stress).

OSU C.O.R.N. Newsletter: corn.osu.edu
OSU Weed Science: agcrops.osu.edu/weeds
Weed Control Guide for Ohio and Indiana: OSU Extension Bulletin 789

Best to control in year before seeding!
Most forage herbicides provide poor control of perennial weeds
Control Problem Weeds Before Seeding

- Herbicide options, year before seeding:
  - Glyphosate, 2,4-D, dicamba
  - Apply during active weed growth

- Kill grass sods early, products released from decay can inhibit legume seedings.
  - Allow one month of soil temperatures above 60°F before seeding legumes after killed sod.
  - Don’t seed alfalfa after alfalfa within same year

Weed Problems During Establishment

- Spring seedings
  - crabgrass, foxtails, ragweeds, pigweed
  - smartweed, & lambquarters

- Late-summer seedings
  - chickweed, henbit, mustards,
  - shepherd’s-purse, pennycress,
  - wild turnip/birdsrape mustard
  - (a big problem in Eastern Ohio!)

Forage Establishment Phase

- Weeds emerging with crop are most destructive.
- Weed emergence after 60 days will not influence yield, but may reduce quality.
- Winter annual weed competition in early spring is very damaging.
- Grassy weeds usually very competitive with legumes.

Spring seedings - weed control in alfalfa

- Later planting = more weed problems
- Preplant incorporated herbicides:
  - Balan & Eptam for grasses, lambquarters, and pigweed
- Postemergence options:
  - bromoxynil, 2,4-D for broadleaf weeds
  - Poast, clethodim for grass weeds
  - Pursuit, Raptor for grass and broadleaf weeds
  - Chateau right after last Sept cutting, for winter annuals
  - Glyphosate in RR alfalfa for many weed species
  - Apply when weeds are less than 2 to 4 inches tall
Summer seedings - weed control in alfalfa

- Early planting reduces weed problems
- Fall herbicide application
  - Very effective for winter annuals
    - 2,4-DB, Pursuit, Raptor during October
    - Glyphosate in RR alfalfa
- Late-winter, dormant application
  - Gramoxone in late February (variable control)
- Spring herbicide application
  - Less effective than fall application
  - 2,4-DB, Pursuit, Raptor, bromoxynil

Herbicides for established alfalfa

- Late winter, dormant application for winter annuals, dandelion, chickweed, henbit:
  - metribuzin (early winter) – Tricor, Glory, etc
  - Velpar, Sinbar
  - Check rotational crop restrictions for these products

- Postemergence for annual broadleaf weeds:
  - 2,4-DB, Pursuit, Raptor in fall - 2 to 3 inch weeds
- Postemergence for annual grass and broadleaf weeds:
  - Pursuit, Raptor in fall or spring - 1 to 3 inch weeds
  - Glyphosate in RR alfalfa
- Postemergence for grasses:
  - Poast and clethodim
- Postemergence for annual, biennial, and perennial weeds:
  - Roundup in RR alfalfa

Mixed grass/legume forages

- Most broadleaf herbicides for grasses will injure or kill legumes:
  - Examples: dicamba, Crossbow, 2,4-D
- metribuzin - dormant application in early/late winter on alfalfa/grass stands.
- Glyphosate spot treatment.
- 2,4-DB and Buctril/Moxy
  - not labeled for grass/legume stands used for hay, but are labeled for CRP

Perennial, biennial weeds in forages

- Control perennials and biennials prior to forage seeding with glyphosate
- Most forage herbicides are ineffective
- Metribuzin, Velpar will suppress dandelion, dock, and a few other perennials
- Glyphosate spot treatment (will injure forage)
- Glyphosate in RR alfalfa

Wild turnip/birdsrape mustard control in alfalfa

- Seeding year and Established stands
  - Pursuit (2.16 oz/A) or Raptor (6 oz/A)
  - Pursuit (1.44 oz/A) or
    Raptor (4 oz/A) + 2,4-DB (1 - 2 qts/A)
  - Glyphosate in Roundup Ready alfalfa
- Apply in fall for best results

Birdsrape mustard (aka wild turnip)

Wild turnip/birdsrape mustard control in Mixed stands and Grass only

- Mixed stands - legume + grass
  - Butyric - 2 qts/A
  - Apply in fall for best results
- Grass only stands
  - 2,4-D (1qt/A), 2,4-D + dicamba (1 pt + 1 pt/A), metsulfuron, metsulfuron + 2,4-D or dicamba, Cimarron Max, Crossbow
  - Apply in fall for best results
- Check label for which grass species are safe for use with metsulfuron, not all grasses are tolerant
Cereal crops can be effectively used to produce forage for grazing, greenchop, haylage, or silage in several seasons of the year. Winter cereals (e.g. barley rye, wheat, winter triticale) can be planted in autumn and harvested for forage the following spring. Spring planted cereals (e.g. oat, spring wheat, spring triticale) can be harvested for forage in early summer. Ohio producers have also been planting cereal forages in early August (primarily oat) or early September (oat, spring triticale) for grazing or forage harvest in late autumn.

Foliar diseases can infect cereal crops and can reduce both forage yield and forage quality. Studies in our region are limited that evaluate the effect of foliar diseases on forage production and forage quality of cereal crops. However, we have received reports and have observed cases of serious leaf and stem rust infestations on oat planted in late July and August that is intended for forage harvest or grazing in the fall. Under severe foliar and stem disease infestations, stunting of the plants is evident. The presence of leaf and stem rust reduce palatability and acceptability of the forage by livestock. This occurs particularly when conditions are humid and warm, as often occurs in August.

While we have no data on efficacy of fungicides for controlling foliar diseases in oat, we do have ratings for their efficacy against several diseases in wheat developed from multi-year trials conducted across the North Central region (see table below) by the North Central Regional Committee on Management of Small Grain Diseases (NCERA-184). We added to the table the cereal crops that are listed on each individual fungicide product label and the harvest restrictions for forage use that must be observed after fungicide application. Keep in mind the ratings were developed only in wheat, and may not accurately predict performance in other cereal species. Growers should experiment on a small scale, always leaving non-treated areas, to determine if fungicides reduce the incidence and severity of foliar diseases in their cereal forage crop.
### Fungicides Labeled for Cereal Crop Diseases

The North Central Regional Committee on Management of Small Grain Diseases (NCERA-184) has developed the following information on fungicide efficacy for control of certain foliar diseases of wheat for use by the grain production industry in the U.S. Efficacy ratings for each fungicide listed in the table were determined by field testing the materials over multiple years and locations by the members of the committee. Efficacy is based on proper application timing to achieve optimum effectiveness of the fungicide as determined by labeled instructions and overall level of disease in the field at the time of application. Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table. Table includes most widely marketed products, and is not intended to be a list of all labeled products.

The original table was modified as shown below by adding information on labeled cereal crops and harvest restrictions for forage and hay use.

### Fungicides Labeled for Cereal Crops and their Efficacy on Wheat Diseases based on appropriate application timing

<table>
<thead>
<tr>
<th>Fungicide(s)</th>
<th>Active ingredient(s)</th>
<th>Class</th>
<th>Rate/A (fl. oz)</th>
<th>Labeled cereal crops</th>
<th>Harvest Restriction</th>
<th>Powdery mildew</th>
<th>Stagonospora leaf blight</th>
<th>Septoria leaf blotch</th>
<th>Tan spot</th>
<th>Stripe rust</th>
<th>Leaf rust</th>
<th>Stem rust</th>
<th>Head scab</th>
<th>Mixed modes of action</th>
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<tbody>
<tr>
<td>Strobilurin</td>
<td>Picoxystrobin 22.25%</td>
<td>Triazole</td>
<td>6.0 - 12</td>
<td>B,O,R,T,W</td>
<td>NL</td>
<td>VG</td>
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<td>Crops: B=barley; O=oat; R=rye; T=triticale; W=wheat</td>
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<tr>
<td></td>
<td>Aproach SC 6.0 - 12</td>
<td>Triazole</td>
<td>6.0 - 12</td>
<td>B,O,R,T,W</td>
<td>NL</td>
<td>VG</td>
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<td>E</td>
<td>1. Effiacy categories: NL=Not Labeled; NR= Not Recommended; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent; -- = Insufficient data to make statement about efficacy of this product. 2. Product efficacy may be reduced in areas with fungal populations that are resistant to strobilurin fungicides. 3. Efficacy may be significantly reduced if solo strobilurin products are applied after stripe rust infection has occurred. 4. Multiple generic products containing the same active ingredients also may be labeled in some states. Products including tebuconazole include: Embrace, Merslon, Muscle 3.6 F, Onset, Oris 3.6 F, Rabon, Tebucon 3.6 F, Tebuzol 3.6 F, Tegrol, and Toledo. Products containing prothioconazole include: Bumgar 3.6 EC, Fitmax, Fungochlor E-AG, and PropiMax 3.6 EC. Products containing tebuconazole + prothioconazole include: Aframe Plus, Arborite 2XS. 5. Products with mixed modes of action generally combine triazole and strobilurin active ingredients. Priaxor is an exception to this general statement and combines carboxamide and strobilurin active ingredients.</td>
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<td>Fluoxastrobin 40.3%</td>
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<td>Evito 480 SC</td>
<td>Triazole</td>
<td>2.0 - 4.0</td>
<td>B,O,R,T,W</td>
<td>NL</td>
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<td>Triazole</td>
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<td>Caramba 0.75 SL</td>
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<td>Tilt 3.6 EC</td>
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<td>Prothioconazole 41%</td>
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Weed Control in Grass Hayfields, Pastures, and Noncrop Areas
Mark Loux and Marc Sulc
Horticulture and Crop Science, Ohio State University Extension

Outline
- Impacts of weeds in forages
- The most effective weed control strategy in forages
- Biology of weeds affecting forages
- Mowing strategy
- Herbicide options for specific weed problems

Impact of Weeds in Forages
- May limit stand establishment
- Reduce yield (but not necessarily)
- Increase drying time
- Generally reduce quality and palatability
- Feed value of weeds varies
  - weeds with woody stems or stalks have low feed value (50% of alfalfa value)
- Some are toxic to animals
- Harbor insects and pathogens

Healthy Forage Stands Compete with Weeds
- P & K fertility & pH > 6.0
- Good grazing & cutting management
- Strategic mowing/clipping in pastures
- Protecting stands in wet weather (use sacrifice lots in grazing systems)

Weed Biology
- Winter annuals (e.g. common chickweed, downy brome)
  - Emerge in August through October (some in early spring)
  - Apply herbicides in mid-to late fall
- Summer annuals (e.g. foxtail, ragweeds)
  - Apply herbicides in early summer after most emerged
  - Best control when less than 6 to 8 inches tall (1-3 inches best) and actively growing (not under stress).

Weed Biology
- Biennials (e.g. wild carrot, poison hemlock, burdock)
  - 1st-year plants – apply herbicides in fall
  - 2nd-year plants – apply herbicides in spring before too large
- Perennials (e.g. Canada thistle, quackgrass, horsetail, dandelion, curly dock, common burdock)
  - Broadleaf - apply herbicide during bud to bloom stage
  - Grass – apply herbicide during boot to seedhead stage
  - Cool-season perennials – apply herbicides in late fall

*Best to control in year before seeding!*
Most forage herbicides provide poor control of perennial weeds

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**The Ohio State University**
College of Food, Agricultural, and Environmental Sciences

Pesticide Safety Education Program, Ohio State University Extension

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Mowing/Clipping Strategy

- Mowing is a viable option, depending on the weed species, especially when done several times per year
  - Annual weeds – mow just before or soon after flowering to prevent weed seed production
  - Biennial weeds – mow in second year of life-cycle to reduce vigor and prevent seed set
  - Perennial weeds – mow in early bud stage, when energy reserves in roots are at lowest levels; but mowing and chemical control is most effective for perennials

Herbicides for Grass Pastures

- **Milestone, Forefront (Dow AgroSciences)**
  - **Milestone** = aminopyralid
  - **GrazonNext HL** = aminopyralid + 2,4-D
  - Growth regulator herbicide

**Strongpoint of aminopyralid** = thistles

- **Canada thistle**
  - 5 to 7 oz in spring (prebud) or fall (>8 inches)
- **Bull or musk thistle**
  - 3 to 5 oz in spring or early summer (prebolt)
  - 4 to 5 oz in fall (late bolt to early flower)

OSU - Bull thistle control - 2005-06

<table>
<thead>
<tr>
<th>Application Date</th>
<th>Milestone (3 oz)</th>
<th>Milestone (5 oz)</th>
<th>Milestone (7 oz)</th>
<th>Forefront* (1.5 pt)</th>
<th>2,4-D + dicamba</th>
<th>2,4-D ester (1 qt)</th>
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<tr>
<td>Nov 14</td>
<td>60</td>
<td>87</td>
<td>95</td>
<td>--</td>
<td>27</td>
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<td>May 23</td>
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*Forefront now GrazonNext HD
**Canada Thistle Control**

- Most effective
  - *Stinger* (0.67 pt/A) – at least 4 inches tall and prior to bud stage, spring or fall
  - *Milestone* (5 to 7 oz/A) – spring in prebud stage, or fall when plants are at least 8 inches tall
- Good
  - *GrazonNext HD* (1.5 to 2.1 pt/A)
  - *Curtail* (2 to 3 qt/A)

**Poison Hemlock Control**

- Best - apply in fall to control first-year plants
- Apply in spring to control 2nd-year plant growth
  - when plants are small
- Ratings from OSU Weed Control Guide (9 = best)
  - *Crossbow, Remedy Ultra* 9
  - *Glyphosate, dicamba, Cimarron Max* 8
  - *2,4-D* 7

**Wild Carrot Control**

- Make herbicide applications in fall (October to early November) for most effective control
- Most effective
  - *Metsulfuron – Accurate/Valuron* (0.2 oz/A)
  - *Cimarron Max*
  - *Crossbow* (4 qt/A)
  - *Glyphosate*
  - *Chaparral*
- Good
  - *GrazonNext HD* (1.5 pt/A) (except 2,4-D resistant)
  - 2,4-D ester (1-2 qt/A) (except 2,4-D resistant)

**Tall Ironweed**

**Ironweed Control in Pastures/Noncrop**

**Most effective**

- *Crossbow* (2-4 qt/A)
  - Apply in mid to late summer but before rust is evident on leaves – before early August
- *glyphosate*
  - spot (3-4 % solution) or rope-wick application (2 directions) at beginning of flowering

**Good to fair**

- *GrazonNext HL* (2.1 pt/A)
- *Milestone* (7 oz/A)
Multiflora Rose control with herbicides

- **Foliar spray** – after full leafout
  - Glyphosate and metsulfuron most effective – May to September
  - Dicamba (Banvel), Crossbow – apply in May

- **Basal bark** – winter
  - Crossbow, dicamba, SuperBrush Killer
  - Treat lower 18 to 24 inches of plant
  - Treat both sides
  - Apply late December to early April
Autumn olive

- Foliar spray – after full leafout
  - Dicamba (Banvel, etc)
  - Crossbow
- Basal bark – winter
  - Crossbow
  - Dicamba (Banvel, etc)
- Cut stump – anytime except during heavy sap flow
  - Dicamba or RTU formulations of dicamba

Spotted Knapweed

- Problem in eastern OH
  - Pastures and marginal grass hayfields
- Short-lived perennial
  - Forms low rosette first year
  - Stem elongation and flowering following year
- Herbicides –
  - Stinger/Transline – after basal leaves up to bud stage
  - Milestone/GrazonNext – fall or spring, rosette to bolt stage
  - 2,4-D + dicamba – early bolting stage
  - Curtail – fall or spring – rosette to mid-bolting
- Mowing – during flower and prior to seed set

Smooth bedstraw

- Problem in eastern OH
  - Marginal grass hayfields that get harvested once a year
- Foliar spray – in spring after leafout
  - Mid-April into early May
- Most effective reduction in population
  - Crossbow – 1 qt/A
- Control of topgrowth and some reduction in population
  - Metsulfuron (Accurate/Patriot) – at least 0.4 oz/A
  - Cimarron Max
  - Dicamba + 2,4-D – 0.5 lb ai + 1 lb ae/A

Primary Grass Pasture Herbicides

- aminopyralid (Milestone)
- aminopyralid/2,4-D premix (GrazonNext HD)
- aminopyralid/metsulfuron premix (Chaparral)
- dicamba (Banvel, others)
- metsulfuron (Accurate/Valuron)
- metsulfuron/2,4-D/dicamba premix (Cimarron Max)

Primary Grass Pasture Herbicides

- triclopyr (Remedy Ultra/Relegate)
- triclopyr/fluroxypyr premix (PastureGard)
- triclopyr/2,4-D ester premix (Crossbow, others)
- 2,4-D amine and ester (Various)
- 2,4-D/dicamba premix (WeedMaster, Brash, others)
- glyphosate (spot treatment)
- tebuthiuron (Spike - spot treatment for brush)
Grass Pastures – grazing restrictions

- Stinger, Milestone
  None
- Dicamba, Banvel, etc
  Dairy – 7 to 60 days
  Other - none
- MCPA
  7 days
- metsulfuron
  None
- 2,4-D
  Dairy – 7 day
  Other - none

Prairiegrass/Warm-season Grass Problems

- Warm-season grass seedings promoted by FSA, others
  - CREP acres, wildlife areas
- Primary herbicide option
  - Journey = imazameth (Plateau) + glyphosate
    - Preplant use only
  - Plateau available only through NRCS
- Attempts to establish without preparation
  - Johnsongrass, Canada thistle

Prairiegrass/Warm-season Grass Problems

- New infestations of kochia, Palmer amaranth, shattercane
  - Appear to be contaminants of grass seed
  - Species not common in Ohio
  - Kochia breaks off and rolls around
  - Herbicide resistance common in these species
  - Are becoming problem in corn and soybeans
- Need to be sure grass seed is free of weed seed
  - Seed should be labeled and seller approved
  - ODA is willing to test seed prior to planting

OSU C.O.R.N. Newsletter
corn.osu.edu

OSU Weed Science
agcrops.osu.edu/weeds

Weed Control Guide for Ohio and Indiana
OSU Extension Bulletin 789

loux.1@osu.edu – Weed Management
sulc.2@osu.edu – Forage Management
Livestock Update
Tim McDermott, DVM
Hocking County, Ohio State University Extension

External Pests of Livestock
Timothy McDermott DVM
Ag/NR Hocking Co.

Economic Costs of External Parasites in Swine
• Insects, ticks and mites cause direct and indirect losses to the swine industry.
• For hog lice, estimated losses to the US hog industry are between 10 to 50 million dollars per year. *
• The economic losses to producers in a study of swine breeding farms in Hesse, Germany in 2004 showed a loss of 4200 euros(about 4700 US$) on average per farm per year from lice and mange.**

Economic Costs of External Parasites in Beef Cattle
• Insects, ticks and mites cause direct and indirect losses to the beef industry.
• Blood loss, irritation, annoyance, insect contamination of meat are direct losses. In addition, insects transmit many bovine diseases such as bluetongue, pinkeye, epizootic bovine abortion, and anaplasmosis.
• The USDA estimated that insects and mites cause $2.2 billion annual loss to the cattle industry in this country (Mock, 1997).
• Entomologist, Don Mock, at Kansas State University estimated that insects and mites cause the Kansas beef industry $130 to $150 million loss annually.

Economic Losses from External Pests Sheep Keds
• 8% reduction in weight gains
• 15% reduction in wool production
• 30% reduction in value of sheep skins

Source: Montana State University Extension guide MT20111

Economics of Horn Flies in Cattle
• Estimated Horn Flies alone cost US Beef Industry $800 million dollars per year.
• Can reduce calf weaning weights by 12-14#
• Can reduce gain in yearling steers by 30# over the course of the grazing season.
External Pest Treatment Methods

- Systemic
  - Injection
  - Feed Additive (Veterinary Feed Directive concerns)
  - Bigger concern with withdrawals potentially
- Topicals
  - Pour On
  - Dust
  - Sprays
  - Back rubbers/dusters
- Baits
- Pass throughs
- Ear tags
- Pesticide sprays
  - Residual vs. Area vs. Manure treatment
  - Avoid contamination of food, water and the animals
- Always read the label before buying and using any pesticide

Integrated Pest Management

- Need to correctly identify the pest
  - Different methods, rates, routes, etc. work better for different pests. For example, lice generally need two treatments spaced 2-3 weeks apart in almost all species.
- Minimize pesticide use
  - Continued use of one pesticide can lead to resistance to that pesticide as well as related pesticides in the same class.
  - Certain application methods will speed resistance (ex. Ear tags)
- Promote and protect beneficial insects
  - Manure/Standing water/Organic matter management
  - Maximize health of stock
  - Reliable monitoring/scouting for pests to avoid infestation
  - Biosecurity

Precautions to take with pesticides

- Cover feed and water containers to prevent contamination during application.
- Keep chemicals thoroughly mixed in sprayer. Some formulations will separate unless constantly agitated, resulting in overdoses for some animals and underdoses for others.
- Do not mix pesticides or load a sprayer where animals (including children, pets, livestock or wild animals) may have access to spilled chemicals.
- Do not use a pesticide if an oily or gummy film is present on the surface. The chemical may have deteriorated in storage.
- Pesticides should not be applied to animals already treated with other pesticides or drugs. The combination of chemicals may produce undesirable effects.

Precautions to take with pesticides (cont.)

- Sick or stressed animals should not be treated with certain pesticides.
  - Young animals are often susceptible to pesticides. Read label precautions before treating young animals.
- Do not use sprayers with leaking tanks, hoses, or connections. Leaking pesticide solution increases the risk for contamination of humans, livestock, and premises and the chance of under/overdosing.
- Certain types of animals are susceptible to some pesticides. Sensitive animals should not be treated.
- Some solvents have a tendency to stay in the air and cause toxicity problems to animals while in the holding area. To prevent this problem, animals should not be treated during hot, still afternoons.

Precautions to take with pesticides (cont.)

- Have a dedicated area for cleaning sprayers so that excess pesticide and wash water do not contaminate animals or food and water. Keep drainage out of water supplies and streams. Do not allow animals to come into areas where sprayers are cleaned.
- Mix only the amount of chemical needed for the number of animals to be treated at that time.
- Excess pesticide solutions left in spray tanks should be disposed of properly. Do not store pesticides after they have been mixed for use except where permitted by label instructions. Many pesticides lose potency when mixed for use and then stored. In addition to the above precautions, protect yourself from the effects of pesticides by following all safety procedures on the label and using accepted pest control practices.

Different Livestock Pesticides

- Pyrethrin/Pyrethroids
- Organophosphates
- Amitraz
- Rotenone
- Carbamates
- Ivermectins
- Piperonyl – not a pesticide, a synergist
- “New” Isoxazoline
## Dosing differences – Example – Ultra Boss (Permethrin with Piperonyl Butoxide)

<table>
<thead>
<tr>
<th>Apply To</th>
<th>Target Species</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactating and Non-Lactating Dairy Cattle, Beef Cattle, Calves, Horses (Not intended for human consumption)</td>
<td>Lice, Horn flies, Face flies Acts in control of Horse flies, Stable flies, Mosquitoes, Black flies, and Ticks</td>
<td>Apply 3 mL/100 lbs body weight of animal up to a maximum of 30 mL for any one animal. Pour along back and down face. Back Rubber Use: Mix 100 mL/G of #2 diesel oil or mineral oil. Keep rubbing device charged. Results improved by daily forced use.</td>
</tr>
<tr>
<td>Lactating and Non-Lactating Dairy Goats</td>
<td>Sheep kids, Lice</td>
<td>Apply 1.5 mL/50 lbs body weight of animal up to a maximum of 18 mL for any one animal. Pour along back and down face. Pour along back. Apply 1.5 mL/50 lbs of body weight of animal up to a maximum of 18 mL for any one animal</td>
</tr>
</tbody>
</table>

## External Pests of Swine

### Swine – Lice

**Haematopinus suis**

- Feeds on blood
- Spread by animal contact or infested bedding
- Causes animals to itch
  - Economic losses due to anxiety, weight loss, secondary disease
- They reproduce faster in winter than in hot weather
- Can complete entire life cycle on the host, only lives 2-3 days off the host
- *H. suis* is the vector for swine pox and hog cholera

Do not purchase this pest → Biosecurity

### Swine – Mites and Ticks

- **Mites**
  - Sarcoptic Mange – itch mite
  - Demodectic Mange – follicle mite
  - Wild boar reservoir in southern Ohio?
- **Ticks**
  - More of a problem with pastured swine or free range swine in forested grazing areas
  - Ticks are major disease vectors in mammals

### Biosecurity

### External Pests of Swine – Flies and Mosquitos

- Manure management
  - Flies can complete life cycle in 10 days
  - Larvicides for manure treatment
- Standing water management
  - Mosquito life cycle 4-30 days depending on conditions
  - Insecticides alone will not control the pests completely as long as breeding sites exist.
- Flies – all manure, wet bedding and spilled feed removed 2X/week to break cycle
- Both can be vectors for diseases

### External Pests of Horses

- **Flies** – many different types
- **Ticks** – disease vector
- **Mosquitoes** – blood feeding and disease vector
- **Lice/Mites**
- **Bots**

Clinical signs – poor performance, anxiety, secondary disease, physical nuisance, skin irritation/infection, unthriftness
Equine Pests - Flies

• Filth Flies (Stable and House Fly)
  - Develop in moist organic matter
  - House flies do not bite, will feed on fluids
  - Stable flies do bite, do not spend much time on horse

• Biting Flies (Black, Horse, and Deer Fly)
  - Usually develop in wetlands
  - Can travel several miles
  - Usually more active in bright daylight, keep horses indoors during day
  - Can make life miserable for horses (and people)

• *Pesticides alone may not kill flies*

• Most flies can carry and spread disease

Equine Pests - Ticks

• Ohio’s three most common tick varieties:
  - Black Legged Tick (Deer Tick), American Dog Tick, Lone Star Tick

• Common tick-vectored diseases:
  - Lyme disease
  - *Anaplasmosis (Equine Ehrlichiosis)*
  - Need to do frequent tick checks

Equine Pests - Mosquitoes

• Mosquito transmitted diseases in horses are a major medical concern

• Diseases:
  - West Nile Virus
  - Eastern Equine Encephalitis (EEE)
  - Western Equine Encephalitis (WEE)

• West Nile Virus is the leading cause of Arbovirus encephalitis in the US.
  - Horses and Humans. (Most cases are equine)

• Birds are a prime reservoir hosts. Rodents second.

Equine Parasites – Lice and Mites

• Lice
  - Biting Lice -
  - Sucking Lice -

• Mites
  - Sarcoptic Mange mite
  - Lice transmitted by contaminated tack, bedding or direct.
  - Sarcoptic mange can affect humans but is equine variant

Equine Parasites – Bots

• Primary disease process in horses is as an internal parasite

• Treatments are dewormers once inside horse

• Potential to treat with external pesticide, but need to avoid mucus membranes

• “Fly Strike” – bot flies lay eggs on horses which migrate into the gastrointestinal system to complete life cycle

• Horses either lick the eggs off the hair while grooming or the larvae hatch and then migrate in through mucus membranes

• Common bots, nose bots, throat bots

External Pest of Small Ruminants

• Keds
• Lice
• Ticks
• Mites
• Midges
• Flies
• Mosquitos
External Pest of Small Ruminants – Sheep Keds

- Looks like a tick, but is a fly
- Primarily sheep, but can affect goats
- Blood sucker
  - Can cause anemia
  - Diseases vector
- Life cycle complete on host, like a tick
- Economic losses
  - Wool damage, staining, lower weights, death
- Shear, then treat with insecticide
  - Sprays, dips, pour-on, dust
  - Pyrethroids, invermectins
- Biosecurity

External Pest of Small Ruminants - Lice

- 3 primary species affecting sheep and goats
  - Biting, Foot, African blue
- Biting louse is #1 louse problem of sheep worldwide
- Treat with similar products as Keds
  - Biosecurity

External Pest of Small Ruminants – Ticks/Mites

- Ticks
  - Less common than other external pests
  - Can transmit serious disease
- Mites
  - Psoroptic Mange (Sheep Scab)
    - Reportable
    - Currently eradicated
  - Sarcoptic Mange
  - Corioptic Mange
  - Demodicectic Mange

External Pests of Poultry

- Major
  - Mites
  - Flies
- Minor
  - Lice
  - Chiggers
- Different problems in large scale houses vs backyard poultry
  - Biosecurity important (especially backyard flocks)

External Pests of Poultry - Mites

- Most common/most important mite is the Northern Fowl Mite
- Blood feeder
- Direct spread or from wild birds
- Will bite humans as well
- Very small, can have huge infestation
- Egg → Adult in 7-10 days

External Pests of Poultry - Flies

- House fly
  - THE major pest associated with manure
  - More active during day when temps are above 70 degrees
  - Rest on surfaces in the poultry house
- Little House fly
- Black Garbage fly
- Blow fly
- Fly Management = Manure Management
  - Dryer than 50%,
External Pests of Cattle

- Flies
- Lice
- Grubs

Cattle Parasites - Flies

- Confinement
  - House flies and Stable flies
- Pastured
  - Horn, face, horse, deer, and black flies

Cattle Parasites - Lice

- Varieties
  - Sucking
  - Biting
- Most prevalent in winter
  - Denser hair coat, animals huddle for warmth
  - Decreased nutrition, increased stress
- Clinical signs: poor thrift, itchy, hair loss
  - Economic loss as a result. Eat less, less healthy
- Many different treatment options.
  - Including by maintaining optimum nutrition and health
- Many different treatment routes

Cattle Parasites - Grubs

- Larvae of Warble Fly
- Larvae very large
- Can affect many species
- SQ migration
- Emerge as swellings
  - “warbles”

References/Useful Links

- Livestock Pest Management Training Manual
- MSU Extension online PDF for Commercial Cat. 1D
- Purdue has factsheets for most livestock species groups
  - Cattle, Poultry, Swine
- University of New Hampshire Extension Equine External Pests
- Pest Management Recommendations for Dairy Cattle
- Cornell/PSU Extension
Livestock Building Pests and Problems

Curtis E. Young

Van Wert County Extension Educator, Ohio State University Extension

Two beetles causing problems in poultry and some swine buildings are the darkling beetle and the hide beetle. Both beetles can build to large populations in livestock buildings resulting in problems in several ways. The problems that they can cause include the potential spread of poultry diseases, reduction in feeding efficiency due to disturbance to the chickens and consumption of beetles by the chickens, impaction of intestinal tracts in chickens, and loss of feed to insects. The larvae of the beetles damage structures by boring into soft construction materials. If manure is not properly managed and spread on fields during warm weather months, beetles can leave the fields and invade nearby homes becoming a major nuisance pest in those homes. On a positive note, both beetles do consume the larvae of other insects such as fly maggots.

Darkling Beetles (Order Coleoptera: Family Tenebrionidae: Alphitobius diaperinus)

Darkling beetles are also known as Litter Beetles, Black Beetles and Lesser Mealworm. Although they are cosmopolitan in their distribution today, they apparently are of sub-Saharan origin where they were associated with large bird and bat colonies. An adaptation that they evolved because of their association with bird and bat colonies is to be highly attracted to sources of ammonia such as the ammonia that is released from chicken manure and bat guano. They may not be well adapted to freezing temperatures and may need to be in heated facilities to survive the winter in northern climates. This may be a possible control option in the winter if the houses can be opened and left unheated for several days. Of course, this could be a challenge for water pipes in the structure. There is also no concern for spreading beetles when manure is spread during the colder months of the year.

Darkling beetles are known to be major vectors for a wide variety of poultry diseases. These diseases include: Gumboro disease, Marek's Disease, Salmonella, Campylobacter, Aspergillosis, Reoviruses, E. coli, and coccidial oocysts.

Under excessively dry conditions, darkling beetles crawl onto chicks and chew holes into the skin of the chicks. Disease can develop in these wounds and kill the chicks.

Besides eating feed, the beetles will eat other sources of organic materials such as manure, feathers, egg yolks, dead animals and other insects. When eating other insects, they are not particular. They can be predatory or cannibalistic. Thus to avoid cannibalism, larvae that are ready to pupate search for secure places to pupate. This is when damage to construction materials occurs.

The darkling beetle as all beetles are complete metamorphic with 4 stages in their life cycle (eggs, larvae (grubs), pupae and adults). They lay their eggs in the litter/manure material or in spilled or stored food. The larvae have a segmented body with pointed abdomen tip and three pairs of legs. Larvae start off white and darken to a yellow brown color, and grow to about 1/2” (10-12mm) long. The larvae feed in the litter/manure and feed. In low populations, the larvae pupate in earthen floors or in cracks and crevices, but when populations are large, larvae migrate away from feeding sites to find safe havens in which to pupate.

Darkling beetle adults are shiny-black, somewhat flattened, oval beetles approximately 1/4” (6 mm) long. Adult beetles are typically active at night. When inspecting for beetles, one area that they tend to aggregate in is along walls. During the summer, the adult beetles easily disperse from one location to another during the night and are highly attracted to sources of light. This is why beetles that get spread with manure onto fields during the summer and early fall may descend on houses near these fields.
Hide Beetles (Order Coleoptera: Family Dermestidae: Dermestes maculatus)

Hide beetles are also known as Leather Beetles. They additionally have a close relative called the Bacon beetle or Larder beetle (D. lardarius). Either of these beetles could be found in livestock structures.

The hide beetles are considered to be a minor vector for poultry diseases. However, like the darkling beetles, they interfere with feeding efficiency by disturbing chickens while feeding, and if eaten by the chickens, can cause impaction (clog the intestinal tract). They will consume feed, but will also feed on feathers, carcasses, spilled feed, droppings and other insects.

The bodies of the larvae are covered in rows of hairs of different lengths, called setae. The underside of the abdomen is typically yellowish-brown while the dorsal surface is typically dark brown, usually with a central yellow line. Two long horn-like protrusions are located on the upper surface of the last segment, partially hidden by surrounding hairs.

Hairs on the bodies of the larvae break off easily and can be a major irritant to sensitive-skinned individuals. They can also trigger allergies in other people.

Adult hide beetles range in size from 7/32-3/8" (5.5-10.0 mm). The underside of the abdomen is primarily white due to white hairs with black spots at the sides, and a large black patch on the last segment where the white hairs are absent. The elytra are dark brown or black, with hairs that are mostly black, yellow, or white. The antennae are short and end with a club at the tip.

Dermestid larvae such as hide beetles are used by museums and taxidermists to clean specimens of soft fleshy materials to expose the bone without damaging the bones. The beetles are very proficient at removing even little morsel.

Both beetle species will consume feed intended for the livestock, especially old feed that has drawn moisture and has begun to mold. Spilled grain and/or feed on the ground anywhere around the farm can attract beetles.

Water leaks from plumbing will prevent manure from drying well and provides a suitable environment for flies to breed. This encourages the development of beetle populations that feed on the fly maggots.

The presence of these beetles in swine facilities is a little perplexing. Unlike many poultry facilities where manure collects in semi-dry condition, most swine facilities run on liquid manure pits. These beetles do not breed in liquid, so there has to be other locations where the beetles as well as larvae are developing. That location could be rafts or floating mats of solid organic matter floating on top of the liquid and/or solids crusted to the walls.

Potential Breeding Locations

- Litter in poultry houses
- Anywhere that feed collects (especially old, wet and moldy feed)
- Anywhere fly maggots are developing
- High moisture manure (this is compounded by water leaks in plumbing)
- Manure crusted on walls
- Floating rafts of organic matter in manure pits

Damage to Structures

When populations of beetle larvae are high, the larvae will abandon feeding sites, migrate in search of protected sites in which to pupate and bore into soft construction materials such as plywood, particle board, “soft” Wood (e.g. white pine) and insulation.

The larvae of both beetle species can cause considerable damage to wood, cork, plaster, and insulation (polystyrene boards and fiberglass batting) when they bore into these materials to pupate. This structural damage is a problem in the poultry industry, particularly in cage-layered facilities. Apparently some hog facilities have also experienced problems with hide beetles and/or darkling beetles. In addition to the larvae boring into polystyrene insulation boards, they may be further damaged by mice digging through the infested insulation board to collect and eat larvae and pupae hidden in the insulation.

These boring and digging activities result in reduced insulation values leading to higher costs in temperature control. Damage to support timbers in house of wooden construction may require replacement leading to potentially high repair costs. Reported damage to wood in some houses claim potential concerns for the integrity of the overall safety of the structure due to the insect activity. Controlling the insects in these situations is imperative.
Keys to Successful Beetle Control
Using Insecticides

- Apply the label recommended amounts of each insecticide.
- Knock down large populations of beetles between groups of animals.
- Apply insecticides using as little water as possible.
- Apply insecticide in a 3’ wide band under the feed lines and a 3’ wide band along the walls and footers, and 2’ up onto the wood above the footers (major action sites).
- Add 1 packet of Citric Acid or PWT to each organophosphate or pyrethroid insecticide
- Add 2 ounces of clear household ammonia/gallon of tank mix when using Elector (spinosad).
- Control beetles on manure in storage piles.
- Rotate between the different classes of chemicals
- Don’t be too hasty in judging any particular chemical to be ineffective.
- Kill rate is very different between different classes of chemicals.

Avoid Pesticide Resistance

Rotate pesticide classes used relatively frequently to avoid the development of pesticide resistance. Classes of insecticides include Organophosphates (e.g. tetrachlorvinphos, dichlorvos), Carbamate (carbaryl), Pyrethroids (e.g. cyfluthrin, permethrin), Neonicotinoids (e.g. imidacloprid), Spinosyns (spinosad) and Borates (boric acid). The following table shows insecticide chemical class, active ingredients and trade names under which they are sold.

<table>
<thead>
<tr>
<th>Chemical Class</th>
<th>Brand names</th>
<th>Active ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonicotinoids (2-3 flocks)</td>
<td>Credo, Exile DB, Dominion, MIDASH Forte</td>
<td>Imidacloprid</td>
</tr>
<tr>
<td>Pyrethroids (2-3 flocks)</td>
<td>StandGuard, PermaCap, Tempo, Permethrin SFR, Tengard, Optimate, Optashield CS, Bifen</td>
<td>Gamma-cyhalothrin, Cyfluthrin, Bifenthrin, Permethrin</td>
</tr>
<tr>
<td>Organophosphates (2-3 flocks)</td>
<td>Durashield CS, Pyrofos CS, Rabon, Ravap</td>
<td>Chlorpyrifos, Tetrachlorvinphos, Dichlorvos</td>
</tr>
<tr>
<td>Spinosyns (2-3 flocks)</td>
<td>Elector PSP</td>
<td>Spinosad</td>
</tr>
<tr>
<td>Borates</td>
<td>SafeCide Brand IC</td>
<td>Ortho-boric Acid</td>
</tr>
</tbody>
</table>

Alternative and Supplemental Cultural and Mechanical Control

Cold temperatures (sub-freezing for several days - this requires draining and blowing out water pipes), frequent manure clean-out/sanitation (pick up trash, animal droppings, carcasses, spilled feed, broken eggs and other food sources of beetles), keep manure dry (good cross-ventilation in the pit), resistant insulation material, mechanical barriers to prevent larvae from reaching insulation and other soft construction material, break up floating rafts of organic solids in liquid manure pits (apply biological digesters), and clean crusted manure/organic materials off of walls.

To lessen the chances of releasing large numbers of beetles to invade homes near agricultural fields by composting poultry litter and manure before taking it to fields to be spread.

References

- Ralph E. Williams, Purdue University, Control of Poultry Pests. http://extension.entm.purdue.edu/publications/E-3.pdf