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Armyworms in Grass Pastures and Corn in Western Oregon

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Armyworms are the larvae (caterpillars) of the moth *Pseudaletia unipuncta* Haworth. This insect is a serious pest of turf, forage, and seed grasses; small grains; and corn throughout North America. Armyworms can cause sudden, extensive damage to these grasses and grasslike plants (Figures 1 and 2). Note that the armyworm does not feed on clover, alfalfa, or other broadleaf plants in mixed grass–legume stands.

Armyworm outbreaks can occur suddenly, and crop and economic losses can be substantial. If armyworms are not detected and controlled early, they are very difficult to control, even chemically.

In western Oregon, armyworm outbreaks are cyclic. They occur every 7 to 15 years, from August through October, and may persist for 1 to 3 years. Grasses and corn are the crops most affected.

A 3-year armyworm outbreak (2003–2005) in southwestern Oregon caused serious economic injury in grass pastures and corn. We recorded populations of larvae exceeding 40 per square foot. At these levels, pastures were defoliated, hay yields plummeted, and producers were forced to purchase supplemental feed. Armyworms also infested orchardgrass seed crops and corn in the Willamette Valley.

During an outbreak, armyworm larvae can consume all but the toughest stems of grasses, grains, and corn in a matter of days. Once they have exhausted the food supply at a particular location, they crawl over the ground like an army to find new feed. After ravaging fields, they either turn into moths or die. Death usually is from lack of food, disease, or attacks by parasitic flies and wasps.

Armyworm populations usually are kept well below levels of economic concern by naturally occurring biological controls (including parasitic flies and wasps) and cool or cold weather.

Figure 1. Armyworm damage on grass. (Photo: Matt Montgomery, Sangamon-Menard Extension, Illinois)

Figure 2. Armyworm damage on corn.

Figure 3. Armyworm moth. Note the small white dot on each forewing.

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Problems begin when a warm winter and wet spring allow an armyworm population to expand its normal winter range. These conditions create an abundance of wild host grasses and reduce the winter death rate of armyworms. Populations build so rapidly that parasitic insects are not able to suppress the pest.

Effective management of armyworms in pastures, corn, and cereals is based on several factors:

- Correct identification of the pest and understanding of its biology, behavior, and ecology
- Knowing how to detect and scout the pest
- Knowing the relationship between pest numbers and crop loss
- Having options for controlling the pest

Description and life cycle

Armyworms develop through four stages. The adult is a stout moth approximately 1 inch long, with tan to grayish brown wings that measure about 1½ inches. Each forewing has a single tiny, white dot in the center (Figure 3).

Armyworms overwinter in the moth stage. On the first warm spring days, the moths become active. After mating, females deposit eggs on grasses and cereals. Two to 20 eggs are lined up in 1 or 2 rows along leaf veins. One female can lay up to 2,000 eggs during a 2-week period! Eggs are small and round, and they usually hatch in 7 to 14 days.

Newly hatched armyworm larvae are less than 1/16 inch long. However, they begin feeding immediately and will develop to maturity over the next 4 to 6 weeks. They shed their outside skeleton about five times as they grow to almost 1½ inches long.

Armyworm larvae vary in color from dark green-brown to black. Long white, orange, and dark brown stripes run the length of the body (Figure 4). The head is light brown with a brown network of veins.

On most crops, larvae feed aboveground at night. On corn, they burrow into the stalks, tassels, and ears, where they may continue to feed during the day.

When mature, the larva burrows into the soil and transforms to the pupal stage (Figure 5). Inside the pupa, an adult moth forms. It emerges in 10 days to 3 weeks, and the cycle begins again.

Seasonal life cycle

There probably are two or three generations of armyworm per year in southwestern Oregon. The pest is thought to overwinter primarily as an adult moth. An early, small generation of larvae may hatch in April and May.

The outbreak levels of armyworm larvae experienced in August 2005 were probably the result of massive moth flights from late June through July. These flights are of both local and migrant origin. They develop rapidly and persist for weeks with favorable weather. Each female can lay hundreds of eggs nightly. Beginning in late July or early August, depending on field location, the first larvae of these infestations can be seen at night on grasses.

A possible third generation overlaps the second generation. Adults emerging in late September through November are thought to overwinter.

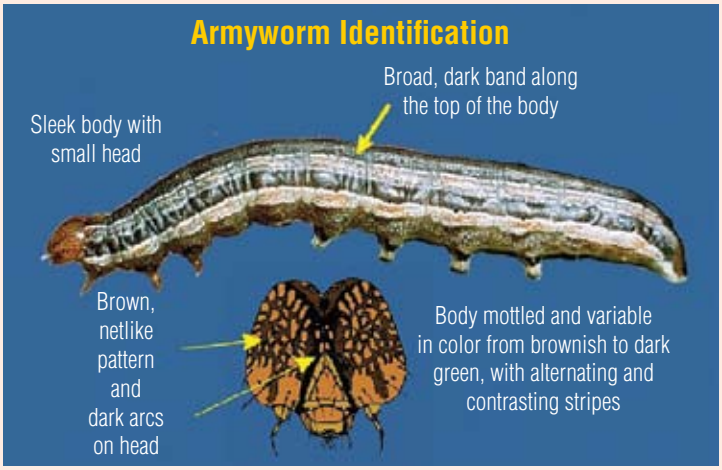

Figure 4. Identifying armyworm larvae.

Figure 5. Red, torpedo-shaped pupa of the armyworm.

Monitoring

Moths

Early detection of armyworm activity is essential. Moth flight is noticeable beginning in June, before damage from the larvae is seen. When moving pipe or livestock, take note of moths attracted to vehicle lights and lights around outbuildings. Increasing moth numbers will be followed by the presence of larvae in fields within 2 to 3 weeks.

Ultraviolet or black light traps have been used to monitor armyworm flights. Trap catches of hundreds of moths per night in a single trap indicate an outbreak.

Sweeping for larvae

Beginning in late July, routinely scout for armyworm larvae in grass and corn crops. Weekly sweeps will indicate the relative size of field populations, whether populations are increasing or decreasing, and whether economic damage is likely.

A sweep net is effective for monitoring larvae in pastures. Sweep fields at night, beginning at least an hour after dark. Take a flashlight and keep records. Sweep at least 10 sites in the field, using 10 straight-line sweeps. Record total larvae collected per site.

In corn fields, conduct visual searches either late at night or very early in the morning. Look for leaf damage (bite marks), frass (insect manure) in whirls, and larvae. Look closely for small larvae. Search at least 10 sites. Record total larvae collected per site.

Determine the average numbers of larvae per sweep at each site in a given field. If more than five larvae per sweep are found, potential for crop injury exists.

Ground searches

Most recommended treatments are based on numbers of armyworm larvae per square foot. In late July and early August, conduct ground searches for armyworm larvae during daylight. Information gathered will help determine the sizes of the larvae present, whether the larval population is increasing or decreasing, and if and when to apply a control.

Make a map of each field. Sample square-foot-sized areas in and around pastures. Select at least 15 sites for every 30 acres of pasture.

At each site, part grasses to expose bare soil (Figure 6). Also look in soil cracks, under soil surface debris, and within curled leaves on the ground. Pay close attention to fence rows, field edges, field ridges, wet areas, and places with the tallest and thickest grass stands. These are the areas where armyworm moths lay the earliest and greatest number of eggs.

Look for parasitic Tachinid fly eggs on armyworm larvae. These tiny, white eggs are easily seen on the larvae (Figure 7).

Recheck fields every 5 to 7 days. Sample fields several times for 3 weeks. Note population trends (increasing, decreasing, or no change), hot spots, the size range of larvae, and whether you find parasite eggs on larvae. Keep a seasonal record of numbers and relative sizes of armyworm larvae per square foot by field, date, and year.

Small larvae are less than ¼ inch long, medium-size larvae are ¼ to ¾ inch, and large larvae are greater than ¾ inch (Figure 8).

What do the numbers mean?

After three sampling periods 5 to 7 days apart, you should have answers to these questions: Are numbers of larvae increasing? What is the proportion of small larvae to large larvae? Are the larvae parasitized?

Five to 10 armyworm larvae per square foot in pasture grass probably justifies control. Increasing armyworm numbers and no signs of parasites also indicate a need for applied control.

Figure 6. Armyworm larvae remain in the soil or under leaves during the day. Look carefully!

Figure 7. Egg of tachinid fly parasite on armyworm larva.

Figure 8. Control is most effective and economical on smaller larvae (¼ inch).

Keep in mind that pasture age, health, drought stress, or crop disease can influence the level of damage armyworms might cause. Likewise, a large, healthy armyworm population will cause more damage than one small enough to be controlled by natural enemies.

The effect armyworms have on a pasture depends on a number of factors, including grass species and variety, overall pasture health, presence of other pests or stresses, and whether the pasture will be clipped or grazed. Vigorously growing pastures with minimal stresses might tolerate up to 10 armyworms per square foot with little apparent effect on yield or health. Older, weedy pastures experiencing other pest problems and stresses might require armyworm control with just an average of five larvae per square foot. In 2003–2005, armyworms exceeded 40 larvae per square foot in southwestern Oregon, and damage was extensive.

Biological control

Armyworm populations often are kept below damaging numbers by natural biological control. Tachinid flies (Figure 9) parasitize armyworm larvae and are an effective biocontrol agent, often accounting for population crashes after outbreaks. Flies deposit eggs on armyworm larvae. When the fly larvae hatch, they tunnel into the armyworm body cavity and eventually kill the armyworm larva before it pupates.

Unfortunately, biological control is not consistent from year to year. Armyworm outbreaks usually occur when weather or other factors reduce biological controls. Populations of biological control agents should recover in a year or two at most. It may take a few years to reestablish the balance between biological controls and pests.

In August 2005, we found Tachinid fly parasites in about one-third of all armyworm larvae collected from pastures in Coos County. We also observed many flies depositing eggs on armyworm larvae in pastures. Interestingly, the fly was seldom seen in 2003–2004.

Armyworm control and organic practices

Organically approved materials are registered for armyworm control. A naturally occurring pathogen, *Bacillus thuringiensis*, can be used for armyworm control but was not very effective in recent Coos County trials. It seems to be effective only on very small larvae. *B. thuringiensis* is a soil bacterium cultured commercially and formulated under various trade names for use on crops to control many caterpillar pests. Some formulations are acceptable by organic standards, but others are not.

Figure 9. Tachinid fly parasites of armyworm are about the size of houseflies and are active at night.

Pyrethrins are formulations of the pyrethrum plant. Many pyrethrin products are listed as acceptable by organic certifiers. In general, they perform poorly on armyworm larvae and are more suitable for fly control.

Spinosad is formulated as Entrust for the organic market and Success for conventional producers. It gave effective control of large infestations of armyworms in our research plots. It was also very effective (greater than 95 percent control) when used in 2005 on grass pasture in Coos County under a special EPA-approved "Crisis Exemption." Entrust was extremely effective at quite low rates in our 2005 trial.

Look for a federal registration in 2007. Use neither product in 2006 unless an emergency exemption is issued or federal registrations are obtained for use of these products on grass. Call your local Extension agent if you are interested in using this product.

Conventional production

Malathion, carbaryl, and *Baythroid* are registered for use on grasses grown for pasture, hay, and silage. Baythroid and malathion are restricted-use pesticides, so applicators must have state certification and an appropriate applicator's license from the Oregon Department of Agriculture. Baythroid is the more effective product. Check all labels for use rates, restrictions, and application methods. Sevin (carbaryl) is a registered control method but gives poor control of armyworms.

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