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Timing Corn Earworm Control

D. R. Scott, C. R. Baird and H. W. Homan

The corn earworm is a pest of corn in the Magic Valley and Treasure Valley areas of southern Idaho. The infestations in corn in Magic Valley usually do not warrant control. In Treasure Valley, sporadic outbreaks occur. Usually in 2 years out of 6, insecticidal control would not be economic; in another 2 of those 6, control would be economic in about half of the fields; during the remaining 2, control would be economic on almost every field. If the grower applied insecticidal controls every year, he would waste half his application money over a 6-year period. If he didn't apply controls, he would sustain losses at least 2 years in every 6. The above applies to sweet corn for processing; sweet corn for seed is different — the product is more valuable.

Thus, the questions for southwestern Idaho sweet corn growers each year are as follows: Will earworms require control this year? If so, when? Growers, processors and fieldmen have had few guidelines to help them make accurate decisions. The answer to the first question is not readily available, but the answer to the second, when should controls be applied, is. This prediction is based on the insect's life cycle and temperature effects on that cycle as measured by Growing Degree Days (GDD).

Life History of Corn Earworm

The corn earworm usually has three generations per year in the Treasure Valley. The insects overwinter as pupae 4 to 8 inches deep in the soil. They emerge as moths during early June. The moths lay eggs on a variety of host plants on which the first generation caterpillars feed after hatching. This generation does little damage because most corn is not in the silking stage; however, early corn may silk in time to attract late emerging moths for egg laying, resulting in a heavy infestation.

The first generation caterpillars become moths during late July and early August. The eggs are laid singly on fresh corn silks, the preferred site for egg laying. About half of the eggs are laid within 2 days of silk emergence and the rest by the ninth day after. Eggs hatch in 2 to 5 days, producing the second generation caterpillars that will feed on the developing kernels until maturity and do much damage. Worms feeding on corn will mature faster and have less mortality. The females from these will lay many more eggs.

As summer progresses, a third generation of caterpillars develops, usually in September and October. These may also be important economically, particularly on late silking corn and early seed fields. This generation overwinters as pupae that are very vulnerable to frost and mechanical damage. The winter of 1978-79 froze most of these overwintering pupae in the Treasure Valley and the insect was virtually absent in the area for the next 2 summers. Cultivating fields between the middle of October and late May is an excellent control measure that destroys many pupae and prevents normal emergence of many moths.

Calculating and Using Growing Degree Days (GDD)

The rate of development of the corn earworm is controlled mainly by temperature. Little development occurs below 55°F, and the rate peaks at 95°F; therefore, 55° and 95°F are the temperature limits used in calculating GDD's. Growing degree days are calculated by adding the maximum and minimum temperatures for the day, but only those between 55° and 95°F. If the maximum is 55° or less, no GDDs accumulate that day. If the minimum is below 55°, use 55°. If the maximum is above 95°F,

use 95°. Add these, divide by 2 then subtract 55 from that. The answer is the number of GDDs accumulated that day.

Examples of Calculating GDDs

Example #1: maximum = 81°, minimum = 45°

$$\frac{81 + 55 \text{ (sub. 55 for 45)}}{2} - 55 = \frac{136}{2} - 55 = 13 \text{ GDD}$$

Example #2: maximum = 97°, minimum = 57°

$$\frac{95 \text{ (sub. 95 for 97)} + 57}{2} - 55 = \frac{152}{2} - 55 = 21 \text{ GDD}$$

GDDs are calculated and accumulated daily from January 1 for predicting the time of egg laying by the summer generation of moths.

Daily maximum and minimum temperatures can be readily obtained from a maximum-minimum thermometer, a valuable investment available for about $16. If readings are missed for one or several days, estimates of the GDDs for those days can be made, especially if maximum-minimum temperatures are available from a U.S. Weather Bureau station close by.

U.S. weather reporting stations in the southwest Idaho corn growing area are as follows:

Boise airport
Bruneau
Caldwell
Deer Flat Dam
Emmett
2 miles W Grandview
2 miles NNE Kuna
Mountain Home
4 miles S. Ola
Parma R&E Center
Payette
Weiser
Malheur Exp. Sta.
Ontario

U.S. weather reporting stations in the Magic Valley are:

4 miles NW Bliss
Buhl
Burley Airport
2 miles N Castleford
Glenns Ferry
2 miles SW Hagerman
Hazelton
Hollister
Jerome
Minidoka Dam
1 miles ENE Paul
1 miles E Rupert
Shoshone
Twin Falls CSI
Twin Falls Weather Station

Application of GDDs to Control

Few, if any, earworm eggs are laid on silks of corn that silk between 1,100 and 1,300 accumulated GDDs. This represents the time between the last of the overwintered moths and the first of the summer moths. Only the earliest of corn will silk before 1,100 GDDs accumulate, and these ears may be subject to damage. Those fields which silk after 1,300 GDDs will be most vulnerable to heavy attack; therefore, the grower should only use insecticides on fields silking after 1,300 GDDs.

Corn can be "scouted" for corn earworm eggs to predict possible infestation levels. Examine 10 silk masses (about 2-day old) on each edge of a field but only in those fields which are beginning to silk or are silking. Examining a field in late silk for the first time is worthless; most of the eggs, if any were present, are already hatched, and the damage cannot be prevented.

When the egg counts average 1 per 2 masses, about 100% ear infestation will occur in that field and other fields of like maturity in the vicinity. With 1 egg per 2 silk masses, about 1 inch of each ear tip will be damaged; 1 egg per silk mass will result in about 2 inches of the ear tip damaged, etc. When the days and nights are warmer than usual, the damage may double because the earworm will develop faster than the corn.

Fields should be scouted about every 2 to 4 days, depending on temperatures. Once economic egg levels are reached, determined on the basis of damage expected, further scouting is unnecessary. All fields which silk after that time in that vicinity will be subject to damage.

In summary, the individual grower should:

1. Use a maximum-minimum thermometer, and calculate GDDs.
2. If the grower has corn silking before July 10 (or about), he should scout this corn for corn earworm eggs.
3. When the accumulated GDDs reach 1,300, the grower should scout his fields as they begin silking.
4. When the economic level of egg counts is reached, the grower should plan to control corn earworm on all fields that are silking then or afterward. If in doubt as to the best chemical, the grower should consult the Extension agricultural agent.

Cultural Control

1. **Tilling**. Tilling the soil will destroy the escape tunnel made by the full-grown larva before pupation. This tunnel leads from the pupal cell, 4 to 8 inches deep, to the surface. Destruction of this tunnel will prevent emergence of the moth. Few corn earworm moths emerge from fields that are tilled between early October and June. The earworm populations are sustained by those developing in alfalfa and other hosts on untilled soil.
2. **Timing of Planting**. The time between 1,100 and 1,300 GDDs (usually between July 10-20) is the period between flights of the overwintered and summer generation of moths. Corn planted to silk at this time should escape infestation, or be subject to a very low, noneconomic infestation.

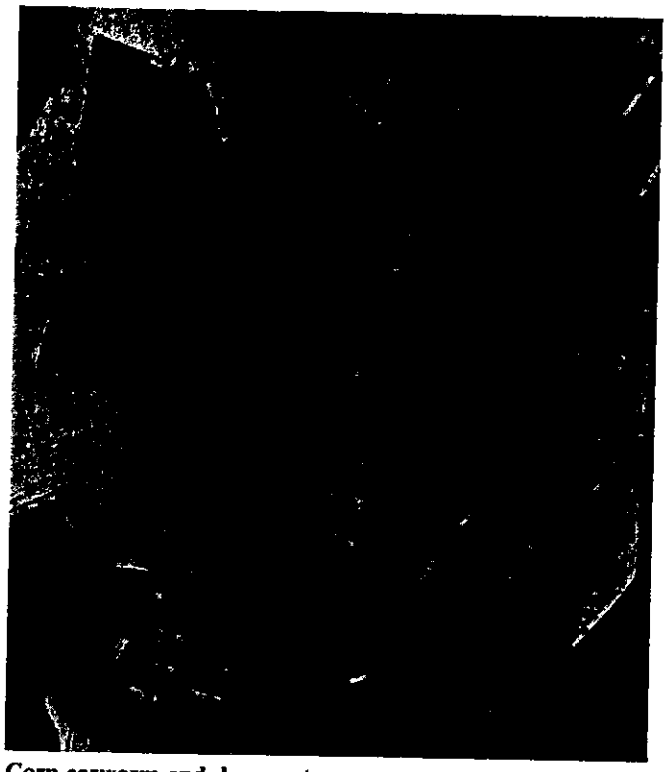
Chemical Control

No chemical will control worms in the ears, so sprays must be timed to control the larvae on the silk before the worms enter the ears. Make the first application when the plants are 50 percent silk, and repeat in 5 to 7 days or as necessary. For sweet corn seed silking during this period, follow the same schedule. For seed corn silking earlier, an application or two during the peak of the second generation egg-laying period (1,450 to 1,650 GDD) may be necessary in heavy earworm years.

Chemical recommendations are:

Insecticide	Rate ai/acre	Days to harvest	Remarks
methomyl	0.45 lb	0	
Penncap M	0.5 to 1 lb	3 - ears	Do not apply when corn is shedding pollen.
		12 - forage	Penncap-M contaminates corn pollen and will kill honeybees and other pollinating insects.
permethrin	0.1 to 0.2 lb	1	Do not apply more than 6 applications per season.
Pydrin	0.1 to 0.2 lb	1	Do not apply more than 2 lb total per acre per season.
Sevin	1.5 lb	0	XLR formulation of Sevin is less toxic to honeybees and therefore is preferred.

All of these insecticides are extremely toxic to bees that normally forage on corn pollen. Do not apply while pollen is being shed because the residue will kill bee colonies that forage upon the corn pollen. Pydrin and permethrin have shown some repellency to foraging bees; therefore, they would cause less bee kill.



Corn earworm and damage to corn.

Pesticide Residues

These outlines for use are based on the best information currently available for each chemical listed. If followed carefully, residues should not exceed the tolerance established for any particular chemical. To avoid excessive residues, follow suggestions carefully with respect to dosage levels, number of applications and minimum interval between application and reentry or harvest.

To simplify information, trade names have been used. Neither endorsement of named products is intended nor criticism implied of similar products not mentioned.

The Authors

Donald R. Scott is a professor emeritus of entomology who was formerly in the University of Idaho Department of Plant, Soil and Entomological Sciences, Moscow. Craig R. Baird is an Extension entomology specialist at the UI Research and Extension Center at Parma. Hugh W. Homan is Extension entomologist in the UI Department of Plant, Soil and Entomological Sciences, Moscow.