

**Time of Turning Legumes and Planting Corn
To Avoid Injury from the Southern
Corn Root Worm**

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Time of Turning Legumes and Planting Corn to Avoid Injury from the Southern Corn Root Worm

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THE southern corn root worm (*Diabrotica duodecempunctata* Fabr.) is a major pest of seedling corn grown on bottom lands or following winter legumes in Alabama. Detailed data on the life history and preliminary data on three years of control work for this insect were published in 1929*. The results of six years of experimental work to determine the best time to turn winter legumes and plant corn in order to avoid serious injury from the southern corn root worm are reported in this circular. A brief account of the life history is also included.

LIFE HISTORY

The adults of the southern corn root worm (Figure 1), known as spotted cucumber beetles, overwinter in the southern states in rubbish, on winter legumes, or other green plants. During very cold weather they become inactive and hide under leaves or in other protected places, but when the temperature rises well above freezing they become active once more and begin feeding.

Many of the beetles congregate and feed on winter legumes in the winter and early spring. The females deposit their eggs in the soil nearby. Egg laying begins in January or February and continues throughout most of the summer; it is most abundant during March and the first part of April. After an incubation period of about eight to twelve days the larvae emerge from the eggs and feed on the roots of winter legumes, grasses, or other plants. When corn is planted following the turning of winter legumes, the larvae often attack the seedling corn, boring into the stalks and thereby causing the buds to wilt and die; the stand of corn may be greatly reduced (Figure 4). After feeding for about two weeks the larvae form inactive pupae which in turn develop into adults in about a week.

The time required for develop-

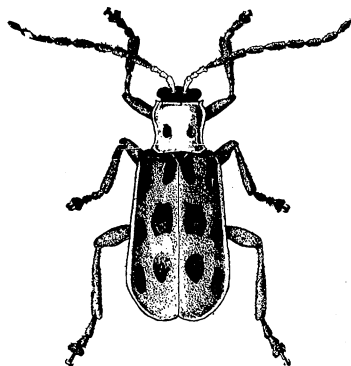


FIGURE 1.—The Adult of the Southern Corn Root Worm. (Enlarged about 4½ times.)

*Arant, F. S. 1929. Biology and Control of the Southern Corn Root Worm, Ala. Agr. Expt. Sta. Bul. 230.

ment from egg to adult varies considerably with the temperature; it is about four to five weeks during warm weather.

Three complete generations of the southern corn root worm may occur annually in Alabama but little damage to corn is produced by any except the first generation. With the coming of summer weather the adults migrate northward where they often become serious pests of cucurbits and other plants in the central and mid-western states. Some beetles may be found in Alabama throughout the summer but they are apparently less numerous than in the spring.

DESCRIPTION OF STAGES

The adult of the southern corn root worm (Figure 1) is an oblong-oval beetle about $\frac{1}{4}$ inch long. The head is black and the body is of a variable yellowish-green color with each wing marked by six conspicuous black spots. The antennae are dark except the three basal joints which are light.

The egg is a tiny, light-yellow, oval-shaped object which is difficult to see; it is less than $\frac{1}{32}$ inch long.

The larva or "budworm" is yellowish white in color; it is about $\frac{1}{2}$ inch long when mature (Figure 2). The head is rather conspicuous and is grayish brown in color; the body is nearly cylindrical in shape, is somewhat curved, and tapers slightly toward the anterior end; two distinct brown shields are present on the upper surface, one on the first segment of the thorax and the other on the last segment of the abdomen.

The pupa, which is rarely seen, is light yellow in color and is about the same length as the adult.

INSECTS MISTAKEN FOR THE SOUTHERN CORN ROOT WORM

Several species of corn insects produce injury quite similar to that produced by the southern corn root worm. Since farmers and other agricultural workers are constantly confusing these insects with the southern corn root worm, it seems advisable to distinguish between the various species as definitely as possible.

One of the insects causing so-called "budworm" injury is the lesser corn stalk borer (*Elasmopalpus lignosellus* Zeller). The

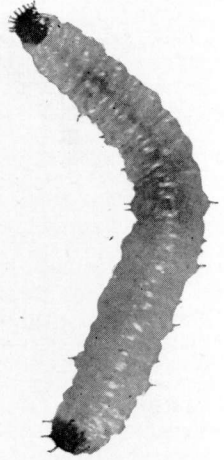
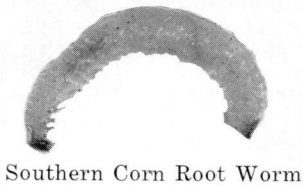
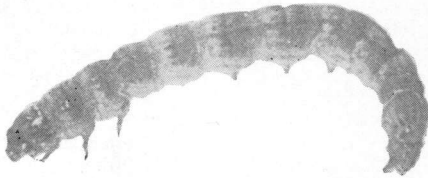


FIGURE 2

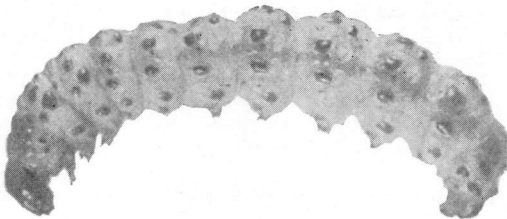
The Larva of the Southern Corn Root Worm. (Enlarged about 5 times.)



Southern Corn Root Worm



Lesser Corn Stalk Borer



Southern (larger) Corn Stalk Borer

FIGURE 3.—The Southern Corn Root Worm and Insects Mistaken for It. (Side view, enlarged about $3\frac{1}{2}$ times.)

larva of this insect is a slender, greenish-colored worm with indistinct transverse bands of a lighter color on the anterior margin of the segments (Figure 3). It is usually a little less than one inch long when mature. The larva eats holes in the unfolding leaves or bores tunnels in the stalk. The most serious injury occurs on poor, upland, sandy soils. The pest can usually be distinguished from other insects by the presence of the tube-shaped web which the larva spins at the surface of the soil. In addition to corn, the lesser corn stalk borer feeds on sorghum, Johnson grass, cowpeas, beans, peanuts, and several other crops. The adult is a yellowish-brown to blackish-colored moth with a wing expanse of slightly less than one inch.

Another insect producing injury by drilling in stalks of corn is the southern corn stalk borer (*Diatraea crambidoides* Grote). This insect is often called the larger corn stalk borer; it is a fat, dirty-white caterpillar (Figure 3) and when full grown is marked with numerous distinct black or dark-brown spots, each of which bears a short bristle; it is about one inch long. The larva may eat holes in the unfolding leaves but typically bores into the base of the stalk, causing the plant to wilt or weakening the stalk so that it is easily broken down by the wind. The adult of this insect is a light, smoky-yellow moth with a wing expanse of about $1\frac{1}{4}$ inches.

A third species of insect which produces so-called "bud-worm" injury is the corn earworm (*Heliothis obsoleta* Fabr.). The larva of this insect varies in color from light green to brown and is marked with alternating light and dark stripes running lengthwise the body; it is about two inches long when full grown. The caterpillar eats holes in the unfolding leaves early in the season

and feeds in the tassels and ears of corn later in the season. The adult is a moth with a wing expanse of about $1\frac{1}{2}$ inches; the color is somewhat variable; the front wings are usually light grayish brown, marked with darker irregular lines; the hind wings are white with darker markings.

A fourth species of insect producing injury that is often mistaken for southern corn root worm injury is the sugar cane beetle (*Euethola rugiceps* Lec.). This insect is a dark brown or black beetle about $\frac{1}{2}$ inch long; it is quite similar in shape to a common "June bug." Injury to corn is produced by the adult eating into the stalk just below the surface of the ground, thereby weakening the stalk and often causing it to wilt.

Several species of wireworms and white grubs also attack seedling corn but it does not seem feasible to attempt a description of the various species in this circular.

It is probable that the larva of the banded cucumber beetle (banded bean beetle, *Diabrotica balteata* Lec.) attacks seedling corn in South Alabama, but the writer has no record of such injury. This larva is almost identical in structure with the larva of the southern corn root worm.



FIGURE 4.—Corn Following Winter Legumes. Land turned March 21; corn planted 2 weeks later. The corn on this plot was almost completely destroyed by the larva of the southern corn root worm.

CONTROL STUDIES

Although parasites and climatic conditions unfavorable to the insect may be of great value in controlling the southern corn root worm during certain seasons, it is desirable to so time the planting of corn that serious injury may be avoided each year. Since the greatest amount of damage in Alabama occurs in corn following winter legumes (Figures 4 and 5), a series of experiments was conducted at Auburn over a six-year period to determine the best time to turn legumes and plant corn to avoid injury.

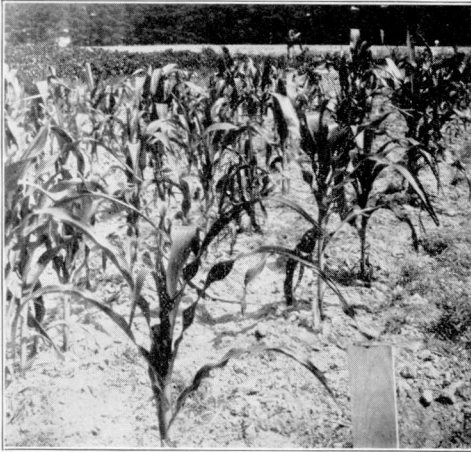


FIGURE 5.—Corn on Check Plot. Land turned March 21; corn planted 2 weeks later. The corn on this plot was injured very little by the southern corn root worm.

In these studies a series of legume and check plots (without legumes) were turned and disked March 15, April 1, and April 15, respectively, or as near these dates as weather conditions would permit. Beginning the day following each turning, a planting of corn was made on the legume and the check series each week until five plantings were made. Observations were made at intervals of two to five days to determine the southern corn root worm infestation on all plots.

The greatest amount of southern corn root worm injury occurred in corn planted on the series of plots turned March 15 and the least amount on the series turned April 15 (Table 1). The six-year average infestation in corn planted on the series of plots turned March 15 varied from 12.3 to 55.5 per cent on the legume plots, and from 6.6 to 12.2 per cent on the checks; on the series of plots turned April 1 it varied from 3.2 to 49.2 per cent on the legume plots and from 2.0 to 8.6 per cent on the checks; on the series of plots turned April 15 the infestation varied from 0.1 to 24.7 per cent on the legume plots and from 0.0 to 2.9 on the checks.

The data in Table 1 indicate that no serious injury occurred to corn planted at Auburn April 30 or thereafter following the turning of legumes on or before April 15. The figures in this table, however, represent only the per cent of infested plants among the total number that came up and do not include the injury which occurred before the plants came up.

The apparent total injury is expressed in Table 2 as the per cent of failure in the stand of corn, due at least in part to southern corn root worm injury either before or after the corn came up. Since corn on the control plots was not usually damaged to any great extent and since weather conditions affected germination alike on both series of plots, the differences in favor of the checks (Table 2) represent fairly accurately the total southern corn root worm injury to corn planted after winter legumes. It will be noted that considerable injury occurred to all corn planted on the legume plots previous to April 30; little or no injury occurred to corn planted April 30 or thereafter (Table 2 and Figure 6).

TABLE 1.—Six-Year Average Per Cent of Corn Plants Infested with the Southern Corn Root Worm, 1927-1933.

Date of turning land*	Date of planting corn*	Average per cent of corn infested following	
		Legumes	No legumes
March 15	March 16	45.7	8.7
March 15	March 23	55.5	7.9
March 15	March 30	39.2	12.2
March 15	April 6	30.0	7.5
March 15	April 13	12.3	6.6
April 1	April 2	49.2	8.3
April 1	April 9	29.6	8.6
April 1	April 16	28.6**	4.3**
April 1	April 23	9.6	4.9
April 1	April 30	3.2	2.0
April 15	April 16	24.7	2.9
April 15	April 23	8.6	2.3
April 15	April 30	2.1	2.0
April 15	May 7	0.6	0.8
April 15	May 14	0.1	0.0

*Approximate date.

**Five-year average; 1933 not included due to mouse injury.

TABLE 2.—Six-Year Average Per Cent Total Failure in the Stand of Corn, 1927-1933.

Date of turning land*	Date of planting corn*	Average per cent total failure in the stand of corn**		
		Following legumes	No legumes	Difference attributed to root worm injury
March 15	March 16	68.1	37.7	30.4
March 15	March 23	74.1	38.7	35.4
March 15	March 30	79.2	45.0	34.2
March 15	April 6	63.3	37.9	25.4
March 15	April 13	46.5	32.1	14.4
April 1	April 2	67.8	38.5	29.3
April 1	April 9	77.1	44.8	32.3
April 1	April 16	58.9	36.2	22.7
April 1	April 23	57.2	45.3	11.9
April 1	April 30	37.9	37.7	0.2
April 15	April 16	61.2	30.8	30.4
April 15	April 23	48.1	32.0	16.1
April 15	April 30	30.9	33.3	-2.4
April 15	May 7	26.7	26.3	0.4
April 15	May 14	22.7	22.1	0.6

*Approximate date.

**Per cent of total failure in the stand of corn = $\frac{\text{No. seed not coming up} + \text{No. plants infested} \times 100}{\text{No. seed planted}}$



FIGURE 6.—Corn Following Winter Legumes. Land turned April 16; corn planted 3 weeks later. There was no injury from the southern corn root worm.

The time of maximum and minimum southern corn root worm injury at Auburn was the same regardless of whether the damage was expressed in terms of plants known to have been infested (Table 1) or total failure in the stand of corn (Table 2). All available data indicate that the safest procedure in planting corn following winter legumes is to turn and disk the legumes on or before April 15 and plant the corn early in May. Corn may be planted one to two weeks before May 1, provided the weather has been warm and reasonably dry, and provided further the legumes were turned before April 1.

There are no data available to indicate the best time to turn legumes and plant corn to avoid southern corn root worm injury in different sections of the State. It is logical to suppose, however, that the date of turning and planting should be a few days earlier in South Alabama and a few days later in North Alabama than in the vicinity of Auburn. It is also logical to suppose that the date of turning and planting in any locality should be later during an extremely cool season than during a more nearly normal spring.

SUMMARY

(1) Adults of the southern corn root worm congregate on winter legumes in the early spring and deposit their eggs in the soil nearby.

(2) The larvae emerge from the eggs and feed on the roots of the legumes, grasses, or other plants.

(3) When corn is grown following the turning of winter legumes, the larvae often attack the seedling plants, boring into the stalks and thereby causing the buds to wilt and die.

(4) Several species of insects produce injury similar to that of the southern corn root worm and are often mistaken for it. Insects commonly mistaken for the southern corn root worm are the lesser corn stalk borer, the southern (larger) corn stalk borer, the corn earworm, the sugar cane beetle, wireworms, and white grubs.

(5) Experimental work has been conducted at Auburn over a period of six years to determine the best time to turn winter legumes and plant corn in order to avoid serious injury from the southern corn root worm.

(6) The most serious injury occurred in corn planted following the turning of legumes March 15 and the least injury following the turning April 15.

(7) No serious injury occurred to any corn planted at Auburn April 30 or thereafter following the turning and disking of winter legumes on or before April 15.