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Common Corn Insects

Abstract
Injury to corn by wireworms occurs usually in spring soon after planting. The failure of seed to sprout, or the dying or withering down of corn plants when two feet or less in height, both indicate wireworm attack. If the field so affected has been in grass recently, the injury is most likely to be that of wireworms. Although the wireworms do not cause any visible injury to grass, when such land is put into corn they concentrate upon the hills of the planted grain, causing much damage.

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COMMON CORN INSECTS

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IOWA STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

ENTOMOLOGY SECTION

Ames, Iowa
COMMON CORN INSECTS

By R. L. WEBSTER

WIREWORMS*

The Injury. Injury to corn by wireworms occurs usually in spring soon after planting. The failure of seed to sprout, or the dying or withering down of corn plants when two feet or less in height, both indicate wireworm attack. If the field so affected has been in grass recently, the injury is most likely to be that of wireworms. Although the wireworms do not cause any visible injury to grass, when such land is put into corn they concentrate upon the hills of the planted grain, causing much damage.

Wireworms feed first on the seed itself, later on the roots, eating entirely the smaller ones and boring or penetrating the larger ones.

The Insects. The common corn wireworms are reddish-brown in color, hard and rather shiny in appearance, cylindrical in shape, an inch or more in length. Several species of the genus Melanotus, as well as the common wheat wireworm, Agriotes mancus, Say, attack corn. (Fig. 1.)

Some of these wireworms (Melanotus) may spend as long a time as 5 years in the soil. The life history is not yet well worked out, but it is evident, from recent studies by J. A. Hyslop, that so long a time as this is possible. One of the corn wireworms of this kind is shown in Fig. 2. The adult beetles are boat-shaped fellows, ½ to ¾ inch long, and usually brownish in color. They are known as “click-beetles,” or “snapping beetles,” from the snapping noise they make when held in the fingers or when turned on their backs.

The wheat wireworms spend 3 years in the soil, less time, on the whole, than wireworms of the genus Melanotus. The adults of this species are small, brown beetles a little more than ¼ inch long, stout and somewhat hairy.

*Fig. 1—The wheat wireworm (Agriotes mancus) a, adult beetle; b, larva; c, side view of last segment of larva. All enlarged. From Chittenden, U. S. Dept. Agr.
Before changing to the adult “click-beetle,” the wireworm in July and early August of the year it becomes mature, first changes to the intermediate pupa stage (fig. 2). After two or three weeks spent in this stage, it changes to the beetle. The beetle, however, does not come out at once, but spends the winter in the pupal cell, emerging the next spring. The beetles then deposit eggs, from which to hatch more wireworms.

CONTROL MEASURES.

Wireworms are extremely difficult to control because they are inaccessible for practically all their life. Wherever possible, constant stirring of ground infested with wireworms is recommended. Land that is in corn and badly infested with wireworms should be deeply cultivated as late as possible. This disturbs the wireworms, making it difficult for them to feed.

A thorough preparation of ground intended for corn, together with a liberal use of manure or other fertilizer is very beneficial. In this way the farmer may often secure a fair stand of corn in spite of the wireworms, since with the aid of manure the corn plant has a better show to withstand injury by wireworms.

Where severe injury in corn has occurred, it is good practice to seed this field the next year in small grain and follow this with clover. While the wireworms may damage the small grain, this injury is seldom severe and would not nearly approximate the loss that might be caused to corn. Since clover seems to be injured little or not at all, the practice of using clover as a part of a definite rotation is especially recommended in localities where wireworms cause damage. Corn following clover sod is rarely severely injured.

The corn wireworms (Melanotus) are ordinarily confined to poorly drained land. Many cases of wireworm injury in northwest Iowa have been in fields only recently drained; that is, within three or four years. With better drainage it is likely that the wireworm damage in these fields will be greatly decreased.
THE CORN ROOT APHIS*

Injury. The presence of the corn root aphis, or root louse, in a field of growing corn is usually shown by a dwarfing of the plants in patches over the field, together with a yellowing or reddening of the leaves. If numerous ant hills are found near such stalks, the presence of the aphis becomes still more certain, and the presence of many small bluish-green lice on the main roots indicates that the corn root aphis is affecting the plants.

The tiny lice suck the juices from the roots, weakening the stalks and reducing the yield. The loss to the Iowa corn crop caused by the corn root aphis amounts to a considerable sum every year.

Relation of the Root Aphis and Ants. It is the presence of the ants that is the interesting part of the story. The root aphis secretes a sweet substance known as "honey dew," of which the ants are very fond. For this reason the root lice are very well cared for by the ants, and especially by one kind known as the "little brown ant." In the fall the ants take the eggs of the root aphis down into their nests and keep them there throughout the winter. The next spring, when the eggs hatch, the ants place the young root lice on the roots of the common smartweed, or some other common weed, where the lice begin to feed. Later on, if the ground be planted to corn, the ants transfer the root lice from the weeds to the corn roots. So the ants care for the root aphis, and in order to fight the root aphis the farmer must fight the little brown ant.

CONTROL MEASURES.

Rotation. While the corn root aphis feeds, to some extent, on other plants than corn, yet a change to any other crop is about the most effective measure against this insect. Where crop rotation is carried out, with but one or two consecutive crops of corn, little injury ever occurs. What other crop is grown on infested land makes little difference; corn is by far the favorite food of the root aphis. This same treatment is also effective against the corn root-worm, which is even a more serious pest. Sometimes it is not practicable to rotate. In that case much may be done by cultivation.

Cultivation. Experiments in Illinois, made under direction of S. A. Forbes, state entomologist, have shown that a deep, thorough, stirring of the soil on old corn ground will tend to reduce injury caused by the root aphis. This stirring breaks up the nests and scatters the ants, which consequently cannot give the root lice the proper care.

\*Aphis mali-radicis, Forbes
Forbes says of this treatment: "The burrows of these ants do not often reach to a depth of more than 6 inches, and if plowing to this depth is followed by a deep stirring of the ground with a disc harrow, * * * the attempts of the ants to recover their property and to reconstruct their nests are greatly disturbed and rendered largely fruitless. The more thoroughly, frequently and deeply the ground is stirred in the interval between the first plowing and the corn planting, the fewer will be the root lice in the field in the beginning or the season. * * * Fortunately the labor of this treatment of the field will usually be more than repaid by an improvement of the corn crop independent of all protection against aphis injury, this being practically the preparation for corn especially recommended by our best teachers of high-grade agriculture and practiced by some of our best farmers."

Life History. The life and habits of the corn root aphis are most interesting. The root lice which hatch from the eggs in the spring are all the same sex, females, which produce their young alive. Only these females are found throughout the spring and summer and not until the cooler weather of the fall do the males appear. The root lice multiply very rapidly during the summer and consequently cause much damage to growing plants. Most of them are wingless, but occasionally winged forms may be found. In the fall both the males and the females appear, mating takes place, and the females then deposit eggs, instead of bringing forth young alive. These eggs are then taken up by the ants and carried to their nests for the winter.

Some admirable studies on the generations of the corn root aphis have been made by J. J. Davis in Illinois, who found that the largest number of generations in a single season was 22, while the smallest number was 11. During midsummer the lice matured in 7 or 8 days. A root louse only a week old was sometimes able to bear young. One root louse, then, might be a grandmother in two weeks after her own birth. In view of the rate at which the root lice increase it is no great wonder that so serious injury is caused to the corn plant.
THE CORN ROOT-WORMS

Injury. The corn root-worms are undoubtedly the most serious insect pests with which the Iowa corn grower has to contend. Their presence in a field is usually indicated by a withering of the young plants, the failure to produce well developed ears, or a general retarding of the growth without any visible cause. A search among the roots of such stalks may bring to notice the tiny root-worms.

The root-worms themselves are small, slender white grubs, about half an inch long when they are full grown. Infested stalks of corn may be pulled out easily and will break off at the place where the root-worms are at work, leaving the greater part of the roots in the soil. Frequently infested stalks are blown down, the root system having been so cut off that the stalks cannot stand the strain.

Preventive Measures. Rotation of crops is the most effectual preventive of root-worms. The beetles of the root-worms usually deposit their eggs in the old infested fields. By changing the corn from such a field to another which was not in corn the preceding year, these eggs are left behind.

THE TWO KINDS OF ROOT WORMS.

There are two kinds of these worms, the "Northern corn root-worm"* and the "Southern corn root-worm."** Since the habits of the two are very different in some essential points, a few further remarks concerning them are given below. The two are easily distinguished in the beetle stage when commonly found on corn silk in the fall.

The Northern Corn Root-Worm. The northern adult root-worm is a plain grass-green-beetle, about one-fifth of an inch long. In the fall these small green beetles are common objects on the silk of the corn and the flowers of the goldenrod. The spotted beetle of the southern corn root-worm is frequently found along with the plain green

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*Diabrotica longica- Bras. Say.
**Diabrotica 12-punctata. Oliv.

Fig. 5—Corn Root-Worm, within the root. Enlarged. The root has been broken in two, showing the root-worm still imbedded in it. (After Forbes.)

Fig. 6—The Western Corn Root-Worm: Adult, or beetle; n. claw of hind leg. Much enlarged. (From F. M. Webster, U. S. Dept. Agr.)
beetle. The beetles deposit their tiny eggs in the soil near the stalks of corn.

The next year these eggs hatch out young root-worms, which begin to attack the corn almost as soon as it is out of the ground. Throughout the summer they work on the roots, until they become full grown in the late summer. When they become mature they change to the pupa, or resting stage, in which they spend a short time. Finally the plain green beetle emerges from this pupa. The beetles then deposit their eggs for another crop of root-worms for the next year. As far as known there is but one generation of this form in a season.

The Southern Corn Root-Worm. The beetle of the southern root-worm is green, with twelve black spots on its back. The black spots are in three rows across the back of the beetle, each row with four spots. Usually these beetles are found along with the plain green beetles on the silks of the corn, but they are not so common. The black spotted beetles are found not only in the fall, but all through the season from early spring as well. There seem to be at least two generations of them during the year. The life history of the southern corn root-worm is similar to that of the northern form, except that it is passed through in a much shorter time. In the corn fields the eggs are deposited in the ground near the stalks.

Comparison of the Two Forms.
Corn is the only food plant of the northern root-worm. On the other hand, the southern root-worms have been found in wheat, rye, millet, and other grasses. The northern form does more injury to corn in Iowa. Since the northern corn root-worm has only one food plant, corn, in its grub stage, it is easy to prevent damage by it. A mere change of crops will bring relief. With the southern form the problem is more difficult, but it is usually not the southern root-worm which does the really serious damage in Iowa.
When the plain green or the black spotted beetles are seen in very large numbers feeding on the silks of the corn in the fall, it is an indication that a corn field on the same piece of ground will be infested with the root-worms the next year. Those fields should be planted to some other crop than corn, and the corn put on a new field.

WHITE GRUBS

In 1912 and again in 1915 occurred very severe outbreaks of white grubs in northeastern Iowa. Corn on sod land was especially damaged. Some farmers lost most of their crop on account of these grubs. A large number of species are common in the state. In the northeastern Iowa outbreak *Lachnosterna fusca* appeared to be the most abundant species concerned. For instance, out of 179 beetles collected at lights at Dubuque, Iowa, May 28, 1914, 153 were Lachnosterna fusca. In 5 counties in northeastern Iowa, Allamakee, Clayton, Delaware, Dubuque and Jackson, there was a 1912 loss to the corn crop amounting to more than one million dollars. Probably the loss in 1915 was nearly equivalent. Since this does not take into account damage in adjacent counties, large parts of which were affected, it is evident that the real damage would amount to much more than one million dollars.

Damage Expected in 1915. Since the insects, as a rule, require 3 years to complete their life cycle, damage may be expected in this area in 1918. The most injury is done by the grubs in the second year. In 1917 the parent beetles are expected to be very abundant in this district, and are likely to strip timber land of its foliage as they did in May, 1914. At that time thousands of acres of timber were stripped as bare of leaves as in winter. This same condition is due to occur again in 1917. If the beetles are as abundant as in 1914 they will be followed in 1918 by injury by white grubs.

Stages of the Insect. The common May beetle or June bug is the parent form of the white grub. Most people are familiar with these insects, large, clumsy, black or brownish beetles which fly to lights in May and early June. Rising from the grass where they are hiding all day, the beetles move to the trees soon after sundown and remain there feeding on the leaves throughout the night.

The beetles deposit their spherical white eggs in rather compact soil, preferably sod ground. These eggs hatch and the young grubs begin to feed that summer. Grubs hatching out one year do not become full grown for 2 years, and even then the insect remains in the soil for a third winter, emerging as the beetle nearly 3 years after the egg was

*"Lachnosterna* spp.
deposited. For all this we may have some grubs every year, since there are so many species of these insects, maturing in different years.

A generalized life cycle of these insects is better shown as given herewith. Later investigations may show that some species have a different life history, but that given applies generally to Iowa.

First Year. Beetles emerge from soil in May, feed and deposit eggs. Larvae hatch and begin to feed, wintering over in the soil. (1917 in N. E. Iowa.)

Second Year. Larvae feed during the season. The most damage to crops is caused in the second year. The larvae winter over in the soil, practically full grown. 1918 in N. E. Iowa.)

Third Year. Larvae feed early in the season, pupate in June or July, changing to beetles a few weeks later, and staying in the soil over winter. (1919 in N. E. Iowa.)

Fourth Year. Same as the first.

CONTROL MEASURES

When the two year old grubs are in the fields damaging corn, there is no practical measure we know of to get rid of them at once, without injuring the crop. However, measures may be taken to prevent further injury and to reduce the number of insects present in any particular field. Such steps are fall plowing, rotation, or turning hogs into grub infested fields.

Turning Hogs Into Infested Fields. Hogs are very fond of eating

Fig. 9—Timberland in Clayton county, Iowa, showing defoliation by May beetles. Photograph taken May 30, 1914. (Davis.)
white grubs and this fact may be taken advantage of in attempting
to control the insects. Hogs turned into infested fields will clear out
the grubs in a short time, provided this be done before the grubs go
deep in the soil in the fall. Do this by the middle of October at least.

One drawback to this measure must be mentioned. An intestinal
worm of swine, the giant thorn-headed worm*, passes one stage of
its life in certain white grubs. Pigs eating grubs so infested take the
parasite into their bodies. Through the pig’s excrement the grubs are
reinfested. It is apparent that both pigs and grubs must be present in
any particular field in order that this worm may complete its trans-
formations.

On the other hand, if young pigs, never before allowed to run out,
are turned into a field that has had no pigs in it for the preceding 3
years, there can be no danger. The young pigs have had no chance to
become infested and the grubs in 3 years time will have all matured or
otherwise disappeared, so they would be free from these worms.

Rotation. Much may be done by an intelligent rotation, particularly
in a district known to be badly infested. Since the grubs are not
known to infest such crops as clover, alfalfa or buckwheat, these may
safely follow on sod ground in a “grub year.” Small grains are at-
tacked by the grubs, but to a less extent than corn or potatoes. When
grubs are expected in any particular year, corn should not follow on
sod ground, it may safely follow a cultivated crop.

By referring to the generalized life cycle one may determine when
to expect the grubs. For instance, if the May beetles are exceptionally
abundant one year, feeding on trees at night, collecting at street lights
or flying into houses, an abundance of grubs may be reasonably ex-
pected the next year. Again, the grubs are likely to be abundant in
3 year intervals, in any given locality.

Since white grubs were common in 1915 in northeastern Iowa, more
damage in 1918 may be expected in that locality. Corn should follow
some cultivated crop, or clover, in 1918 in order to escape injury in the
region infested in 1915.

Fall Plowing. Fall plowing is of some value in grub infested fields.
This brings the grubs to the surface and crushes many of them. But
the grubs go deeper into the soil for the winter, consequently the plow-
ing must be done before cold weather sets in. Early in October is the
best time for this. Where the grubs are turned up in great numbers,
it would be well to follow the plowing with a disc harrow, which would
 crush many larvae that might not be affected by the plow.

THE CORN BILL BUGS*

The Injury. When growing corn is but a few inches high the tender
leaves are often injured by rows of holes cut across the blade. Where

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*Gigantorhycrus hirundinaceus.
*Sphenophorus spp.
severe, the injury causes the growing plant to be greatly stunted. This injury is most likely to occur when corn follows timothy sod.

These holes are made by the corn bill bugs. As it may be guessed, the injured blade is still within the sheath of the corn stalk when the damage is done, and the holes do not become conspicuous until after the blade has grown out. Since the blade is curled up within the sheath, one hole made in the sheath will unfold and make six or eight holes in the blade.

**The Insect.** There are several kinds of these bill bugs. Most of them are black or brown in color. One kind is clay colored. All are beetles with hard backs, and with a long snout with which the holes in the corn blades are made. In this grub stage the corn bill bugs feed on the roots of certain grasses, one of the most common species feeding on timothy roots. So when corn is put on timothy sod that has been infested with these grubs, the mature bill bugs are very likely to take to the corn as soon as it comes up, especially if the sod is turned under in the spring.

**Life History.** Apparently there is in this latitude but a single generation of these bill bugs in a year. Dr. Forbes, Illinois state entomologist, has found such to be the case in that state. In general the insects spend the winter in the beetle stage and the beetles cause the damage to corn in the late spring. In the early summer the beetles deposit their eggs on timothy and other grasses, and finally disappear. The eggs hatch and the young grubs feed in the grass roots until early fall, when the adult beetles appear. Before changing to the beetle form the grub enters the pupa, or the inactive stage, which comes between the grub and the adult beetle. This completes the life cycle. Since there are several species that are concerned, the details of the life history vary with the species.

**Control Measures.** It has been found that the early fall or summer plowing of sod lands, which are infested with these grubs, tend to reduce greatly the injury to corn, if that crop is put on the field the following year. Apparently the stirring of the soil so disturbs the in-
sects that they are unable to survive the winter.

**CUTWORMS***

Cutworms are most troublesome to corn when following sod. The injury to young corn plants is known to most farmers, the cutting off of the stalk at the base of the plant, at or just below the surface of the soil. Usually the cutworm responsible for the damage may be found in the soil near the plant attacked.

The Insect. Full grown cutworms are about 1½ inches long, usually dull in color. Rarely, as with the variegated cutworm, are they well marked or striped. Mature larvae form loose cells in the soil, change first to the intermediate pupa, then to the adult moth. Moths of the various species are much alike, all of them dull in appearance and brownish in color, with the hind legs somewhat lighter than the fore wings. These moths deposit eggs, from which the young cutworms hatch.

Life History. In general most cutworms spend the winter partly

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*Various species of Noctuidae
grown. Consequently they are already good size by the time the young corn plants are pushing their way through the ground. They become full grown late in June, or early in July. One often hears the statement that hot weather kills the cutworms. Such is not the case, however. Hot weather merely gives them a better chance to grow and they complete their transformations and become pupae.

Later on in the summer the adult moth issues from these pupae and deposit their eggs in grass lands. Young cutworms feed there, growing slowly, going below the soil around the plants a short distance, where they spend the winter. As a rule the different species have only a single generation annually, although there are exceptions.

Control Measures. When cutworms are present in a corn field there are only two measures to be taken. The first, replanting, should be delayed until the damage by the insects has practically ceased. The second measure is poisoning. A poison bait may be made by mixing one pound of paris green with twenty-five pounds of dry bran or middlings. Scattered over a corn field this bait attracts the cutworms, which feed on it and are killed.

Early fall plowing of grass land to be planted in corn the next year buries the eggs of young larvae, putting them out of the way so they cannot live over winter. Close fall pasturing of such land is also a benefit, starving out the cutworms in the fall. Corn land should be kept as free of vegetation as possible in spring, so that there may be as little as possible for the cutworms to eat before the corn comes up.

THE CHINCH BUG*

Although chinch bugs have not caused damage to corn in Iowa in recent years, some space may be given to them, since they have been abundant in the past and may cause great injury again in the future. This insect recently caused great damage in Illinois.

In 1887 in Iowa chinch bug injury amounted to $25,000,000, according to Prof. Herbert Osborne, and was noticeable in three-fourths of the counties.

Injury to Corn. Damage to corn occurs, for the most part in midsummer, when the growing bugs pass from ripening wheat to corn. It does not necessarily follow that the chinch bug will not become dangerous in localities where no wheat is grown, although such is likely to be the case.

Chinch bugs feed by driving their
beaks into plant tissue and extracting the juices therefrom. This makes the insect all the more difficult to control, since no arsenical poison is of any use against it.

**Description of the Insect.** The adult form of the chinch bug (fig. 13) is about 1-5 inch long, black in color, with the under wings whitish. These wings cross on the back of the insect, forming a sort of an X-shaped mark. The eggs are very small, 3-100 inch long, oval in shape, with one end cut off square. The eggs are pale at first, later amber in color and still later, reddish. Young larvae (fig. 14) are pale yellow at first, becoming quite reddish later on. At first there are no traces of wings, but in the later stages the wing pads appear. The nymphs moult, that is, shed their skins four times, with slight changes each time. After the fourth moult the insect becomes an adult.

**Seasonal History.** During the winter adult chinch bugs hibernate in clumps of dried or matted grass and other vegetation. In April they scatter from their winter quarters and settle mainly on wheat, which offers an abundance of food at this time. The old bugs soon deposit their eggs in such situations and their young feed there. All the old bugs are dead and the young ones have not yet developed wings when the grain is cut. But the bugs must go to green food, and since they are unable to fly, necessarily must crawl from one field to another. Growing corn at this time offers especially tempting meals to the partly grown chinch bugs.

When the insects mature, sometime in July, they in turn deposit eggs for a second generation of chinch bugs. This is likely to be in corn, if the insects are abundant. These bugs grow rapidly in midsummer, causing great damage to corn where they are common. In September again the insects mature and spend the Winter as adults.

**CONTROL MEASURES.**

**Destroying Bugs in Winter Quarters.** Since the chinch bugs hibernate in clumps of wild grass, and similar situations, much benefit may be obtained by burning this. Burning is best done in the fall, since such bugs as are not killed outright are left exposed to the winter with inadequate protection. In Kansas burning has been practiced largely with great benefits. Clean culture in general is important. The
less grass or weeds in a field, the less chance there will be for the bugs to hibernate therein.

**Barriers.** As wheat harvest draws near the owner of a field infested with chinch bugs should take measures to prevent the insects from entering other fields, especially corn fields. This is best done by making barrier lines around the infested field, using some repellant for this purpose. Probably the most thorough work of this nature has been done in Illinois, under the direction of the state entomologist, Dr. S. A. Forbes. In that state the materials most used are road oil No. 7 as manufactured by the Standard Oil company; crude creosote (containing 8 or 10 per cent tar acids), or crude carbolic acid. The road oil has proven best material, but it must be ordered in advance. The first step in making a barrier around an infested field is to prepare the ground for a path. The precise manner in which to do this will vary with different soils. A bare, rather firm and reasonably level surface is essential. The road oil must be kept so sticky that chinch bugs cannot cross it, but the creosote acts on account of its repellant odor. So while creosote may soak into the soil and still be effective, this is not true of the oil.

One of the simplest ways of making a path around an infested field is to drag a heavy plank until a smooth surface is obtained. If this plank is cut to a V-shape at the front, with sharp iron strips attached to both sides and a small share in the center, still better results may be accomplished. A small square piece of iron, placed on the underside of the plank, about the middle, will make a groove for the oil.

In laying the oil line almost any kind of a container may be used; a pot with a tubular spout, or even a tin pail with a hole driven through the side, close to the bottom. The stream should be half an inch thick or more, about the width of one's finger nail, a hole in the pail made by a 6-penny or 4-penny nail is sufficiently large enough for this.

Post holes 18 inches to 2 feet deep should be dug at intervals of about 20 feet, just inside the oil line. These holes catch the bugs, which are unable to cross the line. By pouring a little kerosene into these holes when bugs collect in them, all of them are killed.

These barriers, whatever the material used, must be kept freshened. Road oil must be renewed just as soon as the surface becomes a little hardened, every 2 or 3 days, varying according to different conditions. But with the creosote and carbolic acid it is necessary to renew the line every day, at least for a time, and every other day while the insects are active. All this seems like a vast amount of trouble, but when it comes to a choice between these measures and probable total loss of a corn crop, it is the only thing to do.

**Dusty Furrows.** This is merely a furrow around a bug infested field, kept dusty by continuous dragging. The temperature of this furrow in hot weather is extremely high and large numbers of young bugs are killed when they attempt to cross it. The main objection to the dust furrow is that it is not equally effective on all kinds of soil and that a slight shower necessitates additional dragging. It is not nearly so good as a measure as the oil barriers.

A double furrow around a field has proven much more desirable than a single one. By fastening together a couple of logs 12 inches apart, or better still two heavily laden troughs, these may be dragged around a field where a path has been previously prepared by plowing.

**Spraying.** Once the bugs are in a corn field there is only one measure available, spraying the infested plants. If this is done when the insects first enter the field, a great deal may be accomplished.

In Illinois the tobacco extract known as Black Leaf 40 has been used for this purpose, ½ ounce in one gallon of water, adding an
ounce of soap. Soap alone, three ounces to a gallon of water, proved nearly as effective as the tobacco extract, according to Doctor Forbes.

**THE CORN EAR WORM**

Injury. This is the common greenish or brownish "worm" that eats into the ears of both field and sweet corn. It is especially a pest to the latter in Iowa, and in some years, very destructive to the former.

The young larva begins to feed on the silks, soon eating into the grains of corn at the tip end of the ear. As it grows the larva tunnels down the ear toward the butt end, eating only a part of the corn, yet injuring the whole ear so far as market purposes are concerned.

The Insect. The eggs are small, white, rather spherical objects, usually deposited on silks or corn. Mature larvae measure about 1\(\frac{1}{2}\) inches long, varying in color from light green to brown, more or less striped in appearance, with alternating light and dark lines.

The intermediate pupa stage is brownish in color, stout and \(\frac{3}{4}\) inch long. The moth, a rather stout insect, is \(\frac{3}{4}\) inch long and 1\(\frac{1}{2}\) inches forewings, with darker markings. The hind wings are drab, darker toward the outer margin.

Life History. The corn ear worm spends the winter in the pupa stage in the ground. Sometimes in late spring, in May or June, the adult moths emerge and deposit their eggs, mainly on sweet corn, although these are not specially common. Around Ames the first mature larvae are found in July. In August, especially in sweet corn, larvae become very abundant. With favorable weather conditions in September and October these larvae may still be found. Even after corn is hardened they may attack clover or alfalfa.

The number of generations in the state is a matter of doubt. Probably it varies with favorable or unfavorable conditions. Three generations are quite probable.

Control Measures. At present there appears to be no reliable measure for combating the corn ear worm in corn. Fall plowing has often been recommended against this insect, but it is doubtful if this really is very effective. The insect breeds with such extreme rapidity during the summer that it may overcome easily any benefit from fall plowing.

Some benefit has been obtained by dusting sweet corn during the silking period with powdered lead arsenate. But at this time the method has hardly passed the experimental stage, so cannot be generally recommended.

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Fig. 16—Corn Ear Worm in sweet corn. (From Quaintance & Brues, U. S. Dept. of Agr.)

*Heliothis obsolet Fabr.*