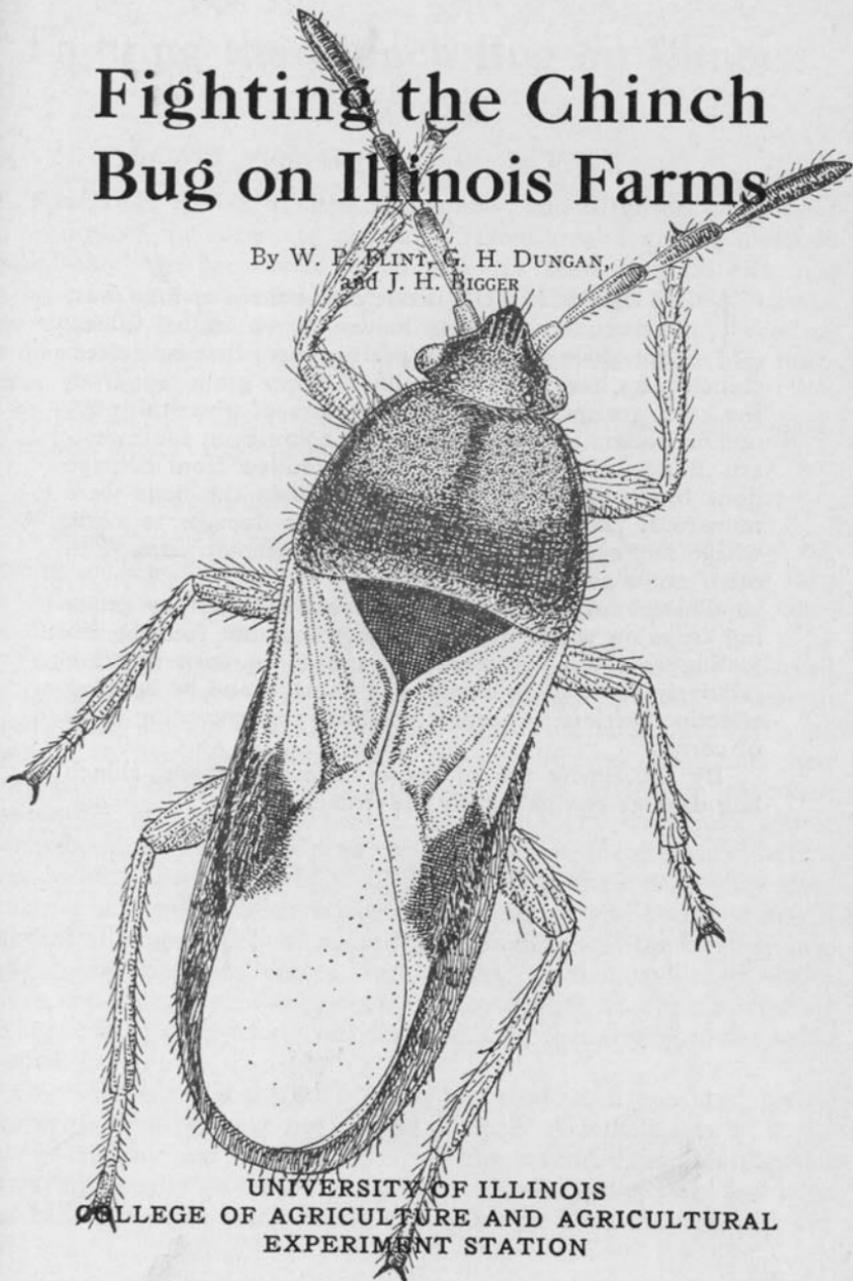


# Fighting the Chinch Bug on Illinois Farms

By W. F. BLINT, G. H. DUNGAN,  
and J. H. BIGGER



UNIVERSITY OF ILLINOIS  
COLLEGE OF AGRICULTURE AND AGRICULTURAL  
EXPERIMENT STATION

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**T**HE CHINCH BUG is one of the three or four most destructive crop pests known in the United States. Ever since the Illinois prairies were first cultivated, chinch bugs have been collecting a heavy grain rent from the corn growers of the state. A loss of practically 6½ million dollars to the farmers in 17 counties in southwestern Illinois is estimated to have resulted from damage done by these insects in one year when the bugs were numerous. This loss was from direct damage to corn, wheat, and oats, and did not take into account damage to other crops and secondary losses.

This circular tells how to combat this pest by growing crops on which the chinch bug does not feed, by adjusting rotations, by planting varieties of corn that are relatively resistant to chinch bug damage, and by building effective barriers to prevent the bugs from invading fields of corn.

By the timely use of these various methods, chinch bug damage can be largely prevented.

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**C**HINCH BUGS at their worst may, and often do, practically destroy the corn crop over an infested area. By using methods that have been well tested and are known to be effective, farmers can avoid at least 75 percent of this damage. Such a saving may mean the difference between a farmer's raising enough feed for his own needs and having some grain to sell, and having to buy practically all his feed.

Outbreaks of chinch bugs sometimes last five years, or longer, sometimes only a single season.

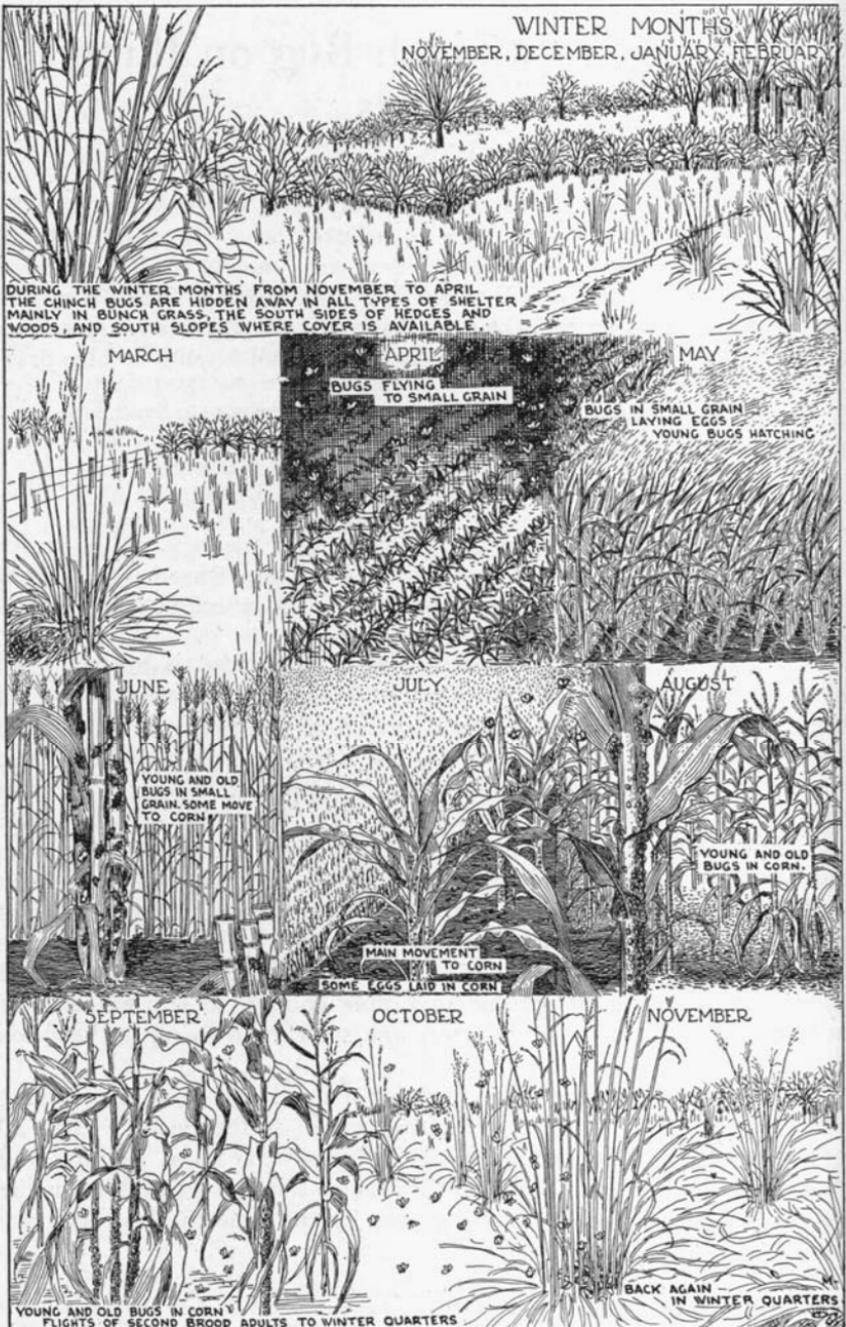
## Habits and Life History of Chinch Bug

In order to understand and put into effect the best methods for fighting the chinch bug, one must know how and where it goes thru the different seasons. The life history of this insect is simple compared with that of many others.

From about the first of November until about the middle of April the full-grown chinch bugs are hidden in various sheltered, protected places. They do not feed during this period and consequently do no damage. In April, May, and June, the overwintered bugs and their young are to be found in fields of small grain or tender, succulent grasses. It is during this period that the flight out from winter quarters occurs. This flight does not always come at the same date in a given locality, nor do the bugs all fly out on a single day—they start leaving winter quarters when there have been several hours of bright sunshine at temperatures of about 70° F. or above. If the weather suddenly cools, the flight ceases, and a week or ten days may elapse before conditions again become favorable enough to stir the rest of the bugs out of their winter quarters and start them flying to the fields of small grain.

Once in the fields the bugs feed for a time, and then start laying their eggs. The eggs are not all laid at once. A female lays 15 to 20 eggs in one day and may not lay again for several days. Mating and egg-laying usually go on for about a month, the young bugs from the first-laid eggs often being nearly grown by the time the last eggs are laid.

<sup>1</sup>W. P. FLINT, Chief Entomologist, Illinois Natural History Survey, and Entomologist, Agricultural Experiment Station; G. H. DUNGAN, Associate Chief in Crop Production, Agricultural Experiment Station; and J. H. BIGGER, Entomologist, Illinois Natural History Survey. For the drawings used herein the authors are indebted to C. O. MOHR, Assistant Entomologist of the Natural History Survey.



Where the chinch bug is to be found at different seasons

By the middle of June most of the old bugs are dead. The first-hatched bugs are usually still in the immature stage, that is, they have not yet acquired wings. When the small grain dries up or is cut, they migrate on foot to fields of corn where, in the latter part of June and July, they very shortly acquire wings. A general flight then takes place, and the bugs scatter over the cornfields, usually picking the thinner stands of corn in order to avoid dampness and shade.

During July, August, and September the bugs from the first brood remain in the cornfields, where the second brood is produced. The flight from the cornfields to winter quarters starts about the last of August and is completed during the first part of November or earlier. The second brood develops almost entirely at the expense of the corn.

Thus there are two broods of the bugs each year, one maturing in the small grain during the late spring and the second maturing in the corn during the summer. For about six months of the year, from about October to April, the bugs are in a quiescent, nonfeeding stage.

### **Weather Controlling Factor in Chinch Bug Abundance**

Of all the factors affecting the abundance of chinch bugs, weather is by far the most important. Chinch bugs are often said to be dry-weather insects, but much depends on the time of year when the dry weather occurs. Heavy rains in the early spring may have little or no effect on the bugs, but frequent heavy rains during the last half of May and June will reduce infestations, and even in years of greatest abundance will keep down the numbers to a point where no serious damage will occur. The rain beats the young bugs down into the ground and "muds" them in so they die. Also dampness and high humidity are favorable to the spread of the white fungus disease which attacks the insects.

Again, if a period of very wet weather occurs in August, starting about the first of the month and continuing thruout the month, the second brood of chinch bugs will be greatly reduced and usually this means no damage the following year.

Contrary to common belief, winter weather usually has little effect on chinch bugs. Extremely cold weather merely causes them to sleep more soundly. Even 20 degrees below zero will kill few, if any, of the bugs that are protected in their normal winter quarters. Studies covering the last twenty years show that the mortality of the bugs in their winter hibernating quarters runs only from 6 to 10 percent.

### **Burning Chinch Bugs in Their Winter Quarters**

It is rarely possible to kill more than 50 percent of the bugs actually sheltering in any given type of cover. Because of the impracticability of burning all the favored cover in an area as large as a county, or even a township, it is doubtful if more than 25 percent of

the bugs in such an area can be killed by winter burning. It is often worth while, however, for the individual farmer, or a small group of farmers, to burn some especially favored areas in which many millions of bugs may be passing the winter.

*Favorite Hibernating Places.*—From mid-October to mid-April 80 to 90 percent of the chinch bugs are in the adult stage hidden in various types of protective shelter. The favorite shelters are *prairie grass, bunch grass, broom sedge, bluestem*, and other native and cultivated grasses that form dense bunches or clumps. The bugs are especially abundant where these grasses grow on south slopes along roads, south sides of ditch banks and hedges, and the south and west edges of woodlands. Large numbers occasionally infest other types of shelter. Only a comparatively few bugs hibernate in cornstalks. Many seek shelter around buildings, under the loose bark of trees and posts, in accumulations of some types of trash, and under the leaves of mullein and other plants. They rarely penetrate more than 10 or 15 rods into the denser woodlands.

*When to Burn.*—Make a survey of all areas suspected of harboring numbers of bugs, and then give special attention to burning off those areas where the bugs are found in greatest abundance. The cover can be burned any time between the first of December and the middle of April when conditions are right.

*Burn against the wind* so that the fire will work close to the ground. This type of fire is more readily controlled and kills more of the bugs than burning with the wind. *Burn only during dry periods.* If the vegetation is green or wet the fire will not work close enough to the ground to be of much value.

Burners of the type used for weed burning or asphalt melting on streets can be used to advantage in some places.

*What Not to Burn.*—In burning hibernating quarters in winter, take care not to destroy the natural shelters for birds and other forms of wild life, for these are likely to be of much greater value than the benefit derived from chinch bug destruction. Do not burn well-established stands of bluegrass, as they rarely contain large numbers of bugs. Whole tracts of woodland should not be burned, as the damage done by killing the young growth and destroying wild-life shelters will more than offset the benefit gained. In short, concentrate on the favored hibernating places and burn those, but do not attempt to burn off the whole countryside, as more harm than good results from indiscriminate general burning.

### **Immune Crops Best Weapon Against Chinch Bug**

Of all methods of fighting the chinch bug, the cheapest and most effective is the use of crops that are immune to attack. These include

such crops as *alfalfa*, *red clover*, *sweet clover*, *alsike clover*, *lespedeza*, *cowpeas*, *soybeans*, *sunflowers*, *flax*, *sugar beets*, *artichokes*, *potatoes*, and *rape*.

The chinch bug has never been known to feed on a plant that did not belong to the grass family and, so far as is known, no member of the grass family is chinch bug proof. Fortunately for the farmer not all crops of the grass family are equally favored by the chinch bug. Among the small grains, for instance, *barley* is most liked. It is therefore a hazardous crop in most parts of the state if the bugs are at all numerous. Other small grains ranked in about the order in which the chinch bug chooses them, are: *spring wheat*, *spelt*, *wheat*, *oats*, and *unpastured rye*. Where rye is thinned by pasturing, it will become heavily infested. All grass weeds such as *foxtail*, *barnyard grass*, *tickle grass*, and *quack grass* serve as pasture for the chinch bug.

The larger growing grass crops are favored by the chinch bug in the following order: *sudan grass*, *sorghum*, *broomcorn*, *grain sorghum*, and *corn*.

A heavy stand of grain of any variety is avoided by the bugs. A growth of clover in small grain discourages them and helps to prevent damage.

### Crop Rotations to Reduce Damage

As has been stated, the bugs of the first brood depend for their food mainly on small grain, especially *wheat*, *oats*, *barley* and *rye*, and the second brood feeds almost exclusively on *corn*. It naturally follows that a good way to hold this insect in check is to make its food scarce somewhere along the line. This means that wheat-growing areas should cut down on their acreages of corn, substituting, if possible, some crop on which the chinch bug will not feed; and that heavy corn-producing areas should reduce the acreage devoted to small grains. A rotation of corn, soybeans, wheat, and clover will suffer as little loss as any rotation that contains both wheat and corn.

In an area where *wheat* is the main money crop, the following rotation will be satisfactory, for it contains no crop on which the second brood of chinch bugs can feed:

Wheat.....	25 percent
Soybeans or cowpeas.....	25 percent
Wheat, with some oats or rye.....	25 percent
Red or sweet clover.....	25 percent

Where *corn* is the main money crop, a rotation of the following type may be used:

Corn.....	20 percent
Corn.....	20 percent
Soybeans.....	20 percent
Wheat or oats.....	20 percent
Red clover, sweet clover, or alfalfa.....	20 percent



#### Good crops for chinch bug areas

Alfalfa and soybeans are especially good crops for chinch bug areas. Alfalfa is immune from injury by this insect. Soybeans are not only immune but their dense shade discourages the insect from feeding on corn growing in the hill with the beans. When chinch bugs are extremely numerous, sunflowers are sometimes grown for silage instead of corn.

The essential point to observe in arranging a rotation to prevent chinch bug injury is to grow as large an acreage as possible of the crops on which the chinch bug does not feed.

Where both small grains and corn are grown on the same or on adjoining farms, the fields of these two crops should preferably not be adjacent to each other.

### Some Varieties of Corn Relatively Resistant

Some varieties of corn can withstand the feeding of the second brood of chinch bugs and still produce a reasonably good crop of grain. There is no variety, however, that can withstand the onslaught of a horde of hungry first-brood bugs traveling on foot from adjoining fields of small grains.

The particular quality that makes some strains of corn less favored by chinch bugs than other strains is not known. An important factor in the resistance of a variety to chinch bugs is superior vigor, which enables the variety to produce a good crop of grain even tho many bugs feed upon it.

The annual yields of different varieties of corn grown on the Alhambra field in Madison county during years when chinch bugs were bad are shown in the accompanying table.

*Varieties for Southern Illinois.*—Four varieties—*Champion White Pearl, Black Hawk, Mohawk, and Golden Beauty*—have proved resistant to chinch bug damage and are also adapted to the upland soils of southern Illinois. These varieties have a medium to smoothly indented grain which has a rather hard, flinty endosperm. The ears of *Champion White Pearl* are pearly white; *Black Hawk* has a red kernel

CORN YIELDS ON ALHAMBRA FIELD (MADISON COUNTY)  
DURING CHINCH BUG SEASONS

Variety	1924	1925	1926	1931	1932	1933	Percentage rating <sup>1</sup>
	<i>bu.</i>	<i>bu.</i>	<i>bu.</i>	<i>bu.</i>	<i>bu.</i>	<i>bu.</i>	
Waddell Utility White Dent.....	.....	.....	.....	.....	71.5	10.0	116.8
Black Hawk (Haller).....	39.4	63.1	39.1	13.5	64.8	7.6	102.7
Golden Beauty (Waddell).....	.....	.....	.....	.....	62.0	9.3	102.1
Champion White Pearl.....	33.8	64.5	33.4	15.3	57.7	14.7	99.0
Stanley White Dent.....	.....	.....	.....	9.5	62.1	6.6	93.0
Mohawk.....	36.5	71.4	41.4	16.3	73.0	.....	92.9
Golden Gint.....	25.1	67.7	35.9	12.3	.....	7.0	91.8
Golden Beauty (Gilbert).....	27.2	59.9	36.8	.....	.....	.....	90.1
Reid Yellow Dent.....	37.8	62.2	26.4	12.2	46.0	7.4	86.6
Moore Yellow Dent.....	.....	.....	.....	14.4	52.0	4.8	84.7
Boone County White (Wyatt)...	31.7	52.3	26.2	.....	.....	.....	80.1
Calico.....	.....	.....	.....	12.8	45.3	9.2	80.0
Eversole White Dent.....	.....	.....	.....	7.8	46.2	.....	72.3
Western Plowman (Eckhardt)...	.....	.....	.....	9.0	35.5	.....	59.6

<sup>1</sup>Percentage rating is based upon the average yield of *Black Hawk, Champion White Pearl, Golden Beauty, and Mohawk* for the same years.

with a yellow cap; Mohawk varies from white to blue, with many ears bearing both white and blue kernels. The cobs of Mohawk may be either white or red; Golden Beauty is a yellow corn having either a white or a red cob.

Waddell Utility White Dent has a very good type of grain for live-stock feeding, and the plant seems resistant to chinch bugs altho it did not stand up as well under severe infestation on the Alhambra field as did Champion White Pearl. It was developed by Mr. Elmer Waddell, of Taylorville, Illinois, by crossing Champion White Pearl and Johnson County White.



Effect of chinch bugs on resistant and non-resistant strains of corn

The two inbred strains of corn shown above were planted on the same day and cultivated in exactly the same manner. The second brood of bugs flew into this plot, completely destroying one strain but not preventing the other from producing a good yield. (Courtesy J. R. Holbert, Bureau of Plant Industry, U. S. Department of Agriculture.)

*Varieties for Central and Northern Illinois.* — In the absence of thoro tests of the resistance of most of the corn varieties commonly grown in the central and northern portions of Illinois, it is recommended that only the best adapted and highest yielding varieties be grown in those sections during years of chinch bug outbreaks. While during years of heavy infestation in central Illinois, better yields of corn have been obtained from resistant varieties imported from southern Illinois than from local varieties, such a practice is accompanied by considerable hazard owing to the fact that these varieties mature late and unless planted early on fertile soil they may be caught by frost in the fall.

*Soybeans of Benefit With Corn.*—Planting soybeans in the hill with corn is an effective way to help reduce chinch bug damage. The soybean plants hold the morning dew and the moisture after rains, thus making an unfavorable environment for the bugs. Soybeans grown with corn reduce the yield of corn under normal conditions, but even in moderate infestations of chinch bugs the harmfulness of the soybeans is not as great as the benefit derived from them.

Planting the corn in hills and using two or three beans to the hill gives better results than drilling.

The planting of any crops such as pumpkins or rape in the corn will also lessen the damage from chinch bugs by providing heavy shade for the lower part of the corn plants.

*Thick Planting of Corn Desirable.*—In thickly planted corn chinch bugs do less damage than in thin plantings. In areas where chinch bugs are numerous it is therefore recommended that corn be checked a little thicker than under normal conditions.

### Chemical Barriers Most Effective

Barriers are used to prevent the migration of chinch bugs from fields of small grain or grasses, where the first-brood bugs have hatched, to fields of corn or uninfested small grains. Chemical barriers have proved both the most effective and the least expensive type. Besides stopping the bugs from traveling from one crop to another, these barriers make it possible to trap and kill great numbers of mature bugs.

*Materials for Barriers.*—The best materials for barriers are those that have a strong odor of creosote, cresylic acid, or naphthalene. These are found in certain grades of *crude creosote* (not the wood-preservative type, which is too expensive), *naphthalene*, *naphthalene drain oils*, and to some extent in *pine-tar oils*. Such barriers are much more lasting and are less affected by blowing dust, rain, and wind than are dusty furrows or road-oil barriers. The odor of these materials is so repellent that the bugs will turn back before they will cross the barrier. Two of the best oils so far tested have the following specifications:

- I. "A coal tar distillate obtained by draining oil from either crude naphthalene or thoroly distilled naphthalene oil. It shall contain not more than 2 percent water, which shall be free from crystals at 25° C. (77° F.). Specific gravity at 15.5° C. shall be within the limits of 1.01 and 1.04. Percent tar acids, 5 to 6."
- II. "The oil shall be a distillate of coal-tar or coke-oven tar. It shall not contain more than 3 percent of water, nor more than .5 percent of matter insoluble in benzol. The specific gravity of the oil at 38° compared with water at 15.5° C. shall be not less than 1.03."

"The distillate, based on water-free oil, shall be within the following limits:

"Up to 210° C. not more than 5 percent.

"Up to 235° C. not more than 25 percent.

"The residue above 355° C., if it exceeds 5 percent, shall have a float test of not more than 50 seconds at 70° C. The oil shall yield not more than 2 percent coke residue.

"The above test shall be made in accordance with the standard methods of American Wood Preservers' Association."

In ordering creosote for chinch bug barriers it is recommended that the above specifications be used. The second material is somewhat heavier bodied and not so easy to apply as is the first one, but it is cheaper in price.

*Making the Ridge.*—Barriers are usually made by throwing up a ridge of earth between the field infested by bugs and the field of corn which is to be protected. The ridge of earth should be thrown up about two weeks before the small grain is to be harvested. Make the ridge 6 to 8 inches high and as smooth as possible. Constructing the ridge some time before it is to be used permits the dirt to settle and the ridge to become more smooth than one freshly thrown up. This settling and smoothing is quite essential to the success of the barrier.

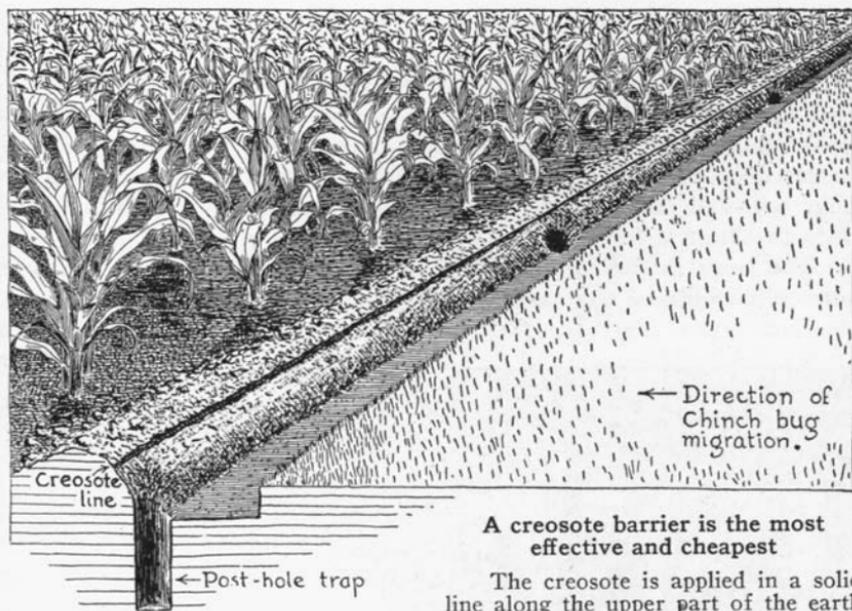
One of the most common methods for constructing a ridge is to plow a furrow around the field, throwing the dirt toward the corn. Smooth the furrow down with the back of a spade or section of harrow or plank drag. Make the post-hole traps in the bottom of the furrow or partly in the sloping side. When the barrier is prepared in advance, it is an easy matter to apply the creosote as soon as the bugs start to move.

A ridge may also be thrown up with a disk cultivator. Where this is done, the ridge will usually have to be placed between the first and second rows of corn, where the ground has been cultivated, the corn being cut out before the ridge is thrown up. A small road grader is also a very good implement for making a ridge.

Sometimes when the bugs start moving before small-grain harvest, a barrier has to be constructed quickly. Under such conditions some very good barriers have been made by driving a truck back and forth several times in the same track between the first and second rows of corn. The large tire of a truck will leave a rounded depression in the soft ground. Creosote applied to the top of the edge of this depression on the side towards the corn will stop the bugs.

It makes little difference what implement is used for throwing up the barrier ridge so long as a smooth ridge results.

*Placing the Repellant Material.*—Always bear in mind that creosote or tar barriers must be placed near the top of a ridge or slope. As has been explained, these materials turn the bugs very largely because of their repellant odor. If they are placed at the bottom of a depression, the large numbers of bugs trying to get out of the field force the



**A creosote barrier is the most effective and cheapest**

The creosote is applied in a solid line along the upper part of the earth ridge on the side of the ridge that

faces the small grain. Note that the post-hole traps are in the side of the ridge, not the bottom. The tops of these traps must be kept flared and dusty if they are to catch and hold the bugs.

front line of bugs over the barrier. If the repellent material is placed near the top of the ridge, where the bugs have to climb up to it, they are repelled by the odor before they actually crawl onto the barrier, and they therefore will not be forced upon it by the bugs behind. Another reason for placing the material near the top of the ridge is that fewer bugs will be blown over such a barrier than over one at the bottom of the depression.

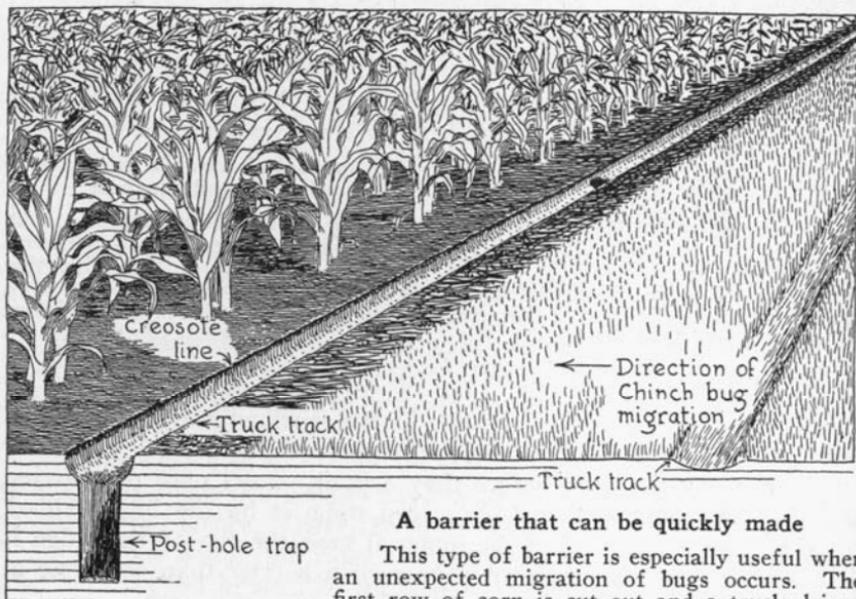
*Bucket for Applying the Material.*—For applying the creosote or other repellent about the best method that has been worked out, considering expense and ease of application, is to punch an 8-penny nail hole in the *side* of a galvanized or tin bucket, placing the hole about an inch from the bottom of the pail directly below the point where the bail attaches. A stream of creosote or naphthalene drain oil flowing from such a hole will form a sufficiently wide path on the barrier ridge to turn the bugs. A half-inch path is wide enough.

All barrier materials will have to be renewed at least once a day for the first several days. In renewing them, try to apply the material on the same path. If this is done with the better barrier materials, complete renewal will be necessary only every other day after several applications have been made, altho the line should be gone over and

patched every afternoon between 1:30 and 6 o'clock, as the bugs are more active in the afternoon.

*Post-Hole Traps.*—To get the best results from a barrier, a line of post holes in which the bugs can be caught and killed must be maintained at the bottom of the barrier. These holes should be about 18 inches deep, and the tops should be flared and kept dusty so that the bugs will fall into them. The dust also makes it impossible for the bugs to obtain a foothold and crawl out of the holes.

The bugs in the holes should be killed every afternoon at about sundown. One of the easiest ways to do this is to pour one or two



#### A barrier that can be quickly made

This type of barrier is especially useful when an unexpected migration of bugs occurs. The first row of corn is cut out and a truck driven along the side of the field, one wheel being kept in the soft dirt of the cornfield and the other on the stubble. The post holes are placed in the bottom of the cornfield track. The creosote is applied to the top of the track on the side toward the corn.

tablespoonfuls of kerosene into the hole, scattering it around over the bugs. Do not ignite the kerosene—let the bugs work it around among themselves. In this way nearly all the bugs in the hole will be killed.

*Cost of Barriers.*—Thirty-five to 50 gallons of creosote, naphthalene drain oil, or other effective material is usually required for a line a quarter of a mile long. This amount will provide for renewals for the period during which a barrier is necessary, which is usually 14 to 18 days.

An acre of corn saved will usually more than pay for the maintenance of a quarter of a mile of barrier. Where the maximum amount of material is used, that is, 50 gallons for 80 rods of line, the material will cost \$7.50 at 15 cents a gallon. The labor cost will be a little more than the cost of materials. If the bugs are really to be stopped, the time of a man or boy will be required for every half-mile of barrier from 1:30 to 6 o'clock every afternoon while the barrier is maintained.

### Other Barriers of Little Value

Ordinary road oil and used crank-case oil are usually not worth using. They are effective only while sticky and wet. Their smell is not repellant.

The old dusty furrow type of barrier is effective on certain types of soil so long as the weather is dry, but when a heavy shower occurs, the bugs start crossing the barrier and usually penetrate into the corn 8 to 10 rows before another mulch can be worked up.

Strips of soybeans or cowpeas planted a few rods or even 10 to 20 rods wide between fields of small grain and fields of corn do not prevent the bugs from migrating from one field to another.

If planted very early, a row of Sudan grass or sorghum between the small grain and corn will often hold the bugs for a week. None of the bugs are killed, however, with this type of barrier. They merely stop in it and feed until they acquire wings and then fly to the corn-fields. This type of barrier is of value only if the food plant is 12 to 14 inches high when the bugs move. *In most cases it is worthless.*

### Natural Enemies of Chinch Bugs

A white fungous disease attacks chinch bugs during rainy or damp weather. Little, if anything, can be gained by artificial dissemination of the spores of this fungus, for they are practically always present in the fields and infect many other insects also. When weather conditions are right, the bugs become naturally infected.

### Chinch Bug Effect on Quality of Silage and Grains

Corn used for silage is often literally covered with bugs when it is cut. After standing two or three weeks the silage loses the chinch bug odor and apparently is just as palatable to cattle as corn not so infested. No ill effects have been reported from feeding this material.

Chinch bugs reduce the quality of corn as well as yield, the percentage of sound corn being much lower in infested fields.

Where very abundant, chinch bugs are likely to destroy thin stands of small grain, especially barley and spring wheat. Where the grain is not destroyed, the yield and quality are often greatly reduced.

## Times and Ways to Fight Chinch Bugs

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Chinch bugs can be fought *directly* at two times during the year—

1. While they are in winter quarters, by burning.
2. While they are migrating from small-grain fields to corn, by the use of barriers and traps.

Chinch bugs can be fought *indirectly*—

1. By the use of chinch bug immune crops.
  2. By the use of resistant varieties of the crops on which the bugs feed.
  3. By planting certain crop mixtures.
  4. By the proper rotation of crops.
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Of all methods of fighting this crop pest, the cheapest and most effective is the use of chinch bug proof crops.