

AGRICULTURAL EXPERIMENT STATION

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DEPARTMENT OF ENTOMOLOGY

SUMMER CONTROL OF THE CHINCH BUG¹

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After an absence of six years the chinch bug has again made its appearance in Kansas in damaging numbers. Some injury occurred to wheat throughout the eastern and southern parts of the state in 1920, while in many localities corn suffered severely. The number of bugs that went into winter quarters in the fall of 1920 was much larger than that of any year since 1914, and the dry, mild winter of 1920-21 resulted in practically no mortality during hibernation. The exceptionally warm weather in March, 1921, caused the bugs to migrate from their winter quarters much earlier than usual and large numbers are now to be found in the wheat and other small grain fields. In view of the conditions it is almost certain that the farmers of Kansas are facing another serious outbreak of the chinch bug.

SUMMER CONTROL MEASURES

After the bugs leave their winter quarters and become established in the small grain fields, there is no method of preventing injury to these crops; but by diligent work, corn and sorghum crops may be saved from any injury. The problem of summer destruction involves not only the necessity of getting the bugs to pass from the small grains while yet immature, but also the problem of maintaining efficient dust barriers during dry weather or oil barriers during wet weather, and of destroying all bugs that succeed in crossing the barriers and congregating on the first few rows of corn or sorghum.

Ordinarily before the bugs are mature, the small grain fields ripen, thus forcing the immature bugs to migrate on foot to other fields. However, some years the wheat is so

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delayed in ripening that many of the bugs are mature before harvest. In such cases migration takes place by flight and nothing can be done to destroy the pests. At times the wheat is so thin on the ground that a growth of grass furnishes the chinch bugs with food after the wheat ripens, thus allowing them to mature in the wheat fields before moving to corn. In such cases harvest should be hastened and the field thoroughly disked to destroy all food for the bugs, and thus hasten the migration.

THE DUST BARRIER

There are two types of dust barriers, the double furrow and the single furrow. The first is made by plowing a strip about 10 feet wide between the infested and noninfested fields and then reducing the soil to a fine dust by harrowing and dragging with a brush drag. Two V-shaped troughs about four feet long are made of heavy lumber and held about a foot apart by two timbers, not less than 2 by 4 inches, nailed firmly across the top. This double trough, heavily weighted down, is dragged back and forth on the plowed strip (fig. 1, G) until two deep, parallel furrows are formed, the sides and bottoms of which are covered with a deep, fine dust.

The single-furrow barrier is made by plowing a deep lister furrow between the infested and noninfested fields. The sides and bottom of this furrow are reduced to a deep, fine dust by dragging back and forth a heavy log (fig. 1, F) wrapped with a log chain.

The double-furrow barrier requires a little more time to construct, but demands less attention while the bugs are moving. Either type of barrier can be renewed readily by redragging.

After the bugs are caught in these furrows they may be destroyed by burning with a gasoline blow torch, crushing with the drags, or trapping in post holes. The most successful of these methods is to destroy them with a hot blast. This is done by flaming the sides and bottom of the furrows at regular intervals with a strong gasoline torch. (Fig. 1, H.) Although many bugs may be destroyed while they are moving, by continuous dragging, this method has not been found entirely successful, as many bugs are forced out of the furrow. The post hole method has been found the least satisfactory of all. Holes are dug at intervals of 10 feet in the bottom of the furrow, and the bugs that are caught in these holes are destroyed by pouring kerosene over them. These holes have to be rebored after each dragging of the furrow and the kerosene makes it hard to maintain a fine dust.

The gasoline blast torch method has proved itself to be admirably adapted to this work, for it not only destroys the bugs by simply passing the flame along the furrow, but the furrows can be renewed as often as necessary by dragging the log or trough through them.

THE OIL BARRIER

The oil barrier is designed for use during periods of rainy weather when it is impossible to maintain a dust mulch. Essentially this barrier is a slender line of road oil, crude creosote, or tar poured along a smooth surface between the infested and uninfested fields. Such a barrier is constructed by plowing a sharp backfurrow (fig. 1, A) between the two fields. Two 2-inch planks, about 14 inches wide and 8 feet long, are nailed together hog-trough fashion. (Fig. 1, B and C.) The front end of the trough is rounded off like a sled runner. In order that it may slip well the inside of the trough should be lined with galvanized iron. A smooth pole, about 2.5 inches in diameter, is nailed into the bottom in such a manner that it extends from the front end to a point eight inches behind the rear of the trough. A narrow, rectangular platform, running the length of the trough and extending 10 inches beyond the rear end, is then constructed on the ridge of the now inverted trough. This platform is intended for carrying the driver and any additional weight that is needed. By means of a strong wire or chain, an attachment is made to the clevis of the doubletree and the inverted trough is ready for work.

This trough is dragged up and down the backfurrow until a compact ridge is formed with a groove along the top. (Fig. 1, D.) The oil is poured along this groove from a sprinkling can, the nozzle of which has been removed, in a stream of sufficient size to make a line one-half to three-fourths of an inch in width.

The bugs are destroyed by flaming along the oil line with the gasoline torch, the same as in the dust barrier. (Fig. 1, H.) They may also be destroyed by digging post holes at the bottom of the slope on the bug-infested side.

The material used in making the oil barrier is determined largely by its cost and accessibility. During the previous outbreak of chinch bugs in Kansas (1912-1914), road oil No. 7 and coal tar were both used throughout the state with good results. The Illinois Agricultural Experiment Station has used crude creosote with excellent results and recommends it generally. Crude creosote suitable for this purpose is sold by the F. J. Lewis Manufacturing Company, Moline, Ill. Road oil No. 7 is a product of the Standard Oil Company and may be obtained from their refinery at Whiting, Ind.

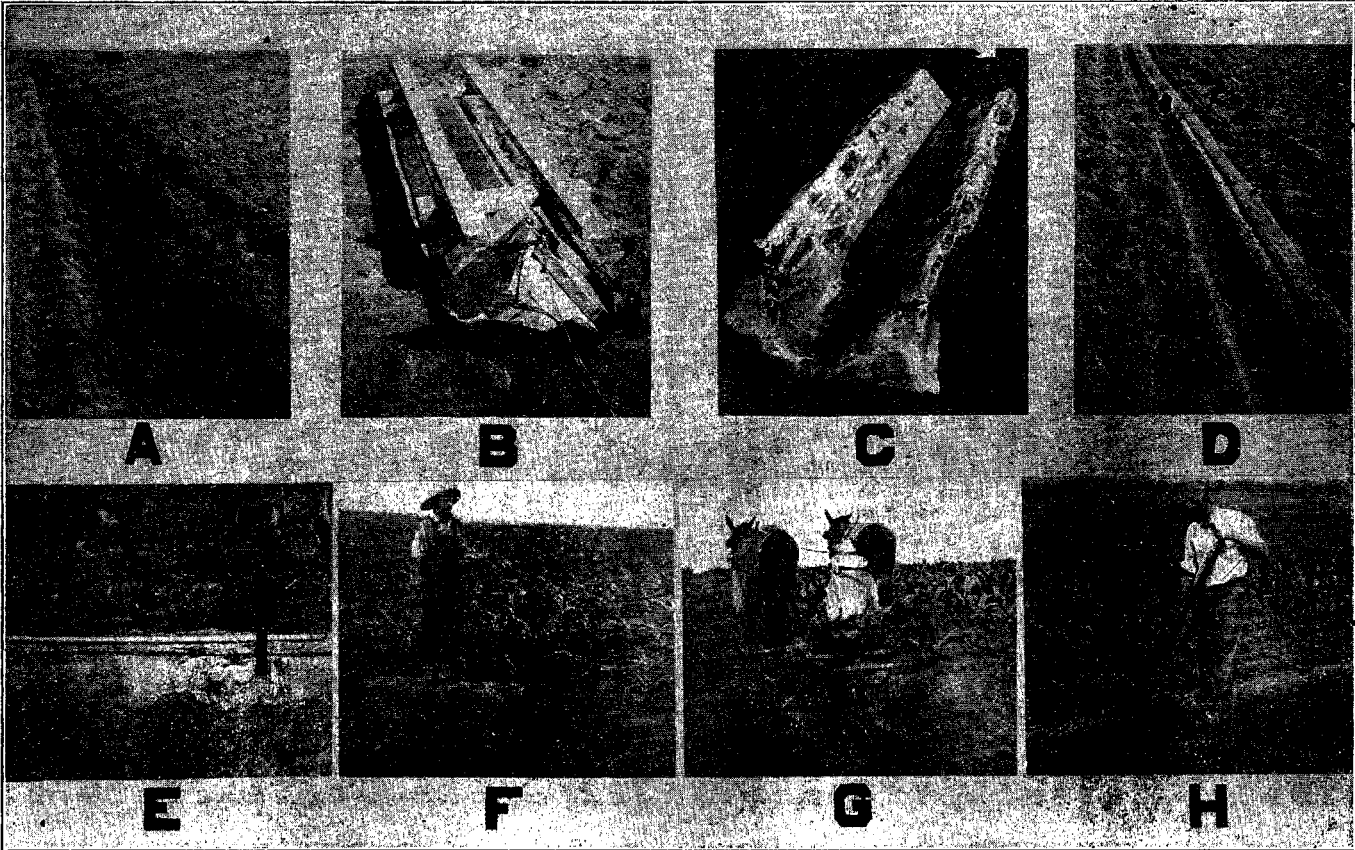


FIG. 1.—Methods of constructing and operating barriers. (After T. J. Headlee)

OPERATION OF BARRIERS

Various stages in the construction and operation of barriers are shown in figure 1. The subdivisions of this illustration may be further described as follows: (A) Backfurrow for road-oil barrier. (B and C) Top and inverted views of trough for shaping ridge for road-oil barrier. (D) Completed road-oil barrier. (E) Close view of road-oil barrier, showing (I) size of oil line in comparison with hoe handle, and (J) ridge. (F) Dragging to get dust in single-furrow dust barrier. (G) Dragging to get dust in double-furrow dust barrier. (H) Destroying bugs by flaming dust barrier with gasoline torch.

The farmer should keep in touch with what the bugs are doing in the small grain fields, especially about harvest time, and should have the barrier materials ready for use when the time comes. A small strip between the infested and noninfested fields should be kept free from weeds so that when the barriers are constructed the ground will break up nicely and be easily pulverized. It is necessary for the farmer to plan to use both types of barriers. At the first signs of migration, the dust barrier should be constructed, if the weather is dry, and the ridge for the oil barrier should be prepared. The oil barrier should be placed between the dust barrier and the field to be protected, but the oil should not be placed on the barrier until, owing to wet weather, it is impossible to hold the bugs in the dust furrow.

Harvest should start as early as possible so that the bugs will have to pass without delay. During the migration of the bugs there must be one person for each one-half to three-fourths of a mile of barrier in the field constantly burning or otherwise destroying the bugs that are caught in the barriers. Ordinarily the migration of chinch bugs from wheat to corn fields covers a period of from one to two weeks, depending on the amount of food left in the wheat field after harvest. Extended observations have shown that for the most part the bugs move during the afternoon. Generally the migration begins about 4 p. m., reaches its maximum between 5 and 5:30 p. m., and is over about 7 p. m. On cool or cloudy days some bugs may move during the morning hours.

DESTROYING BUGS THAT CROSS THE BARRIERS

It is impossible to stop and destroy 100 percent of the migrating bugs. Those that pass the barriers, however, begin work on the first rows of corn. It is possible and practical to destroy these bugs by spraying with a contact spray or by flaming the plants with a gasoline torch.

Two of the best sprays that can be used for this purpose are nicotine sulphate and a strong soapy spray. The

brand of nicotine sulphate usually recommended is "Black Leaf 40." It is used at the rate of one-half pint to 50 gallons of water, plus 2 pounds of common laundry soap. The soapy spray is prepared by dissolving 8 pounds of common laundry soap in 50 gallons of soft water.

These sprays may be applied with any form of sprayer which produces a fine, misty spray. The small knapsack sprayer has proved very satisfactory for spraying corn. Since these sprays kill the bugs only when they come in actual contact with them, they must be applied in such a manner as to thoroughly wet the bugs. To do this it is necessary to fill the pockets formed by the leaves and the stem by drenching the plant, but care should be taken to keep the liquid, especially the soapy spray, out of the growing curl. The bugs must be destroyed shortly after they cross the barrier or they will soon distribute themselves over the field.

Where it is impossible to spray, the flaming of the infested rows with a gasoline torch is to be recommended. Careful tests have shown that practically all of the bugs on the corn plants can be destroyed by this method, although repeated flaming seriously injures the plants. However, it is better to sacrifice a few rows at the edge of the field than to allow the bugs to injure the entire field.

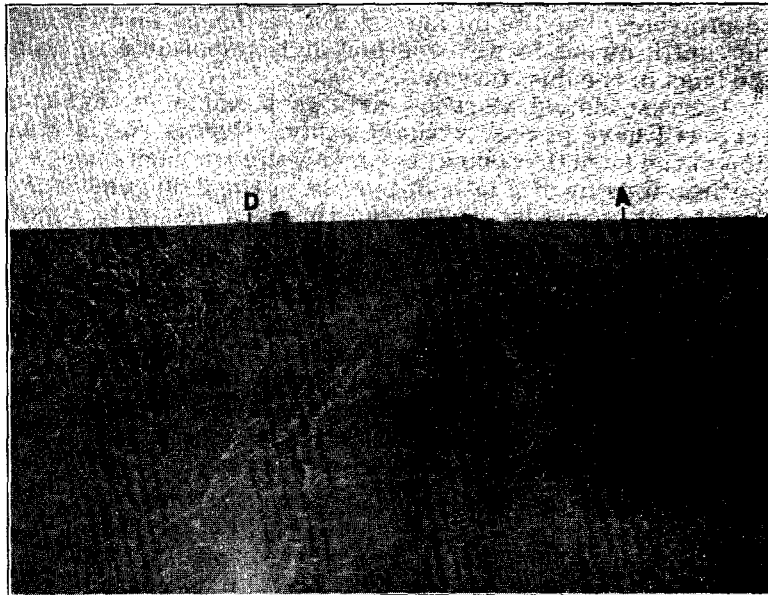


FIG. 2.—A corn field protected from an infested wheat field by barriers: A, the infested wheat field; B, road-oil barrier; C, single-furrow dust barrier; D, the protected corn field. Not a single hill of corn is injured. (After T. J. Headlee)

EFFICIENCY OF BARRIERS

The efficiency of summer control (figs. 2 and 3) is determined by the thoroughness and energy put into the work. During the previous outbreak in Kansas (1912-1914), thousands of acres of corn were saved from injury,

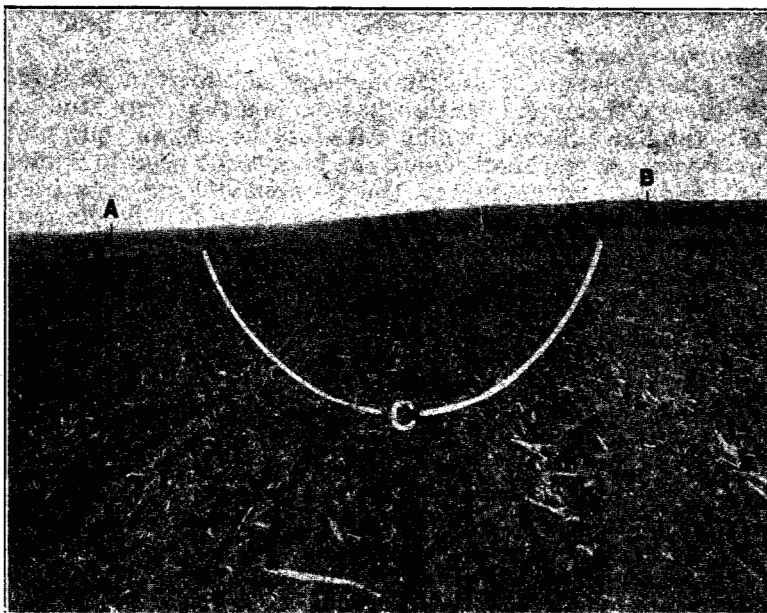


FIG. 3—An unprotected corn field and an adjoining infested wheat field: A, the infested wheat field; B, corn field where bugs were working when picture was taken; C, area of corn field (100 rows in width) completely destroyed within five days after bugs began migrating. (After T. J. Headlee)

often without the loss of a single hill (fig. 2), by constant attention to the barriers during the period of migration. The cost of constructing and maintaining a barrier during 1912 and 1913 was approximately \$50 per mile. Since a mile of barrier is sufficient to protect at least 160 acres, it may be said that the cost per acre was about 32 cents.

Forbes¹ reports that approximately 1,500 miles of barriers were constructed and used in Illinois in 1914. These barriers protected 190,590 acres of corn at a total cost to the farmers for labor and materials of \$40,500. It is conservatively estimated that this work resulted in the saving of 1,191,187 bushels of corn valued at \$714,710, giving a net saving of \$674,210.

¹Forbes, S. A. Executive report of the Illinois State Entomologist and Director of the Illinois State Laboratory of Natural History for the years 1913 and 1914. Pp. 6-7. 1915.

ARTIFICIAL DISTRIBUTION OF THE CHINCH BUG FUNGUS

Every outbreak of chinch bugs brings numerous requests for diseased or fungus covered bugs for distribution in the infested fields. It is advisable at this time to reiterate the fallacy of this method of control, since dependence on it has resulted in the loss of millions of dollars to crops in Kansas through the neglect of efficient and practical control measures.

The Department of Entomology of the Kansas Agricultural Experiment Station has made a thorough study of the fungus disease which attacks the chinch bug. In every part of the state where the bugs have been in sufficient numbers to do injury, the fungus disease was present. In other words, the disease has been found commonly distributed over the entire bug-infested districts of the state, attacking not only the chinch bugs, but also a large number of other species of insects. However, it should be stated, that although the fungus seems to be present everywhere, the proper climatic conditions must prevail in order for it to propagate; namely, plenty of moisture and summer temperatures. The fungus will break out only under these favorable climatic conditions, and if the bugs are abundant it will soon spread and destroy them in great numbers. The small amount of fungus which could be introduced artificially is too insignificant in comparison with that naturally present in the fields to cause any appreciable reduction in the number of bugs, even under favorable conditions.

Investigations by the United States Department of Agriculture and other experiment stations are in accord with these findings. Thus, it appears that the artificial distribution of this disease is of no avail and reliance must be placed in methods of control such as have been outlined in this circular.