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METHODS OF

DESTROYING CHINCH BUGS.

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Director and Agriculturist.

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METHODS OF DESTROYING CHINCH BUGS.

By G. E. MORROW, Director and Agriculturist.

Chinch bugs were unusually destructive to farm crops over much of the United States in 1895. The farmers of Oklahoma suffered in common with those in many of the states. Unfortunately there are indications at the middle of April that the farmers of Oklahoma are to contend with great numbers of this pest in 1896. They have appeared on the farm of this Station and reports of their presence in alarming numbers have been received from different parts of the Territory. The design of this bulletin is to suggest methods by the use of which the damage done by these bugs may be reduced as far as possible.

THE CONTAGIOUS DISEASE METHOD.

For several years past much attention has been paid by Experiment Station workers and other investigators to attempts to destroy the chinch bugs by introducing a contagious disease among them. There are several diseases which, at times, destroy great numbers of the bugs. The one with which most trials have been made is called, popularly, the White-Fungus disease. It is caused by a very small parasitic plant which grows and feeds on the body of the bugs. The presence of the disease is indicated by the bodies of the diseased or dead bugs being more or less covered with a white fungus growth. This growth is made up of minute branches bearing vast numbers of exceedingly small spores which correspond to the seeds of ordinary plants. If a single one of these spores comes in contact with the body of a chinch bug, and all the conditions are right, it may grow and spread, causing the death of the insect. It naturally occurred to different entomologists that this disease might be made to spread rapidly by finding even a few bugs affected with it, confining these in a box into which healthy

bugs might be placed, these becoming diseased by contact with those already affected, and, after a sufficient number had become diseased, scattering them in the fields of grains in which the bugs had appeared, expecting them to become sources of infection to others, these to still others, until the disease became general. Just this result has been secured in a large number of cases. Unfortunately, however, the percentage of cases of success has been small in the many thousands of trials which have been made in several different states. Chancellor Snow, of the University of Kansas, who has been among the most active in advocating and making trials of this method, stands almost alone among scientists in pronouncing it successful in any very large percentage of cases.

In the extensive use made of this disease method at the Oklahoma Station in 1895, under the direction of the former Director, Dr. J. C. Neal, there was no conclusive evidence of good results in any case. Diseased bugs were sent to many applicants in different parts of the Territory. With one or two exceptions no favorable reports were received, and in one case where such a report was made it seems evident the death or disappearance of the bugs must have been due to some other cause. The writer had personal familiarity with the very extensive trials made in Illinois in 1894 and 1895, under the immediate direction of Dr. S. A. Forbes, State Entomologist. Not only were the large majority of reports of trials by farmers unfavorable, but there was conclusive evidence that in some cases in which good results from the infection were reported the parties so reporting had mistaken the cast skins or moults of the bugs for dead bugs and that others had mistaken the light color of the bugs, after moulting, for the disease. Careful experiments, on unusually liberal scale, tried on the farm of the Illinois Station, failed to produce good results. Similar unfavorable results followed the work of the Ohio Station in 1895, a part of which was participated in by Prof. Bogue, now of this Station.

Not all the reasons for general failure, while there are cases of marked success, are known. It is well known that, while dry weather is favorable for the multiplication of the bugs, it is especially unfavorable for the spread of this fungus disease.

In view of the poor success in the past this Station has decided, as have most other Stations, that it is not advisable to send out infected bugs for general trial until the matter is more fully understood. This Station will make a careful study of

this disease and try experiments with it in different ways of application.

With our present knowledge no other plan for destroying the bugs when they have made their appearance in small grain fields, can be recommended with confidence. In some cases the application of a kerosene emulsion will destroy the bugs, but it is obviously impracticable to make use of this over large grain fields, and most Oklahoma farmers cannot conveniently provide themselves with suitable spraying apparatus.

THE BARRIER AND TRAP METHOD.

It is, however, practicable to keep the bugs out of corn fields, and in many cases out of the oat fields, even when they have appeared in great numbers in the wheat fields. As a help to this, this Station has advised the separation of the corn fields from the small grain fields as far as possible, and to have alfalfa between where this was practicable. The chinch bug does not feed on alfalfa nor any of the clovers. It does feed on grasses, wild or cultivated, although it prefers wheat, and especially barley and the millets. It has been advised to sow millet alongside or around the wheat field so as to attract the bugs to a narrow area, thus helping to more easily destroy them.

The method of saving the corn crop, which is strongly advised, is called the "barrier and trap" method. It consists in forming a barrier over which the bugs cannot pass and then trapping them in holes as they collect at this barrier. This method requires work and attention but it has proved so remarkably successful in many cases that it is strongly recommended. One reason for discontinuing the distribution of diseased bugs is that it has been found that such distribution tends to cause reliance on the possible spread of the disease and unwillingness to make the effort necessary to protect other crops. A statement in the letter by Dr. Forbes, published in this bulletin, gives striking evidence of the value of the barrier method. When twelve bushels of chinch bugs can be killed as they come out of a twenty acre field of wheat and adjacent corn be kept entirely free from the bugs, there is no reason why farmers should not be willing to give the time and labor necessary to thoroughly try this plan, especially as the destruction of the bugs is a great help towards preventing their appearance in alarming numbers next season. It will be noticed that Dr. Snow, while attaching high value to the

disease method, also gives expression to his belief in the great value of the barrier plan.

Both Dr. Snow and Dr. Forbes commend the use of coal tar and kerosene emulsion as aids or in special cases. Of the value of these applications there is no doubt, but their higher price in Oklahoma, the difficulty of securing the tar at points distant from railroads and the great readiness with which they evaporate or become hard here leads the writer to advise chief reliance on the barrier. In trials made in the presence of the writer the bugs paid little or no attention to ridges of salt, even when the salt was saturated with kerosene.

The most easily made barrier, and one that may be entirely effective, is made by making a double furrow with an ordinary plow or with a lister plow, smoothing up the sides with a hoe or spade and seeing that the side next the field it is designed to protect is kept fairly steep, free from clods and as nearly fine dust as is possible to make it. This may be accomplished by frequently drawing a log of wood through the furrow or, instead of the log, a V shaped drag, the sides of which shall press against the sides of the furrow. To prevent failure of the work, should the bugs break over from any cause, it is advised to make two or three furrows. These may be made between the rows of corn at the edge of the field. It is better, however, to have a space, say one rod wide, plowed or thoroughly cultivated and harrowed, in which the furrows may be made. In many cases it is better to surround the wheat or millet field in which the bugs are and thus prevent their escape, rather than to simply keep them out of the corn field. Instead of a single furrow a double furrow with ridge between may be used.

While the bugs can climb up a perpendicular wall, they cannot climb up even a fairly sloping furrow side if this be of fine dust. Care must be taken lest straws, roots or other substances get into the furrows and furnish a means of escape to the bugs. It is interesting to notice the great numbers of the bugs which will crowd upon a stick or a straw set upright in the furrow. The bugs may be destroyed in the furrows by drawing a log of wood back and forth or, better, by digging holes at intervals of say twenty feet, into which the bugs will fall and where they may be killed with hot water or kerosene. It is well known that, at the season of the year at which this work should be done, the bugs almost never make use of their wings.

Let it be clearly understood that this method is not recommended as an easy one. It may be a completely effective one, but it requires work and almost constant attention. It will require closer attention in this region of strong winds than in some other parts of the country. It will be much more helpful in the way of decreasing the probability of injury next year if all the farmers in a community will use this or any other plan of destroying the insects.

A not uncommon mistake is in waiting until the bugs have gotten a start in the corn field. It will be better to sacrifice a number of rows at the edge of the field than to leave the bugs undisturbed on these. Another common cause of partial failure is lack of care in making and keeping the furrows in the proper condition.

It is impracticable to predict how many days the work must continue to be fully effective. Frequently, nearly all the bugs will leave a field within two or three days, when the grain has been destroyed or when it has become too ripe to be palatable. On the other hand many of them may remain for several days if there be much grass in the field. It is worth while to prevent the escape of the bugs, even into open prairie, for, while they do not like the native grasses as well as they do our grains, they can live on them.

The thanks of the writer are given to Dr. F. H. Snow, Chancellor of the University of Kansas, and to Dr. S. A. Forbes, of the University of Illinois, and State Entomologist for that state, who, in answer to inquiries, kindly sent the letters given below. Perhaps no two men in this country have given more study to the subject than have these well known scientists. It will be noticed they differ in their estimate of the value of the contagious disease method. In other respects they are in substantial agreement except that, while it is not stated, the writer knows that Dr. Forbes' experiments with salt saturated with kerosene showed this was not an effective barrier.

Dr. Forbes writes :

"Our work done since you left here all goes to confirm the conclusions reached at that time; first, with regard to the unreliability of the method with contagious disease, and, second, with respect to the great efficiency of the trap and barrier method, supplemented with the coal tar strip and the kerosene emulsion application when these become necessary. A field experiment in Effingham county last year was particularly telling. For a total expenditure of about \$5 for labor and materials, approximately twelve bushels of chinch bugs were

