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CIRCULAR NO. 27, SECOND SERIES.

United States Department of Agriculture,

DIVISION OF ENTOMOLOGY.

THE MEXICAN COTTON-BOLL WEEVIL IN 1897.

PREVIOUS PUBLICATIONS.

Soon after the Mexican cotton-boll weevil (*Anthonomus grandis*) made its appearance in Texas cotton-fields a circular (No. 6, n. s.) was prepared by the writer and distributed during April, 1895, to cotton planters living in the infested regions. The results of the work during 1895 were published in Circular No. 14, of this series, and distributed to Texas cotton planters in February, 1896. An edition of the same circular in Spanish was published during the same month. The results obtained by the work of 1896 were given in the circular (18 of this series) published in February, 1897. This Circular No. 18 gives in complete form the life history of the insect, its habits, and the remedy to be used against it. It also contains information regarding its distribution in Texas at the close of the season of 1896. Editions of this circular in the Spanish and German languages were published during the same month for distribution to Mexicans and Germans living in south Texas, who are more familiar with their native language than with English.

SCOPE OF PRESENT CIRCULAR.

The ground of the natural history of the insect and the remedies having been so fully discussed in Circular No. 18, the edition of which is as yet by no means exhausted, it will be necessary at this time simply to give the facts concerning the work of the insect during the summer of 1897.

THE OBSERVATIONS OF THE SEASON OF 1897.

As injurious as this insect has been, especially during the summer and autumn of 1895, and less so in the two succeeding years, to the planters whose fields it has actually entered, a greater cause for alarm existed through the probability of its spread into more important cotton-growing regions. Thus the reports of damage in 1895 greatly disturbed the cotton planters not only of the rich country lying to the north and east of the infested region in the State of Texas, but also the planters of Louisiana, Mississippi, Alabama, and Georgia. It was at first thought that the spread of the insect into these regions would be certain and rapid. The investigations of the first season largely negatived this possibility, and now, after three seasons' observations, it appears that the spread of the insect toward

the north and east has been very slow; that this spread is practically checked by the first heavy frost, and that it is doubtful whether it will spread to any great extent beyond the region of growth of volunteer cotton.

In the early part of the season an agent of this office, Mr. C. H. T. Townsend, was commissioned to investigate wild and cultivated cotton in south Mexico, which was assumed to be the original home of the insect, although the greatest reports of damage in Mexico have come from more northern counties. Mr. Townsend was stationed during the spring and early summer months in the State of Tabasco, and had no difficulty in finding the weevil breeding very extensively as early as February in the squares of wild cotton and in following it on until July in the bolls. He reared many specimens of the weevil, but was unsuccessful in finding any parasites. He had been sent down there to see whether native parasites could be found which might be introduced to advantage into Texas cotton fields. He sent, during this time, from Tabasco to this office in Washington, numerous specimens of bolls containing this insect in different stages; and the writer has also been unsuccessful in rearing any parasites, although dried fragments in some of the bolls indicate that such a parasite does exist; probably, however, in insignificant numbers. The very fact of the occurrence of the weevil in such quantity in Tabasco is in itself an indication that no effective parasite is to be found there.

In October and early November Mr. Townsend was sent through the infested region in Texas for the purpose of examining the conditions and learning whether the insect had spread. Such an investigation was not necessary in the early season of the year for the reason that previous experience has shown us that the spread of the insect takes place in the autumn if at all. The early generations in the more northern portions of the range of the species are not so numerous as the later ones and the migratory instinct does not become developed as long as there is plenty of food. Wherever in a weevil-infested field the reasonably complete loss of the top crop through drought or from some other cause brings about a lack of food for the weevils in October or later, they then migrate in search of food and proper places to lay their eggs.

The statements which follow have been derived largely from Mr. Townsend's reports.

CONDITIONS AND SPREAD DURING 1897.

In all the infested region the crop this year seems to have been very short, ranging from 1 bale to 6 acres to 1 bale to 10 or even 15 acres on uplands. This condition is largely attributed to drought. In the bottom lands at Victoria the yield was from one-quarter to one-half bale per acre, and had it not been for the weevil a good top crop would have been realized. On the uplands almost no top crop was made, although there was a slight yield here and there in occasional fields, as at San Antonio, Gonzales, and Goliad. At Kenedy Mr. Townsend found that the yield averaged 1 bale to 10 acres; at Cuero, 1 bale to 8 acres; at Victoria, 1 bale to from 2 to 25 acres, varying from bottom lands to uplands; at Goliad, 1 bale to 6 acres; at Beeville, 1 bale to 8 acres. This will show about the yield of the central portion of the area heretofore known to be infested by the weevil.

Where it was found that there was no top crop there were very few weevils present in the fields. There were almost no squares and but few bolls. In the lowlands, however, and where the plants showed some growth of squares, the weevil and its work were abundant. Careful investigation of the country adjoining the borders of the infested area of 1896 showed only one important extension of spread, this being immediately to the north of Cuero. Here the weevil has extended as far to the north as Harwood, Thompsonville, and Moravia, entering the country around Yoakum and Gonzales and extending probably to within 5 or 10 miles of Hallettsville and Luling. It was especially noticed that in these outlying areas of spread the weevil is more or less confined to the valleys of streams or the low-lying lands, and that the adult weevils are frequently very numerous, with few or no larvæ, indicating that the weevils had arrived very recently. However, near Thompsonville, which is about 9 miles east of Harwood and the most northerly point at which the weevil has been found, a one-fourth grown larva was discovered in a square on November 6. Between Thompsonville and Harwood some few squares in the fields show their work, but adult weevils are not often to be found, except near Harwood where they were more plentiful.

At Victoria, in the bottom lands where the cotton was not hurt by drought and was full of squares, the weevils were very numerous. The following is a table of the localities examined by Mr. Townsend, showing those in which the weevil was present and those in which it was absent:

Present.	*Absent.*
San Antonio (very scarce).	Hallettsville (probably approach within 5 or 10 miles to west).
Kenedy (scarce from lack of food).	Luling (probably extend to within 5 miles to south along river).
Cuero (not abundant).	Seguin.
Victoria (abundant with plenty of food).	Marion.
Beeville (not abundant).	Converse.
Yoakum (numerous where there are squares).	Lacoste.
Gonzales (numerous).	Pearsall.
Moravia (numerous near live oak stretches).	Moore.
Harwood (numerous where there are squares).	Wharton (probably approach no farther than Edna).
Shiner (numerous where there are squares).	Hungerford.
Thompsonville (scarce).	East Bernard.
Port Lavaca (reported sparingly but not visited).	Columbus.
	Schulenberg.
	Flatonia.

At Columbus, Wharton, East Bernard, and Hungerford there was as a rule a good top crop, this being in or bordering the Colorado bottom lands, while at San Antonio, Luling, and Gonzales there was only a partial crop. The territory to the south of Beeville was not explored by Mr. Townsend on account of its lack of significance as affecting conditions of possible spread. Judge S. G. Borden, of Sharpsburg, however, informs us, under date of December 28, that the weevil did very considerable damage in San Patricio and Nueces counties during the season. He estimates that about one-half the crop was destroyed by weevil. He thinks, however, that they were not as numerous as in either 1895 or 1896.

PROSPECTS FOR NEXT SEASON.

At the close of 1895 it was feared that there would be a considerable spread during 1896. The severe midsummer drought in 1896, however, resulted in not only limiting this spread but in bringing about a shrinkage of the territory infested. Probably another factor which assisted in this shrinkage was the severe frost of the first week of December, 1896, which certainly resulted in the destruction of the majority of the insects at San Antonio, and probably also at Wharton, where the weevil was abundant in a certain field and where it has not since been found. At San Antonio, by the way, in a field which was very badly infested in November, 1895, no specimens of the insect were found during 1896 and but a single adult weevil was captured in October, 1897. The slight spread to the north and east during 1897 renders it difficult to premise as to 1898. The almost uniform absence of a top crop over regions where the insect has previously been abundant, resulting in a great scarcity during October, will probably make the insect scarce in numbers in the fields next spring. The writer would not be inclined to expect any great damage in such localities in the early part of 1898.

Mr. Townsend writes: "I consider that the weevil has been set back greatly over nearly the whole of the infested district this year." The spread which did occur, however, although not a great one, is serious from its direction. With heavy frosts in the early winter the prospects for the further spread of the insect in the same general direction next summer will be very slight. Without such frosts it is to be feared that toward the end of the summer of 1898 there may be a further spread toward the Colorado River.

In general terms it may be said that the damage done by the weevil bears a direct proportion to the value of the top crop, and since in southern Texas the top crop is probably proportionately more valuable than in other portions of the cotton belt, owing to the greater length of the season, it is here that the damage from the weevil must always be greatest.

THE WEEVIL IN GINNED SEED AND SEED COTTON.

It was the writer's first supposition that the insect was brought from the comparatively isolated region about Matamoras, Mexico, and Brownsville, Texas, to Alice or San Diego or Corpus Christi in unginned cotton. Later observations seemed to negative this supposition, since the insect was not found about the gins. Mr. Townsend, however, the present fall, in visiting a gin at Victoria, found numbers of lively adult weevils crawling about not only in the unginned seed cotton but even in the ginned cotton after it had passed through the machine. Many gins had been examined before this in both Texas and Mexico, but such facts had never before been observed. This indicates the possibility that the weevil may be taken from place to place in ginned seed as well as in ginned cotton.

ANOTHER WEEVIL MISTAKEN FOR THE COTTON BOLL WEEVIL.

In the first two circulars published about this insect the writer referred to several insects which were mistaken for the true cotton boll weevil and figured one of them, viz., the form known as the

"sharp-shooter," a leaf-hopper scientifically known as *Homalodisca coagulata*. The figure was omitted from the last two circulars since it was found that illiterate persons looking at the circular believed that the figure represented the true weevil. Moreover, a growing and more definite acquaintance with the true weevil rendered mistakes much less frequent. The present year, however, there has been an extraordinary abundance of an acorn weevil which has flown to the lights in Victoria, Cuero, Beeville, Goliad, and many other towns to the north. These occurrences began in September with the first "norther," the weevils swarming in the open houses at light in the evening. They were universally thought to be the cotton weevil and created much alarm. Specimens were sent by a number of different correspondents to this office, among them a very great number which were collected by the Hon. J. D. Mitchell, at Victoria, in some experiments which he was making with a trap-lantern during that month. Mr. Townsend was able to allay the alarm to a considerable extent. The mistake was by no means a bad one, since the acorn weevil bears a strong superficial resemblance to the Mexican cotton boll weevil. It is a somewhat larger insect, however, and has a longer and thinner beak.

MACHINES FOR THE DESTRUCTION OF THE INSECT.

In Circular 18 we mentioned a machine invented by Mr. Stronhall, of Beeville, and which was intended to jar the affected squares and blossoms from young cotton plants and to collect them at the same time. Mr. Stronhall has been working upon this machine during the summer, and is now endeavoring to perfect it so as to crush the weevil between rollers when collected. He is also endeavoring to render it less expensive in price. Mr. Townsend was told that this gentleman himself used his old machine on his plantations 12 miles south of Beeville and secured one-half bale to the acre, also getting some top crop.

Another machine, for the distribution of dry poison, has been patented by Mr. Richter, of Moravia. This machine, which Mr. Townsend saw in operation, and of which he has sent the writer photographs, is well adapted to its purpose, and Mr. Townsend writes is very successful as a distributor of dry dust. Whether it can be used to advantage against the weevil is yet a question in our minds, but it will be an excellent machine to use against the cotton caterpillar. The machine is drawn by a pair of horses, straddling a row and dusting three to five rows of cotton at once. The horses must be driven at a smart trot so as to blow the poison out rapidly. Ten acres can be dusted in an hour with poison for the cotton worm.

THE VALUE OF DOMESTIC FOWLS AS DESTROYERS OF THE WEEVIL.

We are indebted to Mr. F. M. Howard, county clerk of Bee County, living at Beeville, for an interesting account of the incidental value of keeping turkeys. He writes that he found one farmer who during last winter had put 100 turkeys on his farm, had planted 75 acres, and made 26 bales, and was not troubled with the weevil during the

season, while a neighbor, who had no poultry, planted 450 acres and gathered less than 50 bales, the land being exactly of the same class of soil. Mr. Howard also states that all the quail killed near Beeville have their crops filled with the weevil.

REMEDIES.

We have nothing to add to the remarks published in Circular 18 on the subject of remedies. In the cultural method of control (there mentioned in detail) we believe that a practically complete remedy for the insect will be found. We may briefly reiterate the recommendations regarding this method:

"The careful investigation of this weevil during the past two or three years by the Division of Entomology has fully demonstrated the supreme importance of the cultural method of control, to which fact we gave special prominence in our first circular on this insect. There can be no question now that in the proper system of growing cotton a practically complete remedy for the weevil exists. In the first place, it has been established beyond question that the conditions of cultivation which make volunteer growth possible also make the continuance of the weevil inevitable. Of first importance is the early removal of the old cotton in the fall, preferably in November or earlier. This can be done by throwing out the old plants with a plow, root and all, and afterwards raking them together and burning them. This treatment should be followed, as promptly as may be, by deep plowing, say to a depth of 6 or 8 inches. This leaves the field comparatively clean of old cotton stalks, facilitates thorough cultivation the following year, and, at the same time, collects and destroys all of the weevil larvæ and pupæ in the cotton at the time, and also most of the adults. The escaping beetles will be buried by deep plowing, and will not again reach the surface. Few, if any, of them will succeed in hibernating in the absence of the ordinary rubbish in the fields in which they winter. Fields treated in this way have given a practical demonstration of the usefulness of this method.

"The greatest danger from the weevil is due to the presence of volunteer cotton, which means early food for the weevils in the spring and abundant means for their overwintering, and the effort made to retain volunteer and get early cotton, or the 'first bale,' is a very serious menace to cotton culture within the weevil district.

"This cultural method, if generally practiced, will undoubtedly prove a perfect remedy for upland cotton, and will vastly reduce weevil damage in the lowland, where the weevil is more apt to winter, perhaps in adjoining woods or roadside vegetation. The early removal of cotton by the means suggested is especially advised whenever the presence of the weevil shows that the picking of a top crop is problematical. In such instances it would be well to uproot and destroy cotton stalks in September or October. If this cultural method can be enforced, either by State legislation or by the cooperation and insistence on the part of landowners that their renters shall carry out the system outlined, the weevil difficulty can undoubtedly in very large measure be overcome.

"In connection with the system of fall treatment of the cotton, constant and thorough cultivation of the growing crop as late as possible is of considerable value, and is also what should be done to insure a good yield. With a crossbar to brush the plants many of the blossoms and squares containing weevils will be jarred to the ground and buried, together with those already on the ground, in moist soil, and a large percentage of the material will rot before contained insects have developed."

L. O. HOWARD,
Entomologist.

Approved:
JAMES WILSON,
Secretary.

WASHINGTON, D. C., *December 31, 1897.*

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