

THE 1936 GRASSHOPPER OUTBREAK IN OKLAHOMA

C. F. Stiles, E. E. Scholl and F. A. Fenton,
Stillwater, Oklahoma

Grasshoppers have always been a problem locally in Oklahoma. There are farms in some counties every year where control measures are necessary. Records of serious state-wide outbreaks, however, are few and far between. It is generally known that these pests are serious over large parts of the state in 1924 and that in 1925 the trouble continued but was not so acute or widespread. It is difficult to compare the seriousness and intensity of the 1936 outbreak with that of 1924-25. People in the southwestern part of the state believe that it was no worse. In the northern part however, it is generally agreed these insects were far more numerous and destructive than at any time since statehood.

Probably nobody will ever be certain or agree as to what were the causes for this tremendous increase in the grasshopper population. Those who have studied the grasshopper situation in Oklahoma for a number of years believe the great reduction in the number of parasitic sarcophagid flies removed a very important natural check. But what conditions caused the scarcity of these flies? Certainly the climatic conditions in 1936 were very unfavorable for the development of this fly, the resting stage of which is spent a few inches deep in the soil. Soil temperatures must have been too high for the survival of many of the fly puparia. Also, since grasshoppers are insects that thrive in dry weather, it is possible that the upward trend in the grasshopper population may have started during the drought of 1934.

There were at least four species which caused most of the trouble, namely, *Melanoplus differentialis*, *M. mexicanus*, *M. bivittatus* and *Dis-sotetra longipennis*. The first three were prevalent over the greater part of the infested area with the differential locust predominating by far and the lesser migratory locust (mexicanus) being next in abundance. The so-called long winged locust of the plains (*D. longipennis*) was confined largely to the panhandle section of the state. It appeared there in flying swarms in mid-August and the hoppers remained more or less active until late October. Some excitement was caused by a night flight of the grasshoppers in June. This species (*Xanthippus corallipes pan-therinus*) is attracted to lights and apparently a migratory flight took place at night over a fairly large area of the state. The insects were attracted to the downtown lights at night. At no time were they very numerous in the fields.

Area in state involved. Most of the entire state was involved in the outbreak except the southeastern part and the three panhandle counties. Even in the latter section the long-winged plains locust caused considerable damage. While a large number of counties were infested, the more serious outbreaks were usually confined to certain sections of each county. In other words the infestation was "spotted." In some parts, particularly the northern and eastern counties, the infestation was more serious in the farms bordering creeks, but this was not always true. In the south-western part of the state the heaviest infested sections were often on the higher rolling land. It was evident, however, that alfalfa was the most important crop which served as a breeding ground for these insects. Pastures were also important. Farm after farm was visited where it was plainly evident that the grasshoppers had migrated to the small grains and row crops from pastures and alfalfa.

Economic losses. The total losses to different crops in the state exceeded seven million dollars of which the largest, a loss of three million dollars, was that caused to the cotton crop. Corn suffered an estimated loss

of one and one-half millions; small grains, chiefly oats, one and one-fifth millions. As is so often true it has been impossible in many cases to evaluate losses chargeable to the grasshoppers and to drought since these very often occur together.

History of the outbreak. Reports of grasshopper damage to crops, especially alfalfa, began to filter into the entomology office in the fall of 1935 and then again early in 1936. On May 23, a visit to a ranch in Osage County revealed grasshoppers to be swarming in the pastures, open woodlands and alfalfa fields. They were mostly in the nymphal stage. In June they began migrating from pastures and alfalfa to small grains, cotton and corn. Where the infestation was unusually heavy in alfalfa, they never gave it a chance to grow, cutting off the tender growth as fast as it appeared. Plants were killed along the margins of the fields, often for considerable distances towards the center. Sometimes there were not enough hoppers to prevent growth or there was a migration from fence rows. In such cases the alfalfa grew to about cutting stage and was then stripped. The small grains did not hold the grasshoppers long. With their harvest these insects were driven out and the concentration on row crops was greatly increased. Corn was full grown and the ears were filling out. In many cases this crop was beginning to suffer from the dry weather. The grasshoppers invaded the fields from the nearest point and usually left nothing but the central stalk. Cotton plants were cut down from the margins, the grasshoppers working towards the centers of the fields. Sometimes there was a general dispersal over the entire field. As the plants were mostly small, a few hoppers caused a large amount of damage.

By late July the temperatures were becoming so excessively high that the grasshoppers began moving to the trees along the creek banks to escape the intense heat. Previous to this time roosting in trees and on fence posts was general during the heat of the day. Thousands of trees were stripped of their foliage, particularly in the southwestern part of the state. Chinaberry and mulberry were especially favored as was sumac. In mid-August swarms of the long-winged plains locust appeared in the panhandle. These could be seen flying with the wind from the desert areas. While poisoning operations over much of Oklahoma were at a standstill, considerable bait was broadcast in Texas and Cimarron Counties to control this species.

A survey was made during August in representative counties in the north-central, northeastern and southwestern sections of the state to estimate the adult grasshopper population. As a result of this survey it was found that these insects had largely disappeared in the southwestern and northeastern counties which were surveyed; especially in the latter section. This was largely due to starvation caused by the drying up of vegetation. In the north-central part, however, there were still many grasshoppers present. During this survey no grasshoppers were observed ovipositing, although a few *differentialis* were observed pairing. Dissection of a number of grasshoppers showed that only a few were gravid with eggs.

On September 15, rains had fallen in some sections and it had been raining in others for somewhat longer periods. The grasshoppers were still largely distributed among trees and shrubbery along creek bottoms. In some sections dissection showed no eggs present in the females but in others eggs were fairly well developed. Some oviposition was observed, and the insects were beginning to migrate back to the alfalfa and wheat fields. By early October oviposition was taking place rather generally and by November 19 most of the insects had died and oviposition was practically completed.

The campaign for control. As soon as it was evident that a statewide outbreak was threatening and that federal aid was possible, a grasshopper control committee was appointed. The membership included the extension entomologist, the director of the extension service and the experiment station entomologist. The purpose of this committee was to serve as a general clearing house for information relative to control, plan, direct and coordinate the state work in cooperation with the U. S. D. A. Two men assisted Mr. C. F. Stiles, extension entomologist, in the field, and in addition the experiment station staff assisted for a limited time in some of the organization meetings.

The county was selected as a natural unit for control operations and the county agent was placed in charge. He was assisted by county grasshopper control committees. These were organized in 71 of the 77 counties of Oklahoma, although actual control work was undertaken in only 60 counties. The county committee consisted of the county agent and two assistants who in many instances were business men or farmers who could devote a large part of their time to grasshopper control work.

At the start it was found that there would be insufficient poison and bran supplied by the federal government to cope with the situation. It was therefore decided, with federal approval, to allow diluting the bran with an equal amount of sawdust. The formula used was 100 pounds of bran (or equal amounts of bran and sawdust mixed) 2 quarts of sodium arsenite and sufficient water for making a moist but crumbly mash. Since sawdust was scarce in the southwestern part of the state permission was secured to substitute cotton seed hulls for the sawdust for mixing with the bran after it was found by field tests that such a mixture was effective.

Each county agent set up from one to several mixing stations in his county and organized his mixing crew. The location of these stations varied from empty warehouses to cotton gins. Each mixing station had its foreman who was often a vocational agricultural teacher, a man hired by the county commissioners, or one of the CCC boys. Farmers desiring poison brought their bran or sawdust and it was then mixed and resacked.

Before federal funds were available the county commissioners in at least 10 counties had set up revolving funds or had purchased some material. Approximately \$1,000,000 was appropriated. It is impossible to get any estimate as to the amount of private funds used, but this was undoubtedly very large in some counties. Approximately 20 tons of crude white arsenic were purchased. Thus it is known that around 400 tons of bait were prepared prior to government aid at an estimated value of \$18,400.00. The total amount of federal bran used in the state was about 800 tons, which is sufficient to prepare 1,600 tons of dry material mixed for bait when matched with an equal part of sawdust or bran.

Ten cars containing 31,000 gallons of sodium arsenite and 51 cars containing 1,235 tons of bran were shipped into Oklahoma to combat the grasshoppers by the federal government. It is estimated that the value of the crops saved by the use of the bait was around one million dollars. To this must be added the great educational value of the campaign.

