

GREENBUG OUTBREAK IN 1949

Dealing With Its Distribution, Damage and Control

By J. A. Munro¹ and E. G. Davis²

The greenbug³, a pest which occasionally does serious damage to small grains, caused widespread damage in North Dakota during the past season. This insect of European origin gained entrance into the United States in 1882 and since that date has spread to practically all parts of the country. It has become an important pest of small grains in the Great Plains. In addition to small grains it also attacks corn and several native grasses.

In some areas to the south, aphids have been reported as spreaders of a virus disease known as wheat mosaic. This disease has not been reported in North Dakota.

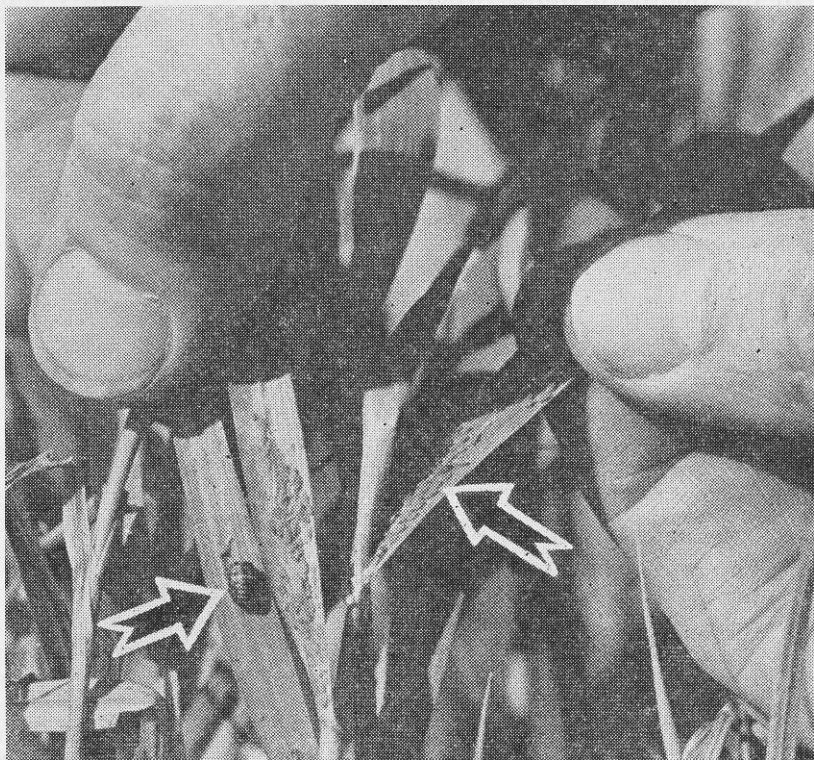


Fig. 1. A colony of grain aphids (greenbugs) feeding on young barley plant. Arrow at right points to colony of aphids; arrow at left points to one of their natural enemies, a ladybug beetle in the pupa stage.

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³Also referred to as spring grain aphid, and plant louse. The scientific name of the predominating species is *Toxoptera graminum* (Rond). This species is responsible for the damage caused in 1949, and is not to be confused with the green grain bug, *Chlorochroa uhleri* Stal., which caused extensive damage to wheat in the southwestern part of North Dakota in 1940.

Description and Seasonal Development

The greenbug is a small greenish, soft-bodied insect about one-twelfth inch long of which there are both winged and wingless forms. In the northern part of the country this insect overwinters as small shiny black eggs laid on the host plants. These eggs hatch in the spring giving rise to wingless females called "stem-mothers." The stem-mothers and all succeeding generations, until late fall, propagate by giving birth to living young females which develop into both wingless and winged forms. Reproduction is extremely rapid as it requires only one week for the young aphids to reach maturity. According to Walton (1921), "A single female may produce from one to eight young per day for periods of at least two or three weeks." In the fall a generation of sexually mature males and females are produced and overwintering eggs are laid.

In the Southern States where the climate is sufficiently mild, the species continues to be active the year around, making the overwintering egg stage unnecessary.

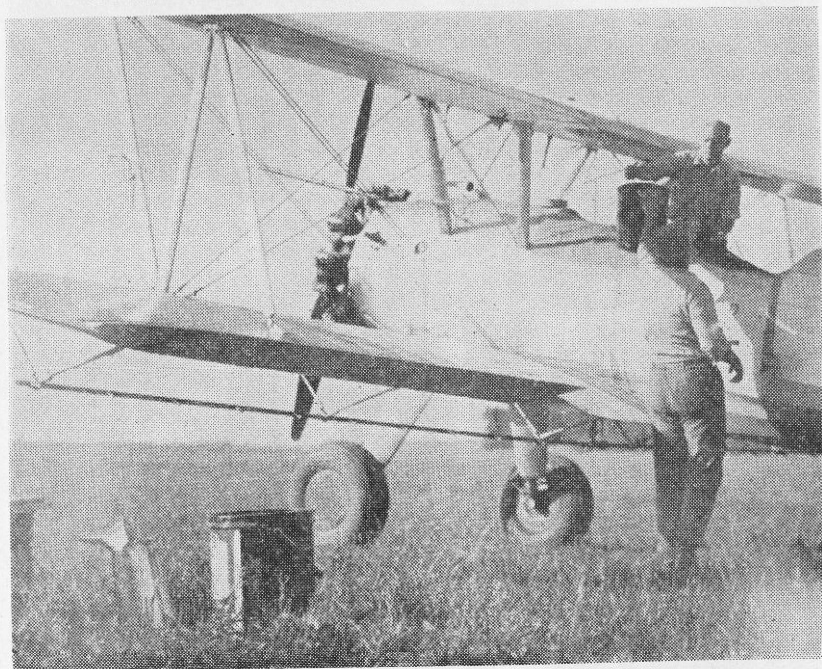


Fig. 2. Taking on the insecticide. The spray tank has a capacity of 90 gallons,—sufficient to treat 45 acres. Note the spray boom mounted under the lower wing.

The 1949 Outbreak Most Severe

Grain aphids have caused damage in North Dakota in the past, particularly to late seeded grain, but it is believed that this year's outbreak was the most severe on record.

The infestation moved into North Dakota following widespread destruction in States to the south, having moved progressively northward as spring advanced. By June 7 severe damage was reported from the southeastern part of the State in Dickey County and within a week to 10 days the aphid situation had become serious in adjoining Sargent County. During the time the outbreak was occurring in the southeastern part of the state winged forms were observed being carried northward by southerly winds. These migrant insects were seen in "swarming" flights at points 70 miles or more from the heavily infested area. The infestation continued to move progressively north and northwest and by the first of July damage was being reported from counties along the northern border and a week later in the northwestern part of the state. A letter under date of July 18 from Mr. H. E. Wood, Department of Agriculture and Immigration, Winnipeg, Manitoba, related how the infestation continued its northward invasion, as follows: "We have had a very heavy infestation (of aphids on grain) in the southwest corner of our province. This involves somewhere between 150,000 and 200,000 acres almost entirely of late seeded oats and barley. A few fields of very late wheat were also involved. Where the aphid struck early and hard, the first few days of July, the loss was almost 100%. As one moved away from this area the infestation became lighter and lighter with much less damage."



Fig. 3. Applying the spray in plane-width strips at the rate of about 75 miles per hour,—covering more than one acre per minute. Note the mist-like spray particles trailing behind.

Field observations conducted by the authors of this article, supplemented by published reports and the returns from a question on aphid occurrence included in a questionnaire distributed by the Northern Great Plains Advisory Council, as of July 15, showed that grain aphids had caused light to serious damage to the late seeded fields throughout the state, with the exception of twelve western counties where "no damage" or insignificant damage was reported, as shown on the map.

How long it took for the aphids to reach their maximum population in a field, following the initial infestation by the winged migrants, was not definitely determined, but it probably ranged from about ten days to two weeks. Once the population had reached its

peak, it was observed that ladybird beetles⁶ and other predaceous and parasitic insects were becoming well established, and it was usually a matter of a week or ten days until these natural enemies were successful in destroying the aphids. However, by then irreparable damage had occurred.

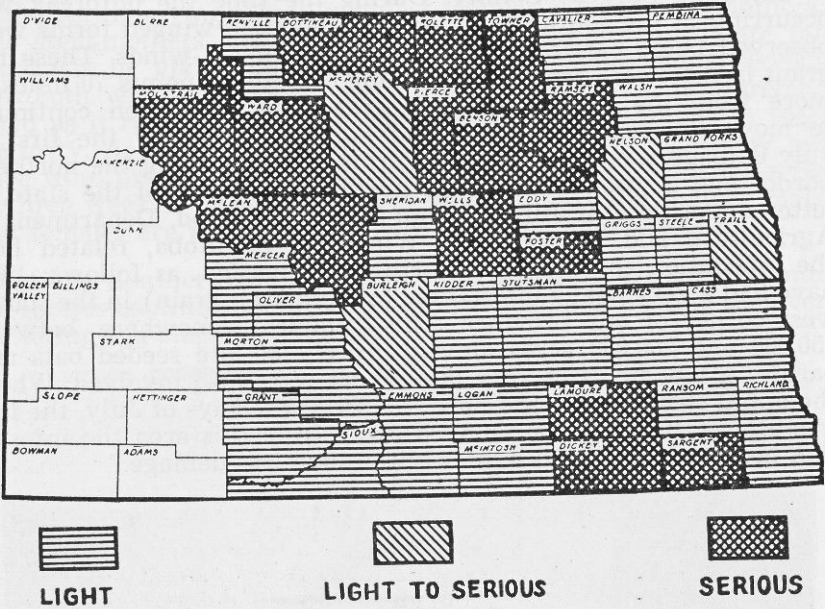


Fig. 4. Grain aphid damage to the late seeding in North Dakota in 1949.

Damage and Loss

Many seeded fields of wheat, barley and oats were severely damaged. The grain in these fields ranged from the seedling to the pre-boot stages when attacked; the plants being readily devitalized by these plant-juice sucking insects. Usually, the first warning a farmer had that his field was infested was when he noticed the presence of yellow spots. These spots gradually increased in size until the entire field had a yellowish appearance. Later the yellow color changed to brown as the plants dried up and died. Fields, once they were injured to the extent of taking on a yellowish appearance, were unable to fully recover and usually the crops were a complete failure.

Early seeded grain fields, where the plants had passed the boot stage and were heading when attacked by the aphids, escaped severe damage. It appeared that these older more fibrous plants did not develop such large aphid populations as did the younger more succulent ones and possibly were more resistant to the attack.

⁶For a discussion of ladybird beetles see article on Page 9 of this issue of the Bi-monthly bulletin, which outlines their percentage occurrence and feeding habits.

Although an accurate estimate of the value of the crops damaged and destroyed during this outbreak is not possible, it undoubtedly amounted to several millions of dollars. Some idea of the magnitude of the loss is indicated by the fact that about 40,000 acres of grain were sprayed to control the pest and that this figure is undoubtedly less than 20 per cent of the total acreage which needed protection. Many of the damaged fields were plowed under.

Preliminary Control Experiments and Observations

On June 18, Dr. R. L. Post, associate entomologist, and Mr. Norman McCally, student assistant in the NDAC Experiment Station, initiated a series of insecticidal control experiments, using for the most part farmer-owned spray equipment in the Gwinner area of Sargent County where the infestation was most severe. The work was done in cooperation with Mr. James Flaa, County Extension Agent. The initial tests, which included a number of the more promising insecticides, while not successful in effecting complete control at the rates applied, indicated that chemicals containing tetraethyl-pyrophosphate (TEPP) gave the greatest promise of controlling the aphids.

Following these preliminary experiments the authors began a joint investigation of the chemicals, formulations, rates of application per acre, and results being obtained by commercial crop spraying companies operating in the Gwinner, Fargo, and Hillsboro areas. All of the chemicals were being applied as sprays by means of aeroplanes at an overall cost to the farmer of about \$3.00 per acre. The first observations were made of fields being treated with TEPP, and it was found that where 1½ pints of the concentrate was mixed with water to make 2 gallons of spray solution and the solution was applied at the rate of 2 gallons per acre, excellent kills were secured. This information was promptly dispatched to all county extension agents by Dr. F. Gray Butcher, Extension entomologist. Later observations revealed that parathion concentrate applied at the rate of 1½ pints of the concentrate per acre also gave excellent kills.

Examinations were also made of fields sprayed with nicotine sulphate, toxaphene, and benzene hexachloride but none of these materials gave results comparable to either TEPP or parathion.

Operators should observe all reasonable precautions in the handling of these insecticides. The TEPP and parathion sprays are especially toxic. Even the fumes from these chemicals are dangerous when inhaled. Care should be observed to avoid breathing the fumes or allowing the spray to get on one's skin or clothing. If the

•This emulsion concentrate was labeled to contain the following:

ACTIVE:	
Tetraethyl pyrophosphate.....	20.0%
Other ethyl phosphates.....	30.0%
Xylol	45.0%
INERT	5.0%

•Parathion 16% emulsion concentrate.

spray solution gets on the skin it should be washed off promptly with water. Contaminated clothing should be changed with as little delay as possible.

Fields examined at different times after the application of TEPP or parathion showed that the aphids began falling to the ground within a few minutes after treatment and by the end of 5 hours 90 per cent or more were destroyed. It was noticed that rain greatly reduced the effectiveness of both of these chemicals if it occurred within five hours of the time of application. Wet plants or wet soil also materially reduced the killing power of the chemicals. In addition to killing the aphids, the sprays also destroyed most of their natural enemies, namely, ladybird beetles and other predacious and parasitic insects. But as these natural enemies were unable to check the pest in time to save the crop, the only alternative was to apply the spray.

Throughout these investigations it was evident that in nearly all cases the fields were being treated too late to properly protect the crops. This situation was largely due to the fact that most farmers were not sufficiently familiar with the grain aphid so as to realize the damage their crops were suffering until the plants had been devitalized beyond the possibility of full recovery. Some fields were treated so late that even though the aphids were destroyed the grain did not recover. Other fields made only partial recovery. In general it appeared that to secure proper protection to the crop the treatment should be applied before any evidence of damage, such as the yellowing of the plants, is apparent.

Conclusions

The pertinent information secured from these investigations can be summed up in the following statements:

1. Tetraethyl-pyrophosphate and parathion concentrates formulated as shown in footnotes 6 and 7 and applied by aeroplane at the rate of two gallons of spray per acre containing $1\frac{1}{2}$ pints of the concentrate in water to make two gallons will control the grain aphid.
2. Rain, wet plants, or wet ground will greatly reduce the effectiveness of either of the chemicals in question and if a field is rained on within an hour or so after being treated, very little control can be expected.
3. To secure the maximum protection of the crop, spraying must be done before any noticeable damage has occurred to the plants.
4. More experimental information is needed on chemical formulations, rates of application per acre, different methods of application, and timing of applications in order that the most feasible and practical control method can be determined.

Acknowledgments

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Literature Cited

Walton, W. R.—1921. The Greenbug or Spring Grain Aphid. Farmer's Bulletin, 1217. U. S. Dept. of Agr., Washington, D. C.