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AGRICULTURAL EXPERIMENT STATION.

KANSAS STATE AGRICULTURAL COLLEGE.

DEPARTMENT OF ENTOMOLOGY.

The Hessian Fly Situation in Kansas.

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1. That the Hessian fly is an insect capable of inflicting great injury on Kansas wheat is being fully demonstrated this season. The injury to this year's crop is almost certain to be even greater than in 1908, when forty-one Kansas counties reported injury ranging from 5 to 50 per cent of the crop, causing a loss of 9,676,000 bushels.

2. The destructiveness of the fly's work to the individual farmer is not measured by its average annual damage, but by the percentage of his crop it may destroy, which may be 100 per cent.

3. The Hessian fly has been increasing in numbers for several years and destroying a considerable amount of wheat. In 1912 it was confined principally to the northeastern part of the state, and in 1913 serious damage occurred in this section, especially along the Kaw valley.

4. The dry summers of 1913 and 1914 did not seriously hinder the development of the fly, and thus the infestation spread over the entire eastern half of the state, causing a large loss of wheat. The fall, winter and spring conditions were favorable for the fly, and with a continuance of these favorable conditions the infestation is certain to increase and become still more serious.

5. To avoid or prevent serious damage next fall it is imperative for the farmer to keep in close touch with the situation and immediately after harvest put into practice the methods of control which have been found practical and effective.

6. The infestation in the fall wheat comes from two sources—the stubble of the previous crop and volunteer wheat. *Disk and plow them under.*

7. Disk the stubble immediately after harvest. This not

only conserves the moisture and makes the plowing easier, but also starts the growth of the volunteer wheat and has a tendency to bring about the early emergence of the fly. In many cases the disking pulls out the stubble and exposes the flax-seeds to unusual climatic conditions, which are fatal to many of them.

8. About three or four weeks after the disking, the ground should be plowed to a depth of at least six inches and all stubble and volunteer wheat buried under at least three inches of soil. By doing this practically all of the flies will be buried, and it will be impossible for them to reach the surface.

9. Immediately after plowing, the ground should be re-firmed and worked into a good seed bed. It should also be kept mellow and free from all weeds and volunteer wheat.

10. The Agronomy Department of the Experiment Station has shown conclusively that where the ground is prepared in this manner it not only produces the maximum yields, but the crop may be planted with safety later in the season.

11. *Delay the planting of the crop until the fly-free date,* which, after eight years of experimental sowings, has been determined according to the accompanying chart.

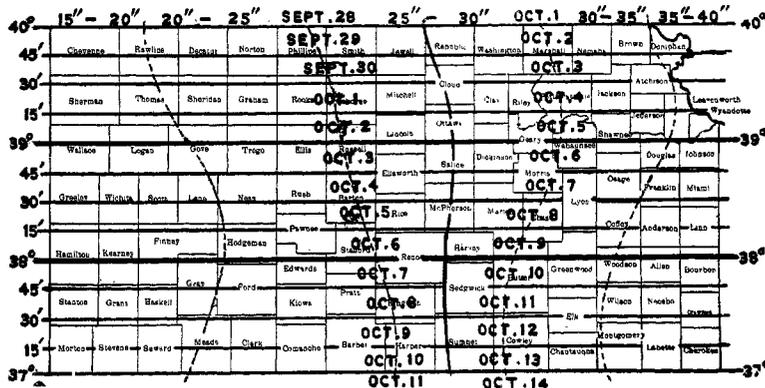


FIG. 1. Map of Kansas, showing date of safe sowing calculated from the experimental sowings from the years of 1907-'08 to 1914-'15.

12. In average years, with proper preparation of the seed bed, the date of safe sowing is at least as early as the date on which wheat should be sown to make a maximum yield if no fly were present.

13. For the best results in the control of the Hessian fly all farmers should cooperate and follow the methods of planting as recommended, for the Hessian fly, like most of the farm-

fly and therefore seeding should be delayed to as near the fly-free date as is practical

NOTE.—On the average seed bed the maximum yield of wheat will be obtained in an average season by seeding a little earlier than the fly-free date. The better the seed bed is prepared, the safer it is to wait until the fly-free date to sow. It should be understood that if the wheat is seeded earlier there is a greater risk of the crop being injured by the fly and therefore seedling should be delayed to as near the fly-free date as is practical.

crop insects, is most successfully controlled when a concerted fight is made against it.

STAGES OF THE HESSIAN FLY.

The Hessian fly in the course of its development passes through four different stages—adult, egg, maggot, and flaxseed. These stages differ so greatly that one would not suspect any relationship between them. The adult fly is a small, long-legged, dark-colored insect, resembling a mosquito. The tiny reddish eggs are usually deposited in the grooves on the upper surface of the leaves. They are so small and inconspicuous as to be barely visible to the naked eye, and resembles wheat rust in its early stages. The maggots are whitish in color and are found between the leaf sheath and the stalk,

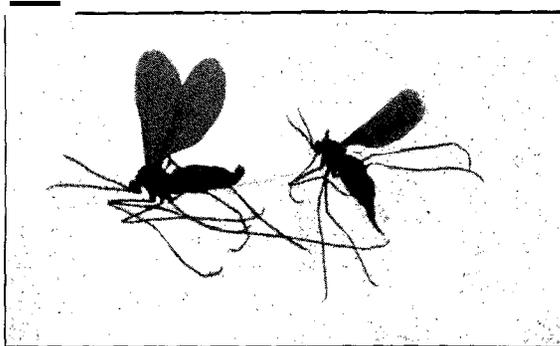


FIG. 2. Male and female Hessian fly. The one to the right is the female. Six times natural size.

either at the crown or at one of the joints. The flaxseed, or resting stage, is the one with which many farmers are most acquainted. It is the reddish-brown stage, found, in the late fall or after harvest, just above the crown or at the nodes of the plant. In size, shape and color it has considerable resemblance to a flaxseed, and hence the name.

LIFE HISTORY.

The life history of the Hessian fly is subject to great variation during the year, but in general it follows a rather definite course. Starting about the first of April, the adult flies begin to emerge from the flaxseeds that have passed the winter in the volunteer and the regular crop of wheat. From this time on until the last of April the adults continue to emerge. The flies live only a few days, but during that time deposit from one hundred to three hundred of their eggs in the grooves along

the upper surface of the wheat leaves. The eggs hatch in from four to eight days, and the young maggots work their way down the leaf to a place between the leaf sheath and the

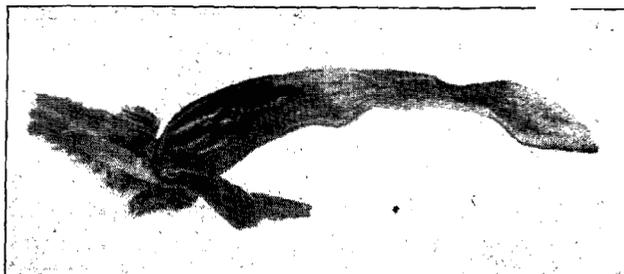


FIG. 3. Hessian fly puparia or flaxseeds in position between the leaf sheath and stalk, two times natural size.

stalk, where the leaf has its origin. Here the maggots feed, grow, reach maturity, and transform to flaxseeds. By the last of May the supplementary spring brood is out, and the life cycle is repeated. After harvest the flaxseeds of this brood may be found just above the crown or just above one of the joints. The main fall brood appears from the last of August to the middle of October, the maximum emergence probably occurring during the last of September. The life cycle is repeated, and after the first of November the flaxseed stage is found just above the crown between the leaf sheath and the stalk. The winter is passed in this stage, and the main spring brood emerges from these flaxseeds. Under favorable conditions a brood of flies may also appear during midsummer and develop on the volunteer wheat. Occasionally a small supplementary brood of flies emerge from the wheat late in November; this was especially true during the fall of 1914.

The length of the life cycle is extremely variable, due almost entirely to climatic conditions. Dry, cool weather lengthens the life cycle, while moist, warm weather shortens it. Excessive dry weather and heat also lengthen it.

The number of broods is also variable, ranging from two to five. In 1908 five broods were determined in the field—the main spring, supplementary spring, midsummer, main fall, and supplementary fall. In 1914 four broods were determined—the main spring, supplementary spring, main fall, and supplementary fall. This spring there was a heavy main spring brood, and the indications are now very favorable for a serious supplementary spring brood, which will continue to injure the wheat up to harvest time.

Approved, J. T. WILLARD,
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