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The Hessian Fly in Oregon

L. P. ROCKWOOD

Oregon State System of Higher Education
Agricultural Experiment Station
Oregon State College, Corvallis
Cereal and Forage Insect Investigations
Bureau of Entomology and Plant Quarantine
U. S. Department of Agriculture, Cooperating

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By

L. P. Rockwood

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THE Hessian fly has been in western Oregon for more than 45 years. It has not been found in eastern Oregon. It is now known to occur from the Columbia River to Douglas County and as far east as Hood River County. It is present in wheat fields every year. Serious injury to wheat has occurred in some localities in certain years when conditions were favorable to a maximum increase of the insect. Such injury is most likely to occur in years with an early spring.

Barley and rye are also attacked by the Hessian fly, but are seldom seriously injured. Oats are free from this pest. Infestations in quackgrass, *Agropyron repens* (L.), have been observed in the fall.

Description. The delicate mosquitolike fly (Figure 1) has a reddish-brown to dusky-black body and dusky wings. The eggs, which are laid on the wheat leaves, are very minute, elongate-cylindrical, and of a pale yellowish-red color. The maggots (Figure 2) that develop from these eggs are found under the leaf sheaths against the wheat stems, usually at or near the joints. They are elongate-oval, about 3/16 inch long, and of a glossy greenish-white color when nearly full grown. The transition stage between the maggot and the fly is passed in the puparium, the so-called "flaxseed," a dark-brown seedlike object about 3/16 inch long (Figure 3). These "flaxseeds" are found under the leaf sheaths against the stems, usually at or near the joints.

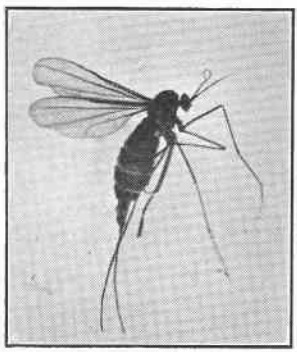

Figure 1. Adult Hessian fly. Magnified about 10 times.

Life history and habits. The winter is passed in the "flaxseed" (puparial) stage in wheat stubble left from the previous season's harvest, in the volunteer wheat, and in wheat fields seeded before early October. The flies emerge from these "flaxseeds" during the first warm days of spring, usually in April. The first spring emergence may begin as early as March 17 or as late as April 25 and continues for about a month after the first fly appears. These flies seek the nearest growing wheat, either fall or spring sowed, and here they deposit their eggs in the grooves on the wheat leaves. A single female fly may lay as many as 330 eggs. The minute maggots that hatch from these eggs crawl down the leaves and under the sheaths where these are wrapped tightly around the wheat stems. They usually settle down at or near the crowns of

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the young plants or at the joints, or nodes, on the stems of the older plants. Here they establish themselves and feed by sucking the juice from the tissues of the wheat stem. They become full grown and change to the puparial stage, "flaxseed," during a period of time that is dependent on the temperature of the season. This period usually is about 6 weeks in April and May under western Oregon conditions. Some of them (often only a small fraction of the whole number) then change, within the skin of the "flaxseed," to the stage of transition between the maggot and the fly, the pupal stage. When the flies are formed, they emerge as the second spring emergence. The second spring emergence of Hessian flies in western Oregon usually occurs in June, but may rarely begin as early as May 13, as in 1926. Since the fall-sowed wheat is nearing maturity in June, these flies usually cause little injury to that crop. Spring-sowed wheat may be considerably damaged if weather conditions are favorable to a maximum emergence of flies. The offspring of the flies that emerge as the second spring emergence go through the same development as has been described for those of the first spring emergence. By the time these have reached the puparial stage, or "flaxseeds," the dry summer has set in and usually they do not emerge as flies until the first fall rains. About 10 days after the first fall rain, flies emerge from the "flaxseeds" in the stubble left in harvested fields. This is the fall emergence of Hessian flies, and they often continue to emerge in the fields for about a month. All of the "flaxseeds" in the stubble fields do not produce flies at this time; many of the maggots in the "flaxseeds" do not change to flies until the following spring. The flies that emerge in the fall lay their eggs upon the young wheat plants developing in the stubble fields from grain that was shattered out at harvest and on any sowed wheat that they find above ground at this time. The maggots that hatch from these eggs develop to the puparial stage, or "flaxseeds," and remain in that stage, often on dead young plants, until the following spring.

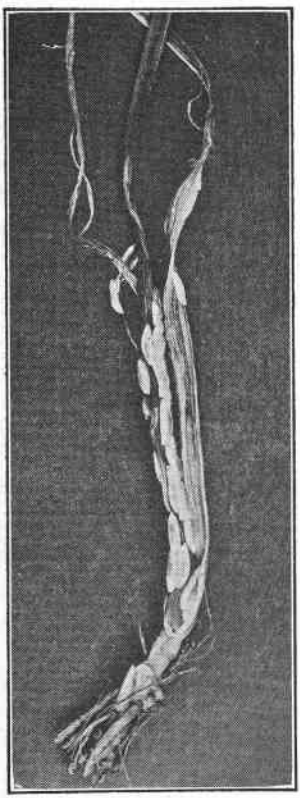

Figure 2. Hessian fly maggots on young wheat plant.

Injury. Wheat infested by the Hessian fly before jointing has occurred has a characteristic stunted appearance. The leaves are broader, less spreading, and of a darker green color than are those of healthy plants. Small plants and young tillers may be killed outright before jointing. When jointed wheat stems are attacked, the injury is less obvious and consists of a weakening of the stems at the point attacked by the maggots. Such weakened stems often fall, or lodge, before harvest. There is also direct loss of grain owing to insufficient nourishment of the kernels as the larvae interfere with the supply of sap to the wheat heads. In severe infestations, this form of injury causes

shriveled grain that reduces its grade. Fall-sowed wheat, if seeded early enough to get a good start before cold weather sets in, is usually so far along as to be little injured by flies of the spring emergence. Spring-sowed wheat in western Oregon often becomes considerably thinned and otherwise injured by a severe

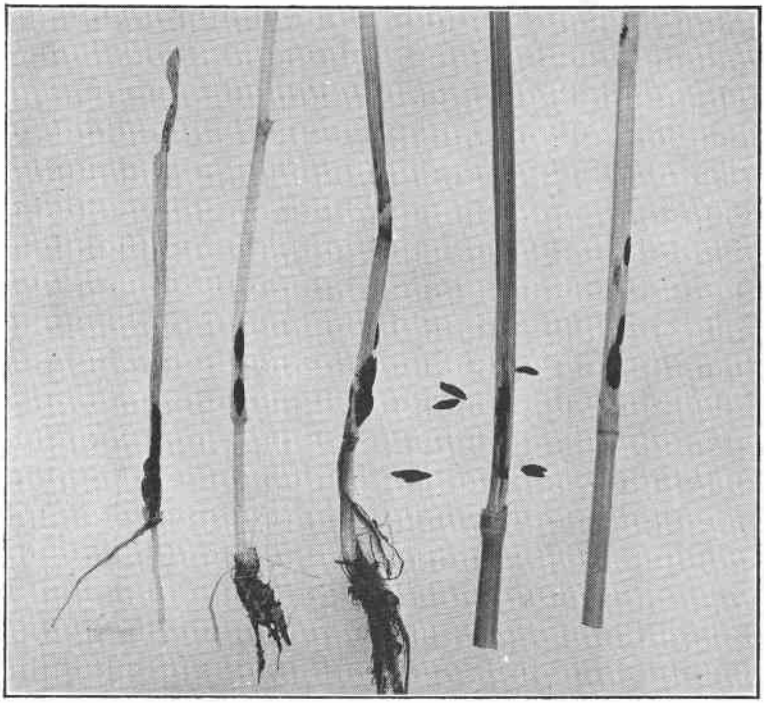

Figure 3. Hessian fly "flaxseed" on wheat straws from stubble field.

infestation. Also wheat seeded very late in the fall or in winter is sometimes severely injured in the spring. This late-sowed wheat is often in a very immature stage that is most attractive to the Hessian fly at the time of the first spring emergence.

Control. All stubble fields should be plowed and the stubble deeply buried as soon as possible after harvest. These stubble fields contain, in the "flaxseeds" on the straw, or as "flaxseeds" or maggots in the volunteer wheat that has sprung up following the early rains, practically all the Hessian flies that will later attack the sowed wheat. In many sections of western Oregon the heavy clay loam soils bake so hard in the dry summers that good plowing cannot be done until after several good rains. It may be impossible, therefore, to plow the stubble under before late August and September when the fall emergence of flies has left it for volunteer wheat close at hand. This volunteer wheat, however, will be located in stubble fields and hence will be destroyed by later plowing. It is important that all of the stubble and volunteer wheat should

be well buried so as not to be raked out by later harrowing. A few flies can increase enormously if conditions are right. Where the straw was cut high it may be advisable to disk it prior to plowing. The Hessian flies on well-covered stubble and volunteer wheat are unable to work out through the covering soil in the following spring after the surface of the soil has been puddled by the winter rains. As Hessian flies can be carried over winter on quackgrass, it would also be advisable to plow under any large patches of this grass that may be located near wheat fields, or to take steps to eradicate it.

Burning the stubble before the fall emergence of Hessian flies, in August or early September, would not kill enough of the "flaxseeds" to warrant endangering woodland and other property in the fire season. A large number of "flaxseeds" are always located very low down on the stems, even just under the surface of the soil, and would not be reached by fire. Burning has proved ineffective except where the remnants of the stubble left from the burning are immediately plowed under.

Where clover has been seeded in the wheat and the stand is too good to plow up, little can be done to combat the Hessian fly. Such fields (Figure 4) often have much volunteer wheat in them as well as all the unemerged Hessian

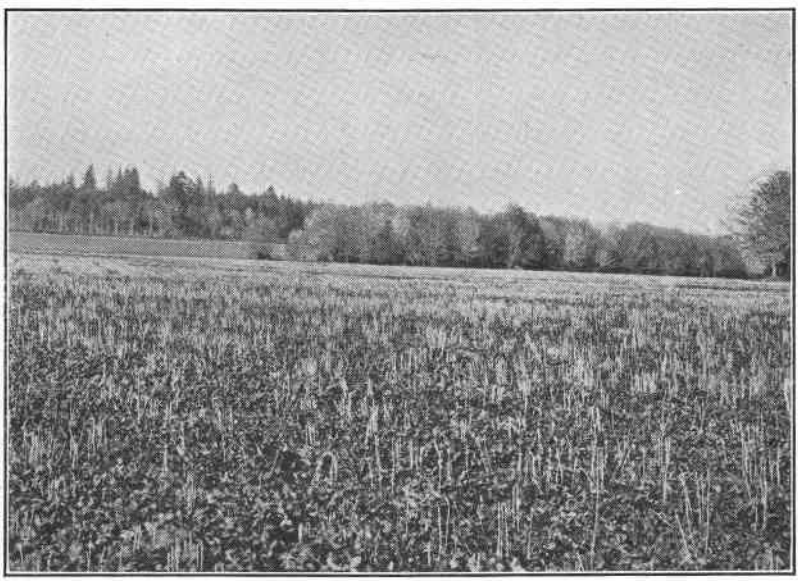

Figure 4. Stubble and volunteer wheat in young clover field, a favorable place for overwintering Hessian fly "flaxseeds."

flies in the "flaxseeds" in the stubble of the previous wheat crop. They are the principal sources of the flies that injure neighboring wheat in the following spring. About all that can be recommended in this case is that wheat fields, especially very late fall-, winter-, and spring-sowed wheat, should be located as far as possible from the infested stubble and volunteer wheat in these young

clover fields. Seeding clover with oats, or alone, would do away with this hazard.

Fall wheat should not be sowed until after the first week in October, and about October 15 would be safer. The fall emergence of Hessian flies occurs after the first fall rains and often continues until well into October. Wheat sowed in September will, therefore, become infested in the fall, serve as a wintering place for Hessian flies, and be subject to the thinning of the stand caused by fall infestation by Hessian fly. Observations during a period of 8 years showed that the "fly free" date, that is, the date on or after which wheat can be sowed without danger of fall infestation, was about October 15 at Forest Grove, Oregon. Growers should not be misled by this recommendation for seeding after the "fly free" date into adopting a regular practice of seeding very late, in November or later. There is no advantage to be gained, so far as the Hessian fly is concerned in seeding much later than October 15. October is the best time to sow wheat for freedom from weeds and for optimum production.

Wheat sowed in a good seedbed, to a variety of wheat well adapted to the locality, and at the right time, is seldom appreciably injured by the Hessian fly. Wheat grown on fertile soil tillers freely and quickly replaces tillers killed by the Hessian fly or other agencies. This is particularly true of fall-sowed wheat. In the case of spring-sowed wheat, a quickly maturing variety in a well-prepared, fertile seedbed will usually be less injured than a slow-growing variety. If sowing must be done late in the spring, it may be better to sow oats rather than wheat.

Wheat should not be seeded on wheat stubble, if it is possible to avoid doing so. If it is found necessary to do this, the stubble should be deeply plowed under in the fall, particular pains being taken to bury thoroughly, beyond the reach of the harrow, all stubble and volunteer wheat. Volunteer wheat should not be allowed to spring up in wheat fields before seeding. If wheat of a true winter habit of growth has been seeded by mistake in the spring, it should not be left for a crop the next year; such a field is an ideal place for maximum production of Hessian flies.

Neighboring farmers should cooperate in repressive measures as the Hessian fly is no respecter of property boundaries.*

* For a detailed account of the Hessian fly in Oregon see United States Department of Agriculture, Technical Bulletin No. 361, The Hessian Fly in the Pacific Northwest, May 1933.