

THE WHEAT LEAF MINER

OHIO
Agricultural Experiment
Station

WOOSTER, OHIO, U. S. A., SEPTEMBER, 1912.

BULLETIN 251



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BULLETIN
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SEPTEMBER, 1912

THE WHEAT LEAF MINER

Agromyza parvicornis Loew*

By J. S. HOUSER

This insect was described by Loew, 1869, from specimens sent him by Osten Sacken from Washington, D. C. The description as found in the Berliner Entomologische Zeitschrift, Centuria VIII, p. 49, and translated by Dr. A. D. MacGillivray is as follows:

Black, shining, front opaque, nigrofuscous, antennae ferruginous, feet varied with black, pale yellow. Halteres white, wings broadened, veins testaceous, last segment of the fifth much shorter than the penultimate.

Length of the body 2 to 2.16 m m. Alar expanse 2.33 to 2.5 m m.

Black, shiny, with black pile. Head concolorous, front dark beyond ocellar triangle and beyond angles of the vertex, and blackish fuscous. Antennae small, ferruginous with the first two segments often yellow-ferruginous, rarely entirely yellow-ferruginous. Cheeks narrow, setae of mystax small; proboscis subfuscous or luteous; palpi black. Feet black, knees lurid testaceous, tibia often nigro-fuscous, tarsi lurid testaceous, with the apex fuscous, posterior legs more obscure than anterior. Halteres white. Wings broadened, cinereous-hyaline, with veins testaceous or slightly sub-fuscous, discoidal cell moderate, with the ante-penultimate and penultimate segments of the fourth vein sub-equal, with last segment of the fifth vein much shorter than the penultimate.

*Determined tentatively by Mr. W. R. Thompson of Cornell University and the determination afterwards confirmed by the late D. W. Coquillett.

HISTORY

Aside from Loew's description, only one additional reference is found concerning this insect—that of Smith in his Catalogue of the Insects of New Jersey 1909, in which he reports it from two localities, Trenton, N. J., May 20, and Riverton, N. J., June 20. In neither of these references is anything stated concerning its economic habits.

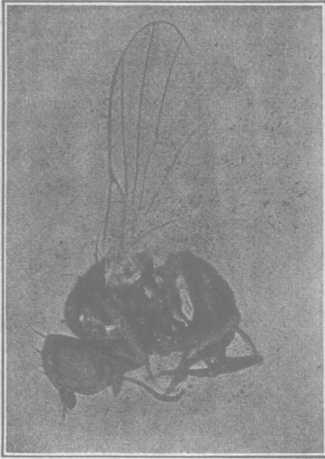


Fig. 1. The adult magnified
14 diameters

The present paper deals with its appearance as a pest in the so-called "Wheat Variety Plots" of the Ohio Agricultural Experiment Station, Wooster, Ohio. It was observed here first by the writer, June 1909, and during the season of 1910 it appeared in slightly increased numbers. No notes were taken during the season of 1911 on account of the writer's absence from the Station, but during the present season, (1912,) only an occasional mined leaf was to be found.

NATURE OF INJURY

During the larval stage, the insect is a true miner, feeding upon the mesophyll of the leaf. As far as has been observed, the upper leaves only are affected and the larva, as a rule, confines its operations to the outer half of the leaf. The relative amount affected depends, of course, upon the size of the leaf (some varieties having longer, broader and thicker leaves than others), and also upon the number of larvae affecting a single leaf. The tendency of the pest is to inhabit the distal portion. After the leaf is mined, the dermis on both sides soon becomes brown and dry, thus resulting in the injured area becoming functionless.

LIFE HISTORY

The Egg. The eggs are deposited in tunnel-like incisions extending lengthwise of the leaf, with the opening in the upper surface, and almost invariably with the blind end of the tunnel towards the leaf tip. The usual length of the tunnel is about .5 mm. Frequently, however, it seems the fly finds it difficult to construct a perfect tunnel, since the top splits as the ovipositor is worked along. As a result, one finds slits which are often 1 mm. or more in length, and they may or may not have an egg at the end. In fact, one leaf examined bore forty-four incisions of varying lengths, only nine of which contained eggs.

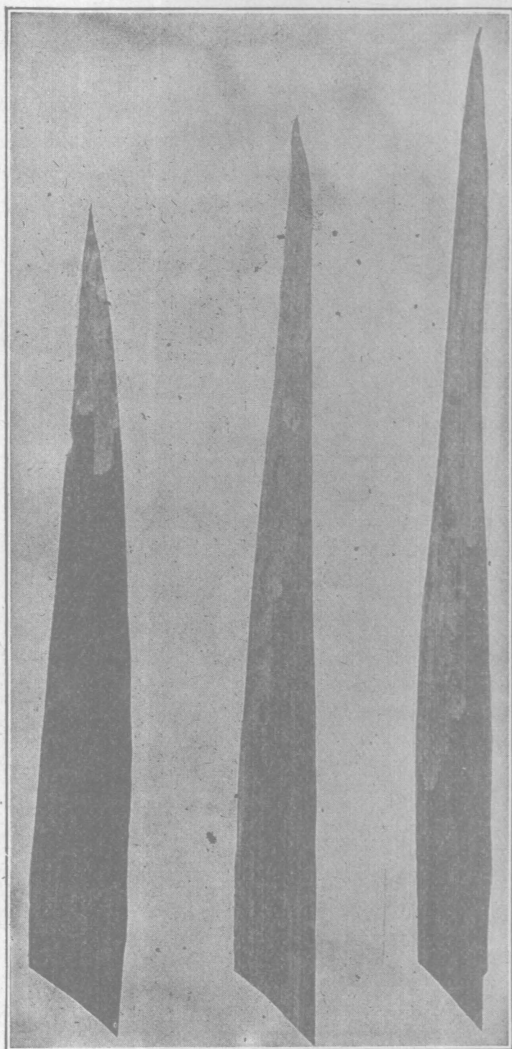


Fig. 2. Wheat leaves showing mines, slightly reduced.

The process of oviposition was observed many times during June, 1910. Almost invariably, as the direction of the tunnel just described would indicate, the fly assumes a position near one of the edges, with the head in the direction of the base of the leaf.

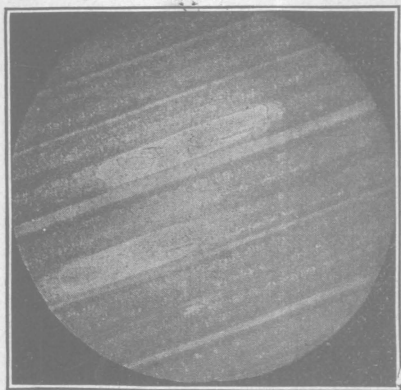


Fig. 3a. The egg deposited in leaf enlarged 19 diameters.

After the tunnel is driven, the egg is placed snugly against the blind end, and a saliva-like excretion is smeared over the tunnel mouth. From forty-five to ninety seconds are required for the construction of the tunnel and the depositing of a single egg.

In appearance, the egg is pearly to milky white, slightly

oval, with abruptly rounded ends, and measures about .184 mm. in length.

The tendency of the ovipositing females seems to be to place a second egg close beside the first. Late afternoon seems the favorite time for the egg-laying operations.

June 13, 1910, was the earliest date upon which egg-laying was observed, but that the adults had been present for some time was evident from the fact that mines were found which contained partially grown larvae. June 12, 1909, full grown larvae were found. However, the numbers of these early insects were small, and it seems logical to consider the few days following June 13 as the main period for oviposition of the summer brood for the year 1910.

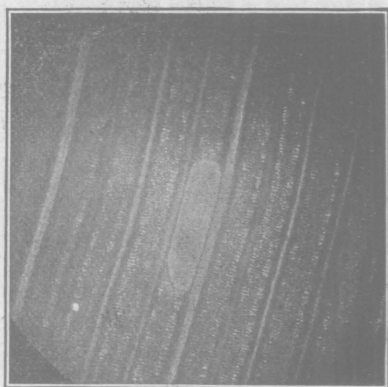


Fig. 3b. The egg deposited in leaf enlarged 19 diameters.

Under normal field conditions incubation requires four days. Freshly deposited eggs, kept in the glass covered insectary and thus receiving the benefit of a higher temperature, required only three days for hatching.

The Larva. The hatching larva invariably emerges head-first from that end of the egg lying against the blind end of the tunnel. As the head appears, feeding begins, and the larva continues mining in an almost straight line towards the tip of the leaf, gradually

enlarging the tunnel laterally as the increasing size of its body demands. Should the larva reach the tip of the leaf before its growth is completed, it turns and feeds in the opposite direction. Indeed,

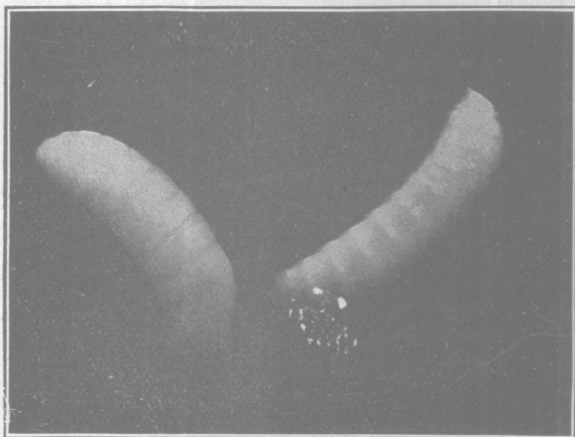


Fig. 4. The larva enlarged 13 diameters.

this proceeding is the usual rather than the unusual one, and occasionally the miner turns back without having been forced to do so by the limiting leaf tip.

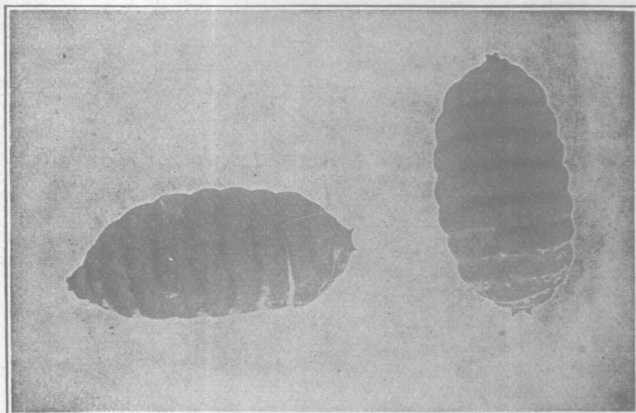


Fig. 5: The puparium enlarged 17 diameters.

From seven to nine days are required for the development of the larva. Upon the completion of the larval growth the insect bursts a slit in the upper leaf surface, and, escaping, falls to the ground, where it burrows down to the depth of about two inches. Here the brown puparium soon forms.

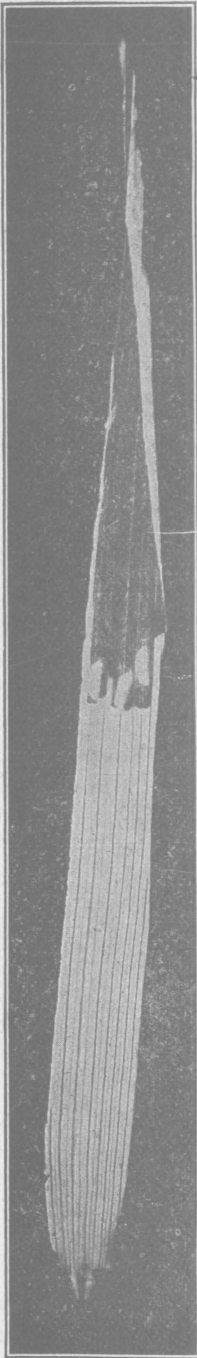


Fig. 6. A mined leaf.

Usually some time other than mid-day is chosen for leaving the mine. Several larvae were observed which had attempted to emerge during the heat of the day, and, with their bodies partially extricated, perished in the excessive heat before their exit could be completed.

The full grown larva is about 1.25 to 1.5 mm. in length, slightly tapering towards each end, and milky white in color. When removed from the mine, it exhibits a tendency to curl and occasionally will spring into the air to a height of several inches.

The Pupa. The pupa is enclosed in a hard, brown puparium about 1 mm. long, of the form shown by the preceding illustration. It will be observed that the puparium is somewhat bottle-like in appearance, and that there are two horny appendages on each end. As stated previously, pupation occurs in the soil at a depth of two or more inches.

Number of Annual Broods. The insect has not been observed continuously through a whole year. The length of the pupal period is not perfectly known, nor can the number of broods be definitely stated. Our evidence, however, indicates the probability of two broods.

A few full grown larvae taken June 12, 1909, and kept indoors under greenhouse conditions, completed their transformations to the adult stage July 6, 1909. During the season of 1910, full grown larvae, taken the latter part of June and treated in the same manner as those of the year previous, pupated June 26th, but did not emerge as adults until the following March. The fact that some of the insects matured in July, while others remained over as pupae until the following spring, indicates quite strongly that there are two annual broods, but our evidence is not sufficiently complete to make a positive statement to this effect. However, assuming that that there are two broods, it may be said that the early one appears to be very small and that the main injury comes from the second, the eggs of which are deposited about the middle of June.

EXTENT OF INJURY

At present the insect is not a serious pest, as not over fifteen to twenty percent of the plants are affected, even during those years when it has been most plentiful. As a rule, the topmost leaves only are infested and the mine of a single larva is rarely more than a half square inch in extent. Further, it may be said in behalf of the insect, that during both 1909 and 1910, the miners did not appear in any appreciable numbers until the majority of the varieties of wheat were headed, hence, growth was practically complete.

On the other hand, it must be remembered that the mining of the leaf results in the complete destruction of the functions of the area affected, and in all likelihood has some effect upon the surrounding tissues; the latter inference pertaining more especially to those instances in which the mine does not extend completely to the tip of the leaf.

PLANTS AFFECTED

In addition to occurring in wheat, the author has observed the insect ovipositing in timothy leaves* and also has found rye and barley leaves bearing the characteristic mines and larvae. While rearings were not made from the last two sources and, therefore, it can not be said definitely that the species found inhabiting them is the same, it is very likely that it is, and it seems quite safe to say that at least four crop plants are affected. By careful search the list of hosts could doubtless be enlarged considerably, especially among the grasses.

Wheat, however, seems to be the favorite of the four known hosts and some varieties are plainly preferred before others. Extra Square Head and Bore, two late exceptionally heavy leaved sorts, were affected to a greater extent than any of the other varieties. That wheat is preferred to timothy was shown definitely by observing stalks of volunteer wheat in the timothy. The leaves of the former were riddled with mines, while the surrounding timothy was little affected.

THE FUTURE OF THE INSECT

While it is impossible to forecast with exactness concerning an insect newly observed as injurious, it seems that the one under consideration is not likely to become a very serious pest. The fact, that as a rule, the upper leaves of the plant only are affected, at a time when they are nearly mature, bears out this supposition. It is known definitely to have been present in the United States for nearly a half century, and has never been recorded as a pest. Also, its numbers

*The eggs hatched; the larvae reached maturity and formed the puparium, but on account of adverse conditions the development went no farther.

are comparatively small. On the other hand, if it should happen that the insect so modify its habits as to appear two or three weeks earlier than now recorded, and should at the same time increase greatly in numbers, the matter would assume a very different aspect. At the same time, it should be borne in mind that already we are reasonably sure of four plants which are acceptable as hosts, and the fact that the insect is able to sustain itself on a number of plants, would prove a very important consideration should it become troublesome.

ACKNOWLEDGMENTS

The work incident to the preparation of this bulletin was commenced at Wooster and completed in the graduate school of Cornell University. To Professors H. A. Gossard and Glen W. Herrick the author wishes to express his appreciation for many helpful suggestions.