Hessian Fly in the Spring Wheat of Southwestern North Dakota

By
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The Hessian fly has been a harmful pest in the winter wheat belt for many years but usually has done only minor damage to spring wheat in this area. In 1924 this insect was found in considerable numbers in this and other sections of the state, but no serious damage was reported. In June, 1944, after a succession of cool seasons with good rainfall, reports began coming in of unusual insect injury, causing spring wheat in this region to show a weak, sickly appearance, despite favorable weather and moisture conditions. Examination of several wheat fields in the vicinity of the Dickinson Experiment Station showed every field to be infested more or less with Hessian fly. The insects appeared as tiny, whitish larvae or the brownish pupae or "flaxseed" stage, at or near the surface of the ground between the leaf sheath and stem.

Varietal field plots of spring wheat at this station began to show the injurious effects of these insects early in June and it appeared desirable to determine whether any of the varieties were resistant to the insects.[2]

Beginning June 21, counts were made of the number of insects present on 50 plants pulled at random throughout 4 plots of each variety. In this group containing 27 hard spring wheats and 2 durums, Mindum durum, Mida and two other wheats having the same parentage as Mida, all showed fewer insects than the other varieties.

With a few changes in varieties, 29 spring wheats again were seeded in field plots in 1945. The Hessian fly appeared a little later than in 1944 and counts again were made on 50 plants of each variety, beginning on June 27. Table 1 shows the number of flies per plant, percent of plants infested, and yield per acre each year, and 2-year average for the varieties grown both years. In 2-year average, Mindum durum showed the lowest infestation of flies and Mida ranked second in apparent resistance to the insects. Reports from farmers both in 1944 and 1945, indicate that Mida had fewer flies than the other varieties of spring wheat grown in this region. A new local variety, N.No. 1924, produced here by crossing Mida with N.No. 1552, evidently has the resistance of Mida as it showed fewer flies in 1945, the first year grown in the field test.

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[2]Varietal tests are conducted in coopcration between the Division of Cereal Crops and Diseases, Agricultural Research Administration, Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Department of Agriculture and the North Dakota Agricultural Experiment Station.

A study of Table 1 indicates that, with some exceptions, varieties having but few flies in 1944 had few in 1945, while others having many in 1944 again showed many in 1945. A correlation table prepared from the number of flies per plant each year for the 23 varieties grown both years shows a positive correlation of .575±.093 between the two years, indicating rather definite resistance in certain varieties and susceptibility in others. (See Table 2) Results for but two years are not conclusive, but the observations of farmers in this region agree with station results showing Mida to be definitely more resistant than other standard varieties of spring wheat commonly grown here.

This is also confirmed in a letter written by Dr. J. A. Munro, Entomologist of the North Dakota Agricultural Experiment Station, under date of February 4, 1946, an extract of which is as follows:

"Last season I had occasion to go to the Dickinson area to look into the Hessian fly situation and secure samples of wheat from the plots at the Dickinson experiment station and farms nearby. An examination of these samples shows the Mida variety of wheat to have a significantly high degree of resistance to the Hessian fly. Of the 15 common varieties of hard red spring wheats examined, I found 22 per cent of the Mida variety infested with Hessian fly, as compared with an average of 38 per cent for the other 14 varieties. Samples taken from nearby fields of Mida and Regent showed for Mida a Hessian fly incidence of 2 per cent as compared with 18 per cent for Regent."

Table 2 also shows negative correlations between the aver-

Table 1.—Relative infestation with Hessian fly and yields of spring wheat varieties in replicated field plots at the Dickinson Experiment Station in 1944 and 1945.[1]

Variety	N. No.	Av. No. of flies per plant			Percent of plants infested			Av. acre yield (Bu.)		
		1944	1945	Av.	1944	1945	Av.	1944	1945	Av.
Hard red spring										
Mida	.....	.52	.72	.62	22	30	26	23.4	25.0	24.2
Cadet	.....	.94	.96	.95	52	52	52	21.4	20.2	20.8
Comet x Rel-Hope	1520	1.02	.96	.99	62	52	57	22.3	19.5	20.9
Regent x Mida	1843	.94	1.14	1.04	46	38	42	20.0	20.3	20.2
Marquis	.....	.94	1.28	1.11	42	48	45	16.4	18.1	17.3
.....	2975	1.12	1.26	1.19	50	50	50	21.5	24.4	23.0
Haynes	.....	1.36	1.10	1.23	56	44	50	15.9	13.9	14.9
Thatcher	.....	1.08	1.42	1.25	50	40	45	20.2	20.0	20.1
1556 x 1563	1840	1.38	1.22	1.30	52	52	52	16.4	23.6	20.0
Regent x Pilot	1753	1.26	1.38	1.32	60	54	57	21.8	22.2	22.0
Newthatch	.....	1.28	1.44	1.36	58	48	53	19.6	17.0	18.3
Pilot x Mida	1756	1.92	.88	1.40	70	42	56	22.3	15.6	19.2
Regent	.....	1.78	1.02	1.40	68	54	61	19.7	17.9	18.8
Pilot	.....	1.80	1.06	1.43	66	46	56	20.0	19.1	19.6
Pilot x Mida	1750	1.52	1.36	1.44	46	52	49	19.7	20.5	20.1
Ceres	.....	1.44	1.46	1.45	62	66	64	16.8	21.0	18.9
Merit x Pilot	1764	1.06	1.92	1.49	48	76	62	20.5	16.9	18.7
Ceres x Hope—G334	1556	1.64	1.40	1.52	60	60	60	18.6	22.4	20.5
Red Fife	.....	1.68	1.36	1.52	46	54	50	16.8	17.0	16.9
Vesta	.....	1.68	1.50	1.59	62	66	64	20.1	21.7	20.9
Rival	.....	1.68	1.72	1.70	70	66	68	22.6	24.3	23.5
Durum										
Mindum	.....	.42	.24	.33	24	16	20	22.1	22.1	22.1
Carleton	.....	.74	.76	.75	40	36	38	20.6	20.6	20.6

[1]Counts were made on 50 plants pulled at random throughout the 4 plots of each variety. Varieties not grown in both years do not appear in the table.

Table 2. Correlation coefficients obtained at the Dickinson Experiment Station between fly infestation in 1944 and 1945, and between fly infestation and yields in 1944 and 1945[1]

No. varieties	Correlations between:	Correlations
23	Av. No. flies per plant in 1944 and Same for 1945	0.575± .093
27	Av. No. flies per plant in 1944 and Acre yield in 1944	—.374± .110
27	Av. No. flies per plant in 1945 and Acre yield in 1945	—.227± .122
27	Percent of plants infested 1944 and Acre yield in 1944	—.222± .122
27	Percent of plants infested 1945 and Acre yield in 1945	—.324± .115

[1]The first correlation was obtained from the data in Table 1; the other correlations included all hard red spring varieties, omitting durums, and including 6 additional varieties each year, not shown in the table.

age number of flies per plant and the average number of bushels per acre as follows: —0.374 for 1944 and —0.227 for 1945. Similar negative correlations between the average number of plants infested and the yields per acre are: —0.222 for 1944 and —0.324 for 1945. While these correlations are low they seem to indicate a definite tendency for the yields to drop as the insect infestation increases. In other words, the higher yields of certain varieties were due in part to greater fly-resistance and the low yields of others to greater susceptibility.

As a result of fly injury during the past two years, farmers in this district indicate an intention to increase the acreage of Mida at the expense of other varieties, believing that the latter will suffer greater loss through fly injury than Mida will suffer through shattering.

The future is uncertain. It is expected that, with the return of drier seasons, the flies will thin out as they did after the previous infestation of 1924. At the beginning of the present winter (1945-1946), spring wheat stubble contained large numbers of the "Flaxseeds" that apparently had been there since last summer. Most of these appeared to be alive despite a very dry fall. There was but little volunteer grain so that egg-laying on green plants after harvest was probably much less than in 1944. If conditions favorable to the insects should again prevail in 1946 it is possible that serious losses might occur from the insects now in the stubble. The annual movement of combines from the winter wheat belt into the hard spring wheat area often is mentioned as a source of infestation that did not exist during the years following 1924.

In the winter wheat belt where the Hessian fly is more common, Painter, Salmon and Parker[3] report different biological strains of the insect, and one strain may damage certain wheat varieties and another strain be more harmful to others. So far, the present writer has not heard of any drought-resistant strain of fly that would be expected to survive our dry seasons in harmful numbers. It is conceivable that such could develop.

Painter, Jones, Johnston and Parker[4] report success in transferring the fly-resistance of Mar-

[3]Painter, R. H., Salmon, S. C., and Parker, J. H.
1931. Resistance of Varieties of Winter wheat to Hessian Fly. Kansas Agr. Expt. Sta. Technical Bulletin 27.

[4]Painter, R. H., Jones, E. T., Johnston, C. O., and Parker, J. H.
1940. Transferrence of Hessian Fly Resistance and Other Characteristics of Marquillo Spring Wheat to Winter Wheat. Kansas Agr. Expt. Sta. Technical Bulletin 49.

quillo spring wheat to winter wheats by crossing. They attribute the high degree of resistance of Marquillo to the durum parent, Iumillo. It is quite likely that the fly resistance of Mida came from the same source, Iumillo being a remote parent. While Mida is not immune to fly injury, it may have enough resistance to make losses negligible where it is grown. Mida is being used in crossing and subsequent new varieties for this region probably should have fly-resistance as a desirable quality.

GREEN PASTURES A Review

"Green Pastures" is the title of a little book which is "A Series of Agricultural Education and Technical Broadcast Talks on Grass as a Crop" issued by The British Broadcasting Corporation. The publishers, Littlebury & Company, Ltd., of The Worcester Press, England, have most appropriately bound the volume in bright grass green cloth. A number of splendid photographs have been well reproduced. For the purposes of this review, certain gems of good counsel which the authors have used as titles under a series of fine farm scenes are selected:

Under a photograph showing a crawler tractor pulling three disk-harrows working down a cloddy surface:

> "People are so used to preparing a Spring tilth for cereals, that they don't give nearly enough forethought to the better conditions that grasses and clovers require." N. V. Hewison.

Under a photograph of a magnificent bit of permanent grassland:

> "We estimated that there were at least ten million acres of permanent grassland in England and Wales that could only be made to play their part in a reasonable national economy, if the plough was put into them." Sir George Stapledon

Under a photograph of a shepherd with his dog and crook with their eyes on a flock grazing a fine turf:

> "This is where the ewe flock comes in and I may say that you cannot graze a pasture properly without cattle and sheep." H. H. Pickering. Few North Dakotans would accept this statement for this State because we don't have the kind of pastures Pickering uses.

Under a photograph of a fine herd of Ayrshire cows, knee deep in pasture:

> "You've got to keep an eye on the future of the plant as well as the present of the animal." Martin Jones.

The long-time grazing trials which the Northern Great Plains Field Station of the U. S. Department of Agriculture and the Animal Husbandry Department of the North Dakota Agricultural Experiment Station have conducted cooperatively for the past thirty years have abundantly demonstrated the necessity of caring for the "future of the plant."

Green Pastures contains the distilled wisdom of the best graziers of Britain and of New Zealand, the two lands which regard grass as their most important crop. (Reviewed by H. L. Walster.)