Cultivar Response to Wheat Strawworm

T. J. Martin and T. L. Harvey

ABSTRACT

A survey of six Ellis county Kansas wheat (Triticum aestivum L. em. Thell.) fields in 1979 indicated that 53% of culms were infested with larvae of the second generation wheat strawworm, Harmolita grandis (Riley) form grandis. Early maturing cultivars tended to escape infestation in cultivar yield trials at Hays, Kans. in 1979. However, ‘Centurk’, ‘Centurk 78’, ‘Rocky’, and ‘Parker’ cultivars had lower infestations than others of the same maturity class, indicating possible cultivar resistance. Yield losses of 6 to 10% were recorded for ‘Sage’ wheat culms infested with form grandis in 1979 and 1980. These losses, combined with the more serious damage reported for the spring form minuta, indicate this pest should be monitored more accurately, since moderate wheat strawworm damage may go unnoticed or credited to other insects.

Additional index words: Wheat strawworm, Harmolita grandis, Wheat, Triticum aestivum, Insect resistance, Yield loss.

Wheat strawworm (WSW), Harmolita grandis (Riley), was once regarded as a major pest of wheat (Triticum aestivum L.), causing losses estimated at 10 to 15 million bushels per year in Kansas (Phillips and Poos 1953). Thousands of acres of wheat were damaged in 1929, and again during 1945-1948 (Gates 1952). It has not been reported in Kansas since 1949. Most of the available information on WSW importance, distribution, biology, and control was reported by Phillips and Poos (1953).

The WSW produces two generations of different morphological forms each year. The spring form minuta is wingless and smaller than the winged summer form grandis. Larvae of form minuta kill young culms and are more damaging than grandis larvae, which feed in the culms near the nodes. However, Phillips and Poos (1953) reported poor quality grain, and yields reduced by 22% from grandis infested culms.

Form grandis of the WSW was found in 1979 and 1980 at the Fort Hays Branch, Kansas Agricultural Experiment Station. Our objectives were: 1.) determine the incidence of WSW in Ellis county Kansas in 1979, 2.) determine if cultivars sustained different levels of WSW infestation, and 3.) determine the yield loss caused by the WSW.

MATERIALS AND METHODS

Nineteen wheat cultivars were planted 1 Sept. 1978, in 0.02 ha plots (6-row plots with 33-cm row spacing). A randomized complete block design with 4 replications was used. Soil moisture was favorable and comparable plant populations among cultivars were obtained. Heading date, grain yield, grain-test weight, and infestation of WSW were recorded. Fifty culms were randomly selected from each plot (200/cultivar) and the number and location of WSW pupae were recorded.

In addition, 25 ‘Sage’ wheat plants (3 culms/plant) were pulled from the two outside rows of each of four replications in the cultivar trial. Only the center four rows were harvested for yield. Location, number of WSW, and grain weights were recorded for the primary culm, the two secondary culms, and total plant. Since few noninfested 3-culm plants were available in 1979, grain weights from the 3-culm plants having one WSW were combined with those from noninfested plants and compared to plants having two or more WSW.

In 1980 a test designed to determine grain yield loss to form grandis was conducted in a production field of Sage wheat. Four plots (6 m × 6 m) staked out 80 m apart were used. On 24, 26, and 28 June 1980, culms with spikes that had just emerged from the boot were tagged. Different colored tags were used to denote heading date, which eliminated the possibility of comparing infested and noninfested culms of different maturities. Tagged culms were harvested and the number and location of WSW...
Resistance to WSW has not been reported in common
wheats, but rye cultivars is probably derived from the same source.

The four cultivars that appeared to have some resistance to WSW are genetically related. Parker is in the parentage of Centurk while Centurk 78 and Rocky are selections from Centurk. The WSW resistance in these cultivars was depleted before late maturing cultivars had completed grain filling. In 1979 yields probably were affected more by maturity than by WSW infestation.

Infestation by form *S. tryoni* larvae of *S. tryoni* were active. In Kansas, early maturing cultivars tend to be favored early maturing cultivars because soil moisture is depleted before late maturing cultivars have completed grain filling. In 1979 yields probably were affected more by maturity than by WSW infestation.

Correlation coefficients were calculated for WSW infestations with plot means of agronomic data collected for wheat cultivars. The numbers of WSW in culms were not significantly correlated with days to heading or grain yield or test weight. However, yield of 3-culm plants infested with two or more (avg 3.1) WSW/3-culm plant was 14% less than the yield of plants infested with zero to 1 (avg 0.8) WSW/plant (P < 0.06). Yields of 3-culm plants infested with two or more (avg 3.1) WSW/3-culm plant were reduced 6% in 1980 (Table 3), similar to the loss we measured in 1979 for single infested culms.

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table start

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Culms node from 1 Jan. kg/hl</th>
<th>kg/ha</th>
<th>WSW infestations</th>
<th>GRAIN</th>
<th>Yield of 3-culm plants infested with two or more (avg 3.1) WSW/3-culm plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triumph 64</td>
<td>8a*</td>
<td>91de</td>
<td>147a</td>
<td>78fg</td>
<td>2070 bcd</td>
</tr>
<tr>
<td>'Trison'</td>
<td>10</td>
<td>ab</td>
<td>64abc</td>
<td>150be</td>
<td>77ef</td>
</tr>
<tr>
<td>'Wings'</td>
<td>12</td>
<td>abc</td>
<td>91de</td>
<td>147a</td>
<td>78fg</td>
</tr>
<tr>
<td>'Vona'</td>
<td>13</td>
<td>bcd</td>
<td>91de</td>
<td>147a</td>
<td>78fg</td>
</tr>
</tbody>
</table>
| 'Triumph 64' to 54 for 'Eagle' (Table 1). Triumph 64, 'Trison', 'Wings', and 'Vona' were equally low in WSW/50 culms, but these cultivars headed 8 days earlier than Eagle. Numbers of WSW and WSW/50 culms in the early cultivars. Infestation by form *S. tryoni* larvae of *S. tryoni* were active. In Kansas, early maturing cultivars tend to be favored early maturing cultivars because soil moisture is depleted before late maturing cultivars have completed grain filling. In 1979 yields probably were affected more by maturity than by WSW infestation.

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table end

Means followed by the same letter do not differ significantly (P < 0.05) for the 19 cultivars. Therefore the earlier maturing cultivars headed 8 days earlier than Eagle. Numbers of WSW and WSW/50 culms in the early cultivars. Infestation by form *S. tryoni* larvae of *S. tryoni* were active. In Kansas, early maturing cultivars tend to be favored early maturing cultivars because soil moisture is depleted before late maturing cultivars have completed grain filling. In 1979 yields probably were affected more by maturity than by WSW infestation.
Table 3. Effects of wheat strawworm (WSW) on kernel weight/culm, kernels/culm, and weight/kernel in culms of Sage wheat with the same heading date in 1980.

<table>
<thead>
<tr>
<th></th>
<th>Kernel wt/culm</th>
<th>Kernels/culm</th>
<th>Wt/kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infested</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uninfested</td>
<td>0.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss</td>
<td>0.05*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Loss due to WSW significant at 0.05 and 0.01 probability levels, respectively. Based on 50 each of infested and uninfested culms from each of four replications.

Phillips and Poos (1953) reported yield reduction up to 22% by form grandis. Our data show smaller losses (5 to 10%) on each infested culm.

It is difficult to accurately determine effects of form grandis larvae on grain yield because plants within cultivars and culms of individual plants are not randomly infested. Since early cultivars tend to escape infestation, it seems likely that early plants or culms within plants may also be infested less than late ones. Therefore a late infested culm compared to an earlier noninfested culm of the same plant would result in a yield bias in favor of the noninfested culm since the earliest culms on an individual plant usually yield more than the later culms. Hopefully this bias was kept at a minimum in 1980 when comparisons were made between culms that headed on the same date. In addition, Doan (1926) reported that WSW form grandis often selects the strongest culms for oviposition, which may bias grain yields in favor of infested plants. The losses shown here from form grandis coupled with the undetermined loss from form minula may be significant. Our survey results, although limited, indicate that WSW infestations may be more widespread than generally recognized. More attention should be given to assessing the importance of WSW in wheat producing areas, particularly under minimal tillage, which should provide optimum winter survival conditions for WSW.