A New Technique for Determining Resistance of Sweet Corn to Second-brood European Corn Borer

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Abstract. A controlled environment technique using freshly silked, excised ears artificially infested with 1st instar larvae was developed for evaluating sweet corn (Zea mays L.) for resistance to 2nd-brood European corn borer, Ostrinia nubilalis (Hübner). At 14 days, infested ears of the moderately resistant dent inbred 'B52' held in plastic bags at 27°C (day) 21°C (night), high humidity, and 16 hour photoperiod (8.6 klx) had fewer 4th and 5th instar larvae and possibly lower larval weight. Use of this technique could improve the efficiency of screening via artificial infestation by reducing environmentally caused variability.

Laboratory rearing of European corn borer has stimulated technique development in screening for resistance in field corn, especially to 2nd-brood attack. Sheath and collar feeding and stalk tunneling have been emphasized and sources of resistance have been found, the most notable being the inbred 'B52' (2, 3, 4, 5). In sweet corn little attention has been given to finding resistance, although the borer is a serious problem in many midwestern and northern production areas (1).

Some of the techniques developed for use in field corn may need modification before application to sweet corn; in the latter, damage to the ear, and particularly to the kernels and cob, is of relative greater economic importance than is stalk tunneling. The

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Kernel damage and silk feeding have been used to some extent in sweet corn for evaluating resistance to 2nd-brood (6), and the husks and silks in field corn have also been recognized as favorite feeding sites (3, 4). Our objective has been to develop methods which place more emphasis on the economically important part of the plant and which at the same time reduce environmental variation and nos. of egg masses used. One development which may satisfy these objectives and also preserve the plant intact (uninfested) for breeding work has been the infesting of excised ears in a controlled environment.

Two sweet corn hybrids, 'Golden Cross Bantam' and 'Maxigold', and the field corn inbred 'B52' were grown in the field in St. Paul in the summer of 1974. Forty ears of each cultivar were harvested at silking. Second ears on the same plants were left for selfing. In the laboratory the ears were divided into 4 replications of 30 ears (10 ears per cultivar). Shanks were removed; flag leaves were cut to 2.5 cm length from their base and the silk was cut back to 2.5 cm beyond the husk tip. Ears were artificially infested by using 1st instar larvae less than 1-2 hr old from egg masses produced in the laboratory. Larvae released at the edge of a sheet of paper on a laboratory table quickly produced silk strands and hung 30-50 cm toward the floor. Extra care was taken in handling these delicate early instar larvae to avoid injuries which could influence survival. Small pieces of rolled tissue paper were used to lift the larvae by their silks. Five larvae were placed between the silks at the cut tip of each ear. Infested ears were placed separately in clear plastic bags. A folded, wet, 3x3 cm section of tissue paper was placed in the bottom of each tightly closed bag to maintain 100% RH. Bagged ears were then held in a growth chamber for 2 weeks at 27°C (day) and 21°C (night) and 16 hr photoperiod (800 fc). Total no. and wt of surviving larvae, as well as instar stage, were scored on each ear.

'B52' was moderately more resistant than the 2 hybrids. The no. of surviving larvae and of 4th and 5th instar larvae were lower in 'B52' (Table 1). No differences in silk feeding between 'B52' and the 2 hybrids were noticed. Ears of 'B52' probably had low total larval wt, but the difference was not different at the 5% level. Larval wt may be greatly influenced by the specific location at which the larva is feeding in the ear. This resistance level in 'B52' was in agreement with previous field work (6).

These results confirm field findings of some 2nd-brood resistance in the ears of 'B52', although it may be lower than might be expected on the basis of its strong resistance to stalk tunneling and to sheath and collar feeding. We are hopeful that the method will be useful in the development of germplasm having ear feeding resistance greater than 'B52'.

The technique, which also might be useful in the search for possible antibiosis in the silk and husk, has the following advantages: 1) Emphasis can be placed directly on the ear, i.e., on the product; 2) infestation under controlled conditions will help to give uniform results regardless of geographic location; 3) the technique might require less time for infestation and scoring, if fewer ears of each genotype are needed; 4) all genotypes, regardless of silking date, can be screened under the same conditions; and 5) the plants are not infested and second ears may be used for selfing or crossing with no risk of borer damage. Upon obtaining the results of resistance evaluation using this technique the breeder can decide to save only the seeds of the resistant lines or plants.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Larvae wt (g)</th>
<th>Surviving larvae</th>
<th>No. of 4th &amp; 5th instar larvae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden Cross Bantam</td>
<td>2.37a2</td>
<td>34.0b</td>
<td>85.0</td>
</tr>
<tr>
<td>B52</td>
<td>1.82a</td>
<td>26.0a</td>
<td>65.0</td>
</tr>
<tr>
<td>Maxigold</td>
<td>2.40a</td>
<td>35.0b</td>
<td>87.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2Mean separation in columns by Duncan’s multiple range test, 5% level. Analysis of variance based on 10 ears per cultivar per each of 4 replications.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Literature Cited**


