### 1. Subject
- **A. Primary**
  - Agriculture
- **B. Secondary**
  - Pests of plants--Cereals--Sorghum--Uganda

### 2. Title and Subtitle
- Increasing infestations of the sorghum shoot fly in experimental plots

### 3. Author(s)
- Starks, K.J.

### 4. Document Date and Number of Pages
- **Document Date**: 1970
- **Number of Pages**: 2p.

### 7. Reference Organization Name and Address
- USDA/ARS

### 8. Supplementary Notes
- (In *J. of economic entomology*, v. 63, no. 5, p. 1715-1716)

### 10. Control Number
- PN-RAB-091

### 12. Descriptors
- Diptera
- Field tests
- Shoot flies?
- Sorghum
- Uganda

### 14. Contract Number
- PASA RA-4-00 Res.
Increasing Infestations of the Sorghum Shoot Fly\(^1\) in Experimental Plots\(^2\)

K. J. Starks\(^3\)

Doggett and Magisu (1965) reported differences in tolerance to the sorghum shoot fly, *Atherigona varia* (Meigen), hereafter called the shoot fly, in the breeding material at Serere Research Station, Uganda. However, selecting for resistance was often difficult because of lack of high and uniform infestations in the field plots; infestations ranged from 8 to 23\% of total plants. Thus, many of the plants selected as resistant were, in fact, escapes. An attempt was therefore made to produce uniform high infestations of shoot flies in the plots used for resistance breeding.

Efforts to rear the shoot fly on plant material or on artificial medium were unsuccessful. However, even if rearing had been successful, production of large-scale field infestations with this relatively small and delicate insect would have been difficult. Thus, it was decided to try to increase natural infestations by making use of characteristics of the insect.

1. The incidence of shoot flies was known to increase as planting progressed during the season, and in Uganda the insect was more damaging during the 2nd than during the 1st growing season. Then, if a known acceptable host could be provided before the test planting, the population might be increased to an acceptable size before the test plots were planted.

Although wild *Sorghum verticilliflorum* (Steudel) Stapf, which is a common plant in most Uganda sorghum-growing areas, was commonly infested early with shoot flies, an abundance of flies did not appear until about 3–4 weeks after emergence of the cultivated crop. This fact indicated that the population may not build up until the emergence of a new generation on cultivated sorghum. Swaine and Wyatt (1954) reported that the fly completes a life cycle in about 19 days. Therefore, early planting of a susceptible cultivated variety might encourage early emergence of a large population.

2. Preliminary tests with chemical lures had indicated that adult shoot flies responded positively to decomposing fish meal: the average catch per trap with fish meal bait was roughly 10 times that of the controls in a series of 3 tests (unpublished data). Also, Rao and Rao (1966) stated that manured plots sometimes had a significantly higher population of shoot flies, presumably because of an oviposition preference for more vigorous plants. However, their paper was unavailable to me at the time of the reported study. In relation to work done on other species of Anthomyiidae, McLeod (1964a, b) concluded that adults of both *Hylemya antiqua* (Meigen) and *H. platata* (Meigen) showed a preference for proteins or amino acids. Kring (1966) reported that flies of *Hylemya* spp. responded positively to fertilizer in tobacco fields. Harris et al. (1966) developed a root maggot diet containing fish meal as food for 1st-stage larvae.

3. The actual test, "Combine Kafir 60" (CK-60) grain sorghum was used to build up the fly population, partly because this variety tillered readily after an infestation of shoot flies (thereby furnishing shoots for additional attacks) but mainly because an abundance of seeds was available. No doubt other susceptible varieties would do as well (Blum \(1967\)). The CK-60 was planted as a border around the test field and in 4-row strips between the ranges of test plots. The test plots were planted about 3 weeks later, and the rows were oriented perpendicularly to the 4-row strips. Also, the test rows were only about 10 ft long, because longer rows in the middle often had uninsected plants. The meal was spread on top of the test rows of broadcast over the rows about 10 days after plant emergence (rate of ca. 1 lb/100 ft\(^2\)) to attract flies from the CK-60 edgings.

Two tests were made to evaluate the effect of meal. Test 1 had 10×10-ft plots with 3 replicates, and broadcast application and application on top of the plants were compared. Test 2 had 32×25-ft plots with 9 replicates. In this test, 2 varieties of sorghum, each with and without meal on top of the rows, were compared. The plots without meal received an equivalent amount of N\(_2\) in the form of calcium ammonium nitrate. Both 'Serena' and CK-60 have been attractive for oviposition, but the former variety has good recovery after shoot-fly attack while the latter has poor recovery. The percent infested plants was determined by counting infested plants at 14 and 28 days after planting. Table 1 gives results of the 2 tests.

In both tests, the controls (no meal) had an unexpectedly high percent infested plants. However, the con-
Table 1.—Influence of meal on the incidence of sorghum plants infested with shoot flies.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Variety</th>
<th>% infested plants*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 14 days</td>
<td>At 28 days</td>
</tr>
<tr>
<td><strong>Test 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meal on plants</td>
<td>CK-60</td>
<td>37.0 a</td>
</tr>
<tr>
<td>Meal broadcast</td>
<td>CK-60</td>
<td>39.6 a</td>
</tr>
<tr>
<td>No meal (control)</td>
<td>CK-60</td>
<td>21.5 a</td>
</tr>
<tr>
<td><strong>Test 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meal on plants</td>
<td>Serena</td>
<td>89.5 b</td>
</tr>
<tr>
<td>Meal on plants</td>
<td>CK-60</td>
<td>92.9 ab</td>
</tr>
<tr>
<td>No meal (control)</td>
<td>CK-60</td>
<td>85.4 c</td>
</tr>
</tbody>
</table>

*Any numbers not followed by the same letter are significantly different at P = 0.01 by Duncan's multiple range test.

Conclusion was that meal can increase an infestation of shoot flies providing certain other conditions are met. The flies already must be abundant in the vicinity; hence, the early-planted border strips and climatic conditions need to be favorable for egg hatch and larval development. The procedure worked successfully; the percent infested plants was nearly always over 50. Selection for tolerance (recovery) from the shoot fly was therefore possible in a recurrent selection-breeding program.

REFERENCES CITED


