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Helicoverpa armigera Incidence in Finger Millet (*Eleusine coracana* Gaertn.) at Kiboko, Kenya

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Abstract

Finger millet is an important cereal crop in Africa and South Asia, and there is considerable variability in finger millet germplasm for susceptibility to cotton bollworm, *Helicoverpa armigera* (Hub.). *Helicoverpa* incidence varied from 8% in IE 46 to 37% in Nagaikuro. AICSMIP 6, AICSMIP 11, AICSMIP 10, IE 581, IE 97, IE 120, IE 17, IE 2154, IE 2323, IE 46, AICSMIP 8, and Ending had <15% panicles with *H. armigera* damage compared with 37% in Nagaikuro. Lines resistant to *H. armigera* can be used to develop finger millet cultivars with resistance to this insect.

Introduction

Finger millet, *Eleusine coracana* Gaertn., also known as ragi in India, is cultivated for human food in Africa and

South Asia. Among the millets, finger millet ranks fourth after pearl millet (*Pemisetum glaucum* (L.) R. Br.), foxtail millet (*Setaria italica* Beauv.), and pro so millet (*Pamcum miliaceum* L.) (Rachie and Peters 1977). It comprises nearly 8% of the total area, and accounts for 11% of the total millets production. Finger millet grain is more nutritious than the grains of other cereals grown in these regions, and the stalks are used as animal fodder. Finger millet is damaged by 57 insect species (Sharma and Davies 1988), of which shoot fly (*Atherigona miliaceae* Malloch), stem borer (*Sesamia inferem* Wlk.), flea beetle (*Chaetocnema* sp), red hairy caterpillar (*Amsacta albistriga* Walk.), Bihar hairy caterpillar (*Diacrisia obliqua* Walk.), Oriental armyworm (*Mythimna separata* Walk.), and head caterpillars [*Heiicoverpa armigera* (Hub.), *Cryptoblabes* sp, *Eublemma silicula* Walk., and *Sitotroga cerealella* Oliv.] are the most important.

Table 1. Incidence (%) of *Helicoverpa armigera* in finger millet at Kiboko, Kenya (1994 short rainy season).

Genotypes	*Helk overpa* damaged panicles (%)
IE 97	8 (2.6)[1]
IE 46	8 (2.8)
IE 2323	9 (2.7)
IE 17	9 (2.9)
IE 2154	10 (2.8)
IE 120	12 (32)
AICSMIP 10	12 (3.3)
AICSMIP 11	12 (3.4)
AICSMIP 6	13 (3.1)
IE 581	13 (3.5)
AICSMIP 8	14 (3.6)
Ending	15 (3.7)
IE 2322	16 (3.6)
IE 234	20 (4.5)
IE 49	21 (4.2)
KNE 479	22 (4.2)
IE 2294	22 (4.5)
IE 2096	22 (4.6)
IE 694	27 (4.9)
IE 528	27 (4.9)
KAT/FM 1	30 (5.4)
IE 85	31 (5.4)
Nagaikuro (ex-Kishii)	37 (5.8)
Mean	18 (5.6)
SE	± (1.08)

1. Figures in parentheses are square-root transformed values.

Recently, efforts have been made to improve the productivity potential of this crop through national, regional, and international crop improvement programs. In this process, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) regional programs in eastern and southern Africa have undertaken the testing and evaluation of improved varieties of finger millet, and distribution of the high yielding lines to national programs. To achieve these objectives, 23 promising genotypes were evaluated for their yield potential at Kiboko, Kenya. There was a heavy incidence *of H. armigera* in this trial during the 1994 short rainy season. Since there was no earlier information on the plant resistance to *Helicoverpa* in finger millet, data were recorded on *Helicoverpa* incidence in different genotypes to gain an understanding of differences in genotypic susceptibility to this pest.

Material and methods

Twenty-three genotypes selected as highly promising in the preliminary yield trials were sown in a replicated trial to determine their relative productivity potential at the Kenya Agricultural Research Station, Kiboko, Kenya, during the 1994 short rainy season. Each entry was sown in a 4-row plot, 4-m long. The entries were sown on ridges, 75 cm apart. The seedlings were thinned to a spacing of 5 cm within the row 15 days after germination. There were three replications, and the experiment was laid out in randomized complete block design. Normal agronomic practices were followed to raise the crop. No insecticide was applied on the crop. The crop was exposed to natural *Helicoverpa* infestation. At the milk stage, heavy *Helicoverpa* incidence was observed in this trial. Data were recorded on number of panicles damaged by *Helicoverpa* larvae (expressed as a percentage of the total number of panicles) in the central two rows of each plot. Data on percentage panicles with *Helicoverpa* damage were converted to square root values, and subjected to analysis of variance.

Results and discussion

There was considerable variability in finger millet germplasm for susceptibility to *H. armigera* (Table 1). *Helicoverpa* incidence varied from 8% in IE 46 to 37% in Nagaikuro. Genotypes AICSMIP 6, AICSMIP 11,

AICSMIP 10, IE 581, IE 97, IE 120, IE 17, IE 2154, IE 2323, IE 46, AIGSMIP 8, and Ending had <15% panicles with *H. armigera* damage compared with 37% in Nagaikuro, Time of flowering seemed to influence *Helkoverpa* incidence. Compact-panicled genotypes suffered greater damage than those having loose/separate fingers. There were considerable genotypic differences for susceptibility to *H. armigera* in finger millet, and this information can be used to develop Finger millet genotypes with resistance to this insect. Seeds of the less susceptible lines can obtained from ICRISAT, EARCAL, Nairobi, Kenya. Since this is one of the most difficult pests to control with insecticides, it is important that crop improvement programs focus on selecting genotypes that are less susceptible to this pest. Low to moderate levels of resistance can be combined with natural enemies to minimize the extent of losses due to this insect in finger millet.

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Striga

Striga hermonthica Infection of Wild *Pennisetum* Germplasm is Related to Time of Flowering and Downy Mildew Incidence

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Introduction

Infection by *Striga hermonthka* (Del.) Benth., on corn (*Zea mays* L.) and sorghum (*Sorghum bicolor* (L.) Moench) can be managed by sound cultural practices and, where available, use of resistant cultivars (Berner et al. 1995; Hess et al. 1992; Ramaiah and Parker 1982). Cultural practices that reduce *Striga* populations in other crops can be adapted to pearl millet (*Pennisetum glaucum* (L.) R. Br.) cultivation; however, little information is available concerning genetic resistance in pearl millet. The objective of this experiment was to evaluate a collection of wild *P. glaucum* ssp *monodii* and ssp *stenostachyum* accessions for resistance to *S. hermonthka.* 'Resistance' in this report is defined as supporting few emerged *Striga* plants.

Materials and methods

Two-hundred-seventy-five wild *P. glaucum* accessions were sown in Bamako, Mali on 11 Jul 1997. Accessions were sown in two-row plots spaced 50 cm apart. Within each row, four hills spaced at 60 cm were sown, and plots were infested with 3 g seed (approximately 230 000 viable seeds) of *S. hermonthka.* Stands were thinned to a single *Pennisetum* plant per hill Incidence of downy mildew (*Sclerosporagraminkola* (Sacc.) J. Schrot.) infection was assessed by counting the number of symptomatic plants in each plot. Metalaxyl (0 5 g L^{-1}) was sprayed on diseased tissue to runoff on 20 Aug and 3 Sep to halt the epidemic.

Numbers of emerged *Striga* plants within plots were counted on 25 Aug, 8 and 23 Sep, and 7 Oct. Due to