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Relative Resistance of Maize Stem Borer, *Chilo partellus* (Swinhoe) Against Some Maize Cultivars

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Abstract: Thirty four Maize cultivars were evaluated to observe their relative resistance against maize stem borer *Chilo partellus* (Swinhoe). The varieties studied were Sarhad Yellow, EV-1097, Kissan, Babar, Agaiti-85, Gauhar, Margala, EV-2097, NC BR-1, NCBR2, C6765-28, NARC 25 FI, NARC 251-1, NARC 25 12-2, NARC 25 12-2I, C6765-9, C 6765-11, C6765-40I, C 6765-40, C 6765-54 L, C 6765-24, C 6765-28L, C6765-29, C 1751-147-3I, C 1751-54-2, C 1751-223, C 1752-16-2I, C 1752-23-2I, C 1752-43-3I, C 1752-44-2L, C 1752-14-2, C 1752-16-1, C 1752-17-3 and NARC 25 E. In case of stem damage, EV-2097 with damage of 4.479% was comparatively susceptible. Varieties that showed more resistance were NARC 25 FI, NARC 25 1-1, NARC 25 12-2, NARC 25 12-2 I, C 6765-9, C 6765-11, C 6765-40I, C 6765-54 L, C 6765-24, C 6765-28 L, C 6765-29, C 1751-147-3 I, C 1751-54-2, C 1752-16-2 I, C 1752-43-3 I, C 1752-44-2 L and C 1752-16-1 with 0.707% stem damage. In case of difference in the height of healthy and damaged plants, the maximum difference of 33 cm was found in C 1751-147-3 I and NARC 25 FI whereas the minimum difference of -5 cm was observed in C 1751-223.

Key words: Maize, stem borer, *Chilo partellus*, cultivars

Introduction

Maize (*Zea mays* L.) is one of the most important cereal crops and occupies 17% of the world acreage and accounts for about 24% of the world production of grain (Abid, 1983).

A large number of insect pests attack this crop and cause tremendous losses annually but maize stem borer, *Chilo partellus* (Swinhoe) is the most notorious pest and causes heavy damage to maize crop (Kumar, 1997 and Swinhoe, 1984). Occasionally, it causes severe damage to the extent of 42.29% (Nazir, 1989). Quite often the extent of damage reaches up to 75% (Latif *et al.*, 1960). The larvae enter into stalk and make tunnels in older plants (Ram, 1986).

Control of pest has long been achieved mainly by using insecticides, which sometimes are used excessively for getting immediate results (Carl, 1962) but have so many adverse effects like mortality of biological control agents, environmental and water pollution and biohazards to human beings and animals. It is found that insecticides kill the natural enemies which results in outbreak of other pests.

Cultivars with high levels of resistance can serve as an effective and economical measure of pest control. France (1985) studied geographic distribution, food plants, biology, injuries and control of *Chilo partellus* and recommended the use of resistant varieties. Parvez *et al.* (1990) evaluated twenty maize cultivars for relative resistance to *C. partellus* (Swinhoe) and observed that

the cultivars Antigua, Gauhar and Munawar were resistant whereas Azam was the most susceptible. Various other workers identified a large number of maize genotypes with varying levels of resistance to *C. partellus* (Kumar and Mihm, 1997; Kumar, 1994; Kumar and Asino, 1994). The plants attacked by *C. partellus* showed less height as compare to healthy plants (Ahmad and Akhtar, 1979). The present studied were designed to observe the relative resistance of some maize cultivars against *C. partellus*.

Materials and Methods

The studies on relative resistance of 34 maize varieties against maize stem borer *Chilo partellus*, were carried out in the experimental area of National Agricultural Research Centre, Islamabad during Autumn, 2001. The varieties were sown in plots of 15 m² under randomized complete block design with three replications. The row to row and plant to plant distance was 75 and 25 cm, respectively. There were four rows of plants in each plot data were recorded from two central rows. The following varieties were included in the experiment:

V ₁	=	Sarhad Yellow	V ₂	=	EV-1097
V ₃	=	Kissan	V ₄	=	Babar
V ₅	=	Agaiti-85	V ₆	=	Gauhar
V ₇	=	Margala	V ₈	=	EV-2097
V ₉	=	NC BR-1	V ₁₀	=	NC BR-2
V ₁₁	=	C 6765-28	V ₁₂	=	NARC 25 FI

V ₁₃ =	NARC 25 1-1	V ₁₄ =	NARC 25 12-2
V ₁₅ =	NARC 25 12-2 I	V ₁₆ =	C 6765-9
V ₁₇ =	C 6765-11	V ₁₈ =	C 6765-40 I
V ₁₉ =	C 6765-40	V ₂₀ =	C 6765-54L
V ₂₁ =	C 6765-24	V ₂₂ =	C 6765-28L
V ₂₃ =	C 6765-29	V ₂₄ =	C 1751-147-3 I
V ₂₅ =	C 1751-54-2	V ₂₆ =	C 1751-223
V ₂₇ =	C 1752-16-2 I	V ₂₈ =	C 1752-23-2 I
V ₂₉ =	C 1752-43-3 I	V ₃₀ =	C 1752-44-2L
V ₃₁ =	C 1752-14-2	V ₃₂ =	C 1752-16-1
V ₃₃ =	C 1752-17-3	V ₃₄ =	NARC 25 E

Stem infestation was recorded before harvesting of the crop by removing all dried leaves from the stem and every plant was observed carefully for holes, made by arvae for entrance during transfer from one plant to another and for adult emergence. The number of plants with stem damage were counted and expressed in percentage. Plant height was measured once by using measuring rod when plants attained their maximum height on completion of tassels. The damaged and healthy plants were measured separately and were expressed in cms. The data were subjected to statistical analysis to reach some conclusion.

Results and Discussion

Stem damage: The data on the stem damage caused by maize stem borer to different varieties are presented in Table 1. The statistical analysis revealed significant differences among the varieties. The highest stem damage was recorded on EV 2097 (V₈) which differed significantly from all other varieties except Kissan (V₃). The next highest stem damage was recorded on EV-1097 (V₂), although, it did not differ significantly from the damage recorded on Margala (V₇), Babar (V₄), NC BR-2 (V₁₀), Sarhad Yellow (V₁), C 6765-28 (V₁₁), C 1752 17-3 (V₃₃), C 1752-14-2 (V₃₁), Gauhar (V₆) and C 1752-23-2 I (V₂₈). Variety NC BR -1 (V₉) was alike statistically in receiving the infestation of maize stem borer with NC BR-2 (V₁₀), Sarhad Yellow (V₁), C 6765-28 (V₁₁), C 1752-17-3 (V₃₃), C 1752-23-2-I (V₂₈). This variety also did not differ significantly from Agaiti-85 (V₅), NARC 25 E (V₃₄), C 1751 223 (V₂₆) and C 6765-40 (V₁₉). All other varieties, namely, NARC 25-1-1 (V₁₃), NARC 25-12-2 (V₁₄), NARC 25-12-2 I (V₁₅), NARC 25 FI (V₁₂), C 6765-24 (V₂₁), C 6765-9 (V₁₆), C 6765-11 (V₁₇), C 6765-40 I (V₁₈), C 6765-54-L (V₂₀), C 6765-28 L (V₂₂), C 6765-29 (V₂₃), C 1751-147-3 I (V₂₄), C 1752-54 2 (V₂₅), C 1752-16-2 I (V₂₇), C 1752-43-3 I (V₂₉), C 1752-44-2

Table 1: Mean stem damage caused by maize stem borer on 34 varieties of maize

Original order		Ranked order	
Variety	Mean	Variety	Mean
Sarhad Yellow	2.606B-D	EV-2097	4.479A
EV-1097	3.274BC	Kissan	3.497AB
Kissan	3.497AB	EV-1097	3.274BC
Babar	3.189BC	Margala	3.245BC
Agaiti-85	1.842D-F	Babar	3.189BC
Gauhar	2.317C-E	NC BR 2	2.750B-D
Margala	3.245BC	Sarhad Yellow	2.606B-D
EV-2097	4.479A	C 6765-28	2.594B-D
NC BR-1	1.935D-F	C 1752-17-3	2.581B-D
NC BR-2	2.750B-D	C 1752-14-2	2.325C-E
C 6765-28	2.594B-D	Gauhar	2.317C-E
NARC 25 F I	0.707G	C 1752-23-2 I	2.192C-F
NARC 25 I-I	0.707G	NC BR-1	1.935D-F
NARC 25 12-2	0.707G	Agaiti-85	1.842D-F
NARC 25 12 2 I	0.707G	NARC 25 E	1.252E-G
C 6765-9	0.707G	C 1751-223	1.191FG
C 6765-11	0.707G	C 6765-40	1.155FG
C 6765-40 I	0.707G	NARC 25 F I	0.707G
C 6765-40	1.155FG	NARC 25 I-I	0.707G
C 6765-54 L	0.707G	NARC 25 12-2	0.707G
C 6765-24	0.707G	NARC 25 12 2 I	0.707G
C 6765-28 L	0.707G	C 6765-9	0.707G
C 6765-29	0.707G	C 6765-11	0.707G
C 1751-147-3 I	0.707G	C 6765-40 I	0.707G
C 1751-54-2	0.707G	C 6765- 54 L	0.707G
C 1751-223	1.191FG	C 6765-24	0.707G
C 1752-16-2 I	0.707G	C 1755-28 L	0.707G
C 1752-23-2 I	2.192C-F	C 1755-29	0.707G
C 1752-43-3 I	0.707G	C 1751-147-3 I	0.707G
C 1752-44-2 L	0.707G	C 1751-54-2	0.707G
C 1752-14-2	2.325C-E	C 1752-16-2 I	0.707G
C 1752-16-1	0.707G	C 1752-43-3 I	0.707G
C 1752-17-3	2.581B-D	C 1752-44-2 L	0.707G
C 1752-25 E	1.253E-G	C 1752-16-1	0.707G

Table 2: Mean plant height differences of healthy and damaged plants on 34 varieties of maize

Original order		Ranked order	
Variety	Mean	Variety	Mean
Sarhad Yellow	18.33C-H	C1751-147-3 I	33.00A
EV-1097	22.67A-G	NARC 25 F I	33.00A
Kissan	29.33A-C	Margala	32.00A
Babar	12.33F-L	NC BR-1	30.67AB
Agaiti-85	18.67C-I	Kissan	29.33A-C
Gauhar	24.67A-E	C 1752-14-2	27.00A-D
Margala	32.00A	Gauhar	24.67A-E
EV-2097	17.00D-J	C 6765-28 L	24.00A-F
NC BR-1	30.67AB	C 6765-28	23.00A-G
NC BR-2	22.33A-G	C 1752-16-2 I	23.00A-G
C 6765-28	23.00A-G	EV-1097	22.67A-G
NARC 25 F I	33.00A	NC BR 2	22.33A-G
NARC 25 I-I	20.00B-H	NARC 25 1-1	20.00B-H
NARC 25 12-2	15.00E-L	C 1752-43-3 I	20.00B-H
NARC 25 12-2 I	12.00G-L	Agaiti-85	18.67C-I
C 6765-9	5.00K-P	Sarhad Yellow	18.33C-H
C 6765-11	17.00D-J	EV-2097	17.00D-J
C 6765-40 I	4.33L-P	C 6765-11	17.00D-J
C 6765-40	-2.00N-P	C 1752-17-3	16.33D-K
C 6765-54 L	7.00I-O	NARC 25 E	16.33D-K
C 6765-24	16.00D-L	C 6765-24	16.00D-L
C 6765-28 L	24.00A-F	NARC 25 12-2 I	15.00E-L
C 6765-29	10.00H-M	Babar	12.33F-L
C 1751-147-3 I	33.00A	NARC 25 12-2 I	12.00G-L
C 1751-54-2	9.00H-N	C 6765-29	10.00H-M
C 1751-223	-5.00P	C 1751-54-2	9.00H-N
C 1752-16-2 I	23.00A-G	C 6765-54 L	7.00I-O
C 1752-23-2 I	0.00M-P	C 1752-44-2 L	6.00J-P
C 1752-43-3 I	20.00B-H	C 6765-9	5.00K-P
C 1752-44-2 L	6.00J-P	C 6765-40 I	4.33L-P
C 1752-14-2	27.00A-D	C 1752-23-2 I	0.00M-P
C 1752-16-1	-3.00OP	C 6765-40	-2.00N-P
C 1752-17-3	16.33D-K	C 1752-16-1	-2.00OP
C 1752-25 E	16.33D-K	C 1751-223	-5.00P

L (V_{30}) and C 1752-16-1 (V_{32}), were similar statistically as regard to damage caused by maize stem borer.

The results further revealed that the varieties EV 2097 (V_8) and Kissan (V_3) were more susceptible to attack of maize stem borer and the infestation ranged from 3.497 to 4.479% on these varieties. Varieties EV 1097 (V_2), Margala (V_7), Babar (V_4), NC BR-2 (V_{10}), Sarhad Yellow (V_1), C 6765-28 (V_{11}), C 1752-17-3 (V_{33}), C 1752-14-2 (V_{31}), Gauhar (V_6) and C 1752-23-2 I (V_{28}) were moderately susceptible where infestation ranged from 2.192 to 3.274%. Varieties NARC 25 FI (V_{12}), NARC 25 1-1 (V_{13}), NARC 25 12-2 (V_{14}), NARC 25 12-2 I (V_{15}), C 6765-9 (V_{16}), C 6765-11 (V_{17}), C 6765-40 I (V_{18}), C 6765-54L (V_{20}), C 6765-24 (V_{21}), C 6765-28 L (V_{22}), C 6765-29 (V_{23}), C 1751-147 3 I (V_{24}), C 1751-54 2 (V_{25}), C 1752-16-2 I (V_{27}), C 1752-43-3 I (V_{29}), C 1752-44 2 L (V_{30}) and C 1752-16 1 (V_{32}) were comparatively resistant against the attack of maize stem borer and the infestation was 0.707% on these varieties.

The results are in accordance with those of Kumar (1994) and Kumar and Asino (1994) who studied the differences between susceptible and resistant genotypes in terms of stem damage and found that susceptible genotypes were distinctly more damaged than the resistant ones.

Plant height differences in healthy and damaged plants:

The data on differences in the plant height of healthy and damaged plants is shown in Table 2. The statistical analysis of the data revealed that the varieties differed significantly from each other. The highest difference was recorded in C 1751-147-3 I (V_{24}) which differed significantly from all other varieties except NARC 25 F I (V_{12}), Margala (V_7), NC BR-1 (V_9), Kissan (V_3), C 1752-14-2 (V_{31}), Gauhar (V_6), C 6765-28 L (V_{22}), C 6765 -28 (V_{11}), C 1752-16-2 I (V_{27}), EV-1097 (V_2), and NC BR-2 (V_{10}), Variety NARC 25 1-1 (V_{13}) was alike statistically with C 1752-43-3 I (V_{29}), Agaiti-85 (V_5), Sarhad Yellow (V_1), EV-2097 (V_8), C 6765-11 (V_{17}), C 1752-17-3 (V_{33}), NARC 25 E (V_{34}), C 6765 24 (V_{21}), NARC 25 12-2 (V_{14}), Babar (V_4), NARC 25 12-2 I (V_{15}), C 6765-29 (V_{23}) and C 1751-54-2 (V_{25}). However, this variety also did not differ significantly from NC BR -1 (V_9), Kissan (V_3), C 1752-14-2 (V_{31}), Gauhar (V_6), C 6765 -28 L (V_{22}), C 6765-28 (V_{11}), C 1752-16-2 I (V_{27}), EV-1097 (V_2), and NC BR-2 (V_{10}).

The table further depicted that the minimum difference (-5 cm) in the height of healthy and damaged plants was recorded in variety C 1751-223 (V_{26}) while the maximum difference (33 cm) in the plant height of healthy and

damaged plants was recorded in variety C 1751 –147-3 I. The results are in agreement with those of Ahmad and Akhtar (1979) who recorded data on losses caused by insects to maize crop and concluded that differences in plant height of different varieties were highly significant.

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