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Tassel Infestation and Dead Hearts Formation Due to Maize Stem Borer (*Chilo partellus*) Attack in Maize Varieties

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Abstract: Thirty four maize cultivars were evaluated to observe their relative resistance against maize stem borer (*Chilo partellus*) during Kharif, 2001. The varieties studied were Sarhad Yellow, EV-1097, Kissan, Babar, Agaiti-85, Gauhar, Margala, EV-2097, NC Br-1, NC BR2, C 6765-28, NARC 25 FI, NARC 251-1, NARC 25 12-2, NARC 25 12-2, NARC 25 12-21, C 6765-9, C 6765-11, C 6765-40 I, C 6765-40, C 6765-24, C 6765-28L, C 6765-29, C 1751-147-3 I, C 1751-54-2, C 175-223, C 1752-16-2 I, C 1752-23-2 I, C 1752-43-3 I, C 1752-44-2 L, C 1752-14-2, C 1752-16-1, C 1752-17-3 and NARC 25 E. Variety EV-2097 was found to be most susceptible with 3.57% tassel infestation. Varieties NC BR-1, NARC 25 FI, NARC 25 1-1, NARC 25 12-2, NARC 25 12-2 I, C 6765-40 I, C 6765-24, C 6765-24, C 6765-28 L, C 6765-29, C 1751-147-3 I, C 1751-54-2, C 1652-44-2 L and C 1752-17-3 were found to be resistant. The maximum percentage of dead hearts (3.56%) was recorded on EV-2097 and was observed as most susceptible variety. The highly resistant varieties with 0.707% dead hearts include NARC 25 FI, NARC 25 1-1, NARC 25 12-2, NARC 25-2 I, C 6765-28 L, C 6765-40 I, C 1752-23-2 I and C 1752-44-2 L.

Key words: Tassel infestation, dead hearts, *Chilo partellus*, maize

Introduction

Maize (*Zea mays* L.) is the most widely adapted crop throughout the world. Potential of maize to contribute towards more nutritive food for human consumption is high (Anonymous, 2000). It has been estimated that 10 to 15% of the world's maize production is lost every year due to insects, diseases and other pest (Anonymous, 1989). Among the insect pests, maize stem borer is of great importance. The young plants generally and the medium sized frequently are killed by this insect. Infestation at any stage, damage the crop which resulted in yield losses which is 10-20% and may upto 80% (Rehman *et al.*, 1986). This loss is caused due to formation of dead hearts, stunted growth and tunneling. This pest attacks immediately after germination, thus, causing dead hearts in young plants (Ram, 1986). Host plant resistance development has the greatest potential for resource poor farmers in developing countries and it is the best, most practical and economical means of minimizing losses of insect pests. There is less need to supply extra inputs to grow resistant varieties.

Rai and Sharma (1998) conducted field studies in Pathnagar, Uttar Pradesh, India during rabi season. Maize varieties Ganga and Naveen were least susceptible to attack by *C. partellus* followed by Kanchan, Tarun, Sweta and D-765 whereas variety Surya was most susceptible. Rao and Panwar (2000) screened seven maize genotypes against the maize stalk borer, *C. partellus* (Swinhoe), during the kharif, 1995 and found Antigua Gr-1 and Deccan-103 resistant as compared to other cultivars. Uma

and Ramanjeet (2000) tested the response of different maize germplasms to *C. partellus* in Punjab, India during Kharif, 1997. They found that varieties KI and CML 71 had the least damage showing their resistance against this pest. Percentage of dead hearts is greater on susceptible genotypes than resistant ones (Kumar, 1994). This study was conducted to observe tassel infestation and dead hearts formation due to maize stem borer *Chilo partellus* attack in maize varieties.

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 (RCBD) 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 plots and data were recorded from two central rows. The plants with damaged tassels and dead hearts were counted and expressed by percentage. The data were subjected to statistical analysis to reach some conclusion. 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 12-21	V ₁₆ = C 6765-9
V ₁₇ = C 6765-11	V ₁₈ = C 6765-40 I
V ₁₉ = C6765-40	V ₂₀ = C 6765-54 L
V ₂₁ = C 6765-24	V ₂₂ = C 6765-28 L
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	V ₂₈ = C1752-23-2 I
V ₂₉ = C 1752-14-2	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

Results and Discussion

Infestation on tassel: The statistical analysis of the data revealed that the varieties differed significantly from each other (Table 1). The highest tassel damage of 3.57% was recorded on EV-2097 (V₈) which differed significantly from all other varieties except C 6765-9 (V₁₆) and C 1752-43-3 I (V₂₉). Variety Margala (V₇) was alike statistically in responding to the infestation of maize stem borer with C 6765-9 (V₁₆), C 1752-43-3 I (V₂₉) and C 1752-14-2 (V₃₁) whereas this variety also did not differ significantly from EV-1097 (V₂), Kissan (V₃), Agaiti-85 (V₅), C 1751-223 (V₂₆), C 1752-23-2 I (V₂₈), C 6765-40 (V₁₉), Babar (V₄), Sarhad Yellow (V₁), C 1752-16-1 (V₃₂), C 6765-28 (V₁₁), C 6765-54L

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

Original order		Ranked order	
Varieties	Mean	Varieties	Mean
Sarhad Yellow	1.712C-F	E V-2097	3.570A
Ev-1097	2.068C-E	C 6765-9	3.350AB
Kissan	2.006C-E	C 1752-43-3 I	2.611A-C
Babar	1.719C-F	C 1752-14-2	2.325B-D
Agaiti-85	1.995C-E	Margala	2.222B-E
Gauhar	1.314D-F	EV-1097	2.068C-E
Margala	2.222B-E	Kissan	2.006C-E
EV-2097	3.570A	Agaiti-85	1.995C-E
NC BR-1	0.707F	C 1751-223	1.946C-E
NC BR-2	1.043EF	C 1752-23-2 I	1.838C-F
C 6765-28	1.597C-F	C 6765-40	1.785C-F
NARC 25 FI	0.707F	Babar	1.719C-F
NARC 25 I-I-	0.707F	Sarhad Yellow	1.712C-F
NARC 25 12-12	0.707F	C 1752-16-1	1.626C-F
NARC 25 12 2 1	0.707F	C 6765-28	1.597C-F
C 6765-9	3.350AB	C 6765-54 I	1.364D-F
C 6765-11	1.236D-F	Gauhar	1.314D-F
C 6765-40 I	0.707F	C 6765-11	1.236D-F
C 6765-40	1.785C-F	C 1752-15-2 I	1.179D-F
C 6765-54 L	1.364D-F	NARC 25 E	1.124D-F
C 6765-24	0.707F	NC BR 2	1.043EF
C6765-28 L	0.707F	NC BR-1	0.707F
C 6765-29	0.707F	NARC 25 FI	0.707F
C 1751-147-3 1	0.707F	NARC 25 I-I	0.707F
C 1751-54-2	0.707F	NARC 25 12-2	0.707F
C 1751-223	1.946C-E	NARC 25 12-2 I	0.707F
C 1752-16-21	1.179D-F	C 6765-40 I	0.707F
C 1752-23-21	1.838C-F	C 6765-24	0.707F
C 1752-43-3 I	2.611A-C	C 6765-28 L	0.707F
C 1752-44-2 L	0.707F	C 6765-29	0.707F
C 1752-14-2	2.325B-D	C 1751-147-3 I	0.707F
C 1752-16-1	1.626C-F	C 1751-54-2	0.707F
C 1752-17-3	0.707F	C 1752-44-2 L	0.707F
NARC 25E	1.124D-F	C 1752-17-3	0.707F

Column means followed by the same letter are not significantly different by Duncan's multiple range test (P = 0.05)

Table 2: Mean dead hearts caused by maize stem borer on 34 varieties of maize

Original order		Ranked order	
Variety	Mean	Variety	Mean
Sarhad Yellow	2.215B-F	E V-2097	3.563A
Ev-1097	1.373E-G	C 6765-11	3.392AB
Kissan	2.774A-D	C 6765-9	2.898A-C
Babar	1.626D-G	Kissan	2.774A-D
Agaiti-85	2.324A-F	C 6765-29	2.627A-E
Gauhar	2.999A-F	C 1752-14-2	2.544A-E
Margala	1.733C-G	C 6765-54 L	2.499A-E
EV-2097	3.563A	C 1751-223	2.418A-F
NC BR-1	1.418E-G	Agaiti-85	2.324A-F
NC BR-2	1.550D-G	Gauhar	2.299A-F
C 6765-28	1.723C-G	Sarhad Yellow	2.215B-F
NARC 25 FI	0.707G	C 1751-54-2	2.203B-F
NARC 25 I-I-	0.707G	C 6765-40	2.065C-F
NARC 25 12-12	0.707G	NARC 25 E	2.012C-F
NARC 25 12 2 1	0.707G	C 1751-147-3 I	1.994C-F
C 6765-9	2.898A-C	C 6765-24	1.898C-G
C 6765-11	3.392AB	C 1752-16-1	1.763C-G
C 6765-40 I	0.707G	C 1752-43-3 I	1.749C-G
C 6765-40	2.065C-F	Margala	1.733C-G
C 6765-54 L	2.499A-E	C 6765-28	1.723C-G
C 6765-24	1.898C-G	Babar	1.626D-G
C6765-28 L	0.707G	C 1752-17-3	1.572D-G
C 6765-29	2.627A-E	NC BR 2	1.550D-G
C 1751-147-3 1	1.994C-F	NC BR-1	1.418E-G
C 1751-54-2	2.203B-F	EV-1097	1.373E-G
C 1751-223	2.418A-F	C 1752-16-2 I	1.179FG
C 1752-16-21	1.179FG	NARC 25 FI	0.707G
C 1752-23-21	0.707G	NARC 25 I-I	0.707G
C 1752-43-3 I	1.749C-G	NARC 25 12-2	0.707G
C 1752-44-2 L	0.707G	NARC 25 12-2 I	0.707G
C 1752-14-2	2.544A-E	C 6765-28 L	0.707G
C 1752-16-1	1.763C-G	C 6765-40 I	0.707G
C 1752-17-3	1.572D-G	C 1752-23-2 I	0.707G
NARC 25E	2.012C-F	C 1752-44-2 L	0.707G

Column means followed by the same letter are not significantly different by Duncan's multiple range test (P = 0.05)

(V₂₀), Gauhar (V₆), C 6765-11 (V₁₇), C 1752 16-2 I (V₂₇), NARC 25 E (V₃₄) and NC BR-2 (V₁₀). All the other varieties were similar statistically as regard to infestation caused by maize stem borer.

It can be concluded that the varieties EV-2097 (V₈), C 6765-9 (V₁₆) and C 1752-43-3 I (V₂₉) were susceptible to the attack of maize stem borer and the infestation ranged from 2.611 to 3.570% on these varieties. Varieties EV 1097 (V₂), Kissan (V₃), Agaiti-85 (V₅), C 1751-223 (V₂₆), C 1752-23 2 I (V₂₈), C 6765-40 (V₁₉), Babar (V₄), C 1752-16-1 (V₃₂) and C 6765-28 (V₁₁) were moderately susceptible with an infestation range of 1.59 to 2.068%. The varieties viz., NC BR-1 (V₉), NARC 25 FI (V₁₂), NARC 25 1-1 (V₁₃), NARC 25

12-2 (V₁₄), NARC 25 12-21 (V₁₅), 6765-40 I (V₁₈), C 6765-24 (V₂₁), C 6765-28 L (V₂₂), C 6765-29 (V₂₃), C 1751-147-3 I (V₂₄), C 1751-54-2 (V₂₅), C 1752-44-2L (V₃₀) and C 1752-17-3 (V₃₃), were comparatively resistant against the infestation of maize stem borer and the infestation was 0.707% on these varieties.

Dead hearts: The data on dead hearts revealed significant differences of the varieties (Table 2). The highest dead hearts (3.563%) was recorded on EV-2097 (V₈), however, it did not differ significantly from C 6765-11 (V₁₇), C 6765-9 (V₁₆), Kissan (V₃), C 6765-29 (V₂₃), C 6765-14-2 (V₃₁), C 6765-54 L (V₂₀), C 1751-223 (V₂₆), Agaiti-85 (V₅) and Gauhar

(V₆). The dead hearts percentage recorded on the variety Sarhad Yellow (V₁) was 2.215% which did not differ significantly from C 1751-54-2 (V₂₅), C 6765-40 (V₁₉), NARC 25 E (V₃₄), C 1751-147-3 I (V₂₄), C 6765-24 (V₂₁), C 1752-16-1 (V₃₂), C 1752-4303 I (V₂₉), Margala (V₇), C 6765-28 (V₁₁), Babar (V₄), C 1852-17-3 (V₃₃), NC BR-2 (V₁₀), NC BR-1 (V₉), EV-1097 (V₂) and C 1752-16-2 I (V₂₇) whereas this variety also did not differ significantly from C 6765-11 (V₁₇), C 6765-9 (V₁₆), Kissan (V₃), C 6765-29 (V₂₃), C 1752-14-2 (V₃₁), C 6765-54 L (V₂₀), C 17510223 (V₂₆), Agaiti-85 (V₅) and Gauhar (V₆). All other varieties were similar statistically as regard to dead hearts %age caused by maize stem borer. It can be further seen that the varieties EV-2097 (V₈), C 6765-11 (V₁₇), C 6765-9 (V₁₆), Kissan (V₃), C 6765-29 (V₂₃), C 1752-14-2 (V₃₁), C 6765-54 L (V₂₀), C 1751-223 (V₂₆), Agaiti-85 (V₅) and Gauhar (V₆) were comparatively susceptible to the attack of maize stem borer and the infestation ranged from 2.299 to 3.563% on these varieties (Table 2). The varieties Sarhad yellow (V₁), C 1751-54-2 (V₂₅), C 6765-40 (V₁₉), NARC 25 E (V₃₄), C 17510147-3 I (V₂₄), C 6765-24 (V₂₁), C 1752-16-1 (V₃₂), C 1752-43-3 I (V₂₉), Margala (V₇) and C 6765-28 (V₁₁) having an infestation range of 1.1752 to 2.215%, were moderately susceptible whereas the varieties NARC 25 FI (V₁₂), NARC-25-1-1 (V₁₃), NARC 25 12-2 (V₁₄), NARC 25 12-2 I (V₁₅), C 6765-40 I (V₁₈), C 6765-28 L (V₂₂), C 1752 23-2 I (V₂₈) and C 1752-44-2 L (V₃₀) were the most resistant against this pest and the infestation on these varieties was 0.707%.

The results are in accordance with those of Kumar (1994) who found that dead hearts % was greater on susceptible genotypes than multiple insect resistant genotypes.

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