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Varietal screening of indigenous maize against *Chilo partellus*

Imtiaz Hussain Malana[1*], M Waqar Hassan[2], Adnan Babar[3], Mirza Abdul Qayyum[4], Muhammad Ishtiaq[5], Zunaira Azmat[6], Muhammad Asad Saleem[7]

[1, 3, 4, 5, 7] Department of Entomology, Muhammad Nawaz Shareef University of Agriculture, Multan, Pakistan
[2, 6] Department of Entomology, The Islamia University of Bahawalpur, Pakistan

Abstract
Maize stem borer (*Chilo partellus*) (Swinhoe) (Lepidoptera: Pyralidae) is a common pest of maize. It causes serious damage to the maize crop. It also causes solemn damage on different parts of the plant. Different local varieties of maize were screened to check the early infestation by maize stem borer. Seven maize varieties *viz.*, C2P-132001, FH-948, MMRI-yellow, Pearl, Sadaf, Sahiwal-2002 and YH - 1899 were obtained from Maize and Millets Research Institute, Yousafwala, Sahiwal to check the relative resistance against maize stem borer. Research was done on experimental field area of University College of Agriculture and Environmental Sciences, the Islamia University of Bahawalpur following Randomized Complete Block Design with three replications. The total area selected for research was 35 x 70 ft^2. Maize was planted with row to row and plant to plant distance maintained as 75 cm and 23 cm respectively. After a few weeks of planting maize in the field, data regarding dead hearts, leaf holes, larval population and larval excreta was recorded on weekly basis. Results on these varieties for early infestation for these parameters revealed that variety C2P-13-2001 showed minimum dead hearts and was proved resistant while variety YH-1899 showed maximum dead hearts by borers. In case of damage in terms of leaf holes the variety YH - 1899 proved resistant compared to the Sadaf variety. FH-948 was more resistant than MMRI- yellow for the larval excreta. Larval population was more on YH-1899 and less on C2P-13 2001. Seasonal infestation results showed dead hearts were present more on date 25-05-2017 and less on 27-04-2017 and the larval excreta was found more on 27-04-2017 and less on 11-04-2017. These data are important for further screening of these varieties for management of maize stem borer.

Keywords: *Chilo partellus*, dead hearts, leaf holes, larval excreta, larvae, resistance

1. Introduction
Maize (*Zea mays*), a standout amongst the most critical grain yields, was grown on a territory of 1.334 million hectares with yearly yield of 6.13 million tons in Pakistan [1]. Being third driving main crop on the planet after wheat and rice in regard of region and creation, it is a multipurpose yield giving fuel and sustenance to individual, diet to creatures and poultry, and feed to domesticated animals. In spite of the fact that it can be developed effectively all through Pakistan, yet its development has been concentrated in the K.P.K. and Punjab. These territories contribute 98 % to the aggregate yield of the nation [2].

The misfortune caused by borers to maize plants in the field has been assessed to be high when no substance treatment is applied, yet such a misfortune differs with the force of attack. Control of the borers by traditional strategies depends on planting maize at the beginning of rain. Chosen chemical treatment at the fitting time reduces the adversity by around 20% [3].

Lepidopterous stem borers constitute one of the real constrains to grain production in southern Africa. *C. partellus*, is a financially constrains stem borer of maize and sorghum. The evaluation of product loss, clarification of mechanism of resistance, advancement of safe yield cultivar, practicality of natural control measures and the execution of other stem borer administration strategies are reported [4].

In Pakistan, per hectare yield of maize has not expanded regardless of the presentation of high yielding assortments, the significant snag in accomplishing this objective is the assault/pervasion by pests. The mainly pest stem borer of Maize and shoot fly (*Atherigona soccata*) the invasion of which eventually result in all out disappointment of fall and spring. The Maize and Millet Research Institute, Yusuf Wala, District Sahiwal, has a long history of maize production. Termites, maize stem borer and shoot fly have turned into a permanent nuisance at seedling and near harvesting time, rendering either early loss of plants and yield production at later stages.

Not with standing presentation of high yielding varieties the real obstruction in accomplishing this objective is the attack by destructive pests. When some note able insects of maize such as maize stem borer (*C. partellus*), shoot fly (*A. soccata*) armyworm (Mythimna) and numerous spp. of aphids, attack on the maize crop, The resulting in of destruct the totally yield of the crop when severe attack of maize stem borer and shoot fly occur on the crop [5]. In Pakistan to reduce the loss which occur due to the attack of stem borer of maize the use of biological control agents has been introduced by the many workers. For this control a parasite Apanteles flavipes (Cam.) (Hym.: Braconidae), which feed on larvae is most important source studied and released to minimise the population and attack of maize stem borer [6].

Owing to ill effects of chemicals on environment, insecticides resistance problem in insect pest and with increasing demand of use of resistant varieties in IPM, present research was designed to screen some popular varieties of maize namely, C2P-13-2001, FH-948, MMRI-yellow, Pearl, Sadaf, Sahiwal-2002, YH – 1899, against *C. partellus* at research area of Islamia University of Bahawalpur.

The study was designed to compare infestation of *C. partellus*

on seven maize varieties and observe seasonal population of *C. partellus* on these varieties.

2. Material and Methods

2.1 Test material

The trial was conducted at the experimental area of The Islamia University of Bahawalpur amid the March 2017.Seven varieties of maize viz., C2P-132001, FH-948, MMRI-yellow, Pearl, Sadaf, Sahiwal-2002, YH - 1899 were screened against maize stem borer. The plot size was 35x70 feet. Every assortment was repeated three time in basic Randomized Complete Block Design (RCBD). The distance between line to line and between plants was 75cm and 23cm respectively. The data was collected at weekly interval up to five times by collecting dead hearts, leaf holes, larval excreta and Larvae on randomly selected plants.

2.2 Land preparation

The land measuring about 35x70 feet was cleared and ploughed twice with a tractor. The land was levelled manually. Beds were prepared by ploughing and ranking. Total land was divided into 21 blocks each block of 225x225 cm size. And the path size between the replications was 5feet. Manual weeding control was done to avoid weeds.

2.3 Data Recording

Percentage infestation was recorded from 8 randomly selected plants from each block by using different visible symptoms of dead-hearts, leaf holes, larval excreta, and population of larvae in randomized selected plants.

2.4 Experimental details

- **Time of experiment:** March, 2017
- **Design:** RBCD (Randomized complete Block design)
- **Replication:** Three (3)
- **Varieties:** Seven (7)
- **Plot to Plot distance:** 75 cm
- **Total Experimental Area:** 35x70 feet …
- **Plant to Plant distance:** 23 cm
- **Row to Row Distance:** 75 cm

3. Results

The present research was done in the field area of University College of Agriculture and Environmental Sciences, The Islamia University of Bahawalpur. There was a non-significant difference in dead-hearts among seven maize varieties. However, we found the variety C2P-13-2001 as relatively more resistant (0.28±0.11 a) while variety YH-1899 as relatively more susceptible (0.48±0.23 a) as in table 1 P>0.05).

There was a non-significant difference in leaf holes among seven maize varieties.

However, we found the variety YH-1899 as relatively more resistant (4.15±1.00 a) while variety

Sadaf as relatively more susceptible (2.49±0.67 a) as in Table 2, P>0.05).

There was a non-significant difference in larval-excreta among seven maize varieties.

However, we found the variety FH-948 as relatively more resistant (0.40±0.17 a) while variety

MMRI-yellow as relatively more susceptible (0.66±0.25a) as in Table 3, P>0.05).

There was a non-significant difference in population of larvae among seven maize varieties. However, we found the variety C2P-13-2001 as relatively more resistant(0.36±0.18a) while variety YH-1899 as relatively more susceptible(0.59±0.28a) as in Table 4, P>0.05).

The date wise data collected on 27-05-2017, 04-06-2017, 11-06-2017, 18-06-2017 and 25-06-2017 of parameters including dead hearts, leaf holes, larval excreta and larval population is given below in this table 5.

Results on these varieties for early infestation for these parameters revealed that variety C2P-13-2001 showed minimum dead hearts and was proved resistant while variety YH-1899 showed maximum dead hearts by borers. In case of damage in terms of leaf holes the variety YH - 1899 proved resistant compared to the Sadaf variety. FH-948 was more resistant than MMRI- yellow for the larval excreta. Larval population was more on YH-1899 and less on C2P-13 2001. Seasonal infestation results showed dead hearts were present more on date 25-05-2017 and less on 27-04-2017 and the larval excreta was found more on 27-04-2017 and less on 11-04-2017. These data are important for further screening of these varieties for management of maize stem borer.

4. Discussion

As indicated by our outcome in term of leaf holes attack was recorded that YH-1899 is safer when contrasted with the Sadaf. The most extreme attack was seen in Sadaf. This work can be contrast to the work of [7]. He assessed 100 maize inbred and 35 crossovers to distinguish the morphological and profitability qualities that were influenced by *C. partellus*.

They revealed that the plant tallness, ear length and number of pervaded internodes were unfavourably plagued by *C. partellus* under extreme pervasion conditions. The inbred line 47-2, 1354-2, 332, 1384-8,326-3,536,193-1 and 1128 would do well to resistance under serious invasion 11 conditions and could be use for further rearing projects to create borer safe cultivars as compared to the our outcomes C2P-13-2001 is more safe against the attack of maize stem borer.

Twenty available genotypes of maize were screened for resistance to *C. partellus* in the field. The genotype Sahiwal 2002 was found to be most susceptible while DK-6525 was most resistant. Maximum infestation was observed at the end of April while the minimum in the last week of March [8].

While as compared to our outcomes Y.H- 1899 is more susceptible and C2P-13-2001 against the attack of Maize stem borer and Sahiwal-2002 showed normal resistance against the attack of Maize stem borer. According to our results the more attack was at the end of April and less attack was in the month of March.

From the present investigations of varietal resistance of six assortments viz. Agaiti-85, Akbar, Sahiwal 2002, EV-1098, Pak-afgoyee and EV-5089 were not essentially unique among themselves with respect to borer attack on various assortments. In any case, however non-fundamentally, Pak-afgoyee recorded most minimal borer attack and Agaiti-85 most astounding pervasion rate [9]. While by our out comes the borer attack was less on the variety C2P-13-2001 and more larval attack was on the Y-H 1899. And Sahiwal 2002 showed more resistance against the borer as compared to the Y-H 1899.

Table 1: Mean dead hearts (No.) formed by *C. partellus* on different maize varieties grown under Bahawalpur conditions during 2017

Varieties	N	Mean Dead hearts± S.E
C2P-13-2001	15	0.28±0.11 a
FH-948	15	0.31±0.14 a
MMRI-yellow	15	0.37±0.15 a
Pearl	15	0.39±0.17 a
Sadaf	15	0.41±0.19 a
Sahiwal- 2002	15	0.44±0.21 a
YH-1899	15	0.48±0.23 a
Total	105	0.38±0.06

Mean values sharing similar letterings are statistically non-significant at *alpha*=0.05

Table 2: Mean leaf holes (No.) formed by *C. partellus* on different maize varieties grown under Bahawalpur conditions during 2017

Varieties	N	Mean leaf holes± S.E
C2P-13-2001	15	3.15±0.82a
FH-948	15	3.38±0.76a
MMRI-yellow	15	4.00±0.86a
Pearl	15	3.09±0.67a
Sadaf	15	2.49±0.67a
Sahiwal- 2002	15	3.64±0.92a
YH-1899	15	4.15±1.00a
Total	105	3.41±0.31

Mean values sharing similar letterings are statistically non-significant at *alpha*=0.05

Table 3: Presence of excreta of *C. partellus* on different maize varieties grown under Bahawalpur conditions during 2017

Varieties	N	Mean plants with excreta± S.E
C2P-13-2001	15	0.40±0.15a
FH-948	15	0.40±0.17a
MMRI-yellow	15	0.66±0.25a
Pearl	15	0.49±0.20a
Sadaf	15	0.48±0.23a
Sahiwal- 2002	15	0.52±0.25a
YH-1899	15	0.55±0.26a
Total	105	0.50±0.08

Mean values sharing similar letterings are statistically non-significant at *alpha*=0.05

Table 4: Mean population of *C. partellus* on different maize varieties grown under Bahawalpur conditions during 2017

Varieties	N	Mean population± S.E
C2P-13-2001	15	0.36±0.18a
FH-948	15	0.41±0.19a
MMRI-yellow	15	0.45±0.21a
Pearl	15	0.49±0.23a
Sadaf	15	0.50±0.25a
Sahiwal- 2002	15	0.52±0.27a
YH-1899	15	0.59±0.28a
Total	105	0.47±0.09

Mean values sharing similar letterings are statistically non-significant at *alpha*=0.05

Table 5: Mean infestation of *C. partellus* on different maize varieties grown under Bahawalpur conditions during 2017

Date	Variety type	Dead heart	Leaf hole	Larval excreta	Larval Population
27.05.2017	Resistant	FH-948 (0 a±0)	YH-1899 (1.12±056)	Sahiwal-2002(0±0)	Shiwal-2002 (0±0)
	Susceptible	MMRI Yellow (0.083a±0.041)	C2P13-2001 (7.17±2.74)	Pearl (0.17±0.11)	Pearl (0.12±0.12)
04.06.2017	Resistant	FH-948 (0.04±0.04)	Sahiwal-2002 (4.54±1.76)	Sahiwal- 2002 (0.12±0)	Sahiwal-2002 (0.04±0.04)
	Susceptible	MMRI-Yellow (0.16±0.04)	YH-1899 (5.66±2.61)	MMRI-Yellow (0.17±0.03)	MMRI-Yellow (0.16±0.04)
11.06.2017	Resistant	Sahiwal-2002 (0±0)	Sadaf (0.20±0.20)	Sahiwal-2002(0±0)	Sahiwal-2002 (0±0)
	Susceptible	FH-948 (0.16±0.04)	YH-1899 (5.5±3.04)	FH-948 (0.12±0.07)	FH-948 (0.16±0.16)
18.06.2017	Resistant	FH-948 (0±0)	FH-948 (2.25±1.4)	Sadaf (0±0)	Sadaf (0±0)
	Susceptible	Pearl (0.13±0.0)	YH-1899 (4.83±3.15)	MMRI-Yellow (1.12±0.94)	YH-1899 (0.16±0.16)
25.06.2017	Resistant	C2P-13 2001(1.16±0)	FH-948 (1.5±0)	C2P13-2001 (1.5±0)	C2P13-2001 (1.66±0)
	Susceptible	YH-1899 (2.17±0.0)	Sahiwal-2002 (5.68±2.50)	Sahiwal-2002 (2.39±0.06)	YH-1899 (2.66±0)

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