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To screened out promising germplasm/varieties of maize against pink stem borer, *Sesamia inferens*

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Abstract
The screening of maize germplasm/varieties against maize pink stem borer, *Sesamia inferens*, was carried out during 2020-2021 in oil seed farm, Kalyanpur and insectary department of entomology, C. S. Azad University of Agriculture and Technology Kanpur, 208002. Geographical location of Kanpur district falls at 26.29° North longitude and 80.18 °C East longitude at an altitude of 125.9 m from the sea level. All the 36 germplasm/varieties were categorized into five different groups that Resistant, moderately resistant, moderately susceptible, susceptible, highly susceptible group. Azad PC-3 demonstrates higher resistance, while GP 20-1 exhibits greater susceptibility to the pink stem borer, *Sesamia inferens*.

Keywords: Germplasm, *Sesamia inferens*, seasonal abundance, Azad PC-3

Introduction
Maize (*Zea mays* L.), known as the highest yielding cereal crop globally, holds substantial significance for nations like India, facing challenges from a swiftly growing population that has exceeded available food resources. With its extensive genetic diversity, maize cultivation demonstrates adaptability across diverse agro-ecological zones. (Ferdu *et al*., 2002) [2] In India, maize is progressively becoming the third most crucial crop following rice and wheat. Its significance stems from its versatile applications, serving not only as human food and animal feed but also finding extensive utilization in industries such as corn starch, corn oil production, and as baby corn in various culinary recipes. (Singh, 2014) [3] Over sixty species of insects have been documented to infest maize crops at various stages of their growth. (Anon. 1998) [10].

Insect pests pose significant biotic constraints on maize productivity, thereby jeopardizing food security. Notably, the spotted stem borer (*Chilo partellus* Swinhoe) and pink stem borer (*Sesamia inferens* Walker) emerge as major threats during the kharif (rainy) and rabi (winter) seasons, respectively. These pests are responsible for substantial yield losses ranging from 25% to 40%. (Khan *et al*., 1997) [1]. The pink stem borer, scientifically known as *Sesamia inferens* (Walker), is identified as one of the primary borer pests commonly observed during the rabi season. (Jalali and Singh, 2002) [6]. Larvae are commonly discovered feeding on immature cobs, silks, and tassels, and severe infestations lead to stunted plant growth and the clustering of cobs and tassels in one location. (Reddy *et al*., 2003) [7] Insects pose a threat to maize crops throughout the entire cropping cycle and even during storage, potentially causing losses ranging from as little as 10% to complete devastation. (Bergvinson *et al*., 2002) [7].

In India, maize production faces significant challenges due to the infestation of two insect pests, namely the spotted stem borer (*Chilo partellus* Swinhoe) and the pink borer (*Sesamia inferens* Walker). While the spotted stem borer primarily affects the northern region during the rainy season, the pink borer inflicts extensive damage on crops across peninsular India throughout the year and across the country. (Santosh *et al*, 2012) [5] Among these, *Sesamia inferens* stands out as the primary insect pest of maize, especially during the Rabi season in India. The larvae of this pest feed on immature cobs, silks, and tassels, leading to severe infestations that result in stunted plant growth and the clustering of cobs and tassels in one location. These infestations cause significant yield losses ranging from 25.7% to 78.9%.

(Chatterjee *et al*., 1969) [8] The utilization of resistant or least susceptible genotypes presents an effective approach for greatly reducing such losses. Implementing host plant resistance strategies for managing insect pests proves to be environmentally safe, economically viable, and socially acceptable. (Mugo *et al*., 2002) [9].

Materials and Methods

The various maize germplasm/varieties were obtained from the Department of Genetics and plant breeding of the university. These germplasm are used for screening against the major insect-pest of maize crop. (Table 1).

Table 1: List of maize germplasm/varieties:

S. No.	Genotypes	S. No.	Genotypes
G1	Azad Kamal Blanded	G10	Azad PC - 3
G2	Azad Kanti'	G11	Azad Baby 7
G3	REHBC 1413-2	G12	Azad Baby 3
G4	Azad Baby 2	G13	Azad Baby 4
G5	Azad BC-5	G14	Azad Baby
G6	Azad Rosting	G15	Azad K-PC
G7	Azad Single	G16	Azad BC-12
G8	Azad PC-20	G17	Azad –PC-9
G9	Azad BC-14	G18	Azad Bunchy
G19	Azad Baby 6	G28	TSK 19
G20	Azad PC- 4	G29	TSK 24
G21	DKC 9108+	G30	HPC 3
G22	TMMH 804	G31	HPC 5
G23	KD 1 BOLD	G32	KD 7
G24	KD 5	G33	D 7
G25	Local 3- 20	G34	GP 20 -1
G26	Local 2-20	G35	Popcorn 7052-1
G27	HPC 2	G36	GP 20-2

Detail of experiment

The studies on seasonal abundance of major insect pests in different maize germplasm were carried out.

1. Length of single row- 4 m
2. Total area - 23 m×20 m (L × W)
3. Each germplasm have - 5 rows of plants
4. Pant geometry - 60 cm×20 cm(R×P)
5. Field boarder - 1 m.
6. Season - Rabi, 2020-2021
7. No. of varieties/germplasm - 36
8. Design - Augmented design
9. Date of sowing - 27 Nov. 2020

Observations: The plant were randomly selected as required in each plot and tagged for the observations of pink stem borer

Pink stem borer (*Sesamia inferens*)

Observation on pink stem borer was recorded at 15 days intervals on five randomly selected plants, started from sowing to harvesting of the crop.

Observation was taken as-

Leaf injury rating scale (1 to 9): (by Reddy *et al*. 2003) [11]

In order to study, the leaf injury rating the number of pin holes on leaves were recorded on randomly five selected plants from each genotypes. The data related to leaf injury rating were grouped under following categories.

Table 2: Below parameters used for checking maize germplasm/varieties against pink stem borer, *Sesamia inferens*

Rating scale	Description	Category
1	1-5 pin holes/plant	Resistant
3	>5-10 pin holes/plant	Moderately resistant
5	>10-20 pin holes/plant	Moderately susceptible
7	>20-30 pin holes/plant	Susceptible
9	>30 pin holes/plant	Highly susceptible

(Reddy *et al*., 2003) [7]

Assessment of percent grain yield loss due to attack of insect pest in maize

Oil seed farm, Kalnyanpur farm was considered as a potential spot to this study where the winter maize is highly infested every year by maize pest. Study was conducted during the winter of 2020 and 2021.

Yield loss was estimated by obtaining the yield difference between the reported yield and obtained yield from maize plants. No insecticide was applied in the maize plants. Every plot was of 2 rows of 4 m length with plant to plant spacing of 2o cm and row to row spacing of 60 cm. Grain yield and 1000 grain weight were taken when the moisture level in the grains was below 14% after sun drying.

$$\text{Percent yield loss} = \frac{\text{Yield obtained after infestation from germplasm}}{\text{Reported yield of varieties/germplasm}} \times 100$$

Experimental findings

Screening of maize germplasm/against pink stem borer, *Sesamia inferens*

All the 36 germplasm/varieties were categorized into five different groups. The results obtained based on percent loss/infestation of the borer are presented in Table-3.

For the study resistance/susceptibility of maize germplasm/varieties was done on the given parameters which is shown in to the Table-2 and are given below table shown the observations taken during the experiment

conducted in *Rabi season*. Table-3 is showed the observation that is taken during the observation after the germination of the crop at 15 days interval.

Table 3: Data taken for maize pink stem borer during the experiment

Germplasm/varieties	Vegetative stage	Cob formation stage	Maturity stage	Mean
Azad Kamal Blanded	2.3	2.5	2.4	2.4
Azad Kanti	4.7	4.51	5.49	4.9
Azad BC-5	3.6	3.2	3.4	3.4
Azad PC-3	1.7	1.5	1.6	1.6
Azad BC 14	8.8	8.11	9.79	8.9
Azad Baby 6	8.5	10.9	10.6	10.0
Azad PC -20	6.9	6.4	6.5	6.6
Azad PC-4	9.4	9.8	9.3	9.5
Azad Baby 7	7.6	7.8	6.8	7.4
Azad Baby 3	9.4	9.8	9.6	9.6
Azad Baby 4	6.9	6.5	7.0	6.8
Azad Baby	8.2	7.6	7.9	7.9
AzadK-PC	5.7	5.5	5.6	5.6
Azad BC-12	8.23	8.25	8.15	8.21
Azad – PC-9	9.5	9.8	8.9	9.4
Azad Baby 2	11.1	11.8	11.9	11.6
Azad Rosting	13.25	14.10	13.15	13.5
Azad single	14.4	15.10	15.20	14.9
Azad bunchy	17.23	16.80	17.27	17.1
REHBC 1413-2	19.44	19.99	19.67	19.7
TSK 19	20.7	20.66	20.44	20.6
TSK 24	15.4	15.11	14.79	15.1
TMMHS 804	17.3	16.80	17.2	17.1
PoPCorn 7052-1	15.95	16.58	15.79	16.1
GP 20-2	15.26	14.78	14.72	14.9
DKC 9108	21.99	21.86	23.65	22.5
KD 5	25.84	26.44	27.22	26.5
Local 3-20	28.79	29.66	30.05	29.5
Local 2-20	24.12	25.33	24.35	24.6
D 7	25.94	26.44	27.12	26.7
KD7	28.85	29.75	29.89	29.5
HPC 2	31.55	32.90	33.35	32.6
HPC 3	38.44	38.9	38.46	38.6
HPC 5	35.14	35.82	35.24	35.4
KD 1bold	39.13	38.92	40.75	39.6
GP 20-1	58.36	59.4	58.94	58.9

Resistant

According to table-3, under resistant group of maize germplasm/varieties against the pink stem borer infestation varied from 1-5 pin holes/plant, four lines were grouped in this category. That resistant lines are shown in Table-4.

Table 4: Resistant line of maize germplasm/varieties against pink stem borer, *Sesamia inferens*

S. No.	Germplasm/varieties	pin holes/plant
1	Azad Kamal Blanded	2.4
2	Azad Kanti	4.9
3	Azad BC-5	3.4
4	Azad PC-3	1.6

Moderately resistant

According to table- 3, under moderately resistant group of maize germplasm/varieties against the pink stem borer infestation varied from >5-10 pin holes/plant, eleven lines were grouped in this category. The germplasm who are moderately resistant are shown in table- 5.

Table 5: Moderately Resistant line of maize germplasm/varieties against pink stem borer, *Sesamia inferens*

S. No.	Germplasm/varieties	No. of pin holes per plant
1	Azad BC 14	8.9
2	Azad Baby 6	10.0
3	Azad PC -20	6.6
4	Azad PC-4	9.5
5	Azad Baby 7	7.4
6	Azad Baby 3	9.6
7	Azad Baby 4	6.8
8	Azad Baby	7.9
9	AzadK-PC	5.6
10	Azad BC-12	8.21
11	Azad – PC-9	9.4

Moderately susceptible

According to table-3, under moderately susceptible group of maize germplasm/varieties against the pink stem borer infestation varied from >10-20 pin holes/plant, 10 lines were grouped in this category. These are shown into the Table- 6.

Table 6: Moderately susceptible line of maize germplasm/varieties against pink stem borer, *Sesamia inferens*

S. No.	Germplasm/varieties	No. of pin holes per plants
1	Azad Baby 2	11.6
2	Azad Rosting	13.5
3	Azad single	14.9
4	Azad bunchy	17.1
5	REHBC 1413-2	19.7
6	TSK 19	19.8
7	TSK 24	15.1
8	TMMHS 804	17.1
9	Popcorn 7052-1	16.1
10	GP 20-2	14.9

Susceptible

According to the table- 3, out of 36 strains the following six were found susceptible against pink stem borer on maize crops. The germplasm categorized by the >20-30 pin holes per plant. These are shown into the table- 7.

Table 7: Susceptible line of maize germplasm/varieties against pink stem borer, *Sesamia inferens*

S. No.	Germplasm/varieties	No. of pin holes per plant
1	DKC 9108	22.5
2	KD 5	26.5
3	Local 3-20	29.5
4	Local 2-20	24.6
5	D 7	26.7
6	KD7	29.5

Highly susceptible

According to the table, out of 36 germplasm/varieties are five found highly susceptible, and that is determined by the using parameter that is >30 pin holes per plant. These germplasm are shown in the table- 8.

Table 8: Highly Susceptible line of maize germplasm/varieties against pink stem borer, *Sesamia inferens*

S. No.	Germplasm/varieties	No. of pin holes per plant
1	HPC 2	32.6
2	HPC 3	38.6
3	HPC 5	35.4
4	KD 1bold	39.6
5	GP 20-1	58.9

Conclusion

In conclusion, this research has investigated Through we have found Our analysis has revealed that Azad PC-3 demonstrates higher resistance, while GP 20-1 exhibits greater susceptibility to the pink stem borer, *Sesamia inferens.*

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