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Effect of resistant and susceptible maize genotype on the growth and development of pink stem borer, *Sesamia inferens*

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Abstract
The laboratory studies on the effect of resistant and susceptible maize genotype on the growth and development of *Sesamia inferens* was studied in poly house, Agriculture college campus, IGKV, Raipur (C.G.) on HQPM-1 (resistant hybrid) and Sugar-75 (susceptible hybrid). The percentage pupation, moth emergence and viability of eggs parameters were more in Sugar-75 and as compared to HQPM-1. The period of development from larva to adult emergence was prolonged in case of resistant genotype HQPM-1 i.e. 35.84 days. The growth index was higher on susceptible genotype Sugar-75 which recorded 1.68, whereas the growth index was 1.48 in the resistant genotype HQPM-1. When the larvae reared on susceptible genotype Sugar-75 the developmental period was recorded 34.90 days. The results appear that resistant genotypes might have certain growth inhibiting factors, which retarded the development of *S. inferens* larvae.

Keywords: Poly house, resistant, *S. inferens*, susceptible

Introduction
Maize (*Zea mays* L.), a major cereal crop belonging to the family Poaceae, originated from South America, from where it was taken to all parts of the world [5, 6]. Development of new agricultural technology helped in the expansion of maize cultivation throughout the year in different parts of the country [11]. At the same time it led to the appearance of new array of constrains in maize cultivation including the attack of insect pests which were not problematic earlier [8]. One such Lepidopteran pest is the Pink stem borer, *Sesamia inferens* Walker (Family: Noctuidae) which was earlier restricted to winter maize in peninsular India [14].
The pink borer, *Sesamia inferens* (Walker), is an important pest of graminaceous crops. It is widely distributed in India, Ceylon, Pakistan, Myanmar, Thailand, Vietnam, Indonesia, Philippines, Taiwan, China and Japan [9].
The typical symptoms of pink borer damage on maize are oblong holes in unfolded leaves, drying of central shoots and dead heart in young plants. It bores into the plant and makes tunnels filled with excreta in the stem with exit holes at the surface leading to breakage of stem. Larvae also feed on immature cobs, silks and tassel, while severe infestation results in stunted growth and appearance of cob and tassel at one place [12]. The total life cycle of *S. inferens* varied under different environmental conditions, food etc. Duration of the life-cycle averaged 45.6 days in summer and 71.1 days in winter in ragi [7].For effective control of an insect pest, knowledge of its life history, and biology on different genotypes are critical for the safe as well as cost effective management [13].

Materials and methods
The development of *S. inferens* was studied on two maize genotypes, *viz*., Sugar -75 (susceptible) and HQPM-1(resistant) under poly house conditions. The freshly hatched larvae obtained from the nucleus culture of *S. inferens* were transferred on to the cut pieces of succulent small maize stem of two maize genotypes and kept separately in 15 glass jars (10 x 15 cm) for replication.
There were 15 larvae in each glass jar as replicate and 15 such replications were maintained for each genotype. The top of each jar was covered with muslin cloth secured with rubber band. For every second or third day the jar were opened and larvae were counted which were subsequently transferred to clean jar containing fresh food till all the larvae pupated.

The pupae thus collected from each jar were kept separately for the emergence of moth. Emerged moths were released in glass jar containing maize leaf sheath. The number of eggs laid was recorded.

The development of *S. inferens* on two maize hybrids was studied under many biological parameters like larval period, percentage pupation, pupal weight, pupal period, growth index value, percentage moth emergence, average development period from larva to adult, average number of eggs laid by per female and percent viability of eggs.

Larval period

Duration of larval period was recorded in terms of number of days taken from release of the larvae to pupal formation. Further, the average larval period for all collected pupae on two hybrids was calculated.

Percentage pupation and pupal period

The number of pupae collected from each jar were counted and calculated the percentage pupation. Duration of the pupal period was recorded in terms of number of days from the formation of pupa till the day of adult emergence.

Pupal weight

Male and female pupae were separated and the average weight for each hybrid was determined by digital balance.

Average development period from larva to adult

The average larval period was added to the average pupal period to find out the total development period from larva to adult.

Percentage of moth emergence

The number of moth obtained from each group was used to calculate the percentage of moth emergence from initial number of pupae collected.

Average number of eggs laid by per female

To find out the average number of eggs laid per female, 10 pairs of moths from emerged adults on each hybrid were selected. Each pair of moth was transferred to an oviposition jar and left for four days and egg masses were collected from leaf sheaths were counted and the average number of eggs in each mass was calculated.

Percentage viability of eggs

Collected eggs from each jar were kept in petri plates in poly house condition ($25 \pm 2\ ^0C$) for the period of one week and the numer of larvae hatched out were recorded to calculate the viability of eggs for each group.

Statistical analysis

The growth index value was calculated by dividing the percentage of the larva becoming pupae (n) with the average larval period (p) (Singh and Marwaha, 1996) [16].

$$\text{Growth index (Per cent/day)} = \frac{\text{Percentage of the larva becoming pupae (n)}}{\text{Average larval period (p)}}$$

The data obtained were analyzed statistically in various biological parameters by t-test (paired two samples for means).

Results and Discussion

The growth and development of different stages of pink stem borer, *S. inferens* as influenced by the varied host availability in the surrounding was studied by rearing the borer on to the resistant (HQPM-1) and susceptible (Sugar-75) maize hybrid genotypes.

Larval duration

Larval duration of *Sesamia inferens* was relatively longer i.e., 26.69 days in resistant genotype HQPM-1 as compare to 25.92 days in susceptible genotype Sugar-75. (Table 1and Fig.1).

Pupal period

In general, duration of pupal stage was longer in pupae obtained from the larvae reared on the resistant genotype HQPM-1 as compare to susceptible genotype Sugar-75.Pupal duration of *S. inferens* was 9.15 and 8.98 days in resistant genotype and susceptible genotype respectively. (Table 1and Fig.1).

Percent pupation

The percentages of pupation were slightly higher in susceptible genotype Sugar-75 with 43.66 percent and the percentage of pupation is less in resistant genotype HQPM-1 with 39.66 percent pupation (Table 1and Fig.1).

Growth index

The growth index was higher on susceptible genotype Sugar-75 which recorded 1.68, whereas the growth index was 1.48 in the resistant genotype HQPM-1 (Table 1and Fig.1).

Pupal weight

The resistant maize genotype affected the weight of the male and female pupae of the pink stem borer. The weight of male pupa obtained from resistant genotype HQPM-1 was 6.49 mg and weight of female pupa was 7.41 mg and on susceptible genotype Sugar-75 the weight of the male and female pupae was 8.98 mg and 10.52 mg respectively (Table 1and Fig.1).

Moth emerged

Moth emergence as evidenced from the larval development to adult when fed with stems of resistant genotype HQPM-1 was less i.e. 94.66 percent and was relatively more in susceptible genotype Sugar-75 i.e. 97.33 percent relatively more in susceptible genotype Sugar-75 i.e. 97.33 percent (Table 1and Fig.1).

Fecundity

The resistant genotype significantly affected the fecundity of *Sesamia inferens*. Eggs found on resistant genotype HQPM-1 was 175.66 eggs/female as against 204.93 eggs/female on susceptible genotype Sugar-75 ((Table 1and Fig.1).

Viability of eggs

The resistant variety also affected the viability of eggs. Viability of eggs laid by moths obtained from resistant genotype HQPM-1 was 62.00 percent and 75.46 percent in case of susceptible genotype Sugar-75 (Table 1and Fig.1).

Total developmental period

The period of development from larva to adult emergence was prolonged in case of resistant genotype HQPM-1 i.e. 35.84 days. When the larvae reared on susceptible genotype Sugar-

75 the developmental period was recorded 34.90 days. The results appear that resistant genotypes might have certain growth inhibiting factors, which retarded the development of *S.inferens* larvae.

The present findings are in conformity with those of Sharma and Chatterji (1971) [17] and Dubey and Sarup (1984) [4] who reported significantly shorter larval period of *Chilo partellus* on Basi local vis- a-vis Antigua Gr I. This findings are also supported by Panwar and Sarup (1980) [10] who recorded prolonged larval period of *Chilo partellus* on resistant maize varieties. Similarly, higher pupal weight of *Chilo partellus* on susceptible maize cultivar compared to resistant cultivar was reported by Ampofo and Kidavai (1987) [2]. Davis and Williams (1986) [3] also reported that the development of South Western corn borer *Diatraea gradiosella* was significantly slower on resistant maize hybrids as compared to susceptible hybrids. Earlier, Sekhon and Sajjan (1990) [15] reported that antibiosis in CM 500 to *Chilo partellus* was evident only 20 days after germination.

The present experiment also demonstrated that Sugar -75 were suitable for larval feeding and larval survival. In the present results growth index of pink stem borer was highest on susceptible hybrid Sugar 75 as compared to resistant hybrid HQPM-1.Similarly, low growth index of *Chilo Partellus* on Antigua Gr I was reported by Singh and Marwaha (1996) [16].

Recently, Abdalla *et al.* (2014) [1] studied growth and development of spotted stem borer, *Chilo partellus* and observed antibiosis in terms of low larval survival, long larval periods, reduced pupal mass and low growth index in three maize genotypes i.e., VIM 325, VIM 308 and VIM 322.

Table 1: Effect of resistant and susceptible maize genotype on growth and development of *S.inferens*

Growth parameters		HQPM-1	SUGAR-75	't' value
Larval period(days) (p)		26.69	25.92	3.41**
Pupation percentage (n)		39.66	43.66	1.62
Growth index(n/p)		1.48	1.68	
Pupal weight(mg)	Male	6.59	8.98	14.79**
	Female	7.41	10.52	11.45**
Pupal period		9.15	8.98	4.00**
Moth emerged (%)		94.66	97.33	1.46
Development from larvae to adult(days)		35.84	34.90	1.07
Number of eggs/female		175.66	204.93	7.14**
Viability of eggs (%)		62.00	75.46	5.41**

** Significant at 1% level

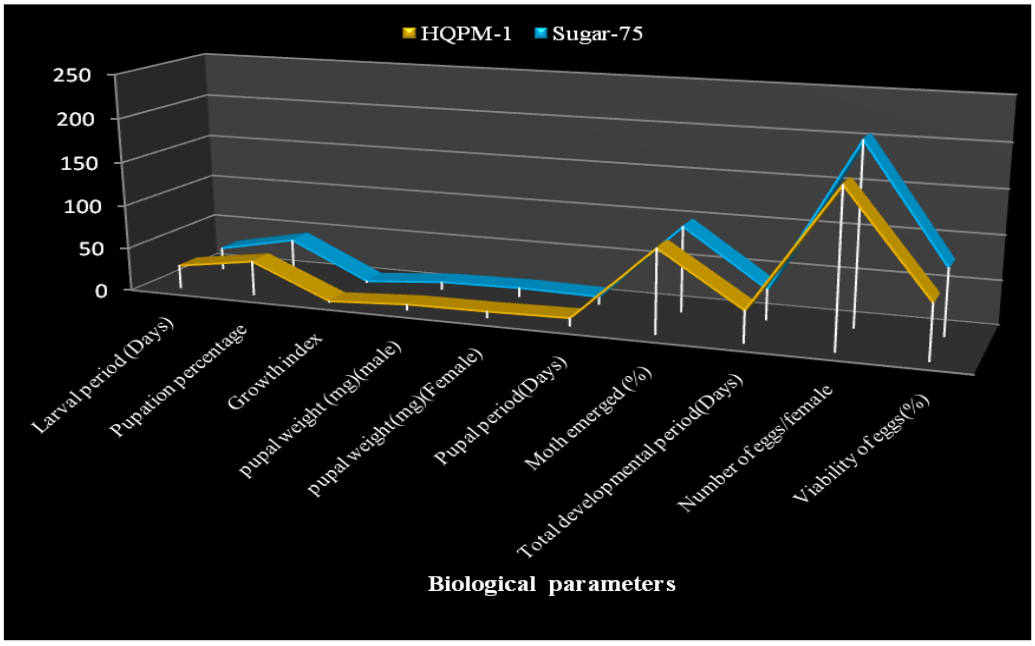

Fig 1: Effect of resistant /susceptible genotype on growth and development of *S. inferens*

Conclusion

The overall development of pink stem borer with resistant genotype was retrograde. Slower larval development on the resistant plants would prolong the exposure to predators and parasites which might reduce population of this pest.

References

1. Abdalla L, Abdalla M, Raguraman S. Screening maize genotypes for resistance to stem borers, *Chilo partellus* (Swinhoe) (Lepidoptera: Crambidae). Trends in Biosciences. 2014; 7(16):212-216.
2. Ampofo JKO, Kidiavai EL. *Chilo partellus* (Swinhoe) (Lepidoptera: Pyralidae) larval movement and growth on maize plants in relation to plant age, resistance and susceptibility. Journal of Applied Entomology. 1987; 103(5):483-488.
3. Davis FM, Williams WP. Survival, growth and development of South Western corn borer on resistant and susceptible maize hybrids. Journal of Economic Entomology. 1986; 79:847-851.
4. Dubey SL, Sarup P. Biological parameters related to antibiosis mechanism of resistance in maize varieties to

Chilo partellus (Swinhoe).Journal of Entomological Research. 1984; 8(2):140-147.
5. Galinath WC, Maize. Gift from America's First Peoples. Chiles to Chocolate. Food the Americans Gave the World. University of Arizona Press, Tucson, 1992.
6. Gonzalez RF. Zapotec Science: Farming and Food in the Northern Sierra Oaxaca. Univ. Texas Press, Austin, U.S.A, 2001
7. Krishnamurti B, Usman S. The ragi stem borer, *Sesamia inferens* Walker. *Bull* Department of Agriculture, Mysore Entomology Series. 1952; 15:70
8. Kumar P, Sekhar JC, Chaudhary R. Management of insect-pests of maize in tropics. In: Zaidi P H and Singh N N (eds) Stresses on Maize in Tropics. 2005, 298-323.
9. Mia AM, Iwahashi O. Seasonal changes in infestation level of sugarcane by the pink borer, *Sesamia inferens* (Lepidoptera: Noctuidae), in relation to a parasitoid, *Cotesia flavipes* (Hymenoptera: Braconidae), on Okinawa Island. Applied Entomology Zoological studies. 1999*;* 34:429-434.
10. Panwar VPS, Sarup P. Differential development of *Chilo partellus* (Swinhoe) in various maize varieties. Journal of Entomological Research. 1980; 4(1):28-33.
11. Panwar VPS, Sharma RK. Evaluation of maize germplasm for locating multiple resistance sources to *Chilo partellus* and *Atherigona* spp. Indian journal of Entomology. 1998; 60:171-76.
12. Reddy MLK, Babu TR, Venkatesh S. A new rating scale for *Sesamia inferens* (Walker) (Lepidoptera: Noctuidae) damage to maize. Insect Science Application. 2003; 23:293-99.
13. Sampson MA, Kumar R. Borer damage and estimation of loss caused by sugarcane stem borers in Southern Ghana. Insect Science and Its Applications. 1984; 16(6):705-710
14. Sekhar JC, Rakshit S, Kumar P, Mehrajuddin, Anuradha M, Dass S. Differential reaction of CIMMYT Maize Lines and their hybrid combinations to pink borer, *Sesamia inferens* Walker. Annals of plant protection science. 2008; 16:404-06.
15. Sekhon SS, Sajjan SS. Antibiosis in maize to maize stem borer, *Chilo partellus* (Swinhoe) in relation to plant age. Indian journal of Entomology. 1990; 52:579-582.
16. Sharma VK, Chatterji SM. Survival and development behaviour of *Chilo zonellus* (Swinhoe) on some selected germplasm of maize under laboratory conditions. Indian journal of Entomology. 1971; 36(4):384-395.
17. Singh JP, Marwaha KK. Growth and development of maize stalk borer *Chilo partellus* (Swinhoe) on different germplasm of maize. Indian journal of Entomology. 1996; 58(2):121-127.