

Research articles

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Behavioral assays of cotton leaf folder, *Sylepta derogata* (Fabricius) (Lepidoptera: Crambidae) on different host plants

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Introduction

The cotton leaf folder, *Sylepta derogata* (Fab.) (Pyralidae: Lepidoptera) mainly distributed in Africa, Australia, Burma, Sri Lanka, Japan, Java, China and India as a minor pest (Mariselvi and Manimegalai, 2016) on different crops like cotton, bhendi, *A. indicum* and other malvaceous plants (Zhou *et al.*, 1975 and, Sidhum and Dhawan, 1979). The egg period varies from 2-6 days and a gravid female lays 200-300 eggs on the ventral surface of the leaves. The larval period ranges from 15-35 days and the larvae are glistening green in color with a dark head. The pupation period is 6-12 days and takes place within the roll or ground or fallen leaf. The adult is medium sized cream-colored moth with wavy markings (Kedar *et al.*, 2014). The young larvae feed on epidermis on the under-surface for two days, later rolls the leaf in the form of trumpets and remains inside (Dhindsa *et al.*, 1980). More than one larva can be seen inside the roll. It is fastened by silken threads in marginal portions. In severe cases, leaves may be rolled or complete defoliation of the plants may occur. (Kedar *et al.*, 2014). It is a sporadic pest in India (Sohi, 1964) on cotton but after

the introduction of *Bt*-cotton its incidences on cotton has decreased. However, it has been still attacking non-*Bt* cotton, okra and other malvaceous crops. Hence to know the ovipositional and larval preferences on different hosts this study was taken up as an objective for understanding the olfactory and ovipositional response of cotton leaf folder to volatiles from different host.

Methodology

To know the ovipositional and larval preferences of *S. derogata* on different hosts this study was conducted at Dharwad (15.4889° N, 74.9813° E) by using different malvaceous plants *viz.*, *A. indicum*, non *Bt*-Cotton, *Bt*-Cotton, okra, hibiscus and wild bendi as different treatments (Table 1).

Table 1: Cotton leaf folder behavioral assay treatment details

Treatments	Hosts
T1	<i>A. indicum</i>
T2	Non <i>Bt</i> -Cotton
T3	<i>Bt</i> -Cotton
T4	Okra
T5	Hibiscus
T6	Wild Bendhi

To study olfactory response of cotton leaf folder to volatiles from different hosts

The eggs of cotton leaf folder were collected from the field and allowed to hatch in the laboratory. An experimental setup was made in such a way that a box was fitted at center with an air tight connection with the different small boxes where we kept different host plants (Fig 1). Then the neonates (young larvae immediately after hatching from the eggs) were individually released into the central box and the observations were recorded as to which host they move towards and which one they feed on. We released twenty larvae for each replication, and each was replicated four times.

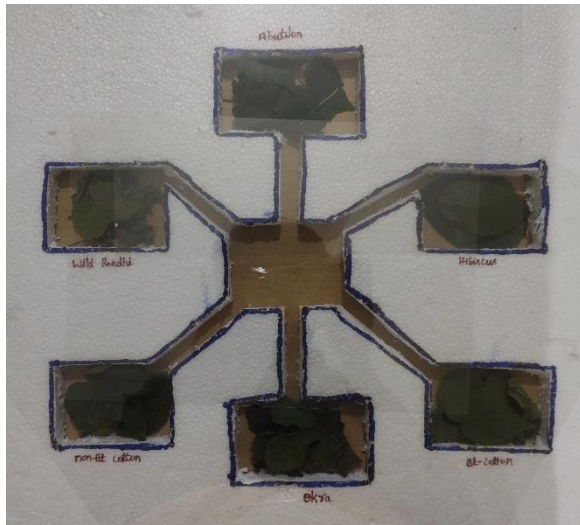


Fig. 1: Experimental setup to know the olfactory response of cotton leaf folder larvae on different host

To study ovipositional choice in cotton leaf folder to volatiles from different host

To study the ovipositional choice test mated female adults were released inside the

cage containing all the different hosts (Fig 2). Then the observations were recorded on which host the highest number of eggs were laid. This was replicated four times.



Fig. 2: Experimental setup to know the ovipositional response of cotton leaf folder on different host

Results

Olfactory and ovipositional response of cotton leaf folder neonate and adult to volatiles from different host

The replication data obtained in the experiment under current investigation for various parameters such as larval and ovipositional response were subjected to ANOVA for a completely randomized design in R software (R Core Team, 2016). The cotton leaf folder neonate showed more olfactory response towards the *A. indicum* with an average of 7.5 larvae (Table 2), followed by the treatment T2 containing non *Bt* cotton with an average of 4.25 larvae, which was statistically on par with the treatment T3 containing *Bt* cotton with an average of 4.0

larvae. However, an average of 2.25 and 2.00 larvae moved towards the Okra (T4) and Hibiscus (T5) respectively. Whereas, no larvae showed response towards the wild bendhi leaves. This might be due to the volatiles

released from the host leaves does not have any effect on the olfactory response of the cotton leaf folder neonate or the host might not contain volatile stimulants.

Table 2. Olfactory and ovipositional response of cotton leaf folder neonate and adult to volatiles from different host

Treatments	Hosts	Larval response (Number)	Ovipositional response (Number of eggs laid)
T1	<i>A. indicum</i>	7.50 ^a	55.50 ^a
T2	Non <i>Bt</i> -cotton	4.25 ^b	32.25 ^b
T3	<i>Bt</i> -cotton	4.00 ^b	31.75 ^b
T4	Okra	2.25 ^c	17.50 ^c
T5	Hibiscus	2.00 ^c	16.75 ^c
T6	Wild bendi	0.00 ^d	8.25 ^d
S. Em (±)		0.312	0.706
CD @ 1 %		1.369	2.873

The gravid cotton leaf folder moth showed more ovipositional response by laying more eggs on *A. indicum* with an average of 55.5 eggs, followed by the treatment T2 containing non *Bt* cotton with an average of 32.25 eggs, which was statistically on par with the treatment, T3 containing *Bt* cotton with an average of 31.75 eggs (Table 2). However, an average of 17.50 and 16.75 eggs laid on okra (T4) and hibiscus (T5), respectively. The lowest number of eggs (8.25) was laid on the wild bendi leaves. This might be due to the volatiles released from the host leaves that do not have any effect on the ovipositional response of the cotton leaf folder adult female or the host might not contain volatile chemicals for stimulating the oviposition.

Discussion

The cotton leaf folder larva showed high olfactory response towards the *A. indicum* leaves. Similarly, the adult female laid more eggs on it. Our experiment results are in accordance with the findings of Wenbin *et al.* (2020), as they recorded that *S. derogate* female adult showed strong responses to abutilon to lay eggs. Lin *et al.* (2015) documented that the female adults of *S. derogata* significantly laid more eggs on *A. theophrasti* (30.5 ± 3.2) than on cotton (7.8 ± 0.8) and leaf folder attracts more towards abutilon than cotton. This might be due to presence of the volatile chemicals like p-ethylacetophenone and 3-ethylheptane that are more attractive in function.

Conclusion

The behavioural assay of cotton leaf folder, *S. derogata* neonate showed positive olfactory response towards *A. indicum* followed by non *Bt*-cotton, *Bt*-cotton, okra and hibiscus as compared to wild bendi. Similarly, adult female laid more eggs on *A. indicum* followed by non *Bt*-cotton, *Bt*-cotton, okra and hibiscus as compared to wild bendi. Hence, *A. indicum* planted on bunds around the cotton or okra field for attracting cotton leaf folder acts as a cultural/ecological tool in managing the pest.

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