



Pod bug or Seed bug in Sesamum: *Elasmolomus sordidus*: biology and management

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Abstract

Sesame (*Sesamum indicum* L.; Family: Pedaliaceae) is also known as the queen of the oil seeds. Sesame seed bug/pod bug, *Elasmolomus sordidus* (Fabricius), is a Hemipteran species which belong to the order Heteroptera and family Lygaeidae. In Tamil Nadu it arises as a major problem in sesame growing areas. Seed bug caused losses in seed weight from 2 to 36%, reduction in oil content from 4 to 43%, increase in free fatty acids from 0.44 to 1.51% and increase in the shrivelled seeds to 40% in comparison with the control and also reported that insects reduce about 25% of the potential yield of sesame. Maximum temperature had negative influence on the bug incidence, the minimum temperature had a positive regression coefficient which predicted that every one degree of minimum temperature increases in the pest population to the tune of 1.704 insects. Mean egg incubation period was 5.4 ± 0.05 days while the total mean nymphal duration took 18.44 ± 0.10 . A mean adult lifespan of 20.24 ± 0.19 days was recorded. The mean lifespan from egg to adult death was 44.08 days, which range from 32-54 days. The reproductive period was 7.08 ± 0.26 days and the peak laying period was on the first and second day of its reproductive days. Even though *E. sordidus* was present the whole year high outbreak was recorded at harvest (October) and continued up to January, which afterward declined until the next harvest time it is found to be hiding in between the gaps of the arranged bag stacks in warehouses in the dark places of the warehouses while in the night time it flies and settles over the bag stacks and feeds on the seeds at storage. The weekly mean of *E. sordidus* adults trapped per UV light trap during the experimental period was 380.38 ± 15.13 . Application of insecticides such as malathion 50 % EC, endosulfan 35% EC, and carbaryl 85 % WP at the stalk, and around the soil of the sesame stalk three times a common practice in Ethiopia to manage this pest. Any dust applied at Threshing floor is common practice in Tamil Nadu. Extracts of neem and birbira seed powder, pyrethrum flower dust, and nimbecidine are effective in controlling sesame seed bugs in storage.

Keywords: Sesamum, pod bug, biology, management

Introduction

Sesame (*Sesamum indicum* L.; Family: Pedaliaceae) is also known as the queen of the oil seeds and is one of the oldest oil seed crops known to be domesticated over 3000 years ago (Myint *et al.*, 2020) [15]. Due to the presence of high oil content (44-60%), rich nutty flavour, stable and nutritious oil, resistance to oxidation and rancidity, it is a common ingredient in cuisines across the world (Yadav *et al.*, 2022, Pathak *et al.*, 2014) [19, 24]. In the world it is grown on an area of 7.73 million ha with the production of 6.11 million tonnes. Among all the sesame growing countries, India ranks first in world with 16.73 Lakh ha area and 6.5 Lakh tonnes production. As compared to other countries in the world the average yield of sesame (391 kg/ha) in India is low. In Tamil Nadu, sesame (Gingelly) was cultivated in an area of 47,874 ha during 2022–23, with a production of 25,071 tonnes and a productivity of 524 kg ha⁻¹ (Department of Economics and Statistics, Government of Tamil Nadu, Statistical Hand Book of Tamil Nadu, 2022–23) [5]. Several insect pests have been reported to infest the sesame crop causing about 25-30 percent yield losses (Biswas *et al.*, 2001) [3]. Among various insect pests, *Acherontia styx*, *Antigastra catalaunalis*, *Cystopteris tenuis* and *Spilarctia oblique* were responsible for the low productivity of sesame (Nayar *et al.*, 1986) [16]. Sesame seed

bug, *Elasmolomus sordidus* (Fabricius), locally known as ‘Setayto’ is a Hemipteran species which belong to the order Heteroptera and family Lygaeidae (Schmeutterer, 1969). In Tamil Nadu it arises as a major problem in sesame growing areas.

Pod bug/ Seed Bug

E. sordidus is considered as one of the most important harvest and post-harvest insect pests at field and warehouses which causes both quality and quantity damage to sesame and groundnut (Biswas, 2001) [3] seed at the field as well as in warehouse conditions. A significant sesame weight loss, a maximum of 94.7%, during harvesting and threshing time was recorded in Ethiopia (Berhe *et al.*, 2008). Osman *et al.*, (2009) [17], also reported that sesame seed bug caused losses in seed weight from 2 to 36%, reduction in oil content from 4 to 43%, increase in free fatty acids from 0.44 to 1.51% and increase in the shriveled seeds to 40% in comparison with the control. Weiss (2000) [23] also reported that insects reduce about 25% of the potential yield of sesame in the world.

Damage due to Sesamum seed bug

Both the nymphs and adults suck the seed oil and its contents, causing qualitative and quantitative losses. In

Ethiopia, the pest caused 50 % to 100 % seed weight loss (Geremew *et al.*, 2012; Muez & Berhanu, 2016) ^[13] and also 11 % to 15.0 % oil content loss (Abdelmanan *et al.*, 2015) ^[1, 8] was observed with *Sesamum* pod bug infestation.

Seasonal Influence

The bug population was abundant and caused maximum damage during the month of October to November and August to September and absent during the month of January and February. The correlation analysis showed that only the minimum temperature and the R.H. were highly and positively correlated with the sesame pod bug incidence on sesame. The regression analysis indicated that while the maximum temperature had negative influence on the bug incidence, the minimum temperature had a positive regression coefficient which predicted that every one degree of minimum temperature increases in the pest population to the tune of 1.704 insects (Kaliyarasan and Palanisamy, 2004).

Biology

The result of this laboratory investigation indicated that the mean egg incubation period was 5.4 ± 0.05 days while the total mean nymphal duration took 18.44 ± 0.10 . A mean adult lifespan of 20.24 ± 0.19 days was recorded. The mean lifespan from egg to adult death was 44.08 days, which range from 32-54 days. The reproductive period was 7.08 ± 0.26 days and the peak laying period was on the first and second day of its reproductive days. Even though *E. sordidus* was present the whole year high outbreak was recorded at harvest (October) and continued up to January, which afterward declined until the next harvest time. Sesame seed bug is the major pest targeting sesame in both fields and storage facilities (Muez and Berhanu, 2016) ^[13]. This insect is understood within the area as “Stayto”, which suggests it consumes an infinite amount of sesame oil. It is a hemimetabolous insect pest (Selemun, 2011) ^[22], whose developmental stages have the following characteristics: Eggs’ color changes from yellow to pale yellow, pink, and eventually full red. Its period is $4.5 \text{ days} \pm 0.2 \text{ days}$ (Osman, 2009) ^[17] or $5.4 \text{ days} \pm 0.1 \text{ days}$ (Berhe *et al.*, 2017) ^[2]. Nymph color is light red, dark brown, and finally black (Berhe *et al.*, 2017) ^[2]. Nymphal periods are complete through six distinct instars. The time required to end all nymphal stages is $18.4 \text{ days} \pm 0.1 \text{ days}$ (Osman, 2009) ^[17]. Consistent with Berhe *et al.* (2017), the whole nymphal period is $18.4 \text{ days} \pm 0.1 \text{ days}$. Female adults have average fertility of 71.8 eggs, (8.4 ± 0.3) eggs per female per day. Adult longevity is $20.2 \text{ days} \pm 0.2 \text{ days}$. For adult females and males, their lifetime is taking $19.2 \text{ days} \pm 0.4 \text{ days}$ and $9.9 \text{ days} \pm 0.4 \text{ days}$, respectively. The reproductive period of female continues laying eggs regularly was 7.88 ± 0.26 days. The sex ratio of males and females is 1:1.2 and thus the oviposition period is $7.1 \text{ days} \pm 0.3$. The egg to the adult stage takes 32 days to 54 days (Berhe *et al.*, 2017) ^[2]. Developmental stage Duration (days) Egg 5 – 7 Nymphal stage (1-6 instars) 16 – 20 Adult longevity 13 – 27 Female reproductive period 7.88 ± 0.26 Total period (egg-adult) 32 – 54 The pest attacks a wide range of host plants (Palanisamy and Kalaiyarasan, 2002) ^[18]. Nature of the

damage Both the nymph and the adult infest sesame within the field during drying and in warehouses. The pest affects the nymph and adult life stages. The ideal climate for the survival of the sesame seed bugs is about 30°C , with cloudy weather conditions and moist soil. The degree of infestation and severity varies not only from one to another year but also between the seasons of the year (Berhe *et al.*, 2017) ^[2].

In storage

Sesame seed bug, *Elasmolomus sordidus* (F.) (Hemiptera: Lygaeidae) is now becoming a severe pest of sesame storage warehouses. In the day time, it is found to be hiding in between the gaps of the arranged bag stacks in warehouses in the dark places of the warehouses while in the night time it flies and settles over the bag stacks and feeds on the seeds. It is also found to fly over the bag stacks at the day time when the bag stacks are disturbed. During late evening hours, *E. sordidus* was found to be settling over the bag stacks and feeding on the seeds during the entire night time. *E. sordidus* was reported to be limiting sesame production in the field and invades the harvested heaps by feeding in large numbers and passes to the storage as a storage pest (Mohanasundaram *et al.*, 1980; Kalaiyarasan and Palanisamy, 2002 and Langham, 2019) ^[11, 12, 18]. During day time it hides at the base of the heap or in the soil near the base and comes out during evening time and starts feeding up until early morning and female bugs lay their egg in the sesame stacks or in the soil. (Schmutter, 1969; Dick, 1987 and Langham, 2019) ^[6, 11].

Damage caused at storage

Both the nymphs and adults cause quantitative and qualitative loss by sucking the seed content, which leads to shriveled sunken seeds, changes in the seed color, seed bitterness, loss in weight (13%), germination, oil content (50%), which affects the marketability of the seeds (Weiss, 2000; Geremew *et al.*, 2012; Elamin *et al.*, 2015; Kinati, 2017 and Langham, 2019) ^[7, 8, 10, 11, 23].

Biology

Sesame seed bug adults are sized from 7-9 mm length up to 3 mm wide, (Dick, 1987, Schumutterer, 1969) ^[6]. The head and eyes are dark brown to black with four jointed and cylindrical shape antennae. The egg of the bug is sausage shaped, changing its color from pale yellow to pink and red during the incubation period (Schumutterer, 1969). Its developmental period from egg to adult is 32.1 ± 0.52 days (Osman *et al.*, 2009 and Langham, 2019) ^[11, 17]. The mean fecundity period of mated female was 112.6 ± 5.65 eggs, and the male to female sex ratio was 1:1.2 (Osman *et al.*, 2009) ^[17]. It was very active during the night hours and was also reported that rainy season is more favorable for the multiplication of the pest than the dry season (Muralibaskaran *et al.*, 1998) ^[14]. Its infestation is high during the months of October to November and August to September (Kalaiyarasan and Palanisamy, 2004) ^[9]. Pesticide spray was not effective as the reinfestation of the pest starts after few days (Muez and Berhanu, 2016 and Langham, 2019) ^[11, 13]. It was reported as a significant

problematic pest in India, Ethiopia, Sudan, Malawi, Uganda and as a minor pest in Bangladesh (Langham, 2019, Teklewold *et al.*, 2011)^[21]. Besides sesame, *E. sordidus* was also reported to infest groundnut after harvest (Weiss, 2000 and Langham, 2019)^[11, 23].

The adults and the nymphs were found in the sesame stacks, the stores and outside under the shades of coarse grass. The bugs move outside their shelters for feeding just before sunset to just after sun-rise and scatter in a wide area around their original shelters (Schumutterer, 1969). The adult bugs are attracted by large dark objects like sesame stacks in the field. During the day, when the temperature is hot, the bugs stay on the base of the stakes or inside the stores to keep themselves away from the heat. As stacks dry out or threshed, migration of the pests is observed from one stack to another (Selemun, 2011)^[22].

Management of sesamum seed bug

Management strategies for many years different management practices have been done to alleviate the crop from infestation. Culturally, the pests are often managed by stalk removal after harvest, ploughing, or alternate host destruction around fields. Other management is to harvest early when pods/stems are yellow and thresh/shake as early as possible when pods open fully (Geremew *et al.*, 2012)^[8]. Ants of varied species, spiders, wasps, egg parasite *Grionini* sp., and lizards' predators for seed bug nymphs. Extracts of neem and birbira seed powder, pyrethrum flower dust, and nimbicidine are effective in controlling sesame seed bugs in storage (Palanisamy & Kalaiyaran, 2002; Selemun, 2011)^[22]. Application of insecticides such as malathion 50 % EC, endosulfan 35% EC, and carbaryl 85 % WP at the stalk, and around the soil of the sesame stalk three times a common practice. But, this method is ineffective due to re-infestation of the pest within a few days after the pesticide application (Muez & Berhanu, 2016)^[13]. However, integrating the use of cultural and chemical control methods is effective in controlling the pest (Geremew *et al.*, 2012)^[8]. Dusting of insecticide in and around storage godown, threshing floor and sesame heaps to kill the marching population. Dust the sesamum stored in the gunny bags with malathion 4D. Application of neem seed powder, pyrethrum flower dust gives protection to seeds from seed bug and burning of sesame stalks after threshing.

Management through UV Light trap

Studies were conducted for 8 weeks in a private sesame warehouse in Virudhunagar district of Tamil Nadu, India, to find out whether TNAU- UV light trap attracts *E. sordidus* during night hours. The studies showed that TNAU - UV light trap was found effective for mass trapping adults of *E. sordidus*. The weekly mean of *E. sordidus* adults trapped per UV light trap during the experimental period was 380.38 ± 15.13 (Brindha *et al.*, 2020)^[4].

Conclusion

In Tamil Nadu pod bug *Elasmolomus sordidus* arises as a major problem in sesamum growing areas. Seed bug caused losses in seed weight from 2 to 36%, reduction in oil content from 4 to 43%, increase in free fatty acids from 0.44 to 1.51% and increase in the shriveled seeds to 40% in comparison with the control and also reported that insects reduce about 25% of the potential yield of sesame in the world. maximum temperature had negative influence on the bug incidence, the minimum temperature had a positive regression coefficient which predicted that every one degree of minimum temperature increases in the pest population to the tune of 1.704 insects. mean egg incubation period was 5.4 ± 0.05 days while the total mean nymphal duration took 18.44 ± 0.10 . A mean adult lifespan of 20.24 ± 0.19 days was recorded. The mean lifespan from egg to adult death was 44.08 days, which range from 32-54 days. The reproductive period was 7.08 ± 0.26 days and the peak laying period was on the first and second day of its reproductive days. Even though *E. sordidus* was present the whole year high outbreak was recorded at harvest (October) and continued up to January, which afterward declined until the next harvest time it is found to be hiding in between the gaps of the arranged bag stacks in warehouses in the dark places of the warehouses while in the night time it flies and settles over the bag stacks and feeds on the seeds at storage. The weekly mean of *E. sordidus* adults trapped per UV light trap during the experimental period was 380.38 ± 15.13 . Application of insecticides such as malathion 50 % EC, endosulfan 35% EC, and carbaryl 85 % WP at the stalk, and around the soil of the sesame stalk three times a common practice in Ethiopia. Any dust applied at Threshing floor is common practice in Tamil Nadu. Extracts of neem and birbira seed powder, pyrethrum flower dust, and nimbicidine are effective in controlling sesame seed bugs in storage.



Pod bug in harvesting and threshing areas



Pod bug infestation in field



Pod bug in stalks of sesamum



Adult pod bug stuck in Yellow Sticky Trap

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