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Cotton Stem Weevil: A Significant Pest in Bhadradri Kothagudem District of Telangana

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Abstract

Cotton is damaged by over 200 species of insect pests from sowing to harvest. Among them, stem weevil has been reported as an important pest. Earlier, it is not a serious menace in regular season crop and only less than 10% mortality of plants is encountered. In the recent years, farmers tend to raise cotton during the off-season. Under such conditions, more than 60% mortality of cotton plants is observed and is becoming a serious botheration to cotton growers. Recently its outbreak has been reported from Bhadradri Kothagudem district of Telangana. The information about the pest is very scanty. In this connection, this paper was written describing about the pest origin, systematic position, bionomics, life history, nature and symptoms of damage, ecology and seasonal occurrence and integrated pest management practices.

Introduction

Cotton is described as "King of Fibres". In India, cotton is damaged by over 200 species of insect pests from sowing to harvest, of which ten are economically important. Among them, Cotton stem weevil *Pempherulus affinis* (Faust) (Curculionidae: Coleoptera), has been reported as an important pest in Telangana, Tamil Nadu, Andhra Pradesh, Karnataka, Bihar, Kerala, Orissa, Rajasthan, Uttar Pradesh, Gujarat and Assam, next to bollworms. Other than India, this pest was recorded in Thailand and Philippines.

Stem weevil, is not a serious menace in regular season crop and only less than 10% mortality of plants is encountered. In the recent years, farmers tend to raise cotton during the off-season *i.e.,* during winter season in summer irrigated cotton tract. Similarly, farmers of winter cotton tract opt for an additional summer crop. Under such conditions, mortality of cotton plants due to stem weevil is more than 60% and becoming serious botheration to cotton growers. Moreover, in the off season management tactics also miserably fail, as they could not be carried out in time due to prevailing unfriendly weather conditions. Those, who raise cotton as winter rain fed crop, allow the crop in summer also, to reap an additional yield from the summer flush. Such continuous availability of cotton, throughout the year, favors this pest to scourge the cotton crop severely in the off-season. Already, it has been recorded that cotton is the most preferred plant that supports to complete its life cycle apart from *Triumfetta rhomboidea,* a wild Tiliaceous plant. This seriousness of the habit of cotton growers to rise an off-season crop has been realized from the beginning of 20th century itself.

In addition to that, due to the cultivation of high yielding varieties in cotton growing tracts of Tamil Nadu, extensive outbreak of stem weevil was reported in many places. Recently its outbreak has been reported from Bhadradri Kothagudem

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district of Telangana, as there was more than 62% of the forest area in the district. The cotton crop grown in and around forest area is highly infested by stem weevil.

Bionomics

Adult: Very small weevil measuring 1/8"; dark brown in colour with two small white patches on the elytra. It lays globular or oval shaped eggs singly in the cavities scrapped out by the weevil at the nodal region of the plants (Figure 1). A female weevil lays an average of 50 eggs with a maximum of 121 eggs. The egg period is 6-10 days.

Grub: white, apodous. The grub feeds on stem tissues internally (Figure 2). The larval period lasts 35-57 days. It pupates in pupal chamber. The adult may live for 25 - 30 days.

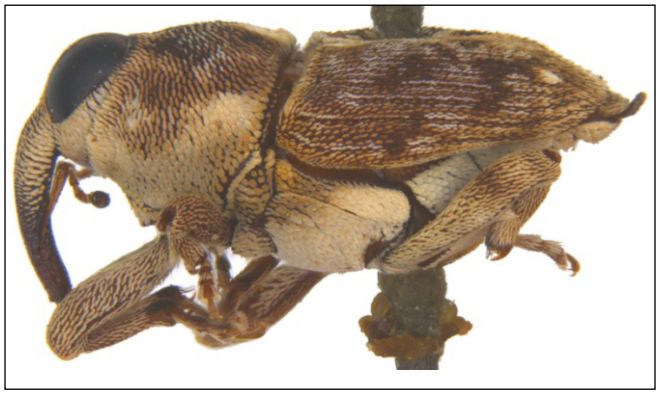

Figure 1: Adult stem weevil

Figure 2: White, apodous grub

Life History

Adults generally feed on the bark of the plant and survives for 36 days and this would help to tide over the off season period. Copulation commences immediately after the adult emergence in frequent intervals. Mating activity is at its maximum during mid day under bright sunshine. Pre-oviposition period under normal temperature ranges from 0.3 to 1.12 days. The egg is 0.40 mm in length and 0.29 mm in width with smooth and uniform structure without external sculpturing. Female lays a maximum of 121 eggs with an average of 50 eggs per female. Grub emerges in a period of 6-9 days. Grubs are creamy white, slightly curved with a distinct head and apodous.

Larval period ranges from 35-57 days. Pupation occurs in a specially made pupal chamber, which is formed by active feeding of grubs. Pupa is white and turns brown as adult is ready for emergence. Adult emerges from pupa in 9-12 days. During emergence, thelytoky is common and the proportion of female weevils outnumbers the males.

Nature and Extent of Damage

Infestation of the weevil occurs in 12-15 days old seedlings. During the early days of the crop, the mortality rate of the plant reaches up to 90%. Grub cuts through the medullary rays, tunnels round the stem along the cambium (Thirumurthi *et al.,* 1974). This causes spiral galleries which damage the vascular tissues, disrupting transport of plant nutrients. Mature plants survive by developing a woody shoot axis gall at the collar region of the plant. Galls are the weak points of the plant which are regular, localized, globular, oval (or) fusiform and extensively nodded. Infested plant gets killed in course of time either due to block of plant nutrients, break down at galled regions due to strong winds, intercultural operations or excessive boll load at later stage. Recent studies on histopathology of stem tissues of cotton helped to trace the path of stem weevil infestation in cotton. A clear indication on the presence of eggs in 8-10 days old plant showed that stem weevil activity starts around 10 days after sowing itself.

Figure 3: Typical swelling of the stem just above the ground level

Figure 4: Dmaged young plant

Symptoms of Damage

• Swellings on the stem just above the ground level (Figure 3).

• Young plants are invariably killed (Figure 4).

• Older plants that survive lack vigor and strength, breaks at the nodes due to strong wind.

Host Range

P. affinis infests a wide range of malvaceous plants other than cotton. As cotton is more suitable for feeding and breeding, it is more preferred, of which Cambodia cotton is its foremost choice (Ayyar, 1943). The list of the hosts other than cotton is furnished in Table 1.

Table 1: List of host plants of Cotton stem weevil *Pempherulus affinis* (Faust)

Sl. No.	*Host plant*	Class	Order	Family
1	*Abelmoschus esculentus*	Magnoliopsida	Malvales	Malvaceae
2	*Abutilon indicum*	Polypetalae	Malvales	Malvaceae
3	*Althea rosea*	Magnoliopsida	Malvales	Malvaceae
4	*Corchorus acutangulus*	Polypetalae	Malvales	Tiliaceae
5	*Corchorus olitorius*	Polypetalae	Malvales	Tiliaceae
6	*Dombey angulata*	Magnoliopsida	Malvales	Malvaceae
7	*Gossypium religiosum*	Polypetalae	Malvales	Malvaceae
8	*Hibiscus cannabinus*	Polypetalae	Malvales	Malvaceae
9	*Hibiscus esculentus*	Polypetalae	Malvales	Malvaceae
10	*Hibiscus ficulensus*	Polypetalae	Malvales	Malvaceae
11	*Hibiscus rosa sinensis*	Polypetalae	Malvales	Malvaceae
12	*Hibiscus vitifolius*	Polypetalae	Malvales	Malvaceae
13	*Malvastrum coromandelianum*	Polypetalae	Malvales	Malvaceae
14	*Sida acuta*	Polypetalae	Malvales	Malvaceae
15	*Sida cordifolia*	Polypetalae	Malvales	Malvaceae
16	*Sida glutinosa*	Polypetalae	Malvales	Malvaceae
17	*Sida rhombifolia*	Polypetalae	Malvales	Malvaceae
18	*Sida rhomboidea*	Polypetalae	Malvales	Malvaceae
19	*Sida spinosa*	Polypetalae	Malvales	Malvaceae
20	*Triumfetta rhomboidea**	Polypetalae	Malvales	Tiliaceae
21	*Urena Lobata*	Polypetalae	Malvales	Malvaceae

* Most preferred wild host

Management

Cultural Control

Preventive measures should be adopted for effective control of the pest. Intercultural operations like earthing up of plants, uprooting and burning of the badly infested plants would keep the pest under check.

Preventive Measures

• Application of neem cake to the soil mixed with farmyard manure (FYM) during the basal fertilization can reduce the chance of stem weevil infestations (10 tons FYM + 250 Kg of Neem cake/ha).

• Furthermore, use dense spacing between young plants can be drenched with a neem oil solution to prevent adult weevils from laying eggs onto leaves.

• A preventive treatment of seeds (10 ml of chlorpyriphos 20 EC/kg of seeds) can be used to limit the spread of the insect.

• Earthing up along the rows of seedlings to hinder the weevil.

• Reduce cropping intensity by planning a fallow or a crop rotation.

• Drench the plants at 15 days intervals starting from 15-20 days after germination.

• Monitor fields and remove affected plants and alternate hosts in and around the fields.

• Always consider an integrated approach with preventive measures together with biological treatments if available.

• Spray treatment of the stem collar with chlorpyriphos 20 EC

@ 2.5 ml/lit is also effective against stem and shoot weevils.

• Remove and burn plant residues after the harvest.

Time of Sowing

In early sown cotton crop infestation and plant mortality was more compared to the late sown cotton crop. It was also observed that off season crop (*i.e.* winter season crop in the Summer Cotton Tract) was much affected compared to the regular season crop (*i.e.* summer season crop in the Summer Cotton Tract).

Intercrops

In most of the crop ecosystems, intercropping/trap cropping plays a pivotal role as one of the important components of IPM in diverting the pests from main crop to inter/ trap crop and reducing the loss to the main crop. Though intercropping or trap cropping is an age old practice of pest management, it has its own scientific back ground to deter the insects or to reduce the attraction towards the main crop. The cotton crop inter cropped with Cluster bean, Maize, Green gram and Field bean recorded significantly less plant mortality due to stem weevil *i.e.* 2.2 to 2.8 percent. The cotton crop inter cropped with Black gram, Cowpea and Bhendi were the next best in recording less plant mortality due to stem weevil *i.e*. 2.9 to 3.1 per cent, whereas the cotton crop raised alone recorded 8.1per cent plant mortality due to stem weevil.

Biological Control

The percentage of parasitism in cotton fields is apparently too low to exercise any adequate control of *Pempheres.* Their numbers are extremely insufficient for the purpose. The host-parasitic ratio is capable of being improved by artificial multiplication and timely liberation of at least one *species-Spathius critolaus.* Beneficial results may follow this procedure. The more promising line of action, however, is to introduce into cotton fields the parasites of its pre-economic habitat by direct importation of parasitized material as also by laboratory breeding and manipulation, should the species prove amenable in this regard. Success in this or any similar project can never be assured. Attempts in these directions are desirable.

Bio Intensive Methods

The efficacy of different biointensive methods against cotton stem weevil, revealed that application of neem cake 150 kg/ha + carbofuran (1 kg a.i/ha) at 10 DAS resulted in damage of 15.13 per cent which is on par with the treated check (16.60%). The yield obtained from the application of neem cake 150 kg/ha + carbofuran (1 kg a.i/ ha) at 10 DAS was 1102.88 kg/ha and was on par with the treated check which recorded 1063.37 kg/ha. Neem cake @ 150 kg/ha + 1% neem oil drenching and earthing up on 25 days after sowing found to be effective after carbofuran @ 30 kg/ha soil application.

Effect of Different Insecticides against Cotton Stem Weevil

To control the damage caused by cotton stem weevil, the order of toxicity of different insecticides is as follows: chlorantraniliprole 18.5 SC > clothianidin 50 WDG > chlorpyriphos 20 EC > carbofuran 3 CG > flubendiamide 20 WG > monocrotophos 36 SL > imidacloprid 17.8 SL > triazophos 40 EC > untreated check. In the study conducted by Anandhi *et al.,* (2020) recent chemicals which are recommended for cotton are tested and results showed that the chemicals *viz*., chlorantraniliprole 18.5 SC at 0.3 ml/l and clothianidin 50 WDG at 0.2 g/l recorded maximum stem weevil reduction and high yield. It may be due to the contact and systemic action of the chemicals against stem weevil. Further, reported that Chlorpyriphos @ 5 ml/l excelled all other treatments in minimizing the stem weevil infestation, followed by lindane, carbaryl 50 WP, neem oil 0.03%, profenophos 50 EC and neem cake. Among the many recent chemicals tested Clothianidin 50 percent WDG @ 20 g a.i./ha was the most effective treatment in reducing incidence of sucking pests on *Bt* cotton (Anandhi *et al.,* 2020).

Conclusion

Cotton is damaged by over 200 species of insect pests from sowing to harvest. Among them, stem weevil, has been reported as an important pest. Infestation of the weevil occurs in 12-15 days old seedlings. Grub cuts through the medullary rays, tunnels round the stem along the cambium. This causes spiral galleries which damage the vascular tissues, disrupting transport of plant nutrients. Preventive measures should be adopted for effective control of the pest. Intercultural operations like earthing up of plants, uprooting and burning of the badly infested plants would keep the pest under check. In case of severe infestation, spray newly recommended chemicals *viz*., chlorantraniliprole 18.5 SC at 0.3 ml/l and clothianidin 50 WDG at 0.2 g/l.

References

Anandhi, P., Gailce Leo Justin, C., Elamathi, S., 2020. Development of integrated pest management strategies for the management of cotton stem weevil, *Pempherulus affinis* (Faust). *Journal of Entomology and Zoology Studies* 8(3), 1239-1244.

Ayyar, P.N.K., 1943. Further studies on the distribution and seasonal history of cotton weevil, *Pempherulus affinis* Faust. in South India. *Indian Journal of Agricultural Sciences* 13, 255-263.

Thirumurthi, S., Subramanian. T.R., Parameswaran. S., 1974. Incidence of the stem weevil, *Pempherulus affinis* Faust in MCU 5 cotton. *Madras Agricultural Journal* 60, 10-15.