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Coreidae: Pod bugs emerging insect pest in legume crops and its management

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ABSTRACT:

The pod bugs belonging to Coreidae family and Heteroptera sub order of Hemiptera are major phytophagous insect pest infesting legume crops and causing severe yield loss in pigeonpea, greengram, blackgram, cowpea, fieldbean and soybean. The incidence of these pests is increasing due to favourable climatic conditions and widespread use of broad-spectrum insecticides accompanied by monocropping. The genus *Clavigralla* and *Anoplocnemis* are two economically important genus causing economic yield loss. In this manuscript brief note on their identification morphological and molecular based detection was described along with their damage symptoms and their management.

***Keywords*:** *Calvigralla gibbosa*, *Clavigralla scutellaris*, squash bugs, true bugs, giant bugs and leaf footed bugs

INTRODUCTION:

The term Coreidae is derived from Greek word '*Coreus*' meaning 'bedbug'. The family consists of plant sucking bugs commonly known as 'squash bugs' or 'leaf footed bugs' due to leaf like expansion on hind tibiae in some species. In some parts of the world like Africa they are referred as twig-wilters or tip-wilters based on the damage they cause. The family was described and established by William Elford Leach in 1815. Further Schuh and Slater (1995) classified the Coreidae into 4 sub-families viz., Agriopocarinae, Meropachydinae, Coreinae and Pseudophloeinae. The insects belonging to Coreidae in general are oval in shape while some are slender sized. Presence of four segmented antennae, two ocelli, four segmented rostrum or beak, presence of 'Hemelytra' in forewings i.e. distinct leathery wing at the basal while membranous wings at apical portion with numerous veins, presence of two repugnatorial stink glands at the fifth abdominal tergite (one at the anterior and one at the posterior edge) in the nymphal instar while in adult it will be in metathoracic between mesocoxae and hind coxae. Enlarged hind tibiae with spines or tubercles is a typical character of members belonging to this family. Almost all the species in this family are phytophagous in feeding

habit. The Coreidae family falls under super family 'Coreoidea'. This superfamily comprises of 4 families *viz*., Coreidae, alydidae, Rhopalidae and Stenocephalidae. Further this super family is paraphyletic with Lygaeoidea and Pyrrhocoroidea.

In the present work special focus is given for pod bug i.e. *Clavigralla gibbosa* Spinola (Fig 1A), *Clavigralla horrens* Dohrn, *Clavigralla scutellaris* Westwood (Fig 1B & C). Further in this Coreidae family giant pod bug with 3 species is also reported in India *Anoplocnemis phasiana* Fabricius, *Anoplocnemis compressa* (Dallas) and *Anoplocnernis bionotata* Distant.

Pod bugs host crops, identification & biology:

The *C. gibbosa* commonly infests legume crops like pigeonpea (*Cajanus cajan*), field bean (*Lablab purpureus*), greengram (*Vigna radiata*), blackgram (*Vigna mungo*) and cowpea (*Vigna unguiculata*).

The genus *Clavigralla* belongs to the sub-family 'Pseudophloeinae'. A gravid female of *Clavigralla* spp. can lay up to 200 eggs on the leaf, pods (Fig 1D) and flower. The eggs are tiny and brown coloured. The eggs are smooth and shiny in case of *C. scutellaris* while its roughly sculptured in case of *C. gibbosa.* Further the chorion is lightly etched with hexagonal patterning in case of *C. scutellaris* (Hegde *et al*. 2008). The eggs are laid in clusters of 3 to 15 or 18 to 20. The egg incubation period is 2 to 5 days. The newly hatched nymphs are red in colour and tiny in appearance. The nymphs had 5 instars and complete its development to adult within 3 weeks depending on the degree days. The adults are brownish grey in colour with an average life span of 1 month (Chitralekha *et al*., 2017). The adults can be differentiated by absence of long spine in 7^{th} sternite and reduced paratergite in 8^{th} and 9^{th} segment in case of *C. horrens* whereas presence of long spine in 7^{th} sternite and paratergite was not reduced for *C. scutellaris* (Gupta *et al*., 2015).

Apart from infesting legume crops, *A. phasiana* (Fig 1E) is also reported to feed on erythrina, cassia, glyricidia, pongamia, sorghum, groundnut, brinjal, potato, ridge gourd, citrus, cocoa, etc. (Mitchell, 2001)

The *A. phasiana* belongs to the sub-family 'Coreinae'. A gravid female *Anoplocnemis* can lay upto 382 eggs which are oval shaped and it lays eggs on stem or petiole or on leaf. The life cycle of *A. phasiana* is briefly given here 8 to 9 days egg incubation period, this is followed by five nymphal instars, first stadium 3-4 days, second 11-12 days, third 6-7 days, fourth 9 to 14 days, and fifth 16 to 17 days. The total nymphal period varies from 29 to 54 days depending on degree days. Early nymphal instars resemble ants. Adult longevity varies from 24 to 84 days, but virgin females and males have survival rates of upto 170 days (Davies and Lateef, 1975).

Kumar and Nath (2005) have showed a positive relation of *C. gibbosa* population with wind velocity and sunshine hours whereas the pod bug population has negative relationship with rainfall. The molecular identification of the pod bugs can be performed with the help of primer pairs LCO1490 (5'-ggtcaacaaatcataaagatattgg-3') and HCO2198 (5'-taaacttcagggtgaccaaaaaatca-3') (Srinivasa murthy *et al*., 2022).

Damage symptom & yield loss:

The nymphs and adults of *Clavigralla sp*. and *Anoplocnemis phasiana* are the crop damaging stages in insect development. They suck the sap of seeds in young developing pods with the help of piercing and sucking mouthparts. The infested pods have tiny yellow-coloured blotches which may disappear during pod maturity. Prolonged feeding results in shrivelled and malformed pods under severe infestation premature drying of pods is also seen. The seeds are shrivelled and its unfit for human consumption. Further the infested seeds won't germinate also and easily succumb to secondary fungal infection. In pigeonpea, pod bug alone causes upto 50% yield loss (Hillocks *et al*., 2000). Muchaddiya *et al*., (2024) reported that 29.75% yield loss in pigeonpea due to pod bug (*C. gibbosa*) during 3 years of evaluation (2018 to 2020) at Bharuch. Similarly, Chetan *et al*., (2018) also reported 19.33% pod damage in pigeonpea by *C. gibbosa* in pigeonpea variety, TS-3R at ARS, Kalaburagi. The yield loss due to pod bugs in greengram, black gram, field bean and cowpea are limited and scanty.

Management:

Scelionidae parasitoids such as *Gryon fulviventris* (Crawford) (Hymenoptera: Scelionidae) and *G. gnidus* were reported as egg parasitoid of *C. tomentosicollis* in Africa, an unidentified *Gryon sp*. against *C. gibbosa*. Whereas in Asia *Gryon clavigrallae* Mineo against *C. gibbosa* and *C. scutellaris* is reported to be effective egg parasitoid (Romeis et al. 2000). Further in Africa 2 more egg parasitoids viz., *Ooencyrtus utetheisae* (Risbec) (Hymenoptera: Encyrtidae) and *Anastatus* sp. (Hymenoptera: Eupelmidae) were also reported. Generally, farmers are not aware of pod bug damage due to lack of knowledge on pest identification and its damaging or infesting stage in crop hence very rarely they rely on chemical management. Various researchers had reported the efficacy of following insecticides viz., methomyl 40 SP, chlorpyriphos 20 EC, acephate 75 SP, deltamethrin 2.8 EC, flonicamid 50 WG and spinosad 45 SC in manging this pod bugs in pigeonpea and other legume crops. If parasitoids are recorded in the field, avoid using broad spectrum chemical pesticides that would be lethal to these natural enemies. Botanicals like neem oil or Neem seed kernel extract can be sprayed at podding stage.

CONCLUSION:

The pod bugs are diverse and cosmopolitan phytophagous insects and damage specifically the legume crops. Their persistent infestation during podding stage results in severe economic loss to farmers. Hence there is need to disseminate the pod bug identification, damaging stages, symptoms to farmers and implement sustainable management strategies to mitigate the loss due to these insect pests. Researchers have to identify pheromones or kairomones to monitor these insect infestation and activity in legume crops so that timely management tactics can be implemented. No insecticide is available in approved list of insecticide usage for legume crops for manging this pest from Central Insecticide Board and Registration Committee (CIBRC). Hence ample scope is there for government and private research and development organisations for identifying new molecules for managing these insect pests.

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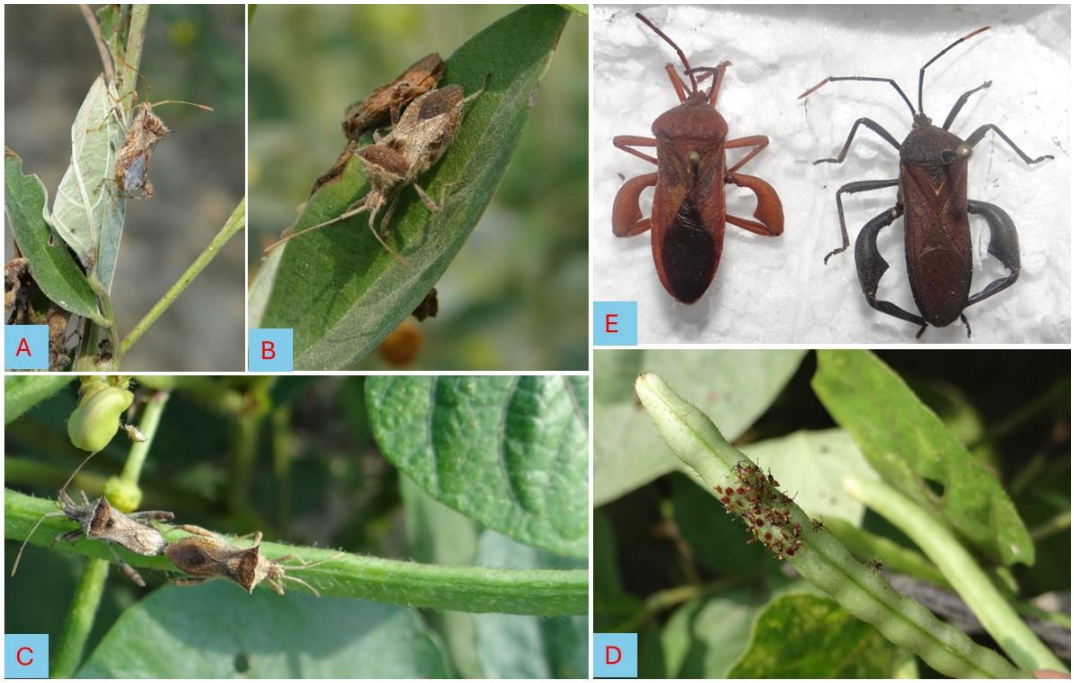

Fig 1: Pod bugs belonging to Coreidae infesting legume crops