

Alternate Hosts and Off-Season Survival Strategies of Groundnut Bruchid *Caryedon Serratus* (Olivier)

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During storage, groundnut bruchid *Caryedon serratus* (Olivier) severely damages groundnut pods and kernels. *C. serratus* is an important and primary storage pest of groundnut. The beetles lay their eggs on groundnut pods, grubs bore into the pods and feed on the kernels, causing economic damage (Fig. 1). Mature grubs make an exit hole and come out of the pod and then pupate in thin silken cocoons. Within a span of two to three months of storage, bruchids can cause more than 50% of the economic damage to groundnut. Protecting the seeds from damage caused by insect-pests requires the information on the bioecology of insect-pests and favourable factors that are responsible for their establishment and infestation. The level of damage caused by the bruchid beetle varies with the seasons. The infestation of bruchids starts from the field, which later becomes critical during storage. The most favourable factors for the growth and development of bruchids are temperature ($28\pm 2^{\circ}\text{C}$), relative humidity ($70\pm 5\%$), seed moisture content ($>9\%$) and the presence of previously infested/broken seeds in produce. The bruchid infested pods and kernels including broken seeds are highly prone to damage by the secondary insect-pests. Hence the damage is more when temperature and relative humidity is higher and damage to the stored groundnut pods is less when temperature and relative humidity is low. In winter season the bruchid take more time to complete its life cycle on the contrary during *Kharif* it completes its life cycle within a month (Ranga Rao et al., 2010).

Bruchids normally occur during June to December in areas where warm humid condition prevails. Further, the bruchid population increases with the increase in temperature and humidity. However, the combination of $28\pm 2^{\circ}\text{C}$ and $70\pm 5\%$ RH is highly conducive for growth and development of bruchids. The increase in temperature from 25 to 40°C results in shortening the time required for generation doubling by three times. The total span of life cycle varies from 65 to 80 days. The adult longevity for males is 20 days, whereas for females is 17 days. The

pre-oviposition period is 2-3 days, the oviposition period is 5-7 days and the post-oviposition period is 8-9 days. Maximum number of eggs will be laid during first four days after the adult emergence and the average fecundity per female is 67 eggs. The incubation period of egg is 4 days; the grubs upon hatching scrape the pod or kernel surface and penetrate the pod to feed on kernels. The grubs pass through four larval instars before pupation, viz., first, second, third and fourth which complete in 13, 9, 13 and 17 days, respectively finishing total larval period in 52 days. The fully grown grubs emerge out by making an exit hole and construct a tough silken cocoon on the surface of pods or kernels. Grubs pupate inside silken cocoons, where pupation lasts for 12 days. Generally, sex ratio in bruchids is recorded being 1: 0.7 (female: male). Irrespective of egg density (number of eggs laid), only two adults emerge out of one-seeded pod/kernel, however four and five adults can emerge out of two- and three-seeded pods, respectively.

In India, groundnut bruchid is reported from Gujarat, Karnataka, Tamil Nadu, Rajasthan, Maharashtra, Uttar Pradesh, Kerala, Punjab, Haryana, Jammu and Kashmir, Himachal Pradesh and Orissa (Arora and Singal, 1978; Fletcher, 1914; Mital and Khanna 1974). The hosts are *Acacia nilotica*, *A. pinnata*, *A. ontana*, *A. tortilis*, *A. arabica*, *A. chundra*, *A. donaldi*, *Albizia lebbek*, *Bauhinia monandra*, *B. tomentosa*, *B. malaborica*, *B. racemosa*, *Caesalpinia pulcherrima*, *C. bocalla*, *Cassia fistula*, *C. grandis*, *C. nodosa*, *C. renigera*, *C. auriculata*, *C. ontana*, *Casuarina equisetifolia*, *Hardwickia binata*, *Helianthus annuus*, *Pongamia pinnata*, *Prosopis cineraria*, *P. juliflora*, *P. spicigera* and *Tamarindus indica* (Fig. 2) were reported as the alternate hosts of *C. serratus* (Arora and Singal, 1978; Bagheri-Zenous, 1995; Beeson, 1918; Chatterjee, 1916; Fletcher, 1914; Mital and Khanna, 1974; Purthi and Singh, 1950; Radadia, 1995; Raina, 1972; Rangarajan et al, 1978; Satya Vir and Jindal, 1996; Singh and Bhandari, 1991; and Singal and Tokky, 1990).

The Saurashtra region of Gujarat is known as the 'Groundnut bowl of India' and contributes significantly to the production, processing and export of groundnut. Therefore, there are a large number of storage godowns exist and operate in Gujarat to cater to the needs of groundnut processors and exporters. Concern for bruchid infestation of groundnut among the groundnut processors and exporters of Saurashtra are at a higher level compared to those of other states or regions. In Saurashtra, groundnut is mainly grown in the *kharif* season and harvesting/post-harvest operations for groundnut begin in the months of October-November. Bruchids survive in the wild during the off-season (i.e. April-September) on alternate hosts. For example, *Prosopis* sp. pods are available for bruchid survival and multiplication during the time-periods of February-March and August-September; likewise pods of *T. indica*, *Acacia* sp., *Bauhinia* sp. and *A. lebbek*, will be available for bruchids respectively in the time-periods of February-June, April-May, August-October and November-December.

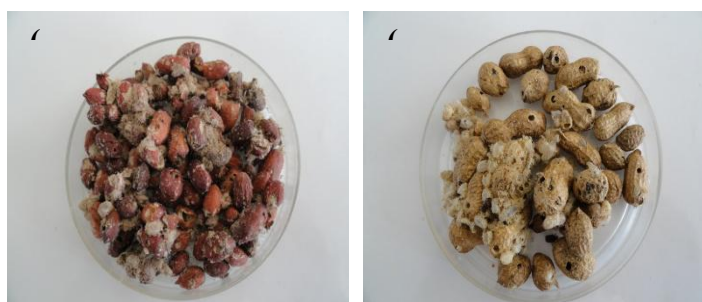


Fig. 1: Groundnut bruchid, *Caryedon serratus* infested (A) kernels and (B) pods.



Fig. 2: Bruchids on an alternate host, (A) tamarind tree in the field and (B) egg on tamarind pod (inside red circle).

The eco-friendly management of the insect-pests of stored groundnut could be achieved by targeting the weak points in the life cycle or by altering

the favourable factors responsible for infestation and establishment of the pest. Bruchids can be effectively managed in the field, thereby reduce the carry-over of infestation to storage godowns through strategic sanitation of the field before the harvest of groundnut. Strategies include: (i) collecting and destruction of the fallen, damaged or leftover pods or seeds of alternate hosts; (ii) Ensure earthing-up soil around the plants before peg initiation (iii) Harvest the produce at right maturity stage (iv) Avoid heaping the produce in the field itself (v) employing quicker sun-drying of groundnut pods to a safe moisture level, i.e. 7%; (vi) trapping of beetles using semiochemicals; and (vii) early detection of bruchid infestations in groundnuts for curative measures. Insights into off-season survival and alternate hosts of groundnut bruchids will help in formulating both preventive and curative strategies for management.

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