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Quantitative and Qualitative Losses Inflicted by *Caryedon serratus* in Stored Groundnut Pods

Man Mohan Sundria*, Akhil Kumar[1] and D.B. Ahuja[2]

Agricultural Research Station, Mandor, Jodhpur 342 304, India

[1]Department of Agricultural Zoology & Entomology, RCA, Udaipur 313 001, India

[2]NCIPM, LBS Building, IARI, New Delhi 110 012, India

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Abstract: Studies on the qualitative and quantitative losses inflicted by *C. serratus* in stored groundnut pod during three to nine months of storage under fluctuating laboratory conditions revealed that pod weight loss (from 2.23 to 27.39%) and seed damage (from 29.52 to 96.02%) increased due to multiplication of bruchid population with the period of storage. Storage period coupled with insect infestation play vital role in decreasing the protein and carbohydrate (total soluble sugar) contents and in increasing oil content in the pods.

Key words: Groundnut, *Caryedon serratus*, qualitative losses, quantitative losses.

The groundnut, *Arachis hypogea* L., is grown extensively in India, and is generally stored for 6 to 9 months from harvest to next sowing season in unshelled form to avoid pest infestation. Groundnut gets infested due to an array of insect pests. Among them, bruchid (*Caryedon serratus)* causes considerable damage to groundnut during storage. The *C. serratus* is reported to damage different crops including groundnut (Dick, 1987), paddy (Arora and Singal, 1978), tamarind (Mital and Khanna, 1967), *Acacia nilotica* (Satyavir *et al*., 1996), *Bauhinia variegata* (Nilsson and Johnson, 1992). Very little work has been done on the effect of feeding of this species on groundnut. The present investigations were, therefore, undertaken to find out the quantitative and qualitative losses during storage caused by this bruchid.

Materials and Methods

Experiments were laid out at the Stored Product Section, Division of Entomology, IARI, New Delhi, from August, 2002 to May, 2003. The groundnut pods, procured from local market, were cleaned of inert material and subjected to a temperature of 50±2°C for overnight to eliminate any hidden pest infestation. To find out the losses caused by this bruchid, 500 g of groundnut pods were taken in plastic container of 2 kg capacity and five pairs of newly emerged (0-24 hrs.) adults were released in each container. Separate jars were taken to record observations after 3, 6 and 9 months of storage. Four replications were maintained for each month. The jars were kept at room conditions.

Per cent weight loss: After removing the bruchid from each jar, weight of pods was taken on analytical balance after 3, 6 and 9 months of storage. The loss (%) in weight was calculated as per formula:

$$\% \text{ weight loss} = \frac{I-F}{I} \times 100$$

where, I = initial weight of pods; F = final weight of pods.

Per cent damage: Groundnut pods weighing 50 g were taken from each replication and counted. The damaged pods were separated from the lot and damage (%) was worked out for each replication. The same procedure was adopted for the observations taken each for 3, 6 and 9 months after the storage. The damage (%) was calculated (Adams and Schulten, 1978).

Biochemical changes: The nitrogen content in the groundnut samples was determined by AOAC (1970) method using 0.2 g samples. Protein content was ascertained by multiplying the percentage nitrogen by 5.46. The oil content was estimated by cold percolation method (Kartha and Sethi, 1957). Total soluble sugar was estimated by the Anthrone method (Sadasivam and Manickam, 1992). The biochemical analyses

*E-mail: manu2015@rediffmail.com

Table 1. Effect of C. serratus infestation on % protein, oil, carbohydrate (total sugar), pod damage and weight loss in groundnut pods at varying storage periods

Storage period (months)	Per cent protein*	Per cent oil content*	Per cent carbohydrate (total soluble sugar)*	Per cent damage*	Per cent weight loss*
Initial	25.57 (30.38)[bc]	42.79 (40.86)[b]	13.22 (21.32)[a]	00.00	00.00
Three	28.42 (32.22)[a]	46.30 (42.88)[a]	13.08 (21.21)[a]	29.53 (32.92)	2.23 (8.59)
Six	27.18 (31.42)[ab]	47.26 (43.43)[a]	12.83 (20.99)[ab]	71.34 (57.63)	13.12 (21.24)
Nine	24.29 (29.53)[c]	44.76 (41.99)[ab]	12.36 (20.59)[b]	96.02 (78.50)	27.39 (31.56)
S. Em ±	0.51	0.55	0.19	1.07	1.16
CD at 5%	1.57	1.69	0.58	3.42	3.71

* Mean of four replications, Figures in parenthesis are arc sine values.

were done at Division of Biochemistry, IARI, New Delhi. The data obtained were analyzed statistically.

Results and Discussion

The extent of losses caused by a particular species varied from host to host, depending upon the host suitability of oviposition and development (Singh, 1962). The density of insects ultimately reflects not merely the quantitative, but qualitative losses as well. Interestingly, *C. serratus* larvae were observed making holes in plastic containers with their biting and chewing type of mouth part.

Per cent weight loss: The bruchid grub, feeding inside the groundnut pods, caused the loss in weight, which was 2.23% after three month of storage. Due to fast multiplication of the bruchid population in subsequent storage period, the loss to groundnut pods eventually increased to 27.39% after 9 months of storage (Table 1). These findings were supported by Dick (1987), who reported that *C. serratus* was responsible for approximately 20% weight loss in groundnut kernel after five months of storage. This pest resulted in 22.51% weight loss in seeds of *Acacia nilotica* (Satyavir *et al*., 1996) and 22.93% in stored groundnut pods (RVB-1) after three months (Ghorpade *et al*., 1998) of storage.

Per cent damage: Damage to the pods, the ultimate effect of the bruchid infestation, was more or less parallel to the population of the bruchid, *C. serratus* in groundnut pod. The findings (Table 1) revealed that the initial damage after 3 months was 29.53%, which increased abruptly to 71.35% after six months of storage due to fast population build up of bruchid. After nine-months of storage, 96.02% damage was observed. Similarly, Ghorpade *et al*. (1998) also recorded per cent pod damaged from 64.40 (ICGS-11) to 92.82 (RVB-1) by *C. serratus* in stored groundnut. Singh and Bhandari (1987) recorded 100% loss of the seeds of acacias due to *C. serratus*, while Singh and Toky (1990) reported 6.8% pod damage in *A. nilotica* by *C. serratus* in the field. Doharey *et al.* (1987) also observed same trend in seed loss in stored green gram caused by *Callosobruchus chinensis* with an initial loss of 1.35%, which increased gradually up to 99.91% after 120 days of storage.

Protein content: Decrease in protein content has been reported in seeds of peanut (Jiang and Sung, 1994; Dudu *et al*., 1996), sunflower (Dadlani *et al*., 1995). In the present study, increased protein content was found up to six months. However, the increase was more profound due to *C. serratus* infestation and accelerates aging. The initial protein content was 25.57%, which reached 24.29% after nine months of storage with slight decrease (Table 1). Dudu *et al.* (1996) also reported slight decrease in protein content in groundnut from 24.5 to 23.4% after nine months of storage, due to merchant beetle (*Oryzaephilus mercator*).

Oil content: A slight increase was observed in oil content after nine months of storage (Table 1). The initial oil content was 42.79%, which increased to 44.76% in groundnut after nine months of storage. Dudu *et al*., 1996 also recorded increase in oil content in groundnut

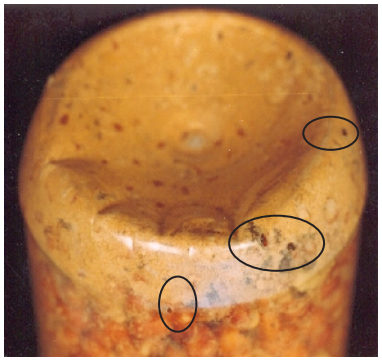

Fig. 1. Holes made by larvae of groundnut bruchid, Caryedon serratus (ol.) in plastic container.

from due to merchant beetle (*O. mercator*) 43.0 to 46.2% after nine months of storage.

Carbohydrate content: There was significant variation in per cent carbohydrate content of groundnut after 9 months of storage. The carbohydrate reduced from 13.22 to 12.36% after 9 months of storage (Table 1). Similar reports was made by Vijay (2000), who recorded slight decrease in total soluble sugar in maize and soybean after 15 months of storage. The present findings are in conformity with the investigation made by Singh *et al.* (1982) in stored green gram infested with *Callosobruchus maculatus* F. where the reducing sugars increased up to four months of storage (1325 mg of maltose/100 g of seed) followed by a decrease in the fifth month (1085 mg of maltose/100 g of seed).

It was inferred from these findings that storage duration and insect infestation play a vital role in decreasing protein and carbohydrate (Total soluble sugar) and increase in oil content in stored groundnut. Over and above, the grub of this bruchid is capable to make hole in plastic containers during the experimentation (Fig. 1).

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