Research Paper Agricultural Science

Life Cycle of Ground Nut Seed Beetle (Caryedon Serratus)

Pravasini Behera	College of Agriculture,OUAT,Bhubaneswer,Odisha
Anita Mohanty	KVK,Puri.OUAT,Bhubaneswer,Odisha
Dharitri Patra	KVK, Jajpur,OUAT,Bhubaneswer,Odisha
Dibya Sundar Kar	KVK,Dhenakanal,OUAT,Bhubaneswer,Odisha

ABSTRACT

The life cycle of, Ground nut Seed beetle (Caryedon serratus) on stored groundnut was studied under fluctuating laboratory conditions of 28±1°C and 70% relative humidity. The incubation period was 4.9 to 8.7 days in autumn, summer and winter season. Number of egg laid per female was 34.9 in winter and 89.8 in summer. There were six larval instars and the duration of total larval period on an average of 24.6 days in autumn,26.4 days in summer and 42.2 days in winter. . The pupal stage varied from which.6.8, 9.0 and 12.5 days in autumn, summer and winter respectively. Adults could survive up to 26.1 days in winter, 27.9 in summer and 25.3 days in monsoon months. Study about life cycle and morphology is very essential for measures taken for controlling this dangerous pest.,

KEYWORDS Ground nut seed beetle, incubation period, life cycle, pupa, larvae

Introduction

Oilseeds contribute the major source of dietary lipid requirement of human health. Among the food materials oilseeds occupied main important position. In India groundnut (***Arachis hypogaea***) ranks first both in area and production under oilseed crops in the world but in productivity it occupies only 10th position. Groundnut is among the oilseed productions contribute more widely to the covering of nutritional needs (in particular, proteinic and calorific). About 10 percent of the harvested produce is lost during post harvest operations. Out of 109 percent postharvest loss of food grain, insects share about 2.5% percent, which appears to be quite alarming.

Among different major insect pest stored ground nut, groundnut seed beetle ***Caryedon serratus*** (Oliv.) plays a great role so far as storage ground nut pod is concerned. It is the only insect species known to infest kernels and intact pods and is thus potentially the most important pest of kernels (Ramadevi & Rao, 2005, Panday ***et a***l. 2011).More than 20% damage of groundnut pod by this pest have been reported. (Khrustaleva, 1978 and Dick,1987). The pest was first known in S. Africa attacking tamarind then found to attack other crops (Delobel,1995). The pest is assumed a great importance in ground nut growing groundnut pods. (Patel and Koshiya 1994 and Sontakke ***etal***.1995).

Material Methods

A series of experiments were conducted to study the different characters (morphological, biological) of groundnut seed beetle, ***Caryedon serratus*** (Oliv). Prior to start the culture of insects, dried pods were disinfested with Aluminium Phosphide tablets for 7 days. A weekly interval of fresh culture was set, so as to get a steady supply of freshly emerged beetles .

Beetles of both the sexes were collected with the help of aspirator and specimen tubes from the infested stocks of groundnut. Rearing and multiplication of the insects were carried out in specimen bottles of 15 x 10cm size in the storage laboratory of the Department of Entomology. For mass collection of insects flat bottom flasks of 10 lit capacity containing sufficient groundnut pods and mouth of the flask was covered by a piece of muslin cloth and tied firmly with the rubber bands. These flasks containing insects were kept in dark till the next generation was completed and sufficient number of adults available for further investigations.

Studies on the morphology of groundnut seed beetle C. serratus was carried out in laboratory during summer months. The measurements of morphological features of the pest were made with the help of stage and occular micro-meter and expressed in cm. For this purpose all the stages of insect were killed by benzene and preserved in 70% alcohol.

Life cycle of groundnut seed beetle was carried out in the laboratory at 70% RH maintained in desiccator and at 28± 1^0 C temperature in different seasons on pods and kernels separately. To study the life cycle of the pest, healthy pods were selected and one pair of freshly emerged beetles was released. Observations on fecundity, larval development, duration of life stages of the pest were recorded daily. To record the duration of developmental stages, groundnut pods and kernels were splitted and observations were ' recorded on the growth of the pest inside the groundnut seed. Adult longevity were also studied on recording the number of days spent by the adult on groundnut seed from emergence to death.

Result and Discussion

Morphology of Caryedon serrratus (Oliv.)

Morphology of groundnut seed beetle ***C. Serratus*** studied in the laboratory. The adult female lay eggs on matured groundnut pods and glude on the surface of the shell. Eggs are small, whitish and oval shaped ad 0.03cm long and breadth 0.01cm. The larvae are creamy white in colour with brownish head. The length of last instar larvae vary from 0.50 to 0.60cm and breadth 0.30-0.40cm.The pupa in light brown in colour. The length of the pupa varied from 0.40 to 0.70cm and breadth 0.30 to 0.40cm. (Table - 1)

Both the sexes of adult beetles are dirty grey in colour. The length of adults varied from 0.40 to 0.55cm. and 0.65 to 0.70cm. and breadth 0.30 to 0.40 and 0.45 to 0.50cm in case of male and female respectively. The antennae of the beetle are serrated short and 12-segmented and number of bristles present on antennal segments. Length of antenna varied from 0.32 to 0.34cm. Eyes of beetles are prominent and deeply emarginated, mandibles are strongly built and dented. Fore wings i.e., elytra are hard in consistency, grey in colour with black markings, which don't cover the last abdominal

segment. The length of elytra varied from 0.45 to 0.50cm. and breadth 0.15 to 0.20cm (Table - 2-a). Thoracic segments almost confused and abdominal segments are prominent in case of female.

Leg segments i.e., coxa, trochantor, femur,tibia and tarsus are distinct. Hind femur of the beetle is enlarged and spiny bristles are present in all segments of the legs. Last segment of tarsus in bifurcated.As this pest assumed importance recently only limited references available in this respect. Privette (1966) in Nigeria studied the pest and described that it is brown coloured beetle with small black markings on elytra in 0.40-0.70cm long.

Sontakke ***et.al.*** (1995) have reported that the beetles is robust, reddish brown in colour with serrataed antennae and dark irregular markings on elytra. The hind femur is broad and bears conspicious comb of spines. Biswas & Maity (1996) stated that the beetle on brown in colour 0.40 to 0.70cm. in length 0.30-0.50cm in breadth with small markings on elytra. The female insect could be differentiated from male which on having more length and breadth and bigger sized ovipositor.

Biology.

The biology of groundnut seed beetle ***Caryedon serratus*** was studied in laboratory during winter, summer and autumn seasons at 70% RH and 28±1° C temperature (Table-3). The female beetles of found to lay eggs on depressions of pod surface and glude firmly. The average incubation period was 8.7, 5.3 and 4.9 days in winter, summer and autumn season respectively.

The first instar larva spend three days to bore into the pod and reached the kernel. Duration of first instar larva 7.3, 5.5 and 5.2 days respectively in winter, summer and autumn.The larval development in second, third, fourth, fifth instars were found quite active and feed gregariously. Larvae were stout creamy white with brownish head. Maximum production of frass was produced by the larvae during feeding. The average duration of these instars varied from 7.5, 4.9 & 4.4; 6.2, 4.4 & 3.9; 5.9, 3.7 & 4.1; 7.4, 4.2 & 3.5 days in winter summer and autumn months respectively. There was existing of another instar i.e., 6th instar where one to three days passed in feeding of kernel and rest period spent in preparation of cocoon. This stage was 7.9, 3.7 and 3.5 days in winter, summer and autumn respectively.

The shape of cocoon was capsule shaped and dirty white in colour. Owing to the size of cocoon generally the pupation took place outside the kernel due to insufficient space inside the pod. The pupal stage was 12.5, 9.0 and 6.8 days in winter, summer and autumn months respectively. Average life cycle of the beetle from egg to adult stages were 63.4, 40.7 and 36.3 days in winter summer and autumn respectively. The adults found to flay upto few metres, which help them in migration. The longevity of adults were found 26.1 days in winter, 27.9 days in summer and 25.3 days in autumn.

Prevette (1966) studied the biology of ***C. Serratus*** and stated that the eggs of pest were attached to surface of groundnut shell. Hatching took place by penetration through eggshell and pod into the kennel where the larvae feed and develop. No sign of damage was visible externally unless eggs are carefully examined. He reported that egg to adult development period was about 42 days in 28 c and 75% RH. But Kapadia (1995) found that in laboratory condition C. serratus completed its life cycle in groundnut within 82 days. Biswas & Maity studied the biology of pest at 28+1° C and 75% RH in groundnut pod and kernel at different seasons. They reported that a single female on an average laid 30.6 and 92.4 eggs in winter and summer respectively and 84.1 eggs on kernel surface. The larva of the pest passed through six larval instars and pupation generally took place inside and outside the pod. Studies on the biology of the beetle ***C. serratus*** on groundnut and other host showed the incubation period, grub development and pupal period were 9.58 days, 42.62 days and 27.16 days respectively**(**Halle ***et.al.,***2002).

In the present investigation the life cycle was observed 40.7 days or summer which is agreed with the result of Prevette (1966) and **(**Halle ***et.al.,***2002). The results of Kapadia (1995) recorded the life cycle of the pest was 82 days which is contradictate with the present investigation. Such a long biology by Kapadia (1995) might be due to stress condition. The results of Biswas & Maity studied in the same laboratory at 28 ± 1° C and 75% RH recorded total life cycle of pest 61.6, 40.5 and 34.9 days in winter, summer and autumn respectively. The duration of life stages of pest recorded almost at par with their results.

The detail study of morphological and biological characters of ground nut seed beetle help to find out the duration of life stages and to plan the control programme in appropriate life stage of pest.

Table - 1
Measurement (cm) of C. serratus at different Life Stages.

Sl. No.	Life Stages	Length (cm)	Breadth (cm)	Head Capsule (cm)	Colour
1.	Egg	0.03	0.01		Whitish glude on the surface of pod.
2.	1st instar	0.07-0.10	0.01-0.02	0.01	Creamy White
3.	2nd instar	0.10-0.20	0.04-0.10	0.05	Creamy White
4.	3rd instar	0.30-0.40	0.10-0.15	0.10	Creamy White
5.	4th instar	0.40-0.45	0.10-0.15	0.15	Creamy White
6.	5th instar	0.50-0.60	0.20-0.30	0.20	Creamy White
7.	6th instar	0.65-1.00	0.30-0.50	0.30	Creamy White
8.	Pupa	0.40-0.70	0.30-0.40	-	Dirty White
9.	Adult				
	(a) Male	0.40-0.55	0.30-0.40	0.45	Dirty Grey
	(b) Female	0.65-0.70	0.45-0.50	0.45	Dirty Grey

Table-2(a) Measurement of external morphological features of adult C. serratus (cm).

Sl.No	External Structure	Length (cm)	Breadth (cm)	Colour
1.	Wing			
	(a) Force wing	0.45-0.50	0.15-0.20	Dirty grey
	(b) Hind wing	0.70-0.75	0.30-0.35	Dirty grey
2.	Antenna	0.32-0.34	0.03-0.05	Dirty grey
3.	Thorax	0.20-0.25	0.18-0.20	Dirty grey
4.	Abdomen	0.30-0.50	0.20-0.25	Dirty grey

Table -2 (b)
Measurements of leg segments of C. serratus (cm).

Sl. No.	Leg Segments	Prothroracic leg Length (cm)	Mesothoracic leg Length (cm)	Metathoracic leg Length (cm)
1.	Coxa	0.08-0.10	0.09-0.11	0.10-0.11
2.	Trochanter	0.06-0.08	0.06-0.08	0.08-0.10
3	Femur	0.15-0.18	0.18-0.19	0.20 - 0.22
4.	Tibia	0.12-0.13	0.14-0.16	0.21-0.22
5.	Tarsus (bifurcated)	0.10-0.11	0.10-0.12	0.11-0.12

Tarsus - 3 segmented
Antennae - 12 segments

Table-3
Biology of Caryedon serratus on groundnut at different seasons in days.

Seasons	No. of eggs laid per female	Egg stage	Larvel Stage						Pupal stage	Total life cycle	Adult longevity
			1st instar	2nd instar	3rd instar	4th instar	5th instar	6th instar			
Winter (Dec- Jan)	34.9	8.7	7.3	7.5	6.2	5.9	7.4	7.9	12.5	63.4	26.1
Summer (Mar-Apr)	89.8	5.3	5.5	4.9	4.4	3.7	4.2	3.7	9.0	40.7	27.9
Autumn (Aug- Sep)	86.3	4.9	5.2	4.4	3.9	4.1	3.5	3.5	6.8	36.3	25.3

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