

Life table study of *Caryedon serratus* (Olivier) in stored groundnut

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ABSTRACT

Investigations on fecundity life tables and age specific distribution of *C. serratus* revealed that the life expectancy of newly deposited eggs was only 14.63 days. The maximum duration of egg, larva and pupa was 8, 20 and 33 days, respectively. The pre-oviposition and oviposition period was 1 and 14 days, respectively. The net reproductive rate (R_0) was 22.63 with the mean length of generation (T_c) 38.52 days. The values of intrinsic rate of natural increase (r_m) and finite rate of increase in number (λ) were computed to be 0.0809 and 1.0871 females per female per day, respectively.

Ranaware, S.S., Kapadia, M.N. and Acharya, M.F. (2011). Life table study of *Caryedon serratus* (Olivier) in stored groundnut. *Internat. J. agric. Sci.*, 7(2): 390-391.

Key words : Life table study, *C. serratus*, Groundnut

INTRODUCTION

Bruchid beetle, *Caryedon serratus* (Olivier) is the major storage pest of groundnut found in many parts of tropical Asia and Africa and spreaded from Asia to Greece, France, Italy and north and west coasts of Africa. In Gujarat the only primary pest of stored pods *C. serratus* was reported in 1969 but remained a pest of tamarind and only a minor pest of groundnut. However, this pest became a major problem in 1990s. This being a new pest of stored groundnut in Gujarat, information on innate capacity of increase in numbers and finite rate of increase in number is very scanty. Therefore, an attempt was made to construct the life-tables under laboratory condition on groundnut.

MATERIALS AND METHODS

The investigation on fecundity life table was carried out at a constant temperature of $28 \pm 1^\circ\text{C}$ in the laboratory. To construct the life table, pairs of adults were kept into glass container of 1 kg capacity. Eggs laid on groundnut kernels were used for this study. In order to construct the life fecundity tables, one hundred freshly laid eggs were collected carefully by keeping only one egg on each kernel and placed in ten plastic containers (5.0 cm diameter x 5.5 cm height) in batches of 10 each. Observations on hatching, total larval development, formation of pupae, successful emergence of adults and fecundity of females were recorded daily. Age specific mortality in different developmental stages such as eggs, larvae, pupae and adults were also recorded. With a view

to determine the age specific fecundity, total number of adults emerged on the same day kept separately in plastic containers (10 cm x 10 cm) for oviposition. Fresh groundnut kernels were kept into plastic containers for oviposition. The groundnut kernels were replaced daily and number of eggs laid on subsequent days on the groundnut kernels was recorded. The observations on fecundity were continued till all the females died.

The number of eggs laid per female was divided by 2.38 {sex ratio 1:1.19 (based on 1400 adults)} to get the number of female birth (m_x). Observations on mortality during different stages from hatching of eggs till the emergence of adults were recorded daily which provided the values for life table (l_x). Life tables were constructed according to the method of Howe (1958) and Atwal and Bains (1974). The sum total of products ' $l_x m_x$ ' is the net reproductive rate (R_0) (Lotka, 1925). The innate capacity of increase (r_m), net reproductive rate (R_0) and mean generation time (T) were the basic parameters used to assess the population growth.

RESULTS AND DISCUSSION

The life-table showing the survival (l_x) and age specific fecundity of *C. Serratus* is presented in Table 1. The pre-oviposition period was 34th day of pivotal age. Females deposited first batch of eggs on 35th day. The first female mortality was observed on 7th day ($l_x = 0.64$) after the emergence of adult female and it increased slowly thereafter. The maximum mean progeny production per day (m_x) was 7.16 per female on 35th day of pivotal age.

The net reproductive potential (R_0) was obtained 22.63

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| Table 1 : Survival and age specific fecundity for <i>C. serratus</i> in stored groundnut | | | | | |
|--|---|---------------------------------------|--------|----------|-----------------|
| Pivotal age in days 'x' | Survival of female at different age intervals 'lx' | Age schedule for female birth 'mx' | 'lxmx' | 'xlxmx' | |
| 0-33 | 0.70 | - | - | - | Immature stages |
| 34 | 0.70 | - | 0.70 | 23.8 | |
| 35 | 0.70 | 7.16 | 5.01 | 175.42 | |
| 36 | 0.70 | 2.33 | 1.63 | 58.72 | |
| 37 | 0.70 | 3.00 | 2.10 | 77.70 | |
| 38 | 0.70 | 3.08 | 2.16 | 81.93 | |
| 39 | 0.70 | 4.25 | 2.98 | 116.03 | |
| 40 | 0.64 | 3.21 | 2.05 | 82.18 | |
| 41 | 0.62 | 2.48 | 1.54 | 63.04 | |
| 42 | 0.6 | 3.73 | 2.24 | 94.00 | |
| 43 | 0.53 | 1.42 | 0.75 | 32.36 | |
| 44 | 0.45 | 1.33 | 0.60 | 26.33 | |
| 45 | 0.44 | 1.00 | 0.44 | 19.80 | |
| 46 | 0.41 | 0.54 | 0.22 | 10.18 | |
| 47 | 0.34 | 0.42 | 0.14 | 6.71 | |
| 48 | 0.32 | 0.23 | 0.07 | 3.53 | |
| 49 | 0.25 | 0.00 | 0.00 | 0.00 | |
| | | | 22.63 | 871.7272 | |

| Table 2 : Mean length of generation, innate capacity of increase in numbers and finite rate of increase in numbers of <i>C. serratus</i> in stored groundnut | | | |
|--|--------------------------------|-------------------|--------------------|
| Population growth statistics | Formulae | Calculated values | |
| Net reproductive rate | $R_0 = \sum lxmx$ | 22.63 | |
| Mean length of generation | $T_c = \frac{\sum xlxmx}{R_0}$ | 38.52 | Days |
| Innate capacity for increase in number | $R_m = \frac{\log_3 R_0}{T_c}$ | 0.0809 | Females/female/day |
| Arbitrary rm | 0.07 to 0.09 | | |
| Corrected rm | $\sum e^{7-rmx} \cdot lxmx$ | 0.0835 | Females/female/day |
| Corrected generation time | $T = \frac{\log_e R_0}{rm}$ | 37.35 | Days |
| Finite rate of increase in number | Antilog e^{rm} | 1.0871 | Females/female/day |
| Weekly multiplication of population | $(\lambda)^7$ | 1.7941 | times |
| Hypothetical F_2 females | $(R_0)^2$ | 512.12 | numbers |

with the mean length of generation (T_c) 38.52 days. The intrinsic rate of natural increase in numbers (rm) and finite rate of increase in number (λ) was 0.0809 and 1.0871 females per female per day, respectively. Population would be able to multiply 1.7941 times per week and the hypothetical F_2 females were worked out to be 512 (Table 2).

Investigations on fecundity life tables and age specific distribution of *C. serratus* resulted that the life expectancy of newly deposited eggs was only 14.63 days. The results on survival of different stages of *C. serratus* in stored groundnut are the maximum duration of egg; larva and pupa were observed 8, 20 and 33 days, respectively. The pre-oviposition and oviposition period

was 1 and 14 days, respectively. The number that survived from egg to adult emergence was 70 individuals.

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Received : February, 2011; Accepted : May, 2011