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## Life cycle of bean beetles *Callosobruchus maculatus* (F.)

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**Abstract:** Life cycle of bean beetle, *Callosobruchus maculatus* (F.) is theoretically described to observe holometabolous pattern of metamorphosis. However, host specific life cycle of this stored grain pest propagating on stored dry gram needs to be carefully observed in order to record the duration of life cycle in different seasons. The number of larval instars also undergoes variation which has been reported in this article. The pattern of life cycle of the pest also determines the number of generations observed in one year which is also called voltine cycle. The voltinism is responsible for regulating the degree of damage caused by the pest to the host. In this study, the pest has been found to be tetravoltine with pentainstar holometabolous metamorphosis.

**Keywords:** Holometabolous metamorphosis, tetravoltine, pentainstar, life cycle, bean beetle (*C. maculatus*)

### INTRODUCTION

Bean beetles, *Callosobruchus maculatus* (F.) are insect pests of Africa and Asia that probably range throughout the tropical and subtropical world. This species is also known as the 'Southern Cowpea Weevil'. The larvae of this species feed and develop exclusively on the seed of legumes (Fabaceae) hence the name 'been beetle'. The adults do not require food or water and spend their limited life span (one-two weeks) mating and laying eggs on beans.<sup>1,2</sup>

The systematic placement of bean beetles is as follows: *Callosobruchus* is one of the genera in the family Bruchidae (seed weevils) that is in the super family Chrysomeloidea. This group is part of the order of beetles, Coleoptera.<sup>3</sup>

Bean beetles (*C. maculatus*) are small in size, about 1/8 inch long. They are reddish – brown, slightly elongate

beetles compared to the typical rounded appearance of other members of this family (bruchids). Although weevil like, they are not true weevils (Curculionidae) and do not have heads prolonged into a long "snout". The head is small with a blunt rostrum, long conspicuous serrate antenna. The prothorax is well developed. Wing covers (elytra) are marked with black and grey and these are two black spots near the middle. The elytra are short and do not cover the abdomen completely. The last abdominal segment also has black spots visible.<sup>4,5</sup>

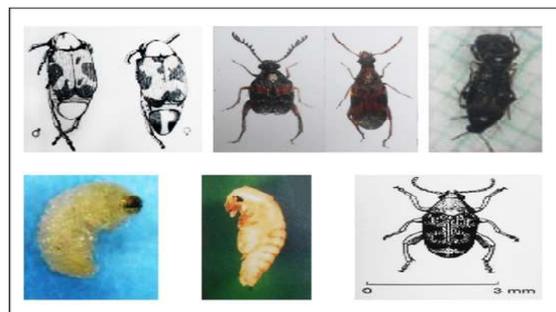


Figure showing the life cycle of *Callosobruchus maculatus* (F.)

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Bean beetles exhibit two adult forms (morphs), a sedentary (flightless) form and a dispersal (flying) form. The dispersal morph is induced by high larval density in stored grams or laboratory cultures and is caused by density dependent micro-habitat temperature increases. These two morphs have very different life history characteristics such as longer adult lifespan in the dispersal morph and significantly reduced fecundity compared to the sedentary morph. In the sedentary form, the sexes are highly dimorphic and readily distinguished but sex differences are very subtle in the dispersal form.

Male and female gram beetles (of the sedentary morph) are easily distinguished from one another by general appearance. The most distinguishing characteristic is the colouration on the plate covering the end of the abdomen. In the female, the plate is enlarged and is darkly coloured on both sides. In the male, the plate is smaller and lacks stripes. In some strains, females are larger in size than males. Also, females are black in colouration and males are brown.<sup>6,7</sup>

They attack practically all whole pulses, gram, beans and grain. Once inseminated, adult females lay single fertilized egg on the external surface of gram. Individual eggs are about 0.75 mm long, oval or spindle shaped and grayish white in colour. The eggs are firmly glued to the gram surface. The hatching period is about 5 days. Larva hatches out from egg. Penetrated into the pod or grain. The egg larva is fleshy, curved, white creamy in colour with black mouth parts. The larva feeds on the gram endosperm and embryo, undergoes a series of molts and burrows to a position just underneath the seed coat prior to pupation. Larval stage lasts about 30 days. Although the seed coat of the gram is still intact, a round 1-2 mm window is apparent at the location where the beetle is pupating. Pupal period lasts about 4 days in summer and about 2 weeks in winter. The adult that results from pupation chews through the seed coat and emerges from the gram. The elapsed time from newly laid eggs to the emergence of adult beetles varies from 3-4 weeks in a 30°C incubator and average 30% RH to 5-6 weeks in 25°C incubator and average 50% RH. The adults are fully mature 24 to 36 hours after emergence. Neither male nor female adults require food or water during their short adult lifetime (10-14 days).

#### **MATERIAL & METHODS**

Freshly emerged adult beetles from the stored gram were randomly collected from the store houses as the test insects. Both infected & fresh grams were also procured from the local market as host on which the pest was allowed to propagate in the laboratory. For this purpose at least 5 pairs of both male & female beetles were taken in different plastic jars containing at least 50 gms of host gram seeds. Constant observation on the egg laying, larval development & emergence of the new adults were made to carefully record the life cycle.

#### **RESULT & DISCUSSION**

The beetle has been found to complete its life cycle in 28 days at 30°C & 30% RH at laboratory temperature & humidity respectively whereas the life cycle duration was prolonged upto 40-45 days at lower temperature of 25°C & higher humidity of 50%.

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