

Observations on the Biology of *Cylas formicarius* Fabricius at Coimbatore *

by

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Introduction:

Cylas formicarius Fabricius, commonly known as the sweet potato weevil, is a well known cosmopolitan insect, which causes serious damage to sweet potato (*Ipomea batatas*) both in the field and storage. The loss caused by this pest is very extensive all over the world and in India damage to the extent of 60 to 70% is not uncommon. In recent years the weevil has been found to cause serious damage to sweet potato at Coimbatore especially to some of the exotic varieties. The author took up a detailed study on the biology of this insect at Coimbatore especially on aspects like number and duration of larval instars, alternate host plants and incidence of the pest on different varieties of the sweet potato etc. This paper gives an account of these observations together with detailed morphological descriptions of early stages of the weevil.

Life History and Descriptions of Stages:

Copulation and oviposition: The weevils were noted to copulate freely both in the field and laboratory and the time taken varied from 30 to 40 minutes. Copulation takes place frequently. The time from emergence to copulation was found to vary from 3 to 5 days. Eggs are laid in cavities prepared by the weevil in the lower portions of the vines near or just beneath the surface of the ground. The insect however prefers the tuber for oviposition. Eggs are laid singly in each cavity.

The pre-oviposition period was noted to range from 4 to 11 days with an average of 7.2 days and the oviposition period from 51 to 102 days with an average of 80.0 days for 50 individuals. The total number of eggs laid during the entire period of oviposition by one female varied from 97 to 216 with an average of 148.2. Eggs laid in one day varied from 1 to 7 but in majority of cases 4 eggs in one day were obtained at regular intervals. Intervals of one or more days often occurred between oviposition.

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Egg : The egg is white, soft, translucent and broadly oval in shape measuring on an average 0.64 mm. in length and 0.45 mm. in width. The surface has a granular appearance. No change in colour is noted until hatching.

Under laboratory conditions the incubation period was found to range from 6 to 7 days with an average of 6.4 days for 50 eggs.

Grub : The grub has five instars in the laboratory. The general characters of these various instars are similar and the difference is found only in the measurements of body and head. The description of first and full grown grubs are given in detail. The measurements and the duration of all the instars are given in the Table below :

Instar	Body		Head		Duration in days	
	L	W	L	W	Range	Average
1	1.1 — 1.5	0.4	0.31	0.26	4 to 5	4.4
2	1.9 — 2.4	0.72	0.38	0.34	4 to 6	4.4
3	2.9 — 4.0	0.92	0.53	0.42	4 to 6	4.1
4	4.5 — 5.5	1.12	0.75	0.53	5 to 6	5.7
5	5.5 — 6.5	1.60	0.84	0.64	5 to 6	5.7

L. length in millimetres. W. width in millimetres.

First instar : Apodous. Colour uniformly white. Body moderately curved, tapering towards the posterior end and sparsely beset with hairs. Head dull yellowish brown, longer than broad, frons with a dark streak on the posterior end; mandibles uniformly dark and bifid.

Full grown grub : Apodous. Colour white. Body soft, elongately subovoid weakly curved, wrinkled, tapers gradually towards the posterior end. Head capsule subhemispherical, chitinised, light brown, the entire mouth frame and mandibles much darker, longer than broad. Epicranial suture distinct equal to half the cranial length, basal two thirds bordered by dark brown, distal one third bordered by yellow. Frontal suture distinct, each arm slightly longer than epicranial suture; each epicranial half bearing seven long and one tiny setae. Frons subtriangular, one and half times as wide as long; length equal to epicranial suture; median dark line on the posterior end distinct; extending forward to about two fifths the length of frons; provided with three pairs of long setae. Antennae small, fleshy, two jointed; apical joint conical. Clypeus

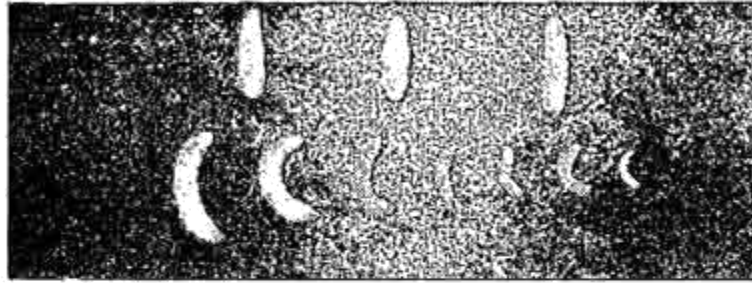


PLATE I. Stages of the weevil



PLATE II. Tubers infested by weevil



PLATE III. Stem infested by weevil

broadly transverse, width about three times the length provided with two pairs of setae on the posterior margin. Labrum semicircular, depressed beneath the level of clypeus, twice as broad as long, length half of clypeus, upper surface carrying three pairs of setae, posterior margin prolonged into clypeal zone. Epipharynx with a pair of more or less parallelly situated slender rods, which extend slightly into clypeal zone; anterior margin with two pairs small and stout and one pair of long slender median setae and four long lateral setae obliquely placed on each side; between the rods are two pairs of short stout setae; anterior pair bigger and placed one and a half times as wide as the posterior ones which are smaller in size. Mandibles very prominent bluntly bidentate, dark brown apically, gradually becoming lighter brown basally; length equal to its greatest width. Maxilla elongate with smooth cardo, stipes longer than broad with a basal lateroventral seta and two setae in the palpiferous region; palpus two jointed; basal joint slightly wider than long with a small seta and a pair of sensory pore in the middle and sensory pegs at the tip; mala with 10 to 12 dagger like long setae and another small seta at the posterior end. Labium cordate posteriorly limited by a Y shaped chitinised bad with one pair of long setae on each labial stipe; palpi two jointed each with one small sensory pore, similar to maxillary palpus but smaller in size; ligula with two pairs of setae anteriorly; subfascial region entire with three well developed setae on each side.

Prothorax dorsally not divided but has the prescutal and and scutal areas roughly indicated by row of hairs. Meso and Meta thoracic regions divisible into two distinct areas namely prescutum and scutoscutellum; prescutum with two small setae and scutoscutellum with four setae in a straight line; pedal lobes with four or five hairs.

Abdomen ten segmented, segments, 1 to 8 divisible into prescutum, scutum and scutellum and alar area; prescutum with one pair of setae, scutum with one seta and scutellum with four pairs of setae. Each epipleural lobe with one seta and each hypopleural lobe with two setae. The last two abdominal segments simple with a number of setae. Spiracles small, all of equal size, each with two contiguous annulated air tubes which project well beyond peritreme and are as long as peritreme.

The total larval period varied from 21 to 26 days with an average of 23.5 days.

Prepupa: The average length of this stage is 5.2 mm. and the duration is one or two days.

Pupa: Length of the body 4.9 mm. Greatest width 1.5 mm. General colour white. Body subellipsoidal, soft and beset with moderately long hairs which are concolourous with the body. Head as wide as long with three pairs of setae originating from a minute tubercle; one pair between eyes at base, one pair immediately behind the eyes and one pair between eyes. Rostrum about one fourth total length of body, three times as long as wide, provided with three pairs of setae on small tubercles, posterior pair close to the eyes, middle pair between the positions where the scape is inserted. Antenna straight, directed cephalad, segments not distinct, inserted approximately at apical third of snout. Prothorax compressed anteroposteriorly, one and half times as wide as long with four pairs of marginal setae raised on tubercles. Mesothorax bears three pairs of small setae between bases of elytra. Metathorax provided with two rows of setae in tiny tubercles, anterior row with two pairs of setae and posterior row with six pairs. Elytra striate and reach the base of seventh abdominal segment. Legs white, two anterior pairs directed cephalad; each femora with one pair of small setae; last pair except the tibia and the tarsi entirely covered by the wings. Abdomen nine segmented, dorsal side of each segment with a trasverse row of five pairs of setae on small tubercles on the posterior margin as follows: two pairs median and three pairs lateral; in addition a pair of setae on the pleural region; last segment provided with on each side slender pointed S shaped pleural process.

Pupation takes place inside the larval burrow. The pupal period was found to range from 8 to 11 days with an average of 9.5 days.

The total life cycle from egg to adult was found to range from 36 to 43 days with an average of 38.8 days for 25 individuals.

Adult: Adult is an active insect resembling ant at a glance. The detailed technical descriptions are found in the works of Blatchley and Leng (1916) and Pierce (1918). The length of life of adults were studied in the laboratory for both sexes with and without food. The females had the duration of life ranging from 69 to 108 days with an average of 93.6 days with food and 3 to 10 days with an average of 6.2 days without food for 50 individuals. In males it ranged from 91 to 130 days with an average of 109.6 days with food and from 4 to 7 days with an average of 5.6 days without food.

Proportion of sexes: During the rearing of the weevils in the laboratory out of a total of 1547 weevils 780 were males making a percentage of 50.4 males and 49.6 females.

Natural enemies: No parasites were got from any stage of the weevil during the study.

Host plants: Apart from sweet potato the weevil has been recorded on *Ipomea purpuria*, *I. prescaprae*, *I. lateralis*, *I. trifida*, *I. trichocarpa*, *I. paundurata*, *Jaquemontia tamnifolia* and *Calonyction aculeata*. During the present investigations the author was able to record a few more host plants for the weevil at Coimbatore. viz. *Ipomea sepiaria*, *I. learii* and *I. palmata*.

Incidence of the weevil on different varieties of sweet potato at Coimbatore: Observations were made on ten varieties of sweet potato grown in replicated plots at the College Farm Coimbatore. Regarding the incidence of the weevil during 1951 and 1952. The intensity of attack was assessed in each case by recording the healthy and infested tubers under each variety during the harvest from equal-sized plots and working out percentage of attack. The details are given in the following table.

Variety	Percentage of Infestation
V. 1 (Delhi)	21.2
V. 2 "	41.9
V. 10 "	20.2
V. 12 "	26.5
I, B. 22 (Coimbatore)	36.9
B 196 (America)	21.7
B 219 "	37.1
B 4004 "	17.2
B 5999 "	51.4
Local	33.9

It was found that no one variety could be singled out as relatively more immune to the attack of the weevil than others.

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