POPULATION ABUNDANCE OF *LEUCOPHOLIS CONEOPHORA* BURM. IN COCONUT GARDENS

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ABSTRACT

Population of different life stages of white grubs *Leucopholis coneophora* Burm., an important pest of the coconut palm at different depths of the soil and their seasonal intensity were studied for a period of three years. The beetle population and eggs were more at depths of 30 to 100 cm, first, second and third instars at 15 to 45 cm and pupal stages at 60 to 100 cm depth. The information gathered is of great significance in planning management schedules against white grubs.

INTRODUCTION

The white grub *Leucopholis coneophora* Burm. is one of the key pests of the coconut palm in the loamy sand soil tracts of Kerala and Karnataka, in India. Grubs of this melolonthid beetle feed on the soft tender apical portion of fresh roots. Continuous infestation by grubs in a garden results in general weakness of palms and reduction in yield. Management of this insect is a difficult task because the pest is soil inhabiting with a long life cycle. Soil application of insecticides and collection and destruction of adult beetles during the peak period of emergence are the most practicable methods for the management of the pest. With a view to developing effective schedules for pest management a study was undertaken to find out the seasonal intensity of population abundance of the life stages of *L. coneophora* at different depths of soil in coconut gardens.

MATERIALS AND METHODS

The population of different life stages of *L. coneophora* was assessed at fortnightly intervals at two locations at Thazhakkara and Vazhuvadi, Alappuzha

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District, Kerala from September 1977 to September 1980. At each location a pest-infested 0.50 ha coconut garden with loamy sand soil was identified, and 10 (1 m^3) sample pits were taken, 3 m away from the base of the palms. The soil in the pit was removed in layers and the same was passed through 20-inch mesh sieve to separate the life stages of the pest present. The number of adults, eggs, different instars of grubs and pupae present in layers of 0 to 15, 15 to 30, 30 to 45, 45 to 60 and 60 to 100 cm depths were recorded. Using these data the distribution of different life stages at different depths of soil and in different months was assessed.

RESULTS AND DISCUSSION

Table 66.1 shows the mean percentage of different life stages at different depths of soil observed at monthly intervals. Data relating to the seasonal distribution of life stages of *L. coneophora* are presented in Table 66.2.

Table 66.1: Distribution of life stages of *Leucopholis coneophora* in different depths of soil

Location	*Depth (cm)*	*Average percentage population of*					
		Adult	*Egg*	*Grub instar*			*Pupa*
				First	*Second*	*Third*	
Thazhakkara	0–15	2.2	3.6	22.0	17.8	9.5	0.0
	15–30	14.7	24.4	45.5	39.0	27.4	4.2
	30–45	26.5	32.9	19.8	28.8	25.5	19.3
	45–60	21.0	19.4	9.8	12.0	21.9	23.7
	60–100	35.4	19.5	2.8	3.2	15.7	52.7
Vazhuvadi	0–15	2.1	0.5	23.7	13.5	6.3	1.1
	15–30	14.5	11.2	34.6	37.3	27.3	8.1
	30–45	26.6	31.5	27.0	35.1	27.9	23.1
	45–60	23.7	14.9	12.0	8.3	22.9	28.0
	60–100	33.0	41.7	2.7	5.6	15.5	39.4

The beetle population at both the locations was low in the upper stratum of the soil at 0 to 15 and 15 to 30 cm. About 80 per cent of the population was at depths of 30 to 100 cm with the maximum at 60 to 100 cm depths. Beetles collected till the month of June were mostly from depths of 45 to 100 cm whereas a relatively higher proportion was obtained at 15 to 30 cm depths from June to August. The beetles collected till June might have been pre-emerged individuals, whereas the collection obtained from July onwards included the beetles which had emerged, mated and resettled for egg laying. The adults were seen in the soil from the second half of May to the end of August, but stray beetles were seen in April and September. With reference to the occurrence of beetle population in the soil, no distinct peak could be observed. In general, the population in the months of June and July was higher than the population in May and August.

Table 66.2: Seasonal distribution of different life stages of white grub *Leucopholis coneophora* in two locations in Alappuzha district (Kerala)

Life stages	*Location*	*Average population during the months of*															
		Apr.	*May*	*Jun.*	*Jul.*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*Jun.*	*Jul.*	*Aug.*
Adult	1	0	7	42	49	30	2											
	2	4	23	66	49	18	2											
Egg	1		27	216	334	223	0											
	2		126	370	222	252	95											
Grub – first	1		3	73	101	146	143	9										
instar	2		13	32	111	102	59	12										
Grub – second	1				20	41	106	52	14									
instar	2				13	33	44	35	17									
Grub – third	1							238	72	117	102	105	132	124	70	27	11	
instar	2							108	49	114	88	82	134	93	40	43	19	
Pupa	1												0	13	38	49	36	5
													11	37	45	96	23	2

Location 1 Thazhakkara.
2 Vazhuvadi.

The least number of eggs was found in 0 to 15 cm depth. A higher percentage of eggs was observed in depths of 60 to 100 cm during May and June. During the months of July to September, eggs were largely obtained from a depth of 15 to 60 cm. The eggs were generally seen from the second half of May onwards to the end of August. However, there was no distinct peak of occurrence of eggs in the field.

The highest percentage of first instar grubs was seen at depths of 15 to 30 cm and the least in the deepest layers of 60 to 100 cm. Although the eggs were seen in deeper strata, the first instar grubs were seen in fairly large numbers in the upper stratum of 15 to 30 cm, where coconut roots normally do not exist — obviously, the first instar depended on the roots of weeds and other intercrops as the source of food. First instar grubs were obtained from the second half of May to the beginning of October, but the higher level of population was recorded from the second half of June to the end of September, and second instar grubs were largely distributed at depths of 15 to 45 cm. The percentage of grubs seen at lower depths was very low. Generally, the top zone of 0 to 15 cm also had less population. In different months during the period of observation no definite trend in the depth-wise distribution of grubs could be determined. Second instar grubs were observed from the first half of July to the first half of November.

Third instar grubs were seen predominantly at depths of 15 to 30 cm during October to January and at depths of 45 to 60 cm after January. Moisture in the upper stratum would be higher during October to January due to the North-east monsoon. The influence of rainfall on the distribution of third instar grubs was evident by the trend in distribution from January onwards. During January, February and March higher percentage of grub population was observed in deeper depths of 30 to 100 cm. This might be due to the comparatively higher soil temperature and less moisture in the upper stratum of soil during the summer months. Downward migration of grubs of *L. coneophora* from the upper to the lower layers during the summer months was reported earlier also (Mathen *et al.*, 1964; Nirula, 1958). The third instar grubs were seen from the first half of October to the end of July of the succeeding year.

Pupae were observed largely at depths of 30 to 100 cm. The population of pupae observed in the higher stratum of 15 to 30 cm was mostly during the heavy monsoon period, June and July. The depth chosen for pupation appeared to be influenced by soil conditions.

Pupae were seen from the beginning of March till the end of August. But the number observed in March and August was relatively low and the regular period of occurrence of pupal stage can be treated as April to July.

The above studies have clearly brought out the pattern of distribution of the life stages of this important pest in different depths of soil as well as the seasonal intensity of the same. The information gathered is quite relevant in developing an integrated management schedule for the pest. Collection and destruction of beetles of *L. coneophora* is one of the important management methods to bring down the population. As is evident, beetles are abundant

during June and July and the above management method can be adopted during this period. Insecticidal application into soil is another method for pest suppression in the grub stage. In a separate study, Abraham (1983) has shown that the LD_{50} value for third instar grubs was nearly four times higher than that of second instar grubs. Hence, the control of grubs using insecticides during the first and second instar stages is more economical, effective and least hazardous. Insecticide application may therefore be adopted during June to September period. Attracting third instar grubs to the root zone of trap crops and control of them can be achieved after January when other crops are harvested. Using cassava as a trap crop is a possibility.

It is evident from the depth-wide distribution that pest population in the upper stratum of 0 to 15 cm is very low. Therefore, insecticidal application has to be deeper in the soil for making contact with the pest for effective control.

Ploughing or digging and exposing the grubs to predators like birds is a very effective natural control measure. Ploughing or digging to a depth of 30 cm or more would be beneficial in exposing the immature stages of the pest.

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DISCUSSION

P.A.C.R. Perera: Have you made any studies on the feeding habits of the adult beetles because it may be possible to control them by application of insecticides?

V.A. Abraham: Adults do not feed on any plant and do not congregate on alternate hosts prior to mating as seen in other species of root grubs. Hence, the suggested method of control is not possible with *L. coneophora*.

R. Mahindapala: How important is *Leucopholis* in Kerala and what is the economic damage caused by it?

V.A. Abraham: The pest is serious in localised pockets in soils with loamy sand texture. The economic damage has not been precisely estimated so far.

T.P. Sreeharan: Does the use of trap crop increase the pest population?

V.A. Abraham: Trap crop namely, cassava will attract the grubs to the root zone which can be collected and killed. Hence it will reduce the population of the pest.

D.C. Sastri: How physical and chemical properties of soil affect the distribution of larvae?

V.A. Abraham: Soil moisture and temperature influence the distribution at various stages. They prefer loamy sand type and the population in other soil types is very low. Excess moisture and dried condition are also not preferred by the insect.