

EFFECT OF DIFFERENT FOOD PLANTS ON GROWTH AND DEVELOPMENT OF THE COCONUT WHITE GRUB *LEUCOPHOLIS CONEOPHORA* BURM*

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ABSTRACT

Effect of different food plants on the development and biotic potential of the coconut white grub, *Leucopholis coneophora* was studied in specially designed field cages. Three-day-old first instar grubs were individually reared upto adult stage on coconut seedlings, cassava, cacao and wild sunn-hemp. Duration of different stages of *L. coneophora*, size and body weight, percentage survival, fecundity and viability of eggs were recorded. The duration of development was least in cassava and coconut followed by those in cacao and wild sunn-hemp. The observations indicated that cassava and coconut were more favourable hosts of *L. coneophora*. A higher build up of pest population is, hence, likely in coconut gardens in which cassava is grown as an intercrop.

INTRODUCTION

The coconut white grub, *Leucopholis coneophora* Burm. (Coleoptera: Melolonthidae) is one of the major pests of coconut palm in Kerala and Karnataka states of India. The grubs feed on the roots resulting in the yellowing of leaves and shedding of buttons and nuts. The grubs also feed on the roots and tubers of various intercrops grown in coconut gardens. The present study was undertaken to find out the influence of various host plants grown in coconut gardens on the growth and development of *L. coneophora*. Coconut and three crops commonly grown as intercrops viz., *Manihot esculenta* Cranz. (cassava) *Theobroma cacao* L. (cacao) and *Crotalaria striata* DC. (wild sunn-hemp, grown as green manure) were used as food plants. The development and biotic potential of insects reared on these hosts were studied and the results are reported here.

MATERIALS AND METHODS

Three-day-old first instar grubs of *L. coneophora* reared from eggs of adult beetles collected from field were caged individually in earthen pots (25 x 30 cm) planted with different host plants. In the case of coconut the grubs were released in three month old seedlings and in the case of cassava, cacao and sunn-hemp two-month old plants were used.

Two hundred grubs were exposed to each crop @ one grub per plant. When the host plant got killed the grubs were transferred to fresh, potted plants. The larvae were periodically examined for ascertaining the moultings/mortality and thus recording the duration of different life stages and their survival percentages. Adults emerging from each host plant were maintained in pairs in egg laying chambers for recording longevity of adults and fecundity and hatching percentage

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of eggs laid. The data obtained were subjected to χ^2 test of independence.

The length and width as well as the weight of different life stages of *L. coneophora* reared on different hosts were recorded using individual life stages obtained from the rearings maintained separately for the purpose. The data thus obtained were subjected to the analysis of variance.

RESULTS AND DISCUSSION

Data relating to the larval and pupal duration of *L. coneophora* raised on different host plants are presented in Table I. The duration of the first instar grubs reared on different hosts did not vary significantly. The development periods of the second instar, third instar grubs and pupae (in both sexes)

were shorter on cassava and it was followed by those reared on coconut. In terms of the duration of development from egg to adult, cassava was found to be the most suitable host plant, followed by coconut. Cacao and wild sunn-hemp were on par and significantly inferior to the former two hosts. The favourable influence of nutrition manifested in the second stage persisted in the subsequent stages too. Influence of nutrition in the larval duration among root grubs was reported on *Aphodius howitti* Hope (Crane, 1958) and *Holotrichia consanguinea* Bl. (Kaira and Kulshreshtha, 1961) also.

The data relating to the body size of grubs reared on different host plants are presented in Table I. Body length and width of the

Table I. Effect of different host plants on the duration of life stages and body size and weight of different stages of *L. coneophora*

	Cassava		Coconut		Cacao		Sunn-hemp		Critical difference			
	M	F	M	F	M	F	M	F	M	F		
Duration of life stages (days)												
First instar grub	38.2	40.2	40.3	40.9	40.5	41.6	42.0	41.4	NS	NS		
Second instar grub	48.8	48.8	51.6	51.6	55.7	55.5	63.4	67.7	6.19	5.92		
Third instar grub	166.0	172.8	168.1	177.5	181.9	188.7	179.7	185.1	8.61	7.45		
Pupae	23.3	22.9	25.3	25.7	26.8	26.1	24.7	25.2	1.45	1.89		
Egg to adult	299.3	307.7	308.3	318.7	327.9	334.9	332.8	342.4	10.09	7.83		
Body size (mm) and weight (g)												
Third instar grub	Length		49.3	56.3	48.8	56.3	46.8	53.9	44.1	50.3	2.3	1.57
	Width		14.1	15.9	13.9	16.3	12.8	15.5	13.4	15.2	0.85	0.72
	Weight		3.4	5.8	3.4	5.7	3.1	4.9	2.9	4.4	NS	0.51
Pupae	Length		31.3	36.0	31.3	35.5	28.7	33.2	28.1	27.3	2.11	1.80
	Width		15.0	17.0	15.0	17.0	13.7	15.7	13.2	15.2	0.91	1.10
	Weight		2.7	4.6	2.7	4.3	2.2	3.4	2.3	2.8	0.26	0.51
Adult	Length		26.8	30.8	26.8	30.9	25.2	29.9	23.8	27.5	1.48	1.47
	Width		13.5	16.1	13.6	16.9	13.1	14.3	12.7	15.6	NS	1.05
	Weight		1.8	3.2	1.7	3.2	1.5	2.5	1.2	2.2	0.21	0.34

M — Male, F — Female, NS — Not significant.

grubs reared on cassava was the maximum, followed by those reared on coconut there being no significant difference between them. The body weight of male grubs reared on different host plants did not vary significantly. The highest weight of female grubs was observed in cassava, followed by coconut. Similarly the length, width and weight of pupae obtained from cassava and coconut were higher than those obtained from the other two hosts. Body length and weight of adults (male and female) obtained from coconut and cassava were on par and significantly higher than those obtained from other host plants. But, body width of adults obtained from different hosts did not vary significantly. Kalra and Kulshreshtha (1961) recorded more length and width of grubs of *H. consanguinea* fed on sugarcane than on grass roots. Weight gain of grubs of *Costelytra zealandica* White was significantly different on *Lotus pedunculatus* than on a hybrid of this species (Farrel and Sweney, 1974). Greater overall weight increase in *Melolon-*

tha melolontha was recorded on broad leaved plants (Hauss and Schutte, 1976).

The data relating to the survival of different life stages of *L. coneophora* reared on different host plants (Table II), when subjected to χ^2 test of independence, revealed that there were no significant variations in the survival upto the third instar. But, maximum number of pupae were obtained from cassava, followed by coconut, cacao and wild sunn-hemp. The adult emergence also showed the same trend. The gradual increase in the χ^2 values from the second instar to the adult stage indicated increasing influence of the hosts in later instars of the insect. The differences got manifested in the pupal and adult stages only. Population build up is likely to take place much faster when fed on cassava and coconut root than on cacao and sunn-hemp. Hauss and Schutte (1976) found that mortality of *M. melolontha* was less for grubs fed on broad leaved plants than on roots of grasses and the effect of food on

Table II. Effect of different host plants on the survival of the immature stages of *L. coneophora* and the longevity, pre-oviposition period and fecundity of adults

Host plants	No. of first instar grubs observed	First instar grub surviving till attaining				Mean				
		Second instar	Third instar	Pupal stage	Adult stage	Adult Sex longevity (days)	Pre-oviposition period (days)	No. of eggs/female	Per cent of eggs hatched	
Cassava	200	150	128	86	69	M	44.7	34.0	19.4	96.8
						F	48.7			
Coconut	200	140	126	72	63	M	42.3	34.8	18.5	95.0
						F	42.6			
Cacao	200	140	124	62	42	M	38.7	30.9	8.9	58.2
						F	34.5			
Sunn-hemp	200	150	124	67	40	M	37.8	30.5	7.2	65.5
						F	33.2			
χ^*	2	2.51	4.91	8.33*	17.13**	CD M	4.42	2.15	2.52	13.24
						CD F	2.89			

M — Male F — Female CD — Critical difference

mortality and weight gain was not apparent until the grubs reached the second instar stage. Wilson (1978) reported that survival of *C. zealandica* was highest on large leaved lines of white clover.

With regard to the longevity of adults, cassava and coconut were superior to others. Similarly the adults reared on these two plants had significantly longer pre-oviposition period and higher fecundity. Initial body weight of adult also was higher in these insects. Higher rate of egg production was seen in females, having higher body weight. Besides the eggs laid by them showed a higher hatching percentage. Farrel (1973) reported that egg production of *C. zealandica* varied significantly with the initial body weight.

The results indicated the possibility of certain favourable nutritional factors in cassava and coconut roots which increased the biotic potential and the survival rates of *L. coneophora*. In general, different host plants seen to have some influence on the grubs of both sexes of *L. coneophora*. The overall results indicate the possibility of a higher population build up of *L. coneophora* in coconut gardens grown as a monocrop or intercropped with cassava. The feasibility of raising cassava as a trap crop in coconut

gardens for management of the pest is also suggested from this study.

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REFERENCES

- CRANE, P. B. 1958. An ecological study of the pasture scab *Aphodius howitti* Hope. *Aust. J. Zool.* 4: 259-314.
- FARRELL, J.A.K. 1973. Effect of initial body weight and feeding on the fecundity and longevity of adults of *Costelytra zealandica* N. Z. J. *Sci.* 16: 53-57.
- FARRELL, J. A. K. and SWENEY, W. J. 1974. Plant resistance to the grass grub *Costelytra zealandica*. *N. Z. J. agric. Res.* 17: 69-72.
- HAUSS, R. and SCHUTTE, F. 1976. On the polyphagous habits of the grubs of *Melolontha melolontha* L. on meadow and waste land plants. *Anzeiger fur Schadlings Kunde Planzeric Schutz unweitt Schutz.* 49: 129-132.
- KALRA, A. N. and KULSHRESHTHA, J.P. 1961. Studies on the biology and control of *Lachnosterna consanguinea* Blanch, a serious pest of sugarcane in Bihar (India). *Bull. ent. Res.* 52: 577-587.
- WILSON, E.R.L. 1978. White clover and grass grub. II. Screening 74 overseas lines for resistance and tolerance. *N.Z.J. agric. Res.* 21: 723-726.