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Effect of *Lantana Camara* Leaf Extract on the Growth Rate and Life- Table Characteristics of *Paederus Fuscipes.*

Sudhakar Gupta[1]* , Harpreet Singh[2] , and Monika Gupta[3].

[1]Department of Zoology, Suraj Education Group, Mahendergarh, Haryana, India
[2]Department of Zoology, Career Point University, Kota, Rajasthan, India
[3]Department of Chemistry, Suraj Education Group, Mahendergarh, Haryana, India

ABSTRACT

The life - table indicated a higher rate of moratality of eggs, that is recorded in all the treatments, although its level in L_2 stage increase upto 30% after 5% treatment of *Lantana camara* leaf extract.The highest mortality of pupae has been recorded 12% in 1% treatment as compared to that of control. The dry biomasses, of L_2, pupae and adults at 1% tratment as well as those reared on 5% treatment was significantly lower than those of control. The absolute growth rate of only untreated pupae was 0.083mg/day declined to 0.065 mg/day (at 1% treatment) and 0.030mg/day (at 5% treatment) the growth rates of other stages were not higher and that declined in adults (-0.008mg/day). Adults obviously indicate negative growth rate. These observations suggested that the leaves of *L. camara* may be a new safer, eco-friendly insectiside for the control of *Paederus fuscipes.*

Keywords: *Paederus fuscipes,*Growth Rate, Life- Table Characteristics*, Lantana camara*.

Corresponding author

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INTRODUCTION

Paederus fuscipes (Staphyilinidae) is one of the biggest family of beetles order Coleoptera with a number of species distributed throughout the worldwide [1]. The beetle is found in India, Pakistan, Central Africa, Asia, New Guinea, Malaysia, Iran and Europe. Adult *P. fuscipes* are attracted to incandescent and fluorescent light at night [2,3]. This species contains coelomic fluids [4]. *P. fuscipes* is also well known for causing acute human dermatitis. The toxic haemolymph of the beetle is known as paederin, causes necrotic blisters when the insect is crushed on human skin. It is found in cropped areas preferably in maize, berseen and rice fields. Although it is widely occured but very less awareness is observed about its biological and ecological system. It is also useful insect in agricultural fields being a major polyphagous predator of several agricultural pests[5]. Due to its predatory and medicinal importance, the growth rate and life-table characteristics of *P. fuscipes* was studied thoroughly under laboratory conditions with the treatment of *L. camara* leaf extract.

MATERIAL AND METHODS

COLLECTION OF INSECT

The *Paederus fuscipes* were collected from the bajra and maize fields located near surrounding area of Suraj College Compus, Mahendergarh, Haryana that is situated at 28.27N laitude and 76.15E longitude in northern India.

EXTRACTION PROCEDURE

Green leaves of *L. camara* were collected from its natural habitats and washed thoroughly to remove dust and other particles. After washing, kept for shade drying at room temperature for 10-15 days and finally ground to fine powder. The powdered plant material was extracted with absolute ethanol as solvent in Soxhlet Apparatus for 72 hrs. After extraction the extract was evaporated to dryness using rotatory vaccum evaporator. The semi-solid crude extract was then transferred in glass vials and stored in refrigerator for experiments. To assess the efficacy of leaf extracts, 1% and 5% concentrations were prepared in distilled water and mixed in diet of *T. granarium*.

BIOASSAY

The individuals of *P. fuscipes* were reared in the laboratory at 30 ± 2^0C and 70 ± 5% RH in BOD incubator. Initially, the desired number of eggs were collected by allowing the untreated adults of both sexes of similar age-groups to lay eggs in prepared control diets and sifting the eggs. Batches of 10 eggs (n=3) were kept separately in beakers covered with muslin cloth, containing various dietary formulations (the dietery compound *T.granarium* is treated with 1% and 5% aquous extraxt of *L. camara* using the direct contact method, that was feeded by *P. fuscipes*) and control with normal diets [6].

The life-table characteristics of *P. fuscipes* were determined [7,8]. Accordingly, the following parameters were determined.

Equations

$$l_x = n_x / n_o \quad \text{----------} \quad \text{I}$$

$$d_x = n_x - (n_x+1) \quad \text{----------} \quad \text{II}$$

$$q_x = d_x / n_x \quad \text{----------} \quad \text{III}$$

where

X = age interval

n_o = number of individuals at the beginning of the experiment.

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n_x = observed number of alive individuals at the start of age interval x.

l_x = proportion surviving to start of age interval x .

d_x = number of organisms dying within age interval x to x +1.

q_x = rate of mortality during age interval x to x+1.

To determine the growth - rate of the developmental stages of *Paederus fuscipes,* its fresh and dry weights (samples were taken at 60^0C for 24 hrs) were determined using the standard methods [9,10,11] .

Absolute daily growth (mg/day) = $w_2 - w_1 / t_2 - t_1$

Where

w_1 and w_2 = the mean biomasses of the individuals at times t_1 and t_2 respectively.

STATISTICAL ANALYSIS

All the data of the present study was statistically analyzed using SPSS computer software. The differences in the mean values were subjected to oneway ANOVA.

RESULTS AND DISCUSSION

The life - table characteristics of the developmental stages of *P. fuscipes* reared on *T. granarium,* treated with 1% and 5% aqueous extract of *L. camara* using the direct contact method, indicated total (100%) mortality (q_x) in about 21 days of the life-table of untreated *P. fuscipes*. Similarly, the rate of egg mortality was also fairly high in all the treatments (control = 19.4%, 1% treatment = 28% and 5% treatment = 45%). At 5% treatment of *L. camara* leaves extract, L_2 stage larvae were found more susceptible showing 30% mortality in comparison to untreated control (10.6%). However, in case of pupa, mortality of 12.7% was recorded in 1% treatment as compared to that of control (8.1%).

Table No.1 : The life-table characteristics of *P. fuscipes* reared on *T. granarium* at 30±2°C. (L_1- L_2=Larval Instars)

Treatment	LIFE STAGE	DURATION (Days)	TOTAL AGE (Mean)	n_x	l_x	d_x	q_x
Untreated *T. granarium* (Control)	EGG	3.5	0	100	1.00	19.4	0.194
	L_1	3.0	03.5	80.6	0.80	08.6	0.106
	L_2	4.5	06.5	72.0	0.72	04.0	0.055
	PUPA	6.0	11.0	68.0	0.68	02.7	0.081
	ADULT	4.0	17.0	65.3	0.65	65.3	1.000
	ADULT	-	21.0	0	0	0	0
T. granarium treated with 1% extract of *L. camara*	EGG	3.5	0	100	1.00	28.0	0.280
	L_1	3.0	03.5	72.00	0.72	04.0	0.055
	L_2	4.5	06.5	68.00	0.68	11.0	0.161
	PUPA	6.0	11.0	55.00	0.55	07.0	0.127
	ADULT	4.0	17.0	48.00	0.48	48.0	1.000
	ADULT	-	21.0	0	0	0	0
T. granarium treated with 5% extract of *L. camara*	EGG	3.5	0	100	1.00	45.0	0.450
	L_1	3.0	03.5	55.0	0.55	15.0	0.270
	L_2	4.5	06.5	40.0	0.40	12.0	0.300
	PUPA	6.0	11.0	28.0	0.28	03.0	0.100
	ADULT	4.0	17.0	25.0	0.25	25.0	1.000
	ADULT	-	21.0	0	0	0	0

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There was a dose dependent increase in mortality after treatment with *L. camara*. Larval stage was found to be more sensitive to the toxic effect than pupae and adults (Table-1). The *L. camara* leaves extract adversely affect the survival of larvae in comparison to survival of pupae of *P. fuscipes* presumably, that is on account of its larvicidal, repellency or contact toxicity, which is in conformity with the present findings at 5% concentration [12].

The adverse affect of leaves extract of *L. camara* on the developmental stages of *P. fuscipes* reducing the dry biomasses of L_2, pupae and adult at 5% treatment up to 0.29 mg, 0.51 mg and 0.40 mg, respectively, which were significantly lower ($P<0.05$ and $P< 0.01$) in comparison to those of control (L_2 = 0.44 mg, pupae = 0.94 mg and adult = 0.91mg). The leaves extract of *L. camara* inhibited the biomass accumulation in the developmental stages of *P. fuscipes* at 5% dose which supports the present data proving it as a powerful antifeedant and insecticidal for larvae [12,13] (Table-2).

Table No. 2 : Analysis of developmental stages of *P. fuscipes* reared on *T. granarium*

Dietary Mixture	Wt. of life stages of *P. fuscipes* (mg) (Mean ± SE)				
	EGG	L_1	L_2	PUPA	ADULT
Untreated *T. granarium*	0.015 ± 0.0005	0.077 ± 0.0140	0.447 ± 0.0591	0.946 ± 0.0106	0.914 ± 0.0062
T. granarium treated with 1% *L. Camara* extract	0.014 ± 0.0002	0.071 ± 0.0029	0.363 ± 0.0470	0.740** ± 0.0305	0.650** ± 0.0264
T. granarium treated with 5% *L. camara* extract	0.014 ± 0.0004	0.066 ± 0.0026	0.290* ± 0.0152	0.511** ± 0.1912	0.403** ± 0.0088
CD at 0.01 LEVEL	0.00231	0.0441	0.2331	0.1166	0.0864
CD at 0.05 LEVEL	0.00152	0.0291	0.1538	0.0769	0.0570

Significant at *P < 0.05; **P < 0.01

The present results on the absolute growth - rate at different developmental stages of *P. fuscipes* revealed an almost identical rate of earlier immature stages in all the experiments. Beyond L_1 stage, however, the growth rates of individuals stages reared on 1% leaves extract (L_2=0.064 mg/day, pupa= 0.062 mg/day and adult = -0.015 mg/day) and those reared on 5% treatment with *L. camara* leaves extract (L_2 = 0.049 mg/day, pupa= 0.036 mg/day and adult = -0.027 mg/day) were significantly lower as compared to those of control (L_2 =0.08 mg/day, Pupa = 0.083 mg/day and adult = -0.008 mg/day). Therefore a negative growth rate in adults is observed on account of the fact that pupae do not fed and use their body nutrient for metabolism. The adverse effects of *L. camara* reducing the growth of body tissues in the immature stages of *P. fuscipes* [14] (Table-3).

Table No. 3: Absolute growth - rates of immature and mature stages of *P. fuscipes* reared on *T. granarium*

Life Stage	Life span (days)	Absolute growth rate of *P. Fuscipes* reared on extract treated diet (mg/day)		
		Untreated *T. granarium*	*T. granarium* treated with 1% *L. Camara* extract	*T. granarium* treated with 5% *L. Camara* extract
Egg	3.5	0	0	0
L_1	3.0	0.020	0.019	0.017
L_2	4.5	0.082	0.064	0.049
Pupa	6.0	0.083	0.062	0.036
Adult	4.0	-0.008	-0.015	-0.027

The present study indicates that the applications of crude aqueous leaves extract of *L. camara* leaves are highly effective in controlling the *P. fuscipes* by causing heavy mortality at the larval and pupal stages under laboratory conditions. This plant product is also eco-friendly, easily available and economically safe. Biopesticides are safe natural products and free from any residue problem on the crop and in the environment [15]. Keeping in mind the overall performance, the crude aqueous extract of *L. camara* leaves may be utilized in the management of *P. fuscipes* after evaluating its effects under field conditions.

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