



Effect of leaf extracts of *Ocimum canum* and *Tridax procumbens* on the larval development of *Tribolium castaneum*

A Senthil Anna, S Raveendran, O Sathick

P.G. & Research, Department of Zoology, Khadir Mohideen College, Adirampattinam, Affiliated to Bharathidasan University, Tamilnadu, India

Abstract

Topical treatment of varied concentrations of *Ocimum canum* and *Tridax procumbens* leaf extracts was studied against the varied larvae of groundnut pod borer, *Tribolium castaneum*. All the concentrations (0.25, 0.50, 0.75 and 1%) effectively caused varied percentage deaths in all larval age groups. Both leaf extracts caused more than 50% larval mortality at two higher concentrations (0.75 and 1.0%). It was evident that the early instar larvae (12 days & 14 days) were more susceptible than the late larval instars (16 days & 18 days) to both leaf extracts of all concentrations tested. Larval mortality increased with concomitant increase in the dose leaf extracts of all concentrations tested. The dose dependent studies revealed that 0.75% of *Ocimum canum* leaf extract was found to be the more potential causing percent larval mortality, which ranged from 70 to 82%.

Keywords: leaf alkaloid extracts, topical application, *tribolium castaneum*, percent larval mortality

Introduction

In recent years, great emphasis is given on the use of plant extracts as insecticides because of their innate biodegradability and non-toxic value (Latha *et al.* 1992; Sushma Gupta *et al.*, 1994; Varena Ulrike Blaske and Horst Hertel, 2001 and Anuradha *et al.* 2002) [2, 6, 16]. One of the desirable effects in controlling the insect pests by botanicals may be affecting the growth and development of noxious insects. Perusal of literature reveals that the total plant extracts and the extracts of their derivatives have yielded good results in effecting various ranges of mortality in insect pests (Rajendran and Gopalan 1985; Shah 1992 & 1996; Sunita Gupta and Sushma Gupta 1993; Venkateswaralu *et al.* 1993; Perich *et al.* 1995; Jayaprakash *et al.* 1997; Young – Cheol Yang *et al.* 2002 and Shah and Maheswari, 2002) [7, 8, 9, 11, 15, 17, 19]. All these reports revealed that the plant extracts inhibited molting or larval growth when fed along with normal diet or applied topically on the integument. Though considerable works are available on the control of pests of agricultural and Human's health importance, data on the larval mortality on stored pests and oilseed products are limited. Groundnut (*Arachis hypogea*) in one of the most important oilseed crops and it is grown in India for its seeds which contain 50% of a non-drying oil and about 35% protein and are used in oil and feed industry or for confectionary. Its storage is affected by pod infesting beetles, such as *T. castaneum*.

Materials and methods

Insect culture

Eggs, larvae and adults of pod borer, *T. castaneum* were obtained from laboratory-bred culture maintained on whole-wheat flour mixed with yeast (17:1; W/v) in a dark BOD incubator set at $28 \pm 2^\circ$ C and 65-70% R.H. The *T. castaneum* larvae used in the experiments were 12, 14, 16, and 18 days old.

Extraction of leaf extracts

The fresh leaves of *O. canum* and *T. procumbens* were collected washed to remove dust and dirty and grounded in a pestle and mortar. An aqueous suspension of 500 ml leaf

powder of each plant was in 100 ml of double distilled water and soxhelted. After cooling the extract, the extract was filtered through Whatman filter paper No.40 to remove any suspended particle. The filtrate was treated by Dragondroft's reagent for the presence of water soluble alkaloids in the extract. The appearance of an orange-coloured precipitate indicated the presence of water soluble alkaloids. One hundred mg of each leaf extract was prepared using 60-65% acetone as the solvent.

Contact toxicity

Aliquots of μ l of the leaf extract concentrations were topically applied on the entire dorsal surface of larval age groups (12d, 14d, 16d and 18d) using a Hamilton micro syringe (Burkard). Control larvae treated with 1 μ l of acetone alone. The treated larvae (n=300) were transferred to glass vials individually after 1 h of treatment. Culture media were added to the respective vials after 24h. Percent larval mortality was calculated after recording mortality values at 24 h periods intervals for 7 days; as per the equation given below:

$$\text{Percent Larval Mortality} = \frac{\text{No. of dead larvae}}{\text{No. of larvae treated}} \times 100$$

Results and discussion

Effects of topical application of *O. canum* and *T. procumbens* on percent larval mortality are presented in Tables.1 and 2. The results obtained on the percent larval mortality of 12 days larvae of *T. castaneum*, at 0.25, 0.50, 0.75 and 1.0% leaf alkaloids of *O. canum* and *T. procumbens* were somewhat similar, the values ranging from 40.0 to 82.66%. A similar trend of results was also noticed and the values ranged between 36 and 77.33% percentage mortality recorded for 16 days larvae of 18 days age group, when topically applied with *O. canum* showed superiority over *T. procumbens* in affecting percent larval mortality, the % value ranging from 34 to 58.33% in *O. sanctum* treatment, while the % values recorded for *T. procumbens* treatment were 28.66 and 49.33%

Table 1: Larval mortality of *T. castaneum* due to different doses of *O. canum* in different age groups (days)

Age of Larvae (Days)	Treatments	Percent larval mortality at different conc.			
		0.25%	0.50%	0.75%	1.0%
12	Control	ND	ND	ND	ND
	Experimental	49.33±4.19	66.0±3.84	82±4.19	82.66 ± 3.18
14	Control	ND	ND	ND	ND
	Experimental	40.66±3.84	54.0±3.64	70.0±4.16	77.33 ± 4.15
16	Control	ND	ND	ND	ND
	Experimental	36.0±3.14	48.0±3.16	61.33±3.14	66.0 ± 4.12
18	Control	ND	ND	ND	ND
	Experimental	34.0±2.10	39.33±2.18	51.73±4.08	58.33 ± 3.16

The values are the mean of three determinations of standard deviations. ND =Not Detectable.

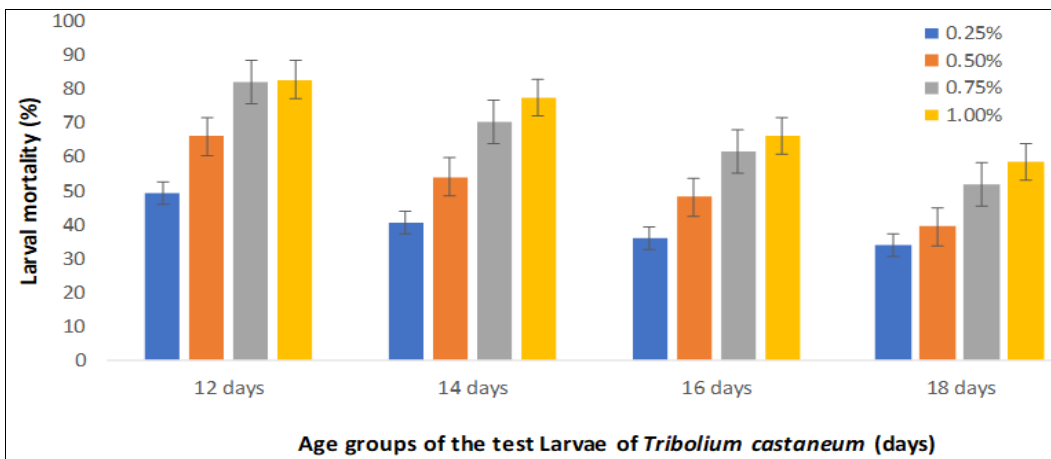


Fig 1: Bar diagram showing the larval mortality of *T. castaneum* at different doses of *O. canum* in varied age groups (days)

Table 2: Larval mortality of *T. castaneum* due to different concentrations of *T. procumbens* in different age groups

Age of Larvae (Days)	Treatments	Percent larval mortality at different conc.			
		0.25%	0.50%	0.75%	1.0%
12	Control	ND	ND	ND	ND
	Experimental	40.0±2.14	45.33±2.16	49.0±3.16	51.0±3.64
14	Control	ND	ND	ND	ND
	Experimental	46.0±2.14	40.66±2.16	44.66±2.18	47.33±2.19
16	Control	ND	ND	ND	ND
	Experimental	31.33±1.18	36.66±1.24	41.0±2.16	43.66±2.84
18	Control	ND	ND	ND	ND
	Experimental	28.66±0.98	32.0±1.04	43.0±2.14	49.33±2.96

The values are the mean of three determinations and standard deviations. ND= Not Detectable

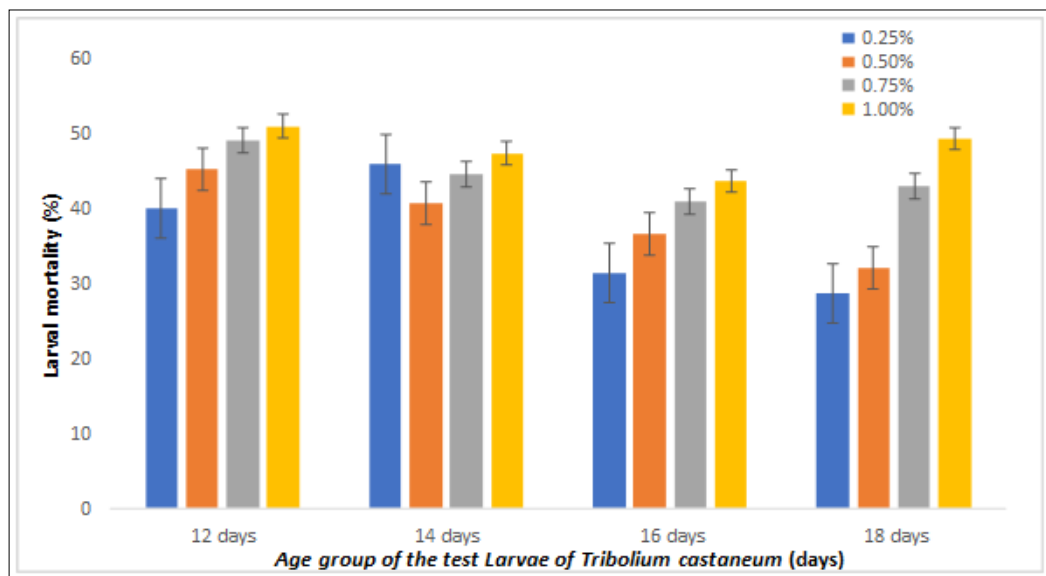


Fig 2: Bar diagram showing the larval mortality of *T. castaneum* at different doses of *T. procumbens* in varied age groups (days)

It was also observed in the present study that the percentage mortality in each of larval age groups was directly proportional to the dose of leaf alkaloids extract used. In general, mortality decreased with the dilution of both leaf alkaloid extracts tested against the varied larval age groups. The same trend of results was reported by previous workers. Young-Cheol Yang *et al.*, (2002)^[19] reported that *Piper longum* fruit extract showed 100% larval mortality in mosquito, *Aedes aegypti* at 2.5 mg/l and 5.0 mg/l treatments while 0.25 mg/l treatment produced 50% larval mortality. Shah (1996)^[10] reported the leaf and root alkaloid extract of *Catharanthus roseus* were effective in producing 11 to 100% nymphal mortality in house crickets, *Grylodes sigillatus*.

It is significant, in the present study that the early instars (12 days & 14 days) were more susceptible than the successive instars (16 days and 18 days) to the leaf alkaloid extracts. The manner in which the leaf alkaloids extract treatments do have their effect on the mortality appears to be also significant. The two higher concentrations, 0.75 % and 1.0 % were more potential than the other two concentrations, since they affected invariably more than 50% deaths in all early instars. These findings fall in line with earlier observations made by Shah and Maheswari (2002) in *Culex quinquefasciatus* and Amanulla Hameed *et al.* (2003)^[1] in *Spodoptera litura*.

In the present study, the mortality observed in most of treated larvae can be attributed to a malfunction in the moulting process by preventing them from shedding their old cuticle. (Warthen and Uebel 1980 and Kubo *et al.* 1983)^[5, 18]. Yet another reason that could be suggested for the larval mortality may be due to disruption in the synthesis of Juvabion, a Juvenile hormone essentially required for larval development as suggested by Slama & Willaims 1965; Bowers *et al.* 1976 and Sharma 2002^[3, 13].

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