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EFFECT OF METHANOLIC EXTRACT OF *CHROZOPHORA PLICATA* ON *SPODOPTERA LITTORALIS*

Entomology

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ABSTRACT

Present Scenario of global warming gives rise to the climate change; which resulted in life cycle disruption of many beneficial as well as pest insects, to boost this problem some insects changed their life according to climatic conditions. Locally available weed plant *Chrozophora plicata* of family *Euphorbiaceae* was used for study. In present investigation Antifeeding and Larvicidal activity was recorded for the methanolic extract of *C. plicata.* Results showed that potential antifeedant, larvicidal and growth inhibiting activity against *Spodoptera littoralis* a serious polyphagus pest. Use of such plants could be remedy from insect pests and weeds too.

KEYWORDS

Chrozophora plicata; Spodoptera littoralis, antifeedant, larvicidal.

INTRODUCTION:

The Present Scenario of global warming gives rise to the climate change; which resulted in life cycle disruption of many beneficial as well as pest insects to boost this problem some insects changed theire life according to changes in climatic conditions [1]. Noctuidae is the largest family of order Lepidoptera, and it contains some of the most destructive insect pests of agriculture. *Spodoptera littoralis*, a Noctuid moth, commonly called as oriental leaf-worm moth feeds on different species of plants such as okra, onion, pigweed, peanut, cabbage, cauliflower, pepper, citrus, taro, tea, cucurbits, carrot, fig, geranium, soybean, cotton, sunflower, tomato, lettuce, apple, alfalfa, tobacco, avocado, pine, pea, poplar, plum, pear, oak, potato, eggplant, spinach, clover, wheat, and corn [2].

Plant weed *Chrozohora plicata* belong to *Euphorbiaceae* family occurs naturally throughout India, Myanmar, Thailand, Andaman Islands and Central java and Malaysia. It is found on common waste lands, biomass; profusely from January to April. It is an erect herb with silvery hairs; lower part of stem is naked, upper part hairy and has slender tap-root [3]. It is traditionally used by the tribes and native medical practitioners for the treatment of various diseases. Its leaves and roots contain xanthone glycosides and a chromone glycoside. Oil extracted from seeds was rich in linoleate and whole plant contains tannin. The coumarin, scopoletin, the alkaloid ricinine [4], flavonoids [4,5], xanthones and chromones[6] are the compounds isolated from different species of chrozohora. The antimicrobial screening of *Chrozophora species* leaf extracts showed considerable amount of inhibition against Bacillus subtilis, Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa; with much activity on Salmonela typhi [7].

Fourteen compounds (1-14) namely 3-carbomethoxyindole (1), 6-hydroxy -7-methoxycoumarin (2), methyl 1-4-hydroxybenzoate (3), 4-hydroxybenzoic acid (4), p-coumaric acid (5), oleanolic acid (6), 4-ketopynoresinol (7), apigenin(8), apigenin-7-p-coumerate (9), apigenin-7-O-β-D-glucopyranoside (10), acacetin-7-O-[4-hydroxy-E-cinnamoyl-(6)- β-D-glucopyranoside (11), apigenin-7-O-[4-hydroxy-E-cinnamoyl-(6)-β-D-glucoyranoside (12), apigenin 7-O-β-D-[2",6"-bis (4-hydroxy-E-cinnamoyl)] glucopyranoside (13) and apigenin 7-O-rutinoside (14) were isolated from the methanolicetract of the whole plant of *Chrozophora plicata*[8].

All these studies orient to study *Chrozophora plicata* for their antifeeding and insecticidal properties on the polyphagus pest *Spodoptera littoralis*, which may be a fruitful to farmers.

MATERIALS AND METHODS:

Locally available weed plant *Chrozophora plicata* of family *Euphorbiaceae* was used for the present investigation. Plants was identified, collected in morning time, washed under tap water, dried in shade at natural temperature, grinded in mixer and subjected to the soaking for extraction using methanol as a solvent.

Spodoptera littoralis eggs were collected from agricultural field and sterilized with 0.02% sodium hypochloride solution, dried and allowed to hatch; after hatching, feed on fresh cotton leaves (*Gossypium hirsutum* L.) in a laboratory condition at room temperature of 27 ± 2º C with 14-10 hours light:dark photoperiod and 65 ± 5% relative humidity.

Antifeedant activity:-

Antifeedant bioassay was carried out using leaf disc no choice method. The crude extract were dissolved in methanol and fresh cotton leaf discs of 1cm diameter were punched using cork borer and dipped in different concentrations. The leaf discs treated with methanol were used as control. In each petridish(1.5cmX 9cm) wet filter paper was placed below leaf to avoid early drying of the leaf and single fifth instar larva was introduced on each leaf. Progressive consumption of leaf area by the larva after 24 hours was recorded in control and treated discs using the leaf area meter. Leaf area eaten by the larva in plant extract treatment was corrected from the control and the percentage antifeedant activity was calculated according the formula given by Bhaskar et al; [9].

Larvicidial activity:-

Different concentrations of crude extracts were used by leaf dip method and exposed to the larvae. After 24 and 48 hours of treatment, the larvae were continuously maintained on the non-treated fresh cotton leaves and mortality was recorded. Five replicates (20 larvae per replicate) were maintained in laboratory and percent mortality was calculated using Abbott's[10] corrected mortality formula. LC50 and LC90 were determined according to probit analysis method of Finney[11].

Statistical analysis:-

The results of antifeedant activity presented with ±SD; LC50 and LC90 values were calculated using probit analysis Finney[11] and Chi square test was employed for upper and lower confidence limits.

RESULTS AND DISCUSSION:

Antifeedant chemicals may be defined as being either repellent without making direct contact to insect or suppressant or deterrent from feeding once contact has been made with insects.

Antifeedant activity of *Spodoptera littoralis* against *Chrozophora plicata* leaf extracts increases as the concentration of crude extract

increases shown in Table1. The assay of antifeedant was lowest for low concentration of 10ppm; it was observed 8.01 ± 0.63 for *Chrozophora plicata* in the laboratory condition. Results of highest antifeedant activity were observed for the *Chrozophora plicata* was 65.75 ± 0.69 as shown in table 1.

The results showed a trend of increased concentration may cause the deterrent effect for the *Spodoptera littoralis* against *Chrozophora plicata* leaf extracts and will be helpful to use as a control measure.

Table1: Antifeedant activity of *Spodoptera littoralis* against *Chrozophora plicata* leaf methanolic extract.

Sr. No.	Concentration in ppm	Chrozophora plicata
1	10	8.01 + 0.63
2	20	11.38 + 0.69
3	30	20.40 + 0.72
4	40	31.34 + 0.66
5	50	43.61 + 1.13
6	60	54.45 + 0.93
7	70	65.75 + 0.69

In present investigation the toxicity assays were conducted for two different exposure times i.e. 24 hours and 48 hours in the laboratory condition. The 24 hours show concentration dependent mortality; as the concentration increases the observed mortality was also get increased and 48 hours showed concentration dependent mortality; as the concentration increases the observed mortality was also get increased (table 2).

Table 2: LC 50 and LC 90 values for methanolic extract of *Chrozophora plicata* leaf against *Spodoptera littoralis* for 24 hours and 48 hours of exposure period.

Sr. No.	Exposure time	LC 50	95% Confidance limits		LC 90	95% Confidance limits	
			Lower	Upper		Lower	Upper
1	24 Hours	39.5	35.60	47.95	71.5	65.95	76.55
2	48 Hours	37.5	31.50	38.33	64.0	62.30	66.55

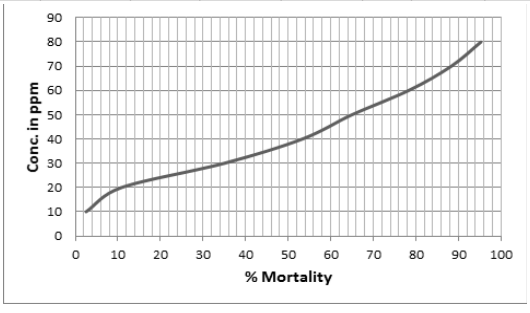

Figure 1: Graph for Determination of LC 50 and LC 90 values for *Chrozophora plicata* extracts against *Spodoptera littoralis* for 24 hours exposure

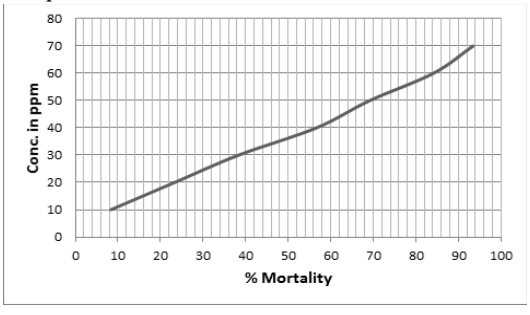

Figure 2: Graph for Determination of LC 50 and LC 90 values for *Chrozophora plicata* extracts against *Spodoptera littoralis* for 48 hours exposure

These results were similar to the recent studies of Bhaskar et al;[9] where they studied antifeedant activity of different plant extracts against *Spodoptera litura* in laboratory condition. The results obtained were also in accordance with Patil et al;[15]; These are also in agreement with Gawande et al;[13] for the Achaea janata and Wasu et al;[1] for the *Spodoptera frugiperda* using different botanicals for insecticidal potential.

Different studies on *C. plicata* showed many active components present in it; which could be used as antifeedant and insecticidal plant material like study of Pandey and Dubey[14] with Leaf extracts of *C. plicata* exhibited strong fungitoxicity against *P. aphanidermatum*. Patil et al;[15], reported that the aqeous extract of leaves of this plant have significant anti-helmintic property against *Pheretima posthuma* (Indian Earth Worm). Aqueous extract of this plant possessed phytotoxic activity on rice , wheat and mustard. In an experimental study by Suparna and Tapswi[16], the leaf extracts exhibited higher inhibition of shoot, root and radial elongation than the stem and root. The isolates of *C. plicata* showed DPPH radical scavenging and enzyme inhibitory activities against enzyme acetylcholinesterase (AChE), butyrylcholinesterage (BChE) and lipoxygenase (LOX)[8].

The weed plant *Chrozophora plicata* has potential antifeedant, larvicidal and growth inhibiting activity against *Spodoptera littoralis* a serious polyphagus pest. Studies suggest further investigations on *C. plicata* for their insecticidal properties on different insect pests.

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