

Effect of aqueous extracts of different plant parts of milkweed plant (*Calotropis gigantea* R. Br.) against ovicidal activity on *Helicoverpa armigera* (Hubner)**S. Prabhu*, P. Priyadharshini** and R. Veeravel*****

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prabhursn@gmail.com**Abstract**

The aqueous extracts of different plant parts of milkweed plant (*Calotropis gigantea* R. Br.) viz., leaves, stem, flower roots and whole plant powder were prepared at 2, 4, 6, 8 and 10 per cent concentrations and tested for ovicidal activity on *Helicoverpa armigera*. Among the different plant parts, leaf extract caused 100 per cent inhibition of egg hatchability followed by flower (90 %) extract. Also it was observed that as the dosages increased there was higher percentage of inhibition in egg hatchability and the early stage of eggs (24-48 hrs old eggs) were found to be highly susceptible at all the concentrations. The present study clearly that the milkweed plant possess ovicidal activity and could be used for the management of *Helicoverpa armigera*.

Keywords: Milkweed plant, *Helicoverpa armigera*, ovicidal activity.**Introduction**

Milkweed plant (*Calotropis gigantea* R. Br.) belongs to the family Asclepiaceae a common waste land weed distributed in tropical and subtropical region of Asia (Mueen Ahmed *et al.*, 2005). All parts of this plant are used as medicine in the indigenous system of Ayurvedic medicine (Warrier *et al.*, 1994). Similarly this milk weed plant gained importance in recent years as a potential pesticidal source against insect pests, (Meshram, 1995). It is known to have insecticidal (Solunke and Deshpande, 1991), antifeedant (Pari *et al.*, 1998), antitermiticidal (Badshah *et al.*, 2004), nematocidal (Philip *et al.*, 1993), antibacterial and antifungal properties (Anil Srivatsava *et al.*, 2000). The plant extract had proved effective against lepidopterous and sucking pests of several crops (Muhammad *et al.*, 2003). Extracts of milkweed plant containing insect toxic principles such as

cardenolides, cardiac glycosides, flavonoids, gigantocine (a novel nonprotein amino acid) and other cytotoxic principles which are effective against an array of insect pests.

Helicoverpa armigera Hübner (Lepidoptera: Noctuidae) is a polyphagous pest that infests cotton, tomato, bhendi, chickpea, pigeonpea, chilli, maize, sorghum and many other crops, inflicting substantial crop losses every year (Sharma, 2001 and Talekar *et al.*, 2006). Although, several conventional insecticides were found to be effective against this pest recently *H. armigera* had developed resistance to many commonly available insecticides posing great problem to farmers (Sahayaraj and Amalraj, 2005). Therefore alternate measures of control that are more efficient, more economical and safer needs to be developed (Suryakala, 1998). Botanical insecticides have long been touted as attractive

alternations to synthetic chemical insecticides for pest management because botanicals reputedly pose little threat to the environment or to human health. In the context of agricultural pest management, botanical insecticides are best suited for use in organic food production in developing countries (Isman, 2006). Hence the present investigation was made on the ovicidal effect of milk weed against *H. armigera*.

Materials and methods

Fresh *Calotropis gigantea* R. Br plant parts viz., leaves, stem, flower and roots were collected and allowed to shade dry to prevent the loss of active principle from the plant parts. The shade drying process was continued until the plant materials were dried enough to be powdered. The dried plant materials were taken individually and ground into powder with the help of Willey Mill. Whole plant powder was prepared by mixing leaf, flower, stem and root powder in equal proportions. The plant parts dust was stored in plastic containers for further use.

Preparation of aqueous extract

Fresh plant materials were used to prepare the aqueous suspensions. The plant materials were washed thoroughly with water to remove dirt, if any and chopped into small pieces with a sharp knife. Chopped pieces were crushed into a fine paste with the help of a pestle and mortar. The paste thus obtained was diluted to 100 ml solution with distilled water and filtered through a fine muslin cloth to get 2, 4, 6, 8 and 10 per cent concentrations. 0.1 ml Teepol was added as a sticking agent to the filtrate. The prepared concentrations were tested in- vitro conditions. All the five plant parts extracts were applied topically on the eggs of *H. armigera* at two, four, six, eight and 10 per cent concentrations. In each treatment, thirty individual eggs were brushed off and taken for the studies. The treatments were replicated three times. The experiment

was conducted with the eggs of different ages viz., 24-48, 48-72 and 72-96 hrs. The effect of extracts of different plant parts on the hatchability of eggs was determined by keeping the eggs on moist filter paper in a petridish (100 mm dia). The hatchability of eggs was noted upto seven days (Samuel and Sundarababu, 1998).

Results and Discussion

The leaf extract at a concentration of two per cent caused 53.33 percentage of inhibition in 24 - 48 hrs old eggs. The percentage inhibition was the least (10.00%) in 72 - 96 hrs old eggs. At four per cent concentration, the percentage inhibition was 56.66, 26.66, 13.33 respectively for 48, 72, 96 hrs old eggs. Percentage inhibition was 66.66 in 24 - 48 hrs old eggs at six per cent concentration. Similarly at 72 and 96 hrs old eggs, the percentage inhibition was observed to be 33.33 and 16.66 respectively. At eight per cent concentration, the percentage inhibition was 83.33, 50.00, 26.66 respectively for 48, 72, 96 hrs old eggs. At 10 per cent concentration, the leaf extract showed highest inhibition of 90.00 per cent in 48 hrs old eggs, 73.33 and 53.33 per cent in 72 and 96 hrs old eggs respectively. Statistically 10 per cent concentration was significantly superior to other concentrations tested in the different egg ages. Thakur *et al.* (1988) determined the effectiveness of neem leaf extract and NSKE at 5 per cent against *H. armigera* and found that neem leaf extract at 5 per cent causes 63 per cent mortality of larvae. Manikantan (2003) reported that the leaf extract of *C. gigantea* was found to be very effective in causing maximum percentage (77.66) inhibition of egg hatchability when tested on 24 h old eggs of *S. litura*. Similar effect of aqueous extract of *Calotropis* spp. was reported by Sahayaraj (2002) at six per cent concentration against *S. litura* Fab. Moursy (1997), Singh *et al.* (2005) and Ramos *et al.* (2006) had reported ovicidal and larvicidal action of *Calotropis procera* leaves against dipterans while

Elimam *et al.* (2009) claimed that leaf extracts of *C. procera* showed remarkable larvicidal, adult emergence inhibition, repellent and oviposition deterrent effect against different dipteran larval instars.

The percentage inhibition with aqueous extract of stem was only 13.33 per cent at two per cent concentration at 48 hrs old eggs. It was 3.33 per cent in 72 hrs and 0.00 per cent at 96 hrs old eggs. At four per cent concentration, it showed 26.66 per cent inhibition in 48 hrs old eggs. At eight per cent concentration, it showed 43.33, 26.66 and 13.33 per cent in 48, 72, 96 hrs old eggs respectively. Maximum percentage inhibition was seen in 10 per cent concentration which recorded 53.33, 33.33 and 20.00 per cent in 48, 72, 96 hrs old eggs respectively. Statistically 10 per cent concentration was significantly superior over all other concentrations. Patel and Patel (1977) conducted experiments on ovicidal effect of some of the botanical formulations alone and in combination with synthetic insecticides on the eggs of *H. armigera* and revealed that among the plant product formulations tested, Parasmani @ 0.3 per cent showed higher ovicidal toxicity (48.91%) than neem oil 0.3 per cent.

Regarding the flower extract, the two per cent concentration caused 26.66 per cent inhibition in 24-48 hrs old eggs and least percentage inhibition (3.33%) was seen in 96 hrs old eggs. Four per cent concentration caused (43.33%) inhibition in 48 hrs old eggs. In 48-72 and 72-96 hrs old eggs, the inhibition was 16.66 and 6.66 per cent respectively. In six per cent concentration, the inhibition was 66.66, 33.33 and 13.33 per cent in 48, 72 and 96 hrs old eggs, respectively. The embryonic development was inhibited to a maximum of 83.33 per cent at 10 per cent concentration in 48 hrs old eggs and significantly superior over other concentrations. Six per cent and eight per cent concentration were on par with each other in the inhibition egg hatchability.

Percentage inhibition with root extract was nil in two per cent concentration tested at 48, 72 and 96 hrs old eggs. However, six per cent concentration showed 20 per cent inhibition in 48 hrs old eggs and higher concentration of 10 per cent recorded 43.33 per cent egg inhibition followed by eight per cent concentration in 24-48 hrs old eggs. Regarding the whole plant extract, it was found to be effective next to leaf and flower extracts. Whole plant extract at two per cent concentration caused 23.33 per cent inhibition in 24-48 hrs old eggs. Also the least percentage inhibition of 3.33 per cent was seen in 72 and 96 hrs old eggs. Six per cent concentration caused 50 per cent inhibition in 48 hrs old eggs, while in 72 and 96 hrs old eggs, the percentage inhibition was 20 and 6.66 per cent respectively. In eight per cent concentration, the percentage inhibition was 66.66 per cent in 48 hrs old eggs and 33.33 per cent in 72 hrs old eggs. The embryonic development was inhibited to a maximum of 76.66 per cent at 10 per cent concentration in 48 hrs old eggs. *Calotropis* Sp. are proved to be lethal to various stored grain pests and delay the developmental stages by interfering with their apolytic and molting processes (Dwivedi and Garg, 2003; Deka and Singh, 2005).

Among the different plant parts, leaf extract caused 100 per cent inhibition of egg hatchability followed by flower (90 %) extract. Also it was observed that as the dosages increased there was higher percentage of inhibition in egg hatchability and the early stage of eggs (24-48 hrs old eggs) were found to be highly susceptible at all the concentrations and the reason might be that the embryonic development would not have started. These promising results in relation with *in vitro* ovicidal activity open the way for further investigation in order to identify the active molecules involved and will be helpful in management of the pest in field conditions also.

Table – 1. Ovicidal action of aqueous extract of *C. gigantea* leaf, stem, flower, root and whole plant on *H. armigera* eggs

Treatment	Percentage inhibition of eggs hatchability *														
	Leaf			Stem			Flower			Root			whole plant		
	24 – 48 hrs	48 – 72 hrs	72 – 96 hrs	24 – 48 hrs	48 – 72 hrs	72 – 96 hrs	24 – 48 hrs	48 – 72 hrs	72 – 96 hrs	24 – 48 hrs	48 – 72 hrs	72 – 96 hrs	24 – 48 hrs	48 – 72 hrs	72 – 96 hrs
2%	53.33 (46.92) ^e	16.66 (23.85) ^d	6.66 (13.64) ^d	16.66 (23.85) ^e	6.66 (13.64) ^d	0.00 (0.00) ^e	43.33 (41.15) ^c	10.00 (18.43) ^e	3.33 (8.84) ^e	3.33 (8.84) ^e	0.00 (0.00) ^e	0.00 (0.00) ^e	33.33 (35.21) ^c	6.66 (13.64) ^d	3.33 (8.84) ^d
4%	73.33 (59.00) ^d	33.33 (35.21) ^c	10.00 (18.43) ^c	30.00 (33.21) ^d	13.33 (21.14) ^c	6.66 (13.64) ^d	53.33 (46.92) ^c	23.33 (28.78) ^d	6.66 (13.64) ^d	26.66 (30.99) ^d	6.66 (13.64) ^d	3.33 (8.84) ^d	40.00 (39.23) ^c	13.33 (21.14) ^c	6.66 (13.64) ^c
6%	86.66 (68.85) ^c	40.00 (39.23) ^c	20.00 (26.56) ^b	43.33 (41.15) ^c	13.33 (21.14) ^c	10.00 (18.43) ^c	76.66 (61.21) ^b	36.66 (37.22) ^c	16.66 (23.85) ^c	40.00 (39.23) ^c	13.33 (21.14) ^c	6.66 (13.64) ^c	53.33 (46.92) ^b	23.33 (28.78) ^b	10.00 (18.43) ^b
8%	93.33 (76.35) ^b	53.33 (46.92) ^b	23.33 (28.78) ^b	53.33 (46.92) ^b	26.66 (30.99) ^b	16.66 (23.85) ^b	83.33 (66.14) ^b	46.66 (43.07) ^b	20.00 (26.56) ^b	46.66 (43.07) ^b	16.66 (23.85) ^b	10.00 (18.43) ^b	66.66 (54.78) ^a	33.33 (35.21) ^a	16.66 (23.85) ^a
10%	100.00 (85.94) ^a	63.33 (52.77) ^a	33.33 (35.21) ^a	66.66 (54.78) ^a	33.33 (35.21) ^a	20.00 (26.56) ^a	90.00 (71.56) ^a	53.33 (46.92) ^a	26.66 (30.99) ^a	53.33 (46.92) ^a	20.00 (26.56) ^a	13.33 (21.14) ^a	73.33 (59.00) ^a	40.00 (39.23) ^a	16.66 (23.85) ^a
Control	0.0 (0.0) ^f	0.0 (0.0) ^e	0.0 (0.0) ^e	0.0 (0.0) ^f	0.0 (0.0) ^e	0.0 (0.0) ^e	0.0 (0.0) ^d	0.0 (0.0) ^f	0.0 (0.0) ^f	0.0 (0.0) ^f	0.0 (0.0) ^e	0.0 (0.0) ^e	0.0 (0.0) ^d	0.0 (0.0) ^e	0.0 (0.0) ^e
SED	3.51	2.72	3.39	2.21	4.31	2.89	1.92	2.39	4.78	3.55	3.47	4.56	2.17	3.72	4.37
CD (p= 0.05)	7.82	6.07	7.55	4.93	9.61	6.44	4.28	5.34	10.65	7.92	7.73	10.16	4.83	8.29	9.75

*Values are mean of three replications , Values in parentheses are arc-sine transformed values
Mean values with various alphabets differ significantly by DMRT.

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