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MOLLUSCICIDAL ACTIVITY OF LATEX OF *CALOTROPIS PROCERA*

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ABSTRACT

Calotropis procera (Ait.) R.Br. commonly known, as "Arka" is a popular medicinal plant found throughout the tropics of Asia and Africa. It has been widely used in the Indian traditional system for the treatment of a variety of disease conditions due to the presence of various cardenolides, triterpenoids, anthocyanins and hydrocarbons in it. In this paper we have evaluated the toxicity of latex of *C.procera* against harmful snails *Lymnaea acuminate* and *Indoplanorbis exustus*. The toxicity of the extracts of latex was both time and dose dependent. Aqueous extract of latex of *C.procera* was less toxic compared to the extracts of ethanol and carbon tetra chloride. The 96h LC_{50} of aqueous extract of latex was 68.49 mg/l and 76.40 mg/l whereas same of ethanolic extract was 40.91mg/l and 35.80mg/l against the snails *L. acuminate* and *I. exustus* respectively. The CCl_4 extract of latex was more toxic to the snails, *L. acuminate* and *I. exustus* and 96h LC_{50} was found to be 14.25mg/l and 22.88 mg/l respectively.

KEYWORDS: *Calotropis procera*, plant molluscicide, *Lymnaea acuminate*, *Indoplanorbis exustus*

INTRODUCTION

Environmental pollution caused by synthetic pesticides has diverted researches towards herbal pesticides. Synthetic pesticides has been implicated in causing environmental problems such as, ground and surface water contamination, negative effects on non target organism, accidental poisoning of human being and development of pesticide resistance (Kushwaha *et. al*., 2004). Switch over to botanical pesticides made us turn to a locally available plant *Calotropis procera*. It is a medicinal plant and belongs to the family asclepiadaceae. A xerophytic shrub widely found in West Africa, Madagascar, the Arabian Peninsula, Southern Asia, and Indochina to Malaysia (Rahman and Wilcock 1991). It occurs almost throughout India. The three species i.e. *C. procera, C. gigantean* and *C. acia* occur in India. *C.procera* is also known as sodon apple, calotrope, french cotton, small crown flower (English), algodon de seda, bomba (Spanish) cotton-france, arbre de soie, and bois canon (French) (Howard 1989, Liogier 1995, Neal 1965, Parrotta 2001). Latex and flass are the main products obtained from it.

In Southeast Asia, especially India and Thailand, *Indoplanorbis exustus* and *Lymnaea acuminate* snail harbor metacercaria and cercariae of several flukes such as the bovine blood fluke, liver fluke (Agarwal and Singh 1988), schistosome spindale (Ito et al, 1962; Papasarathorn *et al.*, 1963; Harinsuta, 1965; Kullavanijaya and Wongwaisavawan,1993) and intestinal echinostomiasis (Bhaibulaya *et al*.,1964, 1966; Yokogawa *et al*.,1965). Human infections are acquired by consumption of the raw snails infected with metacercariae or cercariae. The people in northeastern India and Thailand are fond of eating raw food, including fish, prawns and snails. Thus, these diseases are prevalent in India and Thailand. Control measures for these diseases may be achieved by destroying the intermediate host. However, controlling the intermediate host is difficult because these snails have high reproduction potential (Krull, 1993) and can survive in different habitats (Malek, 1985). Many plant species have been tested as molluscicides all over the world, as indicated by Kolls and Mc-Cullough (1987), Kuo (1987) and Jurberg *et al*., (1989). *C. procera* is a plant with great potential as medicinal plant. The present study aims to evaluate the molluscicidal activity of the plant *C. procera* against the snail *L. acuminate* and *I. exustus.*

MATERIAL AND METHODS

Plant Material

The latex of *C.procera* was collected from the twigs of plants growing in nearest areas of Ramgarhtal in the district Gorakhpur Uttar Pradesh, India and identified by the herbarium of the Botany

department, DDU Gorakhpur University, Gorakhpur, Uttar Pradesh, India.

Preparation of aqueous extract

10ml of fresh latex of plant *C.procera* were mixed with 100ml of distilled water in an electric macerator. The extracts were passed through whatman filter paper and the filtrate was used for subsequent experiments.

Preparation of ethanolic and CCl_4 extracts

The latex was dried under shade at ambient temperature and ground to small granules. The granules of dry latex (DL) were soxhlated successively with ethanol and carbon tetrachloride (CCl_4). The solvents were evaporated under vaccum to yield the dry extracts which were stored at 4^oC temperatures

Animal collection

Adult *L. acuminate* (2.25±2c.m length) and *I. exustus* (0.85±0.037cm) were collected locally and used as experimental animals. The animals were allowed to acclimatize for 72 hours. Toxicity experiments were performed by the method of Singh and Agrawal (Singh and Agarwal 1984). Ten experimental animals were kept in a glass aquarium, containing 3 liters of de-chlorinated water at 24^oC. The experimental animals were exposed continuously for 96 hours to different concentration of plant extract (Table-1). The pH of water was 7.1-7.3 and dissolved oxygen was 6.5-7.2mg/l, six aquaria were set up for each concentration. Control animals were given an equal amount of de-chlorinated water. Mortality was recorded at every 24 hours (24, 48, 72 and 96 hours) during overall exposure period. Dead animal were removed on each observation to avoid contamination in aquarium water. Snail mortality was established by the contraction of the body within the shell and no response to the needle probe was taken as evidence of death. LC_{50} value, upper and lower confidence limit (UCL and LCL) and slope values were calculated according to the method of the POLO computer program of Russell *et al*. (Russell ., 1977)

RESULTS

Table 2 and 3 indicate that the toxicity of the ethanolic extract of latex of *C.procera* against *L. acuminate* and *I.exustus* was time and concentration dependent. Table 2 shows that the LC_{50} of 24 hours of aqueous, ethanolic and CCl_4 extract of latex of *C.procera* against *L. acuminate* were 1067.94 mg/l, 171.43 mg/l and 150.90 mg/l respectively. The LC_{50} of 96 hours LC_{50} of aqueous, ethanolic and CCl_4 extract of latex of *C.procera* against *L. acuminate* was 68.49 mg/l, 40.91mg/l and 14.25mg/l respectively. Similarly Table 3 show the LC_{50} of 24 hours of aqueous, ethanolic and CCl_4 extract of latex of *C. procera* against *I. exustus* was 1006.98

mg/l, 198.98 mg/l and 172.92mg/l respectively. The LC_{50} of 96 hours of aqueous, ethanolic, and carbon tetrachloride extract of latex of *C. procera* against *I. exustus* was 76.40mg/l, 35.80 mg/l and 22.88mg/ respectively. The results indicate that the toxicity of aqueous, ethanolic and carbon tetrachloride extract of latex of *C. procera* against *L. acuminate* and *I. exustus* is time and dose dependent. It also indicates that CCl_4 extract of latex of *C. procera* was more toxic against both the snails than ethanolic and aqueous extract.

DISCUSSION

All part of plant *C. procera* yield latex. The latex also contains the cardiac glycosides, calotropin, uscharin, calotoxin, calactin and uscharidin. Calotropagenin is the common aglycone of all the glycoside. Calotropin and uscharin show digitalis-like action on the heart. A non toxic proteolytic enzyme, calotropain (2-3 percent), has been isolated from the latex. The latex of this plant also contains some poisonous constituents (Wealth of India vol.3, 1992). Our results on the toxicity of latex of *C. procera* show that it is highly effective against *I. exustus* and *L .acuminate*. The study also reveals that the toxic component of latex of *C. procera* more solubility both in ethanolic and carbon tetrachloride. Carbon tetrachloride extract of latex of *C. procera* show more toxicity compared to ethanolic extract of latex of *C.procera* indicating that the solubility of active molluscicidal component is more in CCl_4.

CONCLUSION

The extracts of latex of *C. procera* plant exhibit excellent molluscicidal activity against *L. acuminata* and *I. exustus*. These plants are easily available. Hence they can be effectively used to control of the snail *L. acuminate* and *I. exustus* that are vectors of various fluke.

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Table 1. Concentration of latex of *Calotropis procera* used for toxicity determination against *Lymnaea acuminate* and *Indoplanorbis exustus.*

Against *L.acuminata*	**Concentration used (mg/l)**
Aqueous	25, 50, 100, 150
Ethanolic	10, 25, 50, 70
Carbon tetrachloride	5, 10, 20, 30
Against *I.exustus*	Concentration used (mg/l)
Aqueous	25, 50, 100, 200
Ethanolic	10, 25, 50, 75
Carbon tetrachloride	5, 10, 20, 35

Table 2. Toxicity of the aqueous, ethanolic and carbon tetrachloride (CCl_4) extract of latex of plant *Calotropis procera* against *Lymnaea acuminate* .

Period	**LC_{50} w/v mg/l Aqueous extract**	**LC_{50} w/v mg/l Ethanolic extract**	**LC_{50} w/v mg/l CCl_4 extract**
24 h	1067.94	171.43	150.90
48 h	393.01	134.07	42.56
72 h	135.43	75.92	22.73
96h	68.49	40.91	14.25

Table 3 Toxicity of aqueous, ethanolic and carbon tetrachloride (CCl_4) extract of latex of plant *Calotropis procera* against *Indoplanorbis exustus* .

Period	**LC_{50} w/v mg/l Aqueous extract**	**LC_{50} w/v mg/l Ethanolic extract**	**LC_{50} w/v mg/l CCl_4 extract**
24 h	1006.98	198.98	172.92
48 h	248.67	104.28	112.83
72 h	128.13	59.50	36.45
96 h	76.40	35.80	22.88