

Effect of *Tridax procumbens* Extraction on Fecundity, Fertility and Mating Behaviour of *Culex Quinquefasciatus*

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Abstract

The present study is an effort to report the larvicidal properties of certain indigenous plants against filarial vector. In the present investigation, an effort has been made to investigate the effect of *Tridax procumbens* presented fraction on fecundity, fertility and mating behaviour of *Culex quinquefasciatus* (Diptera; culicida)

Introduction

Diptera is a difficult group of insect, in which the larval stages passes in water or aquatic environment and the adults are terrestrial flying vectors, carrying diseases. A Number of chemicals of plant origin have been demonstrated by several investigators against mosquito vector. Back 1965 reported that the plant contains secondary metabolites that show juvenile hormone effect on insects. The presences of juvenile hormone in plants have been reported by Prabhu and John 1972, Rajendra and Gopalan 1978, Sharma and Saxena 1994, Saxena *et al.* 1992 and Sharma 2000. Very recently, Saxena *et al.* 2000 and 2001 described the pharmacological property of *Tridax procumbens*

Materials and Methods

Tridax procumbens L. (Compositae) is a common weed found throughout India and used for a variety of medicinal purposes. The whole herb was collected from the field of village-Multai district Betul, India in the month of September and October. After proper identification (A voucher specimen is preserved in the herbarium) it was shade dried and powdered to a fine mesh size

Extraction and Purification

Air dried powdered materials was soxhlated in acetone for 24 hours and solvent was evaporated under the reduced pressure in vacuum evaporator. A dark green semisolid substance was obtained which accounted 0.01% of the total dried powdered material. The crude extract was diluted with acetone to make 10% stock solution, serial dilutions were made from this stock solution. The crude extract was initially tested on TLC plates of silica gel "G" (0.22 mm) where total eight spots were obtained using Benzene: Methanol (9:1). The crude extract was then poured into an open glass column (65 cm x 4 cm) and eluted with C_6H_6 : MeOH (9:1). About seven fractions were collected. Some fractions were overlapped when subjected to TLC. The overlapped fractions were once again eluted using the same solvent system. The different fractions were collected in the small glass vials and were kept in refrigerator. Out of seven fractions obtained, fraction FR₅, (brown colour) has been analyzed spectroscopically for active constituents.

Isolation and Structural Elucidation of Compounds

Isolations and structural elucidation of the purified compound was carried out over IR, UV, HNMR and mass spectrum, using spectrophotometer at R.S.I.C. Chennai. The IR spectrum revealed the absorption at 3010 cm^{-1} (C=C-H), 2940 cm^{-1} (-CH₃), 1990 cm^{-1} (Amides), 1450 cm^{-1} (> C- H-1), 1370 cm^{-1} , 1210 cm^{-1} , 750 cm^{-1} (monosubstituted aromatic ring) and 660 cm^{-1} (monosubstituted aromatic ring). The UV spectra showed absorption at X max. 412 nm, H-NMR showed intense peak at 5.0 945 (7-C methyl group), 5.170 (6H), 5.4 27 (3H), 5-7.20 (Orthopteron of the aromatic ring). The CHCl₃, soluble fraction of the methanolic extract of the whole herb, *Tridax procumbens* which yielded flavone glycosides (Fig.1)

The present work will be useful in the commercial utilization of the *Tridax procumbens* as a medicinal plant for curing, dysentery, diarrhoea and to check the haemorrhage of wounds. Sinha and Dogra 1985 also reported the pharmacological study of some medicinal plants and mentioned that it would be quite helpful for commercial utilization of the medicinal plants in the country, Yadav and Kumar 1998 also reported a similar compound in *Tridax procumbens* Linn.

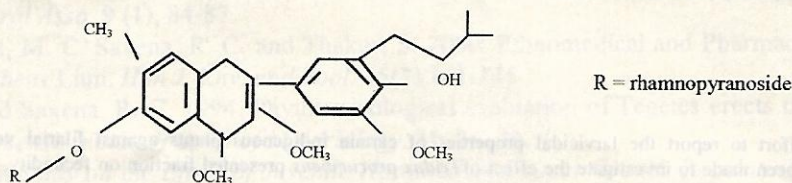


Fig. 1. Flavone glycoside-6,4-dihydroxy-3'-phenyl 3,5,7,5'tetramethoxy flavone

Table 1. Fecundity and fertility effect of AM₆ on adults of *Culex quinquefasciatus* from treated larvae

Treated groups	Females dead (%age)	Percentage of biting	Oviposition day after blood meal	Average no of eggs obtained	Hatching (% age)	Larval mortality (%age)	Adult emergence (% age)	Sterility Index (%age)
T♂ x T♀	60.0	26.6	5	68	40	70	16	86.00
T♂ x UT♀	53.3	33.3	4	74	44	68	20	84.32
UT♂ x T♀	6.66	86.6	3	192	86	12	78	20.52
UT♂ x UT♀	6.66	100.0	3	212	98	02	96	

15 each treated females and males were taken in four replicates

Values are significantly different than the control (Duncan's multiple range test $p < 0.01$)

Table 2. Fecundity and fertility effect of AL₂ on adult of *Culex quinquefasciatus* from treated larvae

Treated groups	Females dead (% age)	Percentage of biting	Oviposition day after blood meal	Average no. of eggs obtained	Hatching (% age)	Larval mortality (% age)	Adult emergence (% age)	Sterility Index (% age)
T♂ x T♀	66.0	40.0	5	62	48	70	14	86.07
T♂ x UT♀	83.3	33.3	4	68	52	64	20	83.44
UT♂ x T♀	66.6	86.6	3	198	72	18	76	33.27
UT♂ x UT♀	6.66	100.0	3	218	98	04	94	

15 each treated females and males were taken in four replicates

Values are significantly different than the control (Duncan's multiple range test $p < 0.01$)

Table 3. Fecundity and fertility effect of AL₇ on adult's *Culex quinquefasciatus* from treated larvae

Treated groups	Females dead (% age)	Percentage of biting	Oviposition day after blood meal	Average no. of eggs obtained	Hatching (% age)	Larval mortality (% age)	Adult emergence (% age)	Sterility Index (% age)
T♂ x T♀	73.3	26.6	5	46	32	78	8	93.10
T♂ x UT♀	66.6	26.6	4	52	46	72	16	88.80
UT♂ x T♀	6.66	93.3	3	196	68	22	70	37.61
UT♂ x UT♀	6.66	100.0	3	218	98	02	96	

15 each treated females and males were taken in four replicates.

Values are significantly different than the control (Duncan's multiple range test $p < 0.01$).

Results

The study reveals the effect of *Tridax procumbens* purified fraction on the fecundity and fertility of *Culex quinquefasciatus*. Tables 1, 2 and 3 provides data on the fecundity and fertility effects of fraction AM₃, AM₆ of *Tridax procumbens*.

The adult obtained from the fraction treated larvae in group I and II exhibited several behavioural changes such as reduction in biting behaviour, significant loss of fecundity and fertility. Out of these two fractions AM₆ proved highly effective with 74.4% reduction in biting behaviour in group I, whereas in fraction AM₃ treated adults only 66.7% biting behaviour was observed in group I. The female took 1 to 2 days more for oviposition in AM₃ and AM₆ treatments of group I than the usual 3rd day oviposition by the females of untreated group (IV). Average number of eggs obtained (AM₃ and AM₆ fractions) also reduced in group I and II ($p < 0.01$). There was significant reduction in the fertility of eggs as compared to the control when AM₆ fraction treated larvae were used due to the mortality in the larvae and pupal stages, the adult emergence got suppressed to 84 percent in group I of AM₆ fraction treatment. Fraction AM₃ put on end to 72 percent adult emergence in group I and almost the same percent in group II.

Table 3 represents the experimental data on the effect of fraction AL₇ on *Culex quinquefasciatus* emerged from the treated larvae. It has been noticed that this fraction was highly effective, causing 73.3% female adult mortality and 73.4% reduction in biting behaviour. The oviposition day in the treated group was found to be on the 5th day and the average no. of eggs obtained were 46 as compared to 218 eggs obtained in untreated group. The effect of the compound was also noticed in the subsequent metamorphosis of the larvae more than 72-78% larvae died and only 8-16% larvae emerged as adult in group I and II. The results are quite significant ($p < 0.001$) as compared to the controlled groups of mosquito.

Discussion

Fecundity and fertility are two important aspects in insect life history. If the compound is effective at fertility level it would be much useful in vector control programme. The fecundity and fertility experiments were conducted in the insect cages taking four different groups of treated and untreated insects. The untreated females and males served as a control group. The experimental data showed the effect of the compound on the hatching of eggs and upon the subsequent metamorphosis of the larvae. Fraction AL₇ showed acute effect causing reduction in the biting behaviour of the females. The treated females took two days more for oviposition as compared to the controlled group of insects. The treated eggs also showed some abnormalities. They are streaked in appearance and vertical in position than normal horizontal position of the eggs raft. The colour of the eggs raft is lighter than the normal dark coloured eggs. Sukumaran *et al.* 1994 showed juvenile hormone activities in four plants similarly Robert and Olson 1984 and Saxena *et al.* 1993 have also reported loss in fecundity in anopheles eggs by the treatment of plant extract therefore, the results of the present study seem to be quite comparable with the previous reports of Yadav *et al.* 1987, Mohsen *et al.* 1987, Saxena *et al.* 1993, E. Pushpalatha and Muthukrishnan 1995 and Sharma 2000.

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