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# POTENTIAL MOSQUITOCIDE PHYTOEXTRACT OF *PARTHENIUM HYSTEROPHOROUS* (CONGRESS GRASS) WEED PLANT

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**Abstract:** The phyto-chemical analysis of weed plant *Parthenium hysterophorous* has indicated that all the plants parts contain toxins called sesquiterpene lactones. The major components of toxic being parthenin and other phenolic acids such as caffeic acid, vanillic acid, ansic acid are reported to have mosquitocidal properties. Parthenium samples were collected from local area and field area were air dried in the laboratory. The plant material was extracted in alcohol (methanol), petroleum ether and ethanol. The crude extracts were dissolved in acetone (6% w/v) to make stock solution. Results on application of phyto- extract on larvae and adults mosquitoes was shown mosquitocidal properties.

**Keywords**: *Parthenium hysterophorus*, larvicide, adulticide , Aedes, Culex.

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**INTRODUCTION**

Mosquitoes are the vectors of human and zoonotic disease affecting human and animal host, including those that cause malaria, filariasis, Japanese encephalitis, dengue and yellow fevers. Vector control is a serious concern in developing countries. Every year a large part of the world's population is affected by mosquito vector-borne diseases, for example malaria, which affects 500 million people annually and kills 2.5 million people annually, primarily children.

Increasing use of chemicals to control mosquitoes was found to accumulate in the food chain, residual effect, high cost and environmental pollution also causes serious toxic hazards to humans, animals and other non-target creatures. Excess use of chemical insecticide also develops resistance to conventional insecticides in many mosquito species. Pesticide exposure among humans has been linked to immune dysfunction, various forms of cancer and birth defects (Bounias, 2003).

All these factors led to search for safer and more compatible alternatives to combat these problems, among which natural products, especially plant derived called botanicals are now emerging as a viable component of Integrated Pest Management (IPM). Apart from neem, various other weed plant species have also shown promising pest controlling properties. These categories of pesticides are known as biopesticides (Mulla, 1994).

*Parthenium hysterophorous* L. (Compositae) is known as congress weed, carrot weed, feverfew, chatak chandani, gajar gavat, garghas. It is believed to have entered India accidentally in the mid 1950s, and know considered is one of the most feared noxious weed species. It is an annual herb, erect upto 2 m in height. The stem is branched and covered with trichomes. Leaves are pale green, lobed, hairy, alternate, sessile, irregularly dissected and bipinnate. Flower heads are creamy white; about 4 mm cross, arising from the leafy fork. Each flower contains five seeds, which are wedge-shaped, black, 2 mm long with thin white scales. A large single plant produces up to 100,000 seeds in its lifecycle. Seeds do not have a dormancy period and are capable of germinating anytime when moisture is available.

Parthenium is reported to have insecticidal, nematicidal and herbicidal properties. The odour of the plant is apparently disagreeable to bees and they can be easily kept away by carrying a handful of parthenium flower heads. In Jamica, the decoction is used as a flea repellent both for dogs and other animals. (Morton 1981).

The chemical analysis has indicated that all the plants parts including trichomes and pollen contain toxins called sesquiterpene lactones. The major components of toxic being parthenin and other phenolic acids such as caffeic acid, vanillic acid, ansic acid are lethal to human beings and animals ( Mahadevappa 1997).

Through this presentation the property of the *Parthenium hysterophorus* against mosquitoes are evaluate.

**MATERIAL AND METHODS**

**Plant collection and preparation of extract:**

*Parthenium hysterophorous* samples were collected from local area, field area nearby campus and brought to the laboratory. The leaves were thoroughly washed with tap water and were dried under shade at room temperature (29± $2^0$ C) for about 7 days. The completely dried leaves were powdered and sieved to get fine powder. The

powdered leaves 100gms were extracted separately with 300ml acetone, methanol and petroleum ether by using the Soxhlet apparatus for 8 hrs. The extracts were concentrated using a vacuum evaporator at $45^0$C under low pressure. After complete evaporation of the solvent the concentrated extract was collected and stored in a refrigerator for further experiment.

**Collection of mosquitoes and rearing:**

The mosquito species used for the tests were *Culex* and *Aedes.* Adult mosquitoes were collected by used of Aspirator and battery operated torches. Mosquitoes were collected in the morning (6 am to 7 am) from cow sheds and human habitation. Out of 3 methods of collection of mosquito larvae, viz dipping, netting and pipetting advocated by WHO (1975), the first method was adopted in the present study. From the fields, ponds, ditches, burrow pits and artificial containers, collection of larvae was attempted. Then the specimens were transported to the insectaries of department. They were identified and reared separated in the insectaries with dechlorinated tap water in laboratory at the temperature of 25-$30^0$C and 80-90 % relative humidity. The eggs and larvae obtained from stock were used for experiments. Freshly hatched larvae were collected and maintained in separate containers with dechlorinated water. Water was changed alternate day.

**Larvicidal tests:**

The test for larvicidal effect followed the WHO standard methods (WHO, 1970) with some modification. Fourth instar larvae of mosquito were exposed to the test concentrations of 25, 50, 75, 100, 150, 200 and 300mg of petroleum ether, methanol and ethanol extract of leaf *Parthenium hysterophorus* in 100ml of water. A control was also maintained by adding solvent to 100ml water. 25 larvae per concentration were used for all the experiments. The number of dead larvae at the end of 24 hours was recorded and the mortality percentage values were calculated. This experiment was repeated three times.

**Adulticidal tests:**

The test for Adulticidal effect followed the WHO standard methods (WHO, 1970) with slight modification. The adult groups of mosquitoes were colonies at the insectariums of the zoology department. The serial dilutions from the stock were prepared to 0.1%, 0.5%, 1.0%, 2.5% and 5% respectively. Four ml of each concentration were then impregnated on the filter paper (140 X 115 mm). For the control papers, they were impregnated with acetone only. Mortality was observed after 24 hours. The test was replicated 3 times and the control was treated with acetone only.

Review the literatures from different sources, books, journals, bulletins and references to evaluate chemical composition of the parthenium weed.

**RESULTS AND DISCUSSION**

The major components of toxic being parthenin and other phenolic acids such as caffeic acid, vanillic acid, ansic acid are shown in **Table 1** with its structural form.

The LC50 and LC90 value of ethanolic extract, petroleum ether (PE) and methanolic (MeOH) extract of parthenium weed against mosquitoes are shown in **Table 2 and 3**. The petroleum ether extract (PE) shows highest activity against Mosquito species as compared to ethanolic and methanolic (MeOH) extract.

**Table 2:- $LC_{50}$ and $LC_{90}$ values against larvae of *Aedes*.**

| Extracts | LC values(mg/l) | |
|---|---|---|
| | $LC_{50}$ | $LC_{90}$ |
| PE extract | 41.34 | 98.35 |
| MeOH extract | 35.16 | 76.21 |
| Ethanol extract | 39.11 | 130.5 |

$LC_{50}$= median lethal concentration, $LC_{90}$= 90% lethal concentration

**Table 3:- $LC_{50}$ and $LC_{90}$ values against larvae of *Culex* sp.**

| Extracts | LC values(mg/l) | |
|---|---|---|
| | $LC_{50}$ | $LC_{90}$ |
| PE extract | 23.82 | 76.32 |
| MeOH extract | 26.84 | 74.84 |
| Ethanol extract | 42.88 | 96.82 |

LC50= median lethal concentration, LC90= 90% lethal concentration

The present investigation results expressed the mosquitocidal potential of P. hysterophorus plant extracts. The result also showed that the petroleum ether extracts were more effective than the methanolic and ethanol extracts. Mortality values of larvae and pupae treated with different concentrations of extracts were of P. Hysterophorus.

The result of the present study was comparable to that of previous studies. Methanolic extract of the leaves of Atalantia monophylla Corr.(Rutaceae) were evaluated for mosquitocidal activity. Pizzaro et.al.(1999) were reported the activity of the saponine fraction of Agave sisalana and estimate the LC50 and LC90 values against 3rd instar larvae of C. quinquefasciatus, which were 183 and 408ppm respectively. Rajmohan and Ramasamy (2007) were reported LC50 value of Aegeratina adenophora against A. aegypti and C. quinquefasciatus. The larvae were killed after exposure to sub lethal doses showed bulging of anal papillae as compared to control which probably led to the death of larvae. Similar observations were also noticed in A.aegypti when treated with Aegle marmelos (Samarasekera et.al., 2004). Similar dose dependant effect of Lantana camera extracts on third instar larvae of C. quinquefasciatus showed larvicidal activity (Sathish kumar and Maneemegalai, 2008).

In the present study P. hysterophorus leaf extract resulted in high mortality which might be due to the multiple actions of a compound or synergestic effects of parthenin. (Narasimhan and Keshava murthy, 1984) and combined effect of other phenolic acids such a caffeic acid, vanillic acid, ansic acid, p-ansic acid, chlorogenic acid and parahydroxy benzoic acid (Oudhia 1998) may possess larvicidal and pupicidal property on mosquito.

**CONCLUSION**

Many plant extracts tested to the date have shown potential insecticidal activity against insect pest including mosquitoes and the result from this study showed that these plant extracts also have same potential against mosquitoes. These results should encourage further efforts to investigate the compounds that might possess higher mosquitocidal properties when isolated in pure form.

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