Journal of Ecobiotechnology 2011, 3(9): 14-16
ISSN: 2077-0464
Available Online: http://journal-ecobiotechnology.com/

Bioactivity of some medicinal plant extracts against *Musca domestica* L.

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Abstract

Musca domestica, is a major vector responsible for spreading many human and veterinary pathogenic organisms. Many methods have been tried to control them but none is found to be 100% effective and even some synthetic ones have given good results but their residues which are being accumulated in water, food, milk, etc. have become serious cause of concern. These residues are known to remain active for many years and their degradation is slow. Moreover, chemical pesticides and insecticides show good results in the beginning but later on these become less effective due to the resistance generated by the insects / pests. Therefore, there is every need to find out alternative for the chemical pesticides. By topical application of some ethnolic extracts the percentage mortality were recorded. Percent mortality and index of repellency induced by the extracts found to be dose-dependent. Extracts of the two plant species may be useful as insecticides for controlling the houseflies and should be exploited as a component of integrated vector control strategies or could be useful in the search of new insecticidal natural compounds. In the present study the different concentrations extracts of some plants were tested for adulticidal and repellent activity against *Musca domestica* L. The percentage mortality was found to increase with higher concentrations of plant extracts which indicates direct relationship between the dose and percent mortality. The plant *Artemisia nilgirica* (C.B.Cl.) Pamp. and *Annona squamosa* L. were shown wide spectrum activity to control *Musca domestica* L. While some other species such as *Blumea eriantha* DC., *Calotropis procera* (Ait.) R. Br., *Lavandula bipinnata* O. Ktze. have also shown the activity.

Keywords: Botanical insecticides, crude extracts, *Musca domestica* L.

INTRODUCTION

Insecticides and pesticides of plant origin have been receiving attention in recent years to overcome the environmental hazards caused due to exhaustive use of synthetic ones. India is rich in biodiversity and known for vast treasure of knowledge about use of plants for various purposes.

Household insects and pests are creating nuisance and controlling them is a big task as they grow very fast. Conventional synthetic insecticides posing threat of not merely potential but actual human injury and damage to environment – to wit the almost ubiquitous presence of impermissible toxic residues in nearly all biotic and abiotic components of different ecosystems (Gupta and Gupta, 1979)

It is estimated that in USA alone 200 deaths are occurring every year due to insecticide poisoning (Srivastava, 2002). Government of India has shown concern over the harmful effects of chemical insecticides/pesticides and has banned 23 chemical pesticides so far, 7 have been refused registration and 10 have been restricted for their use in the country (Chandurkar, 2001). The World Wildlife Fund (WWF) has called for a global ban on the production and use of DDT by 2007. Apart from residues, hazards like resistance, cross-resistance, nonspecific broad-spectrum effects, high persistence, secondary pest resurgence etc. are also attributed to conventional synthetic insecticide.

Better alternative to synthetic ones, the use of botanicals to control household insect-pest is being looked upon as a main source for safer and eco-friendly insecticide/pesticide. Since, botanicals are more eco-friendly, economic, species specific, biodegradable and have lesser or no harmful effects on non-target organisms including human being can be possible alternative to the chemical pesticides.

India, with its tremendous plant as well as ethnic diversity and rich traditional knowledge about plants as treasures of medicine/drugs and as a source of pesticides, is seating on goldmine. In spite of vast plant diversity in India, emphasized research on the preparation of plant pesticide/insecticide has not gained ground (Ignacimuthu, 2004). In the modern era of synthetic organic pesticides only few plants have gained importance as pesticide (Yong & Tang, 1988). This is due to lack of scientific attention rather than the lack of pesticidal potential of plants.

In India, about 250 species of higher plants are being used traditionally for insect and pest management. However, very few plants known as commercial success by way of field ready formulations has been very limited.

Hence present study was undertaken to find out eco-friendly, economical, readily available and effective insecticides preparations, which are expected to be devoid of any residual or the cumulative toxicity to the end user.

MATERIALS AND METHODS

For present work plants were selected based on the traditional leads obtained through field work done in different parts of the

Received: July 18, 2011; Revised September 28, 2011; Accepted September 28, 2011.

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Maharashtra state and information from literature (Pal et. al 1989; Secoy & Smith, 1983; Vivek, 1996, Yong & Tang, 1988). The plant materials were collected and dried under shade. Identification of plants materials were done using regional and state level floras and plant material were deposited in the Herbarium, Post Graduate Department of Botany, Deogiri College, Aurangabad .

Dried plant material grinded for extraction. Ethanolic extracts by using Soxhlet Apparatus prepared by using 16 parts of ethanol to 1 part of the dried course powder. The extracts were stored at –18°C until further analysis or assay

A] Collection and maintenance of insects

Adult houseflies were obtained by setting metal frame cage traps baited with sliced pieces of meat. The flies were reared in 30 x 30 x 30 cm metal frame cages with plywood base and covered completely on all sides with muslin. The muslin sleeves kept at both the rear and front sides of each cage for the introduction or harvesting of flies and for the changing of food, water and oviposition containers. The cages rested on raised stands of Petri dishes filled with engine oil to provide a barrier against cross infestation from other insects and mites.

Adult flies were fed on sucrose solution. Food and water were changed daily. In each cage 100-200 flies accommodated.

B] Adulticidal assay

In House fly: 3-4 days old adults were treated topically with ethanolic plant extracts, while control flies were treated with ethanol. 1 µl of the test solution was applied onthe thorax of four-day-old adult housefly of mixed sexes selected randomly. Ten insects were used for each treatment and treatments were replicated four times. A series of at least five concentrations plant extracts (0.5; 1.0;1.5; 2.0; 2.5 %) were used.

The treatment series included four groups of 10 houseflies treated with ethanol alone to serve as controls. The houseflies were anaesthetized with CO_2 and treated at the rate of 10 flies per minute. Each group of houseflies was held in a petridish for 24 hrs after treatment and the number of dead insects was recorded.

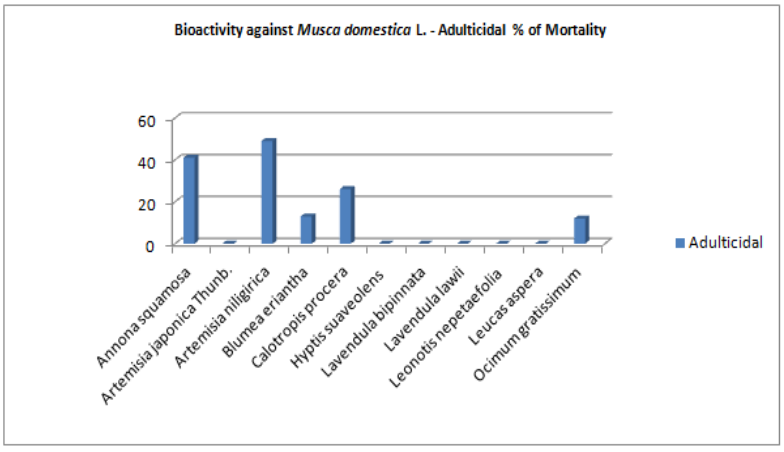
C] Repellent assay

All the filter papers treated either by ethanolic plant extract or ethanol as a control was allowed to dry for 5 - 10 min. Each was then rolled into a cone and joined together. An aperture, large enough to allow a fly to pass through was made at the apex of each cone. The cones were inverted over glass jars to form cone traps. 15 g of sugar placed in each glass jar to serve as an attractant.

Cone traps were exposed for 30 min in a cage containing 100 houseflies of mixed sexes. The flies were starved overnight before use. The number of flies trapped in the treated and untreated (control) traps, was recorded. Each experiment was replicated for 3 times. After each count the cage was turned 90º so that at the end of the fourth count 360º was covered. This was done to minimize any bias for a particular side or bottle. The observations were recorded periodically for repellent activity.

Table :Bioactivity against *Musca domestica* L. with percentage of Mortality.

Sr.No	Plant Name	Plant part	Local Name	Adulticidal activity in percent	Attraction / Repulsion
1	*Annona squamosa* L.	Stem	Sitaphal	41.00	- ve
2	*Artemisia japonica* Thunb.	Whole plant	Davana	00.00	- ve
3	*Artemisia niligirica* (C.B.Cl) Pamp.	Whole plant	Dhor-davana	49.00	+ ve
4	*Blumea eriantha* DC.	Whole plant	Buradi	13.00	+ve
5	*Calotropis procera* (Ait.) R. Br.	Leaves	Akdo	26.00	- ve
6	*Hyptis suaveolens* (L.) Poit	Leaves & Stem	Gandhurty	00.05	+ ve
7	*Lavendula bipinnata* O, Ktze.	Whole plant	Ghodeghui	00.00	+ ve
8	*Lavendula lawii* Wight	Whole plant	Nivali	00.00	- ve
9	*Leonotis nepetaefolia* (L) R.Br.	Leaves & Stem	Matisul	00.00	- ve
10	*Leucas aspera* (Wild.) Link.	Whole plant	Buradi	00.00	- ve
11	*Ocimum gratissimum* L.	Whole plant	Ram- tulas	12.00	+ ve



RESUTLS AND DISCUSSIONS

Adulticidal activity of ethanolic extracts of some plants against *Musca domestica* L. is given in table. After 24 hrs. of exposure the percentage mortality in *Artemisia niligirica* was 49 while in *Annona squamosa* was 41. In rest of the tested plants comparatively lesser effects were found or in some plants no activity found. The percentage mortality was found to increase with higher concentration plant extract which indicates direct relationship between the dose and percent mortality.

During the experiment we have studied the attractant and repellent activity of tested plants extract. Repellent activity found in the plants, such as *Artemisia niligirica, Blumea eriantha. Hyptis suaveolens, Lavendula bipinnata* and *Ocimum gratissimum* against Housefly.

Botanical insecticides provide an alternative to synthetic insecticides because they are generally considered safe, are biodegradable and can often be obtained from local sources (Prabhakar and Jabanesan, 2004). Phytochemicals may serve as suitable alternatives to synthetic insecticides in future as they are relatively safe, inexpensive, and are readily available throughout the world. Protection against mosquito bites can be achieved by avoiding infested habitats, by wearing protective clothing, and by applying repellent (Fradin, 2001). Many plant extracts have shown potential insecticidal activity against houseflies. Studies in Ceylon (now Sri Lanka) using *Cinnamomum zeylanicum* bark and *Cymbopogon citrates* oils showed good result and mortality against adult *M. domestica.*

Moreover, some extracts from *Cyperus retundus*, prevented the sexual maturity of *S. gregaria* (Bakr *et al* 2008.).Also, Saxena *et al* (1992.) found that extracts of *Lantana camera* induced oviposition deterrent effect. The extract also had conspicuous activity against the eggs of pulse beetle, *Callosobruchus chinensis* deposited on treated seeds leading to a pronounced reduction in progeny. As discussed by Weathersbee III and Tang (2002), the disruption of reproductive capacity could lead substantial population decline ever time.

Adamski *et al* (2005) observed that the degree of malformation was directly proportional to the concentration of pesticides.

Many studies have drawn attention of the toxic effects of plant extracts on related Diptera (Dhar *et al*., 1996). Some more control measures by using conventional insecticides tried by (Cao *et al.* 2006; Malik *et. al.* 2007) However, the present work is a further mile stone in the same line the above works have done the plants. *Annona squamosa*, *Artemisia niligirica* etc showed biopesticidal activity against *M. domestica.*

ACKNOWLEDGEMENT

Authors are thank full to University Grants Commission, New Delhi for financial support. Also to the Secretary, M.S.P. Mandal for constant support and encouragement and Principal Deogiri College for facilities.

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