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Larvicidal activity of Mentha piperita extract against Musca domestica

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ABSTRACT

The housefly M. domestica L. is a global insect, responsible for vectoring of various diseases. Nowadays Chemical control methods are majorly used against housefly, but they also lead to disadvantages such as harmful side effects to human beings and the environment as well as houseflies resistance. So in order to find an effective and environment friendly botanical control agent, extract of Mentha piperita was evaluated for its larvicidal activity on housefly. The First Instar larvae showed a higher mortality rate than the third Instar larvae when baited with Mentha piperita extract in increasing concentration of 1% to 5 %. At 5% concentration, the first Instar larvae and third instar larvae showed a mortality rate of 96 % and 82% respectively.

Keywords: Mentha piperita, Musca domestica, larvae, Larvicide

I. INTRODUCTION

Houseflies belong to the order Diptera. These are known for their ability to exploit most ecological niches in any biological environment due to their larvae's ability to evolve (West, 1951). The housefly (Musca domestica L) is found worldwide and was first recorded in Hawaii during1869 by Thompson. This common fly originated of the central Asia, but now occurs in many climates from tropical and subtropical regions. (Derek Gammon, 2008). It is medically important insect and one of the major domestic and veterinary pests. The insect is responsible for transmitting infectious diseases and causes public health problems among human communities. Not only houseflies are a nuisance, but they can also be vector of some diseases especially in tropical area (Zhang et al., 2008). It feeds on and breeds in decaying matter, human waste and food, and is considered a mechanical vector for pathogens (Bacteria, protozoa and viruses) to humans and livestock (Olsen et al., 2001, Sangmaneedet et al., 2005). These pathogens may cause food poisoning, diarrhea, cholera, typhoid paratyphoid, shigellosis and anthrax (Banjo et al., 2005, Fasanella et al., 2005, Yap et al., 2008).

Currently, control of housefly largely relies on chemical insecticides. Unfortunately, house fly has developed resistance to most of chemical insecticides (H.A.A. Khan et. al., 2013) and these chemicals also have adverse environment and health effect, threat of persistence and biomagnifications through the food chain(P. Kumar et. al., 2012). Therefore, as a better alternative to synthetic chemicals, the use of botanicals to control housefly is being looked upon as a main source for safer and eco-friendly insecticide. Moreover, botanical insecticides are biodegradable, species specific, no side effects toxic to non target-organisms, human, animal and environment, however, botanical insecticides from plant oils or extracts have been used effective to control insect pests including house fly.(P. P.Sharma et al, 201 6 , C. Regnault et al 20120).

A huge number of plants having medicinal values are available in India. Since plant-based bio-insecticides have insecticidal and/or insect repellent activities, species-specific in action, easy to manufacture and apply, and Mentha piperita are safer for animals and their environments. Mentha piperita have high medicinal value. Plant extract have drawn considerable attention for their uses against various pest species including houseflies [Islam MS et. al. 2013].

II. MATERIAL AND METHOD

Collection and Rearing of Housefly Larvae

The culture (eggs) of houseflies was obtained from National Chemical Laboratory, Entomology Department, Pune. The eggs were incubated in plastic jars (15 × 25 cm) on moist groundnut crush powder in laboratory at 28±2 ° C. The eggs were allowed to develop larvae and into pupae on the same medium. The pupae were transferred to other container (12 × 24 cm) for adult emergence. Emerged adult houseflies were reared in plastic jars covered on top side with muslin cloth. And continued larval culture of housefly. Among the larvae, first instars and third instars were taken to observe difference in mortality rate. The first instars larvae are considered as infantile larvae while third instar larvae are considered as older larvae. The larvae were fed with groundnut crush powder and water.

Plant Material

The experimental plant used in the study was Mentha piperita (Mint). The plant leaves were collected from and around Pune region. Plant leaves were properly washed with water, shade dried for 6-8 days at 30-32°C. Dried leaves were powdered in Mortar and Pestle. Dried leaf powder weighing 50 g was extracted in 833 ml of Methanol solvent in Soxhlet apparatus for 8 hours. The extract was then collected and evaporated to dryness using rotary vaccum evaporator.

Larvicidal Bioassay

The first and third instars larvae obtained from the same batch of eggs, were divided into 5 groups of 15 larvae each. The larval treatment was carried out in transparent plastic jar (5X7 cm). A group of 15 larvae introduced into separate plastic jar using a new camel-haired brush (No.0). It provided with food (groundnut powder and plant extract). The control jar provided with 3 gm groundnut powder and water. In the treated groups the M piperita extract were prepared 1%, 2%, 3%,4%, 5% .(1µL extract mix with 1 ml water to form 1 % solution). The prepared extract offered to experimental larval group with food (3 gm groundnut powder). Each experimental test was repeated six times. The mortality assessed by touching each larva with a paintbrush (no. 0). The number of dead larvae was counted to calculate the mortality percentage.

Table 1. The Mortality percentage of the housefly larvae

Larval instars	Control	1%	2%	3%	4%	5%
1st instar	0	49	60	71	83	96
3rd instar	0	40	49	62	71	82

III. RESULT AND DISCUSSION

In larvicidal bioassay M. Domestica larvae were treated with the leaf extract of M. piperita and result shows the effectiveness of the leaf extract and its potential control of larval population of M. domestica. The different concentrations of extract were used to obtain mortality against first and third instar larvae of housefly. The results obtained from the experiment are as mentioned in the table with larval mortality percentage. In control, the first and third instar larvae remained alive. The first instars larvae showed higher mortality percentage compared to the third instar larvae as the concentration of extract was increased from 1% to 5 % gradually. At 5% concentration, the First Instar larvae showed 96 % while the Third Instar larvae showed 82% of mortality. This shows that the

Third instars show more resistance than the first Instars towards the Mentha piperita extract. Based on the results achieved, the Mentha piperita extract shows larvicidal activity towards Musca domestica larvae.

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