

ORIENTATIONAL EFFECT OF AQUEOUS LEAF EXTRACT OF *CITRUS AURANTIFOLIA* ON HOUSEFLY, *MUSCA DOMESTICA* (DIPTERA:MUSCIDAE)

Nithiyagowry Rajan

Department of Zoology, University of Jaffna

Abstract

Housefly, *Musca domestica* (L.) is a major public health pest act as vector for human and animal disease causing organisms therefore the control of housefly is vital to human health. Products obtained from certain medicinal plants have proved as alternatives to synthetic chemicals. In this view the present study was aimed to study the repellent activity of aqueous leaf extract of *Citrus aurantifolia* (lime) in comparison with neem leaf extract and additive Turmeric rhizome powder using self made six-armed olfactometer. Five gram of meat pieces soaked separately for one minute in 1:10 (w/v) aqueous citrus leaf extract (aq.CLE), 1:10 (w/v) aqueous neem leaf extract (aq.NLE), 1:10 (w/v) aqueous turmeric rhizome powder (aq.TRP), mixture of 1:10 (w/v) [aq.CLE + aq.NLE], mixture of 1:10 (w/v) [aq.NLE + aq.CLE + aq.TRP] and one ml of distilled water for control and were tested for repellent activity against 1-2 days old adult flies based on the number of adults oriented towards each treatment. Orientation of housefly towards extracts was significantly less in numbers ($P < 0.05$) in all treatments than the water control after 10 – 60 minutes and 24 hours of adult exposure. From the LSD analysis, Aq.CLE showed significantly ($P < 0.05$) high repellent activity as much as Aq.NLE, mixture of Aq.NLE+Aq.CLE and mixture of Aq.NLE+Aq.CLE +AqTRP after one hour and 24 hours of exposure. After 24 hours of exposure, the percentage repellency range from 74 % (for TRP) to 96 % (for mixture of CLE+NLE+TRP). Citrus leaf extract alone showed 83% repellency. It was concluded that the aqueous citrus leaf extract at 1:10 (w/v) has potential repellent effect against house fly and could be considered for integration with other control options in the control of housefly and also pave the way for its use as eco friendly control measure..

Keywords: Housefly, *Musca domestica*, *Citrus aurantifolia*, neem, repellent, orientation

Introduction

Housefly, *Musca domestica* (L.) is a major domesticated pest act as a vector of human and animal disease and also cause nuisance to human so control of housefly is vital to human health. The usage of conventional insecticide pose a substantial hazard to human and environment and also cause pest resistance to insecticides, hence the rising draw backs of synthetic chemical substances have stimulated the search for ecofriendly and biodegradable insecticides. In this view, previous studies revealed the possibility of using

plant extracts as insecticidal on different stages of housefly (Malik *et al.* 2007, Nabawy *et al.*, 2011, Shalaby *et al.*, 1998) and repellent effect against adult fly (Liao, 1999 & 2010, Mathanraj and Rajan, 2012, 2013). Locally and freely available citrus plant parts such as leaves, peel powder and peel oil found to be effective insecticidal and repellent against stored product pests, vegetable pests and flies. Most of the studies carried out using crude extracts of various parts of the plants mostly peel powder and peel oil and used chemical solvents for extract preparation (Siskos *et*

al.,2007) A few studies were carried out against housefly using mostly peel powder and peel oil (Samarasekara,2006) but fresh leaves are easily obtainable at any time. In order to introduce most effective, with low input technology which can be utilized by anybody at anytime without any cost and environmentally safe control method this study was aimed to evaluate the repellent effect of aqueous leaf extract of *Citrus aurantifolia* (lime) and compare the effectiveness with neem leaf extract and additive turmeric rhizome powder against house fly using self made six- armed Olfactometer.

Materials and Methods

Olfactometer setup was used to test the repellent effect of aqueous neem leaf extract against house fly.

Rearing of house fly

Adult houseflies were collected from local shop by sweeping net. They were transferred into a breeding cage (30 x 30 x 30 cm). The cage made of three mesh metal sides and a wooden bottom. On front side a muslin sieve (70cm) long was fixed to an opening. Foods for adults were provided in Petri dishes. 10% (w/v) multivitamin syrup solution and five gram fresh pork liver meat as a food source and oviposition site. Third petri dish contained a piece of cotton wool soaked in water to maintain the humidity (Bisseleua et al, 2008).

Preparation of leaf extract

To prepare the aqueous extracts of citrus and neem; fresh leaves of citrus and neem were collected from the home garden and washed in the distilled water separately and one gram of leaves crushed using motor and pestle. 10ml of distilled water added into the leaf paste and then filtered through muslin cloth separately. The resulting filtrate 1:10 (w/v) used for the experiment.

Olfactometer was made using six plastic bottles. One bottle used as center bottle in which 8cm diameter 6 holes made and connected to 1000ml plastic bottles separately with the help of 32cm long card board tube

with equal gap between them. The end of each arm is fitted with a plastic bottle(1000 ml).

Five gm of meat piece soaked in 1 ml of (i) aqueous citrus leaf extract(aq.CLE) , 1:10 (w/v) (ii) aqueous neem leaf extract (aq.NLE), (iii) 1:10 (w/v) aqueous turmeric rhizome powder (aq.TRP) , (iv) mixture of 1:10 (w/v) [aq.CLE + aq.NLE] , (v) mixture of 1:10 (w/v) [aq.NLE + aq.CLE + aq.TRP] and (vi) one ml of distilled water for control separately for one minute then placed into watch glass separately and kept into each plastic bottle of olfactometer finally closed with lid. Fifty numbers of one to two days old adults from laboratory culture were introduced into the center bottle and covered with muslin cloth.

Number of houseflies each bottle counted in 10 minutes interval up to 60 minutes and then after 24 hours of adult introduction. This experiment was repeated five times. All experiments were carried at the temperature $26\pm 2^{\circ}\text{C}$ and relative humidity (RH) 70-75%. Control experiment was conducted concurrently along with the experimental trials. Data was analysed using ANOVA, T- test and LSD. The percentage of repellency (R %) was determined in accordance with the method of Champbell (1983).

The percentage Repellency (R%) was calculated as follows

$$R \% = [100 \times \frac{(C-T)}{C}]$$

Where, C- The number of flies trapped in the control bottle

T- The number of flies trapped in the treated bottle

Results and Discussion

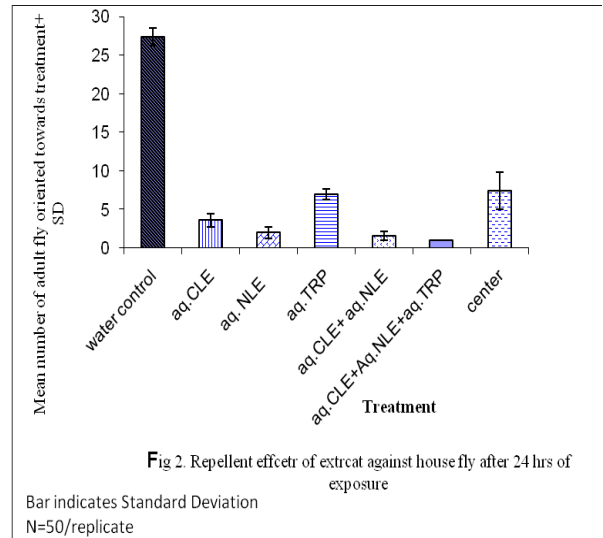
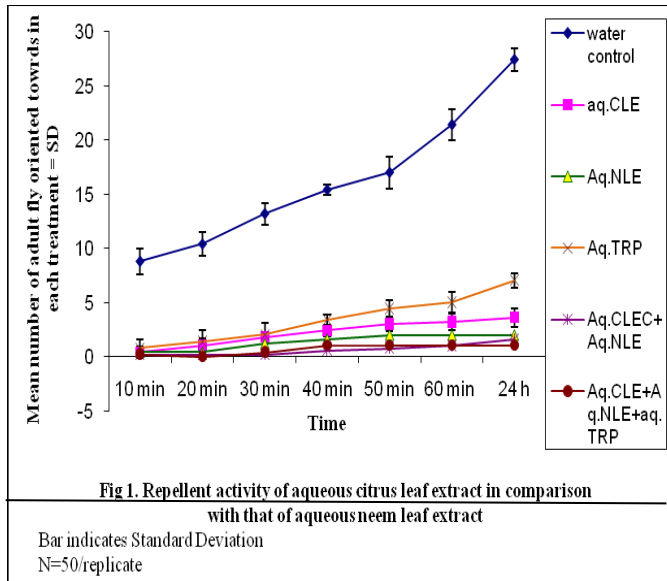
Number of flies' moves towards the treatment bottles containing different extract formulations was compared with that of water control.

The data pertaining to the repelled activity of leaf extract was presented in Figure 1-3. In general all extract formulation tested showed repellent activity against housefly. Orientation of housefly towards extracts was significantly less in numbers ($P<0.05$) in all treatments than the water control after 10 – 60 minutes and 24 hours of adult exposure. From the LSD

analysis, after one hour of adult exposure number of flies in each treated as follows; (aq.NLE+Aq.CLE +aqTRP) =(aq.NLE+Aq.CLE) = aqNLE < aq.CLE =aq.TRP <water control while after 24 hours of exposure, the number of adult flies in each treatment as follows; aq. NLE= (aq.NLE+Aq.CLE) = (aq.NLE+Aq.CLE +aqTRP) = aq.CLE < aqTRP < water control. Citrus leaf extract showed significantly (P<0.05) high repellent activity as much as aq.NLE, mixture of aq.NLE+aq.CLE and mixture of aq.NLE+aq.CLE +aqTRP after 24 hours of exposure.

In the olfactometer study, after 24 hours of exposure, the percentage repellency range from 74 % (for TRP) to 96

% (for mixture of CLE+NLE+TRP) (Table 1). Citrus leaf extract and neem leaf extract alone showed 83.2% and 92.7 % repellency respectively. Therefore the reduction in number of flies oriented or repellent activity may be due to the potentiality of the compounds present in the leaf extracts at 1:10 (w/v), which are enough to repel the house flies . In previous study, aqueous neem leaf extract at 1:1 w/v showed 94% of repellency against housefly (Mathanaraj & Rajan, 2013). This is confirmed by this study. Citrus leaves are freely available in plenty, biodegradable, eco friendly moreover resistant does not develop in insects so the aqueous leaf extract could be used as repellent against housefly.



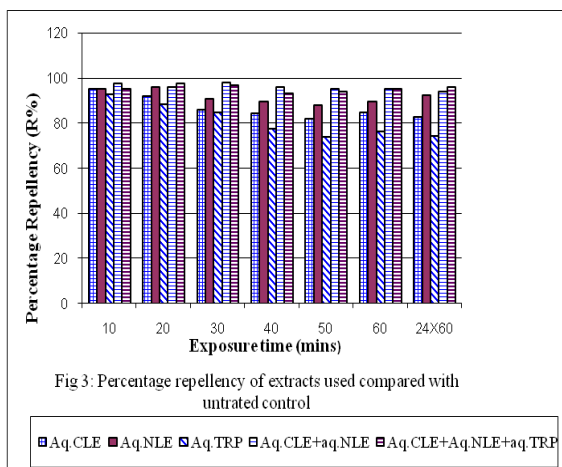


Table 1. Percentage repellency effect of citrus leaf extract compared with water control

	Aq.CLE	Aq.NLE	Aq.CLE+AqTRP	aq.NLE+Aq.CLE	Aq.CLE+Aq.NLE+Aq.TRP
After 1 hr	85.04	89.72	76.64	95.32	95.32
After 24 hrs	83.2	92.7	74.45	94.16	96.35

Conclusion

In this present study a small scale attempt is made to screen locally available plant and using easy application method. It was concluded that the aqueous citrus leaf extract at 1:10 (w/v) has potential repellent effect against house fly and could be considered for integration with other control options in the control of housefly.

No comparable data with aqueous formulation of citrus leaf extract on repellency against house fly therefore further study may be carried out to confirm the present data.

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