



TOXICITY OF ORANGE PEEL AND GARLIC AGAINST *MUSCA DOMESTICA* LARVAE

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ABSTRACT

The efficacy of orange peel and garlic extracts had been screened for their larvicidal activities against *Musca domestica* larvae. *Musca domestica* larvae were treated with different concentrations of orange peel and garlic extracts (0.5mg/ml, 1.0mg/ml, 1.5mg/ml and 2.0gm/ml respectively) by dipping method for 30minutes, 1hour, 2hours, 3hours, 4hours, 5hours, 6hours and 24hours exposure period. The hatching percentage of egg was also recorded and both were affected by toxicity of orange peel and garlic extracts. The data indicated that orange peel and garlic extracts can be applied as optional point sources to control of *Musca domestica* in everlasting technique.

KEYWORDS: *Musca domestica*, orange peel, garlic, infectious diseases, pesticides etc.

INTRODUCTION

The housefly, *Musca domestica* (L.) (Diptera: Muscidae), is a fly of the suborder Cyclorrhapha. It is the most common fly species found in habitations (Jesikha, 2014). Adult flies normally live for 2 to 4 weeks but can hibernate during the winter (Jesikha, 2014). The adults feed on a variety of liquid or semi-liquid substances beside solid materials which have been softened by saliva (Jesikha, 2014). They carry pathogens on their bodies and in their feces and can contaminate food and contribute to the transfer of food-borne illnesses. For these reasons they are considered pests.

M. domestica is an ideal vector for transmission of many pathogens in human and animal because of its biology and ecology (Guntharee, 2008). Houseflies are known to be vectors of typhoid fever, yaws, dysentery, anthrax and some forms of conjunctivitis. The adults are responsible for the transmission of these disease organisms because of their feeding on fecal matters and then contaminating food. Since houseflies do not bite, these diseases are transmitted mechanically thorough contamination of the mouthparts and other appendages (Jesikha, 2014).

Synthetic insecticides (organochlorines, organophosphates, carbamates and later the pyrethroids and neonicotinoids) are characterized by efficacy, speed of action and ease of use, but due to prolonged exposure to chemical insecticides worldwide, houseflies have developed resistance against spinosad, diflubenzuron and other synthetic insecticides (Guntharee, 2008). Their adverse environmental effect and the need to maintain a sustainable environmental have created the need for environment friendly, self degradable and target specific

insecticides (Yunish, 2014). Because of this much effort has been focused on plants or their constituents as potential sources of commercial insect control agents (Dan-pedro, 1996).

In recent years the entire world has shifted its interest to the development of alternative pesticides from plants (Jesikha, 2014); therefore this research work deemed its importance to investigate on the Larvicidal efficacy of orange peel and garlic against *Musca domestica* larvae.

MATERIALS AND METHODS

The experiment was carried out in Parasitology Laboratory as well as Biological Garden of the Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria.

Collection and identification of plant materials

Ripened and freshly harvested orange fruits and garlic cloves were collected from Sokoto Central Market, Sokoto State, Nigeria. It was ensured that the orange and garlic were healthy and uninfected. These materials were identified in the Botany Unit, Department of Biological Sciences Usmanu Danfodiyo University Sokoto. Parts of the plant collected for identification were: orange fruit and garlic clove, respectively. Orange fruits were washed under running tap water to eliminate dust and other foreign particles. The orange was peeled; and orange peeled was dried under shade.

The garlic was peeled, and slices into small pieces and shade dried for 4 days. Then the dried orange peel and garlic were powdered into fine powder using mortar and pestle. The powdered was sieved using a sieve of 0.4mm

size and the powder was kept in an air tight container for further use.

Preparation of Ethanolic Extracts

50g of orange peel and garlic powder (separately) were weighed and poured into 500ml conical flask in which 100ml of ethanol was added. The mixture was kept for 12 hours with constant shaken at 30 minutes intervals. The extract was filtered using Whatman No.1 filter paper. The extracts (filtrate) were concentrated at 40°C under reduced pressure using rotary evaporator, and then kept in a glass flask. The semi-solid extract obtained was stored in a refrigerator for further use.

Preparation of Aqueous Extracts

50g of orange peel and garlic powder (separately) were weighed and poured into 500ml conical flask in which 100ml of distilled water was added. The mixture was kept for 12 hours with constant shaken at 30 minutes intervals. The extract was filtered using Whatman No.1 filter paper and used immediately.

Musca domestica Larvae culture

Adults of *Musca domestica* (House flies) was attracted on rotten animal liver which was placed in Biological Garden at Department of Biological Science, Usmanu

Danfodiyo University, Sokoto, were cultured at $27 \pm 3^{\circ}\text{C}$.

Assessment of Toxicity

Filter papers (5 cm diameter) treated with four different concentrations of orange peels and garlic extracts separately (0.5mg/ml, 1.0mg/ml, 1.5mg/ml and 2.0mg/ml) per filter paper and placed in a Petri dish of 7cm diameter, and exposed to open air for some time to all the organic solvent to evaporate. Then 0.5 ml of distilled water was added to entire surface of each treatment filter papers as a carrier of extracts, control experiments were done using distilled water only. 10 Larvae of 1-2/ days old were introduced into the treated and control filter papers. Every treatment was replicated three times; Mortality of larvae was counted after 30mins, 1hour, 2hours, 3hours, 4hours, 5hours, 6hours and 24hours respectively. Mortality data were analyzed using Analysis of Variance (ANOVA).

RESULTS

The result obtained from this study clearly indicated that Orange peel and Garlic extracts were effective as larvicides and toxicity in all cases was time and dose dependent against *Musca domestica*.

Table 1: Mortality among *M. domestica* larvae treated with Aqueous Extract of Garlic.

Concentration of Garlic Extract → Exposure time ↓	0.5mg/ml	1.0mg/ml	1.5mg/ml	2.0mg/ml	Control
30mins.	0%	0%	0%	0%	0%
1hr.	0%	0%	0%	0%	0%
2hrs.	0%	0%	0%	10%	0%
3hrs.	10%	10%	10%	10%	0%
4hrs.	10%	20%	30%	20%	0%
5hrs.	20%	50%	50%	60%	0%
6hrs.	20%	60%	60%	70%	0%
24hrs.	100%	100%	100%	100%	0%

Values given are % of the experiments replicated three times (where n=3),

Table 1 showed; no mortality at 30minutes and 1 hours exposure period among all the concentrations (0.5, 1.0, 1.5 and 2mg/ml); The extract, exhibited relatively zero percent (0%) in shorter duration (between 30mins to

1hour), lower percent mortality (between 2hours to 4hours) and higher mortality (between 5hours to 6hours time). The longer duration exhibited the highest mortality (100%) in all concentrations.

Table 2: Mortality among *M. domestica* larvae treated with aqueous extract of Orange Peel.

Concentration of Orange Peel Extract → Exposure time ↓	0.5mg/ml	1.0mg/ml	1.5mg/ml	2.0mg/ml	Control
30mins.	0%	0%	0%	0%	0%
1hr.	0%	0%	0%	0%	0%
2hrs.	0%	0%	0%	0%	0%
3hrs.	0%	0%	10%	10%	0%
4hrs.	0%	0%	10%	10%	0%
5hrs.	10%	10%	20%	20%	0%
6hrs.	50%	60%	70%	80%	0%
24hrs.	100%	100%	100%	100%	0%

Values given are % of the experiments replicated three times (where n=3),

Table 2 showed; no mortality at 30 minutes -2 hours exposure periods among all the concentrations (0.5, 1.0, 1.5 and 2mg/ml); The extract, exhibited relatively lower mortality between 3hours to 5hours and highest mortality

at longer exposure period ie, 6 hours- 24hours. The longer duration exhibited the higher mortality (100%) in all concentrations.

Table 3: Mortality among *M. domestica* larvae treated with Ethanolic extract of Garlic.

Concentration of Garlic Extract → Exposure time ↓	0.5mg/ml	1.0mg/ml	1.5mg/ml	2.0mg/ml	Control
30mins.	0%	0%	0%	0%	0%
1hr.	0%	0%	0%	0%	0%
2hrs.	0%	0%	10%	10%	0%
3hrs.	0%	10%	10%	20%	0%
4hrs.	10%	10%	20%	30%	0%
5hrs.	10%	20%	20%	50%	0%
6hrs.	30%	60%	60%	80%	0%
24hrs.	100%	100%	100%	100%	0%

Values given are % of the experiments replicated three times (where n=3)

Table 3 showed; no mortality at 30minutes and 1 hour exposure period among all the concentrations (0.5, 1.0, 1.5 and 2mg/ml); the extract, exhibited relatively zero percent (0%) in shorter duration (between 30mins to

1hour), lower percent mortality (between 2hours to 4hours) and higher mortality (between 5hours to 6hours time). The longer duration exhibited the highest mortality (100%) in all concentrations.

Table 4: Mortality among *M. domestica* larvae treated with Ethanolic extract of Orange Peel.

Concentration of Orange Peel Extract → Exposure Time ↓	0.5mg/ml	1.0mg/ml	1.5mg/ml	2.0mg/ml	Control
30mins.	0%	0%	0%	0%	0%
1hr.	0%	0%	0%	0%	0%
2hrs.	0%	0%	0%	10%	0%
3hrs.	0%	10%	10%	10%	0%
4hrs.	10%	10%	20%	10%	0%
5hrs.	20%	20%	20%	20%	0%
6hrs.	30%	50%	60%	20%	0%
24hrs.	100%	100%	100%	100%	0%

Values given are % of the experiments replicated three times (where n=3),

Table 4 showed; no mortality at 30minutes and 1 hours among all the concentrations (0.5, 1.0, 1.5 and 2mg/ml); The extract, exhibited relatively zero percent (0%) in shorter duration (between 30mins to 1hour), lower percent mortality (between 2hours to 5hours) and higher mortality (at 6hours time). The longer duration exhibited the highest mortality (100%) in all concentrations.

DISCUSSION

The data obtained from this study clearly indicated that Orange peel and Garlic extracts were highly effective as larvicides for providing an exceptional and excellent alternative for the control of *Musca domestica*. In all cases mortality was recorded after 2 hours of exposure or more irrespective with the doses, this is inline with (Ezeonu *et al.*, 2001) who also reported that insecticidal activity of orange peel was better after 60 min than at 30 min spraying of rooms against mosquito, cockroach and housefly; however in contrary with study of Denloye (2010), who reported that aqueous extracts of *A. sativum*

was more toxic against *C. maculatus* than the corresponding ethanol extracts, which can be due to either difference in the body of the tested organism and soft body of *M. domestica* larvae absorbed active moieties more rapidly than the hard exoskeleton of *C. maculatus* or they have a different metabolic pathway.

The larvicidal principle of garlic identified as Diallyl disulphide and Diallyl trysulphide (Na Na *et al.*, 2013). Allin is a sulfoxide that is a natural constitute of fresh garlic. It is a derivative of the amino acid cysteine. When fresh garlic is chopped or crushed the enzyme alliinase converts into allicin. *A. sativum* essential oil was found to interfere with the developmental processes and reduced transformation of larvae into pupae and adult emergence as well as exhibited antifeedant activities against *T. castaneum* in a concentration dependent manner and inhibited acetylcholinesterase enzyme activity in *T. castaneum* adults (Chaubey, 2013).

Extracts of diverse parts of Orange Peel and Garlic have been reported to possess insecticidal properties (Barreto *et al.*, 2008). The extract of essential oil of orange peel was known to caused growth inhibition in adult *Tribolium confusum* (Yunis, 2014).

The phytochemicals present in orange peel includes; carotenoids, isohesperidin, terpeniol, naringin, limonin, flavonoids, hesperidin, limonene (Palacios, 2009). Phytochemicals found in garlic are- flavonoids and sulphur-containing compounds like, diallyl sulphate, alliin, ajoene, allicin (Amonkar and Banerji, 1971). This insecticidal activity of orange peel and garlic extracts could be linked to the presence of such phytochemicals in the plants extracts. The phytochemicals present in both orange peel and garlic are responsible for the mortality of *Musca domestica* larvae. The result is comparable with that of (Jesikah, 2014).

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