*IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*
*e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 7, Issue 12 Ver. IV (Dec. 2014), PP 35-40*
*www.iosrjournals.org*

# Larvicidal Effect of Aqueous Leaf Extract of Tobacco (*Nicotianatabacum*) On the Third Instar Larvae of *Musca domestica*L.

[1]Ogbalu, O.K., [2]Bobmanuel, R. B. [1]Membere, O.
*[1]Environmental Entomology UnitDepartment of Applied and Environmental Biology,Rivers State University of Science and Technology,P. M. B. 5080 Port Harcourt, Nigeria.*
*[2]Department of Biology,Ignatius Ajuru University of Education, Rumuolumeni, P. M. B. 5047, Port Harcourt, Nigeria.*

***Abstract:*** *Tobacco leaf that was grounded and mixed in distilled water was used to test for its larvicidal effect on house fly (Musca domestica). Only the 3rd instar larvae of house fly were exposed to the aqueous plant extract in the Green house at a temperature of 26.5 and 77.5% relative humidity. All larvae were collected from Goat liver that were exposed to house flies. Five different concentrations of aqueous leaf extracts of tobacco 1 ,2 ,3 ,4 ,5 milligram per litre was tested on the aforementioned house fly larvae and the control [0] was not treated with the aqueous tobacco extract. Mortality observed using 1mg/l at 24hours showed that 42larvae died out of 380 larvae [**11.05%**], using 2mg/l, 291 larvae died out of 380 larvae[**72.6%**], using 3mg/l, 372 larvae died out of 380 larvae[**97.8%**]. Mortality observed for 4 and 5 mg/l hourly showed that at 2hours interval immediately after exposure were significantly different and higher than those of the other concentrations. Tobacco leaf extract effect on the house fly larvae was concentration dependent*.

## I. Introduction

House fly,*Musca domestica*[Diptera : Muscidae) is an important medical and veterinary insect pest that causes irritation, spoils food and acts as a vector for more than 100 human and animal pathogenic organisms such as enteropathogenic bacteria, enterovirus and protozoa cysts [1,2].*Musca domestica,* is a major vector for many medical and veterinary pathogenic organisms.

The development of naturally occurring insecticides, represent one of the most promising approachesfor their ecochemical control. Many plant extracts and formulations have been assessed for their toxicity, growth regulatory and repellency to many dipterous flies especially to the houseflies. Petroleum-ether extracts of *Griffoniasimplicifolia* and *Zanthoxylumxanthoxyloides*had been assessed for its toxicity to housefly [3]. Essential oils from clove, lemon grass have tested against different developmental stages of dipterous flies [4; 5].D50 in 24 h topical application of seedextracts of *G. simplicifolia* and root extracts of *Z. xanthoxyloides* were 0.28 and 0.35 µg, respectively.Seed extracts of G. simplicifolia evoked a very strong regulatory effect against the second larval instarof the housefly. Extracts of the two plant species may beuseful as insecticides for controlling the housefly and should be exploited as a component ofintegrated vector control strategies or could be useful in the search of new larvicidal natural compound [6]..

Of the thousands of species of flies, only few are common pests in and around the home. Some of the more common nuisance flies are the house fly [*Musca domestica]*, the little house fly [*Fanniacanicularis*] e.t.c [7]. These pests breed in animal waste and decaying organic material from which they can pick up bacteria and viruses that may cause human diseases. While humans commonly find adult flies to be the most bothersome, the larval stage should be the prime target for control effort.Similar studies carried out by (7) showed that nicotine in tobacco can be used as an effective insecticide. Nicotine is known as the main alkaloid of tobacco, isolated in 1828 from the tobacco leaf, accounting for over 90% of the total alkaloidal content (8}. Apart from nicotine, anabasine, nornicotines are also alkaloid found in tobaccos which also have insecticidal properties (9).

Dried leaves, stalks, and the whole herb of tobacco are widely used traditionally in subcontinent for their insecticidal, analgestic, antispasmodic, emetic, purgative, sedative properties (10). The leaf hot water, acetone, chloroform, and methanol extracts of *Nicotianatabacum* were tested against the larvae of C. quinquefasciatus (11). The crude aqueous and methanol extracts of *Nicotianatabacum* were investigated In vitro and In vivo for antihelmintic activity against *Haemonchuscontortus* (12].*Nicotianatabacum* extracts were tested for pest against *Triboliumcastaneum,* and shown to be very active against *Boophilusmicroplus* (13] 14).

As a form of allelopathy, some pesticidal plants serve as control agents for pests and diseases after intercropping or mix-cropping with the main crop, Nicotianatabacum and some other plant species (16) have been found to possess this attribute. Nicotine and the related alkaloids nornicotine and anabasine which are obtained from aqueous extract of tobacco, induces highly insecticidal effects as they are synaptic poisons that

mimic the neurotransmitter acetylcholine. Therefore, they cause symptoms of poisoning similar to those seen with organophosphate and carbamate insecticides (17). Nicotine is used mostly as a fumigant in green houses against soft bodied pests and insects. Nevertheless, preparation of stable nicotine fatty acid soaps, presumably with reduced bioavailability and toxicity to humans (18) will solve this problem. Nicotine is active against piercing- sucking insects such as aphids, leafhoppers, whiteflies, thrips and mites (19).

Alkaloid compounds such as nicotine, anabasine, methyl anabasine or lupine, had pesticidal activities against other dipterans like*Culexpipens* larvae and other larvae of some hexaopods.. The efficacy of *Nicotianatabacum*extract against the larvae of Anopheles andCulex mosquitoes using Ten larvae of the early fourth instars was evaluated [20). Conclusively, the results obtained from extracts of*Nicotianatabacum*have high larvicidal properties and can be used as environmentally-friendly and sustainable insecticides to control mosquito (21). Wood vinegar showed some inhibitory effects on growth and metamorphosis activity and survival of first instar larvae of *M. domestica* (22).

## II. Materials And Methods

**Preparation Of Tobacco Leaf Extract**

**Plant Material:** Samples of leaves of tobacco (Head) were bought from Mile 1 market, Yoruba Line in Port Harcourt. Fresh leaves of tobacco were dried in Oven and pounded in mortar till it became powdery.Forty grams (40g) of the powdery tobacco was weighed out.

**Extraction Procedure**

A weighed tobacco (40g) was added to1litre of water and was shaken properly and sieved. And a measuring cylinder was used to measure out different concentrations that were used on the larva of housefly. The concentrations were as follows 0 (control), 1 milligram perlitre, 2 milligram perlitre, 3 milligram perlitre, 4 milligram perlitre, 5 milligram perlitre, which were administered on 20 larvae per Petri dish.

**Preparation Of 1 Milligram perLitre Extract**

20 Petri dishes were used and each Petri dish contained 20 larvae. 19 Petri dishes were treated with tobacco concentrations and the last $20^{th}$ Petri dish was not treated, this was the control. Control larva were kept in similar conditions without treatment. The 19 Petri dishes that were treated were treated with 5 milligram perlitre of tobacco extract.

**Preparation Of 2 Milligram perLitre Extract**

It also contained 20 larvae per Petri dish in which 19 were treated and the $20^{th}$ Petri dish which was the control untreated. The treated Petri dish was treated with 2 milligram perlitre of tobacco.

**Preparation Of 3 Milligram perLitre Extract**

The same procedures used in 1 and 2 milligram perlitre were also used here, with exception that the treatment used was 3 milligram perlitre. Control still remained untreated.

**Preparation Of 4 And 5 Milligram perLitre Extract**

The same procedure used in 1,2,3 milligram perlitre was also used here, with exception that the treatment used was 4 milligram perlitre of tobacco and 5 milligram perlitre of tobacco. (4 milligram perlitre used for 19 Petri dish) and (5 milligram perlitre used for 19 separate Petri dish).

**Statistical Analysis**

We adopted percentage analysis to assess mortality in the third larval stage exposed to different concentrations of Tobacco extracts. We also used Analysis of variance for assessing variation in treatments..Students Newman Keule Test[SNK], a furtherance of Duncan Multiple Test [DMRT] was used for separation of means in order to establish their significant differences [P=0.05].

## III. Results

The bioassay showed that out of 380 larvae of house fly exposed to*Nicotianatabacum* at 24 hours, 42 larvae out of 380 larvae died when exposed to 1mg/l of aqueous tobacco leaf extract. When exposed to 2mg/l of aqueous leaf extract of tobacco 291 larvae died out of 380 larvae. [Fig. 1].When exposed to 3mg/l of aqueous leaf extract of tobacco 372 larvae died out of 380 larvae. Other results showed that the remaining larvae died as concentration increased.

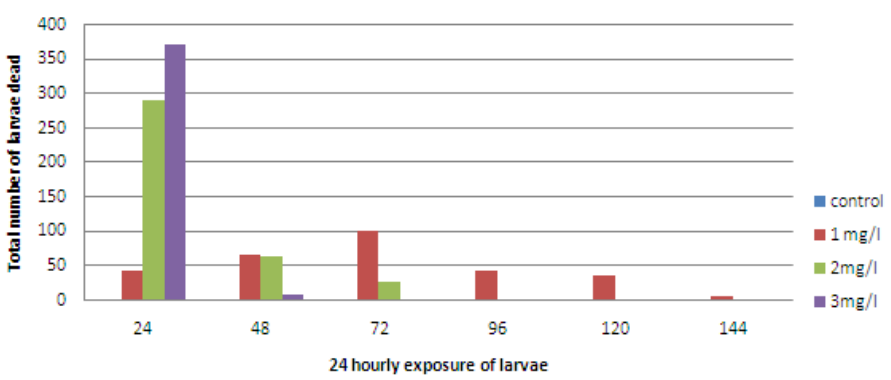


Fig.1. **Effect of aqueous tobacco leaf extract on 3rd instar larvae of *Musca domestica***

**Fig. 2** showed that the number of larvae that died at 2 hours interval immediately after exposure was significantly different and higher than those of the other concentrations, but mortality at 4mg/l was significantly similar at 2, 3, 4, 5 hours after exposure.

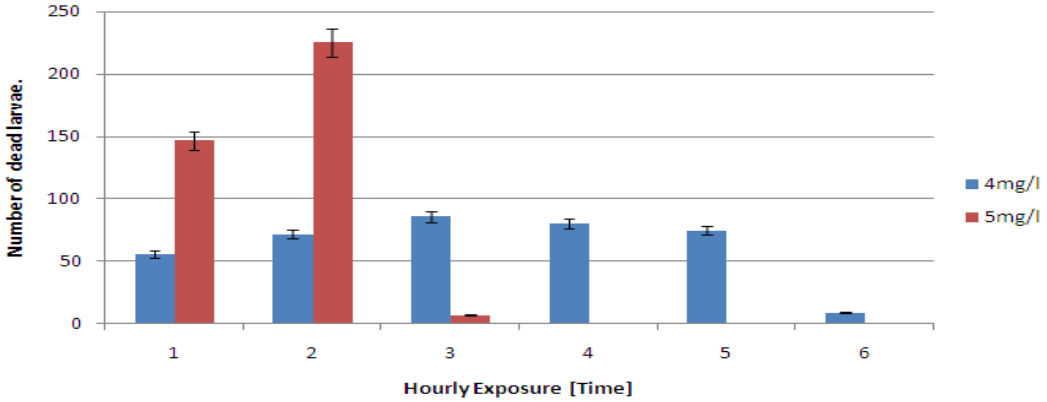


**Fig. 2. Number of larvae of *Musca domestica* exposed *Nicotiana tobacum* at hourly intervals.**

**Fig.3** showed that 24 hours that the larvae exposed to 3mg/l had 97.9% mortality and the number significantly differed from percentage mortality of other larvae. And the trend was the same for those exposed to 2mg/l. Those exposed to 1mg/l at 72hours had higher mortality than the others.

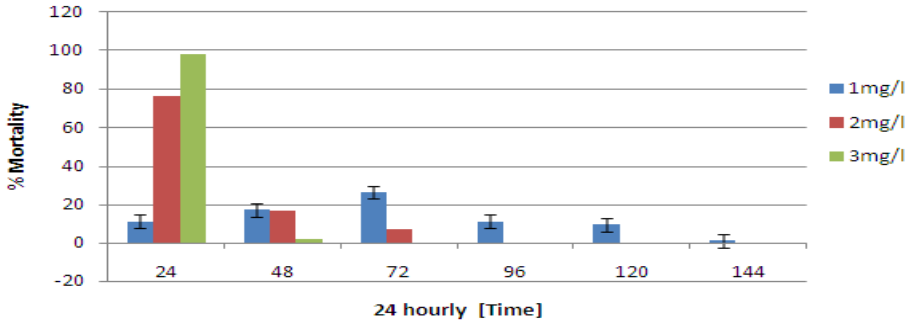


**Fig. 3. Effect of aqueous extract of tobacco leaf on larvae of *M.domestica* [24 hourly observation]**

Mortality of larvae at 4 and 5 mg/l was also concentration dependent, 59.2% of larvae exposed to 5mg/l died at 2 hours after exposure and their number significantly differed from all others.
And those exposed to 4mg/l had lower mortalities and they had no significant difference between each level, those that died at 2, 3, 4, 5 hours did not show any difference between each other but they all differed from those that died at 6 hours.

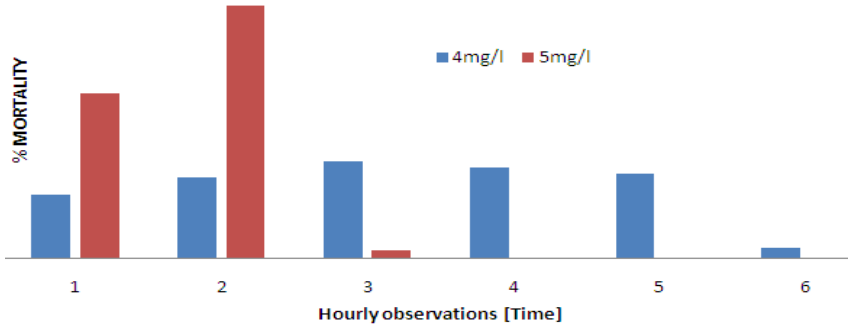


**Fig. 4. Percentage mortality of larvae of *M. domestica* exposed to one hourly observations of aqueous leaf extract of *Nicotiana tobacum*.**

## IV. Discussion

The results showed that aqueous leaf extracts of *N. tabacum* exhibited its toxicity against third instar larvae of *Musca domestica*In 24 hours. Mortality was dose dependent as mortality increased with increases in concentration of leaf extract. This finding corroborates with the findings of authors [2. 4] who reported on the larvicidal activity of aqueous tobacco leaf extract showed positive effect on the third instar larvae of house fly studied. The aqueous tobacco leaf extract caused mortality even though a delayed mortality was observed at the lower concentrations 1mg/l, 2ml/, 3mg/ respectively and some of the larvae treated with 1mg/l pupated and emerged as flies. Other workers reported that nicotine causes symptoms of poisoning similar to those seen in organophosphate and carbonate insecticides and that nicotine is the main constituent of tobacco which induces highly insecticidal effects as they are synaptic poison that mimic the neurotransmitter acetylcholine. Mortality was faster at higher concentrations (5, 4 mg/l) and slower at the lower concentrations (1, 2, 3 mg/l). Mortality of larvae treated with 5 mg/l of aqueous tobacco leaf extract occurred within 24 hours. Mortality of larvae treated with 4 mg/l of aqueous tobacco leaf extract also occurred within 24 hours.

The effect of the aqueous tobacco leaf extracts using 5 and 4 mg/l had 100% death. This is in agreement with those who reported on the efficacy of *Nicotianatabacum*extract against the larvae of (*Anopheles* and *Culex*) mosquitoes [23]. This present work also corroborates the findings of Suleiman, 2011 on other potencies of tobacco leaf extracts offered complete growth inhibition on three pathogens of tomato.

The mortality of the lower concentrations took longer time and days. Mortality of larvae treated with 3 mg/l of aqueous tobacco extract occurred within 48 hours. Mortality of larvae treated with 2 mg/l of aqueous tobacco leaf extract occurred within 72 hours. Mortality of larvae treated with aqueous tobacco leaf extract occurred within 144 hours. Mortality of larvae using 2 and 3 mg/l had 100% death but using 1 mg/l some of the larvae pupated and emerged as flies. This is in contrast to other report on a 100% mortality of larvae within 72 hours [23]..

The control showed no larval mortality on any of the days. They all pupated and emerged as flies. This also corroborates with the work of [24, 25] they reported on the efficacy of wood vinegar against the larvae of housefly and also in agreement with 20] who evaluated the efficacy of *Nicotianatobaccum* extract against the larvae of Anopheles and Culex mosquitoes. Other works reported of the larvicidal efficacy of leaf extracts of *Puthecellobiumdulce*against *Anopheles stephensi* and *Aedesaegypti* [2, 3, 37].They concluded that the extracts of the aforementioned plant caused moderate larvicidal and ovicidal effects on the two species of mosquitoes. This present work showed that the aqueous extracts of*Nicotianatabacum* caused high larvicidal effects on *Muscadomestica*. Larvae of flies exposed to higher concentrations of *N. tabacum* showed higher and faster mortalities after 24 hours; mortality was concentration dependent. Also while evaluating the mosquitocidal activity of two indigenous plants on *Achrassapota* and *Cassia auriculata*it was concluded that the methanol extracts of *A. sapota* was more effective than *C. auriculata* in the control of *An stephensi*.[25]. Works of other researchers[ 6; 27, 29,30,31, 37, 38, 39] showed the roles of indigenous plant extracts in *M. domestica* control. Many indigenous plants including those of the Niger Delta have been found effective in the control of pests of agricultural products [3, 32].

## V. Conclusion

The present study suggests that the aqueous leaf extract**s** of *Nicotianatabacum*have the potential to be used as an eco-friendly approach for the control of maggots of *Musca domestica* in the dustbins at home, hospitals, public places and at waste dumpsites.It exhibited a larvicidal effect against the developmental stages of *Musca domestica* and prevented them from metamorphosing into pupae and subsequently into adults and thereby hindered their multiplications. Therefore *Nicotianatabacum*can also be presented as an insecticide.

## References


[1]. Begum, N., Sharma, B., Ravi, S. and Pandey. [2010]. Evaluation of insecticidal efficacy of*Calotropisprocera*and *Annona squamosa* ethanol extracts against *Musca domestica* J. Biofertil. AndBiopestici.,1(1): 1-6.

[2]. Beseeleua.,H. B. D. , Gbewonyo, S. W. K. and Obeng-Ofori, D [ 2008]. Toxicity, growth regulatory and repellent activities of medicinal plant extracts on Musca domesticaL. (Diptera: Muscidae). African Journal of Biotechnology Vol. 7 (24) : 4635-4642.

[3]. Ogbalu, O. K. ,Umeozor, O. C. and Ebere, N.[20O5]. Oviposition deterrence Effect of NeemAgainst*Atherigonaorientalis* [Schiner] on Pepper [*Capsicum annum*] and Tomato [*Lycopersiconesculentum*] Fruits in Nigeria. Indian Journal of Agricultural Research, Vol. 9 [1]: 18-24.

[4]. Jesikha. M., 2014, Control of *Muscadomestica* using wastes from Citrus sinensis peel and *Mangiferaindica*seed. SIRJ-BES 1[1]: 17-26.

[5]. Hanan, B. A. [2013]. Evaluation of insecticidal activities of*Menthapiperta*and *Lavandulaangustifolia*essential oils against house fly,*Musca domestica*L. (Diptera :Muscidae). J of Entomol and Nematol, Vol. 5 : 50-54.

[6]. Morey, R. A. and A.J Khandagle, A. J. [2012].Bioeffeicacy of essential oils of medicinal plants against house fly ,*Musca domestica*L.Parasito Res, Vol. 111 : 1799-1805.

[7]. Khan, H. A. A., Shad, S.A.andAkram,W. [2013].Resistance to new chemical insecticides in the house fly, Musca domesticaL.,from dairies in Punjub,Pakistan.Parasito Res, Vol. 112 : 2049-2054.

[8]. .Kumar, P, , Mishra , S,, Malik, A. and Satya, A [2012].“ House fly *(Musca domestica*L.) control potential of *Cymbopogoncitratus*Staff. (Poales:Poaceae) essential oil and monoterpenessZcitral and 1,83cineole),” Parasito Res, vol. 112, pp. 69-76.

[9]. Bishnu, C. and Zeev, W.(2005). Larvicidal Effects of Aqueous Extracts of *Balanitesaegyptiaca*(Desert Date) Against the Larvae of *Culexpipens*Mosquitoes. African,., Journal of Biotechnology 4(11) 1351-1354.

[10]. Bowman, W. C., Rand, M. J (1980). Textbook of pharmacology, BlackweeScientific ,Oxford, pp 42. 29 - 42. 31.

[11]. . Casanova, H., Ortiz, C., Pel’ aez, C., Vallejo, A., Moreno, M.E., Acevedo, M (2002). Insecticide formulations based on nicotine oleate stabilized by sodium caseinate. J Agric Food Chem. 50: 6389-6394.

[12]. Govindarajan, M., Raieswary, M and Sivakumar, R. [2013]. Larvicidal and ovicidal efficacy of*Puthecellobiumdulce* [Roxb] Benth [Fabaceae] against *Anopheles stephensi* Liston and *Aedesaegypti* Linn [Diptera: Culicidae. Indian Journal of Medical Research, 138[1]: 129-134.

[13]. Iqbal, Z., Lateef, M., Jabbar, A., Ghayur, M.N., Gilani, A.H (2006). In vitro and In vivoanthelmintic activity of*Nicotianatabacum* Leaves against gastrointestinal nematodes of sheep. Phytotherapy Res 20:46- 48

[14]. Isman, M. B (2000). Plant essential oils for pest and disease management. Crop Protection, 19: 603-608.

[15]. Jamshidi, R., Afzali, Z. and Afzali, D (2009). Chemical composition of hydro-distillations of essential oil of rosemary in different origins in Iran and comparison with other countries. American-Eurasian Journal Agricultural and Environmental Science, 5: 78-81.

[16]. Koul, O., Walia, S. and Dhaliwal, G. S (2008). Essential oils as green pesticides: Potential and constraints. BiopesticidesInternational, 4: 63-84.

[17]. Kuhn (1965). Tobacco alkaloid and their pyrolysis products in the smoke. In : Von –Euler US (ed).

[18]. Kumar, P., Mishra, S., Malik, A. and Satya, S (2011). Repellent, larvicidal and pupicidal properties of essential oils and their formulations against the housefly, Musca domestica. Medical and Veterinary Entomology, 25: 302-310.

[19]. Krishnappa, K and Elumalai, K. [2014].Mosquitocidal activity of indigenous plants of Western Ghats, Achrassapota Linn[Sapotaceae] and Cassia auriculata L [Fabaceae] against a common malarial vector, Anopheles stephensi Liston [Culicidae: Diptera]. Journal of Coastal Medicine, 2[5]: 402-410.

[20]. Malik, A., Singh, N. and Satya, S (2007). House fly (Musca domestica): a review of control strategies for a challengingpest. Journal of Environmental Science and Health, Part B, 42: 453-469.

[21]. Mansingh, A., William, L.A.D (1998). Pesticidal potential of tropical plants – II. Acracidal activity of crude extracts of several Jamaican plants. Insect SciAppl18 :149 – 155.

[22]. Miller, J. A. and Chamberlain, W. F (1989). Azadirachtin as a larvicide against the horn fly, stable fly, and house fly. Journal of Economic Entomology, 82: 1375-1378.

[23]. Moon ,R (2002). Muscid flies (Muscidae) .In G.R. Mullen and L.A. Durden, eds. Medical Vertinary Entomology. San Diego: Academic Press. pp. 279- 301.

[24]. . Nadkarni (1976). Indian material medical. Popular Prakashan, Bombay pp 850-885.

[25]. Nan, R. and Michael, P. T (August 2001). AFLP analysis of genetic polymorphism and evolutionary relationships among cultivated and wild Nicotiana species". Genome44 (4): 559–571. doi:10.1139/gen-44-4-559. PMID11550889.

[26]. Ogunnika, C.B (2007). Medicinal plants : A Potential Agroforestry Components in Nigeria . in : Proceeding of Humboldt Kellog / 3rd Annual Conference of School of Agriculture and Agricultural Technology, (pp.2-7). Akure , Ondo State , Nigeria: The Federal University of Technology.

[27]. Olofintoye, L., Simon-Oke, I., Omeregie, O (2011). Larvicidal properties of Nicotianatabacum (Tobacco) Extract against the larvae of Anopheles and Culex mosquitoes. International multi-disciplinary Journal, Ethiopia, Vol 5(2) : 337-344.

[28]. Palacios, S. A., Bertoni, A., Rossi, Y., Santander, R. and Urzua, A (2009). Efficacy of essential oils from edible plants as insecticides against the house fly, Musca domesticaL. Molecules, 14: 1938-1947.

[29]. Palacios, S. A., Bertoni, A., Rossi, Y., Santander, R. and Urzua, A (2009a). Efficacy of essential oils from native medicinal plants of central Argentina against the house fly, MuscadomesticaL. Molecules, 14: 1938-1947.

[30]. Pangnakorn, U., Kanlaya, S., Kuntha, C (2011). Efficacy of wood vinegar extracts for controlling house fly (Musca domestica). International Journal of Medical and Biological Sciences, vol 5 (2): 477- 482.

[31]. Pavela, R (2008). Insecticidal properties of several essential oils on the house fly (Musca domesticaL.). PhytotherapyResearch, 22: 274-278.

[32]. Philipson, J.D (2001). Phytochemistry and medicinal plants phytochemistry56 : 237 – 243.

[33]. Rahuman, A.A., Bagavan, A., Kamarag, C., Vadivelu, M., Zahir, A.A., Elango, G., Pandiyan, G (2009a). Evaluation of indeginous plant extracts against larvae of CulexquinquefasciatusSay (DipteraCulicidae). Parasitol Res 104(3):637-643.

[34]. Sharma, R. N. and Saxena, K. N (1974). Orientation and developmental inhibition in the housefly by certain terpenoids. Journal of Medical Entomology, 11: 617- 621.

[35]. Soonwera, M.and Sinthusiri, J. [2014]. Thai Essential Oils as Botanical Insecticide Against House Fly (Musca domesticaL.)

[36]. Urzua, A., Santander, R., Echeverria, J., Cabezas, C., Palacios, S. M and Rossi, Y (2010). Insecticide properties of the essential oils from Haplopappusfoliosusand Bahiasambrosoidesagainst the housefly, Musca domesticaL.

[37]. Waliwitiya, R., Kennedy, C. J. and Lowenberger, C. A (2008). Larvicidal and oviposition-altering activity of monoterpenes, trans-anithole and rosemary oil to the yellow fever mosquito Aedesaegypti. Pest Management Science, 65: 241-248.

[38]. Wennig, R (April 2009). Back to the roots of modern analytical toxicology: Jean ServaisStas and the Bocarmé murder case". Drug Test Anal (England) 1 (4): 153–5. doi:10.1002/dta.32. PMID20355192.
[39]. Williams, L.A.D .,Mansingh, A (1993). Pesticidal potentials of tropical plants –I. Insecticidal activity in leaf extracts of sixty plants. Insect SciAppl 14: 697-700.