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New Botanical Derivatives, Used in Medicinal Preparations, Showing Bioactive Action on Insect Pests II: Effect on the vectors *Culex pipiens* and *Musca domestica* larvae

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Abstract: Botanical extracts of two plants having medicinal importance were tested for their insecticidal properties. The toxicities of myrrh extracts (oleo-resin or oil) and jojoba oil were studies against the last larval instar of both mosquito and house fly. The larvae of *Culex pipiens* were highly affected by the tested compounds in comparison with the larvae of *Musca domestica*. The effect of botanical extracts on larvae of mosquito showed LD_{50} 100.55, 138.13 and 649.43 ppm for myrrh oleo-resin, myrrh oil and jojoba oil, respectively. The combination of jojoba oil with myrrh oil was only highly toxic on larvae of mosquito and has a synergistic effect with a co-toxicity factor 53.44. The botanical extracts of myrrh have strong mortal effect on the larvae of both vectors than the jojoba oil. The present study strongly confirms that myrrh extracts could be use safely to control certain vectors.

Key words: Botanical derivatives, medicinal preparations, bioactive action, insect pests

Introduction

Mosquito and house fly have been regarded as two important vectors for transmission of several diseases. Mosquito is a serious pest in the health sector of the world. Mosquitoes create a health menace for human, animal and birds. The most deadly diseases of man such as malaria, encephalitidae, yellow fever, dengue fever and filariases, are mosquitoes borne. Recently, it is reported that mosquitoes can transmit hepatitis B virus (Alamy *et al.*, 1979; Siemens, 1987). On the other side, the house fly is considered as an important vector for transmission of several enteric infections such as dysenteries, infantile diarrhea, typhoid, food poisoning, cholera and parasitic worms (helminthes). Also, they have been incriminated as vectors of poliomyelitis and certain skin diseases such as yaws; hence the house flies constitute one of the greatest problems of human public health (Keiding, 1976).

During the last decade, a growing concern of the toxic activity of plant-derived compounds had emerged. Among these compounds the volatile oils had insecticidal activity against different organisms (Konstantopoulou *et al.*, 1992). These plant extractions or volatile oils can be used to control vectors either separately and/or as synergists to most other insecticidal compounds (Naqvi *et al.*, 1990; Saxena *et al.*, 1992; 1994; Kumari *et al.*, 1994 and El-Kady *et al.*, 1996).

Myrrh is an oleo-gum-resin obtained from the stem of *Commiphora molmol*. Myrrh plant is growing in north-east Africa and Arabia. The resin of myrrh is widely used in Somalia to treat stomach complaints and diarrhea. Recently, myrrh has found to be used to reduce of cholesterol and triglycerides. In addition, it is accepted by FDA for food use. Also the council of Europe included myrrh in the list of plants which are acceptable for use in foods (Massoud *et al.*, 1998). Myrrh was found to be effective in treating schistosomiasis in hamsters and in treating human uncomplicated intestinal schistosomiasis (Massoud *et al.*, 1997). Moreover, it was reported that the *C. molmol* extract is potential as molluscicidal agent against the snail *Biomphalaria alexandrina* that considered the main intermediate host of *Schistosoma mansoni* (El-Alqamy *et al.*, 1998). The other botanical extract jojoba oil is usually obtained from the seeds of *Simmondsia chinesis* shrubs that have been introduced recently to Egypt from the west and north America. The economic importance of jojoba oil is due to its addition in many medicinal and cosmetic preparations (Quiroga *et al.*, 1991).

The present work was conducted to evaluate the toxic activity of two botanical extracts derived from plants, having medicinal important, against larvae of *Culex pipiens* and *Musca domestica*.

Materials and Methods

Tested insects: Mosquitoes and house flies were obtained from laboratory cultures reared as described by Hashem and Youssef (1991) for house flies and by Gaaboub *et al.* (1970) for mosquitoes. The colonies were raised in constant room temperature of 27°C ± 2 and 70 ± 5% RH.

Botanical extracts: The main constituents of myrrh are oleo-gum-resin that obtained from the stem of *Commiphora molmol.* It contains 7-17% volatile oil, 25-40% resin, 57-61% gum and 3-4% of impurities. The botanical extracts of myrrh (oleo-resin or oil) were obtained from Pharco Pharmaceuticals Company, Alexandria, Egypt. The jojoba seed oil extracted from *Simmondesia chinesis* plant and it was obtained commercially in pure form from the Egyptian Natural Oil Company, Egypt.

The different extracts were diluted with the solvent cremophor El to obtain 20% stock solutions. The solvent cremophor El is characterized by it is very save and used as vehicles for various drugs and also very soluble in water (Reynolds, 1990). All concentrations were prepared with distilled water and used in bioassay tests. An aqueous solution of 10% cremophor was used as control.

Bioassay tests: For house fly larvae, the method used in bioassay followed that recorded by Shalaby (1970). While, the method used in testing for mosquitoes is that developed by World Health Organization (1960). The experiments were replicated four times and in each replicate 25 larvae were used. The larval mortalities were recorded after 24 h, the results were analyzed by the probit analysis (Polo-PC, Le Ora software Inc. 1987). Effectiveness was compared at LD_{50} values. Also, a mixture of myrrh and jojoba oils was tested against the mosquito larvae. The combination is proportioned at the deduced rates of their LD_{25} values. The co-toxicity coefficient for the mixture was determined (Mansour *et al.*, 1966).

Percentages of mortality were subjected to analysis of

Table 1: Toxicity of different treatments on mortality of the last larval instar of mosquito

Tested plant extracts	*Culex pipiens*					
	Dose/ppm	% of mortality	F test (LSD values)	LD_{50}	LD_{25}	Slope ± S.E.
Myrrh Oleo-resin	240	80a				
	160	63b	3.49	100.55	45.54	1.961 ± 0.232
	80	39c	(3.34)			
	40	24d				
Myrrh oil	320	91a				
	240	64b	6.34	138.13	63.83	2.012 ± 0.309
	160	53bc	(4.8)			
	40	24d				
Jojoba oil	1600	97a	4.45	649.43	422.20	3.607 ± 0.412
	800	53b	(3.36)			
	400	27c				

Means followed by the same letter (vertically) are not significantly different at 0.05 level by LSD test

Table 2: Toxicity of different treatments on mortality of the last larval instar of house fly

Tested plant extracts	*Musca domestica*					
	Dose/ppm	% of mortality	F test (LSD values)	LD_{50}	LD_{25}	Slope ± S.E.
Myrrh Oleo-resin	100000	86.0a				
	75000	62.0b	12.78	39187	16707	1.822 ± 0.293
	50000	51.0bc	(3.72)			
	25000	14.0d				
Myrrh oil	100000	100.0a				
	75000	90.0b	29.77	30856	20147	3.643 ± 0.369
	50000	73.0c	(2.14)			
	25000	40.0d				
JoJoba oil	--	--	--	--	--	--

Means followed by the same letter (vertically) are not significantly different at 0.05 level by LSD test

variance (ANOVA) and the means separated by LSD at 0.05 level.

Results and Discussion

The obtained results of the effect of various concentrations of the different treatments on the larvae of *Culex pipiens* and *Musca domestica* are presented in Table 1 and 2. Results are expressed as the percentages of larval mortality after 24 h. of treatment. The different concentrations of myrrh oleo-resin produced high mortal effect on the mosquito larvae after 24 h. Myrrh oleo-resin concentrations ranged from 240 ppm to 40 ppm caused percentage of mortality ranged from 80 to 24%, respectively. Also, the different concentration of myrrh oil caused high percentage of mortality which ranged from 91 to 24% under the effect of concentrations ranged from 320 ppm to 40 ppm, respectively. While, jojoba oil caused percentage of mortality ranged from 97 to 27% under the effect of concentration ranged from 1600 ppm to 400 ppm. The present results clearly show that the myrrh oleo-resin extract with the LD_{50} 100.55 ppm, was the most toxic compound against the mosquito larvae. While, jojoba oil has the lower toxicity with the LD_{50} 649.65 ppm. Mean while, myrrh oil had more or less a high toxicity with LD_{50} 138.13 ppm (Table 1). Moreover, the combination between LD_{25} of myrrh oil and jojoba oil leads to a synergistic effect against *C. pipiens* larvae with a co-toxicity factor equal to 53.44. It was reported that it is important to control mosquito by using agents that eliminate this insect effectively but are harmless to human being (Tabassum *et al.*, 1993). They added that the hydrocarbon and saponin are very effective and toxic against larvae of *Culex fatigans.*

Also, plant derived oils, eucalyptus and turpentine, have larvicidal properties on the fourth instar of *Culex pipiens* (Corbet *et al.*, 1995). The larvicidal effect of five plant oils was tested on the mosquito *Culex pipiens* L. (Soliman and El-Sherif 1995), they found that *Jasminum fructicans* was the most effective one.

Concerning the house fly larvae, the different concentrations of myrrh oleo-resin that ranged from 100.000 ppm to 25000 ppm caused high percentage of mortality ranged from 86 to 14%, respectively. Also the same range of concentrations of myrrh oil caused high percentage of mortality ranged from 100 to 40%, respectively. It is clear from Table 2, that the myrrh oil caused percentage of mortality higher than that caused by myrrh oleo-resin at the same concentrations. The result indicates that the myrrh oil is the most active components in the myrrh extracts. While, jojoba oil had no toxic effect even at a high dose of 6×10^4 ppm against the house fly larvae. This may be attributed to the action of jojoba oil is internally and the external contact to different concentrations of jojoba oil did not cause any percentage of mortality.

The myrrh oleo-resin and myrrh oil had toxicities with LD_{50} 30856 ppm and 39187 ppm on the larvae of house fly. The toxicity action of both compounds is stronger on mosquito larvae rather than on house fly larvae. The toxicities of four volatile oils were tested on the 3rd instar larvae of *M. domestica* (El-Kady *et al.*, 1996). They found that the garlic oil was the most toxic oil and eruca oil had no

toxic effect. While, pepon and baraka oils had lower toxicities against the house fly larvae.

The present study shows that the different botanical extracts have bioactive action on the larvae of mosquito and house fly. There are a wide variety and significant differences between the effect of different concentrations within the different treatments (Table 1, 2). The myrrh oleo-resin and myrrh oil had strong mortal effect on larvae of mosquito in compare to larvae of house fly and the main effective components of myrrh extract are the volatile oils. Clearly, botanical insecticides may provide a safe and effective short-term control technology for insect pest larvae, especially mosquito larvae. Additional research is needed to identify exact toxic components in the myrrh extracts and jojoba oil. Specifically, extracts from myrrh offer potential for development as a new biorational insecticide for use in developing countries. Myrrh is recently considered as an excellent source of biologically active natural products and could be use safely in a system of integrated pest management instead of chemical insecticides that have hazards on the human public health and environment.

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