Nakano O, J Agron Agri Sci 2019, 2: 011
DOI: 10.24966/AAS-8292/100011

HSOA Journal of
Agronomy and Agricultural Science

Research Article

Evaluation of *Coffea arabica* Leaf Extract as Insecticides against *Aedes aegypti* (Diptera: Culicidae)

Octavio Nakano

Department of Entomology and Acarology, Escola Superior de Agricultura "Luiz de Queiroz" / University of São Paulo, Piracicaba, Brazil

Abstract

Considering that all the substances are toxic, depending only on the dose supplied, the effect of the caffeine contained in the coffee leaves (*Coffea arabica*), which is an easy-to-obtain plant, in the control of an important domestic pest, *Aedes aegypti*, in its adult and larval stages, was studied. It is known that caffeine is toxic to the larvae of this insect and therefore it was sought to verify the effect of the same contained in the leaves in view of the works of. On the other hand, it was proposed a formulation containing shredded paper mixed in water with ground leaves. After the mixture is dried and burned, the smoke generated could lead the active, intoxicating the confined insect. The liquid resulting from the liquefaction of the materials was also tested in adults and larvae of the species. The fumigant formulation controlled 100 % of the adults, but the liquid formulation was not.

Introduction

Based on the principle that all substances are toxic to humans and insects depending on the amount absorbed, the effect of caffeine contained in coffee leaves of the *Coffea arabica* variety was studied. Caffeine is a toxin contained in coffee [1,2]. However, not harmful to humans due to the small amount ingested each time. On the contrary, it is considered stimulating to the nervous system and even beneficial to the muscular system, with energetic properties recommended to the sportsmen [3].

***Corresponding author:** Octavio Nakano, Department of Entomology and Acarology, Escola Superior de Agricultura "Luiz de Queiroz" / University of São Paulo, Piracicaba, Brazil, Tel: 55 01934227780; E-mail: onakano@usp.br

Citation: Nakano O (2019) Evaluation of *Coffea arabica* Leaf Extract as Insecticides against *Aedes aegypti* (Diptera: Culicidae). J Agron Agri Sci 2: 011.

Received: July 11, 2019; **Accepted:** July 17, 2019; **Published:** July 24, 2019

The amount required to be Lethal to Humans (LD_{50}), is found on the toxic substance scale to be 192 mg/kg of body weight. This is equivalent as an individual of 60 kg needing 11,520 mg or 11.42 g of caffeine in order to have a 50 % chance of intoxication. A cup of coffee contains about 90 mg of caffeine, so the individual would need to drink 128 cups at once to have a 50 % chance of dying.

Therefore, the chance of a coffee-based intoxication is quite remote for humans, and its stimulating effect is more valuable than the negative side of caffeine itself. Different from humans, for insects the situation is different. Due to their weight, the oral or dermal LD_{50} can threat their life. For example, a disease-transmitting mosquito known as *Aedes aegypti* weighs an average of 1 mg. Therefore, the caffeine contained in the leaves of the coffee tree can provide a sufficient dose to intoxicate it, both adult and larvae. This is especially in the larval phase when, in addition of being able to ingest the liquid from the environment in which they live, are in permanent contact with their skin.

A research conducted by in UNESP-Campus of Rio Preto [4], showed that coffee grounds, therefore, coffee already brewed which will be thrown in the trash, can be used to control larvae of this species. The control can be achieved using 50 g of the coffee grounds for each liter of water that contains the larvae,

As a result, the present assay was conducted to show the effect of caffeine contained in coffee leaves [1] on this terrible domestic pest, where the use of synthetic insecticides is not always desirable due to the danger it represents in an environment that is so close to men and animals.

Materials and Methods

The experiment was carried out in the Department of Entomology and Acarology of ESALQ/USP, in Piracicaba, state of São Paulo, Brazil, during the month of February 2019. In the research *Coffea arabica* leaves were tandomimly chosen from the first. Of these, 40 grams of green leaves were mixed with an equal amount of used legal paper, previously cut into small strips and milled along with the respective leaves of the coffee blender containing 1.0 L of water. Then, the liquefied material was sieved obtaining the material, in the form of a small cigar. After drying it in an electric oven, the material could be burned, obtaining the desired smoke.

The mosquitoes were acquired from laboratory bred, population were one day olj adults, were submitted to smoke, inside a transparent plastic jars of 15 × 9.5 diameter × 10 in height. The jars had an orifice for introducing the mosquitoes and the lit cigar, releasing the desired smoke. After 5 minutes of filling the chamber with smoke, the live and dead mosquitoes were counted (Table 1).

The mosquitoes were also submitted to the liquid obtained by the liquefaction of the in the same proportion already mentioned, diluted in the water and squeezed in filter paper for coffee, thus obtaining the liquid for spraying on them. For this purpose, the mosquitoes were

caged in small cylindrical cages of 14 cm in diameter × 2 cm wide, screened on both sides to prevent leakage and allow the spray to reach them. After spraying, the sprayed mosquitoes under the 0-25-50 and 75 % dilution were left for 60 minutes to count the living and dead (Table 2).

The larvae were submitted to the contamination of the same prepared liquid for spraying, diluting it in the following proportions:

Trat.1-20 ml; 2-40 ml; 3-80 ml; 4-160 ml, 5-control-only water, each in 1 liter of water repeated 4 times. After 60 hours, the count of the living and dead larvae belonging to the 3rd in star was performed.

Results and Discussions

Treat	Replication					
	A	B	C	D	Total	% E
1. Smoke + Caffeine	10	50	10	10	50	99,98
2. Smoke	0	0	1	0	1	------
3.Control	0	0	0	0	0	

Table 1: Number of mosquitoes submitted to the test of smoke containing caffeine, in number of 10 per plot, being 5 males and 5 females. Total dead 5 minutes after application (T) and % efficiency (% E). Piracicaba, February 10, 2019.

Treat	Replication					
	A	B	C	D	T	% E
1. 75%	10	9	10	10	39	---
2. 50%	9	10	8	10	37	---
3. 25%	10	10	10	10	40	---
4. 0%	10	9	9	10	38	---

Table 2: Adults sprayed with ground coffee leaves liquid, in a number of 10/plot, 5 males and 5 females in various dilutions. Total of living, 24 hours after application (T) and % efficiency (% E). Piracicaba-SP, 18 February 2019.

Treat	Replication					
	A	B	C	D	Total	%E
1. Liquid (20 ml)	10	10	8	10	38	--
2. Liquid (40 ml)	10	10	10	10	40	--
3. Liquid (80 ml)	9	10	10	10	39	--
4. Liquid (160 ml)	10	9	10	9	38	--
5. Control	10	9	10	10	39	

Table 3: Dilution of the liquid prepared for placement of 10 larvae / plot. Number of living per plot, total per treatment (T) and % Efficiency (% E). Piracicaba-SP, February 20, 2019.

Note: Each treatment received 1.0 L of water with respective dosages.

Table 2 shows that mosquitoes were not affected by spraying the coffee leaf liquid, as prepared. Perhaps due to the insufficient amount of caffeine contained in the liquid or the inefficiency of the penetration of the same by the skin; (Table 3), which was supposedly contaminated, showed no effect of caffeine as demonstrated by Guirado [4], with coffee grounds.

However, in the form of fumigation, either by this effect or by the higher concentration of caffeine in the solid part of the coffee leaves that accompanied the material to make the formulation, the efficiency by this means was 100 %. This opens a perspective for the use of caffeine in mosquito control and possibly other small insects who's LD_{50} allows to relate to their weight.

In relation to the larvae, mortality of the larvae was not obtained until the dilution of said liquid in the ratio of l60 ml/1000 ml of water, which was judged not viable by the excessive amount required by this method. However, in this dosage, two larvae presented formations in the metamorphosis when they transformed into pupae. Although they did not die in the larval stage.

Comparative statistical analysis was deemed unnecessary, given that the data were convincing.

Conclusion

In the form of fumigation, by the tested method, caffeine has 100% efficacy in the control of the *Aedes aegypti* mosquito.

References

1. Chaves JCD, Miyazawa M, Bloch MFM, Yamakami JK (2004) Estimativa do teor de cafeína nas sementes de café baseada na sua concentração nas folhas de mudas e de plantas adultas. Acta Scientiarum, Agronomy 26: 287-292.

2. MAZZAFERA, P. Teor de cafeína em folhas de cafeeiro. CienCult. São Paulo,v.38,n,7, p869-870,l986.

3. MINGOIA,,Q. Excitantes do sistema nervoso central: excitantes psicomotores. In: Quimica Farmaceutica, S.P. Melhoramentos, p.222-227,1991.

4. GUIRADO, M.L,M.- Outros Aspectos do Efeito da Cafeína e da Borra do Café em *Aedes aegypti*. Diss, apresentada para obtenção do título de Mestre em Genética. São Jose do Rio Preto.UNESP.145 pp.2004.