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LETTER TO THE EDITOR

RESPONSE OF C*ulex quinquefasciatus* LARVAE TO THREE INSECTICIDES

Divinópolis, August 26, 2015

Dear Editor,

The adult females of *Culex quinquefasciatus* are vectors responsible for transmission of different arboviruses and lymphatic filariasis. The mosquito has anthropophilic and endophilics habits, their larvae develop in almost all habitats modified by humans[3]. Different insecticides groups such as organophosphates, carbamates, and pyrethroids have been widely used in mosquito control, but in some places, the temephos has shown ineffectiveness for effective control of *C. quinquefasciatus*[7] as a result of resistance development[6]. So, there is a need of monitoring the populations through periodic studies for the detection of susceptibility.

The aim of this study was to establish the response level of *C. quinquefasciatus* larvae to organophosphate, pyrethroid, and ivermectin. The sub-lethal doses were determined.

C. quinquefasciatus larvae were obtained from a laboratory colony as previously described by GERBERG[5]. Selected 4th instars larvae of *C. quinquefasciatus* were exposed for one hour to 40, 8, 1.6, and 0.32 ppb (parts per billion) of the organophosphate, temephos (Fersol 500CE); pyrethroid, deltamethrin (Fersol 25CE), and ivermectin (Ivomec 1% w/v, Merial). For each insecticide tested, the larvae were divided into groups consisting of 20 specimens as well as the control group, three replications for each treatment (360 larvae per group). Control groups were placed in recipients containing just dechlorinated water. After the exposure time, larvae were washed and transferred to other plastic recipients containing dechlorinated water and food (murine chow, Labina – Purina®). The temperature was maintained at 26 °C throughout all the tests, and they were conducted by adapting WHO[8] methodology. The LC_{50} was determined using the probit program DL50 (1987).

Table 1 presents that temephos showed low LC_{50} among the insecticides tested (1.37 ppb), with a confidence interval of 95% from 1.22 to 1.53. In contrast to the study done in Brazil by ALVES *et al.*[1] in 2011 that showed temephos LC_{50} was over 50 times higher than that presented in the actual study, while deltamethrin LC_{50} was four times higher. However, ivermectin LC_{50} was lower than 1/4 previous LC_{50} and the curve presented lowest inclination, demonstrating higher heterogeneity in the response to this insecticide.

Table 1
Lethal concentration (LC) for insecticides in ppb, for *Culex quinquefasciatus* larvae after 1h of exposure

Insecticides	LC_{50} (IC 95%)	*p*-value	χ^2	Inclination
Temephos	1.37 (1.22 – 1.53)	< 0.005*	17.53	0.13
Deltametrine	14.18 (12.20 – 16.48)	< 0.005*	16.93	0.68
Ivermectin	1.01 (0.82 – 1.26)	< 0.005*	27.47	0.06

IC = Confidence Interval; X^2 = Chi-square.

However, as also observed by ALVES *et al.*[1] in 2011, probit analysis demonstrated that the highest concentration used was just the one used for deltamethrin. It is also observed that there are differences between insecticides, but temephos has a greater effect on mosquito larvae in lower concentrations, which for local populations of culicids meant no detection of insecticide resistance. However, lower genetic variability may explain the responses of populations to the tested insecticides. CHEN *et al.*[2] in 2009 evaluated in laboratory the bioavailability of nine commercial formulations of temephos at a dose of 1 mg/L, all of them exhibited varying levels of toxicity against larvae of *C. quinquefasciatus*, *Aedes aegypti,* and *A. albopictus*.

Currently there are thousands of dengue cases in Brazil and tonnes of insecticides are being used to combat mosquitoes, however, few studies have shown resistance of these insects. *Aedes* and *Culex* are part of the same subfamily of dipterans and not always the way to combat each one is distinguished. Thus, the types of insecticides and the doses to be employed against these dipterans should be corroborated for efficacy, in addition, some studies point out that the ivermectin can be an insecticide to be used against these insects[1,4].

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