

LARVICIDAL ACTIVITY OF *SAPINDUS MUKOROSI* ON *Aedes Aegypti*

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ABSTRACT

Aedes aegypti is an ecto-parasite and vector of the Dengue fever. New eco-friendly method to control the population of these insects is necessary. In the present study we evaluated the potential of *Sapindus mukorossi* as larvicide. Methanol extract prepared by percolation method outstand as highly active larvicide, achieving 100 % larval mortality in 24 hours when tested in the concentration of 29 µg/mL. One fractions derived from methanol extract present remarkable LC₁₀₀ at 7 µg/mL. LC₅₀ of methanol extract and active fractions were found 11 µg/mL, and 5 µg/mL respectively. These extracts will be further studied to determine its larvicidal principle and feasibility at field level.

KEY WORDS: *Aedes aegypti*, Dengue fever, *Sapindus mukorossi*, Vector.

INTRODUCTION

Dengue fever is a serious public health problem in the developing world, mainly in tropical countries where the favorable environmental conditions are responsible for the proliferation of vectors *Aedes aegypti*. Among the arbovirus in India, distribution of all the dengue virus type is continuously expanding. Remarkably the reemergence of Chikungunya virus (CHIK) since 2005 is posing an additional concurrent diseases burden in the country including the Maharashtra. Both these virus are born by the mosquito *A. aegypti* (L) (Diptera: Culicidae) (Fulmali et al., 2008; Kumar et al., 2008). Periodic treatments with chemical insecticides are done in breeding sits. Due to environmental concern on use of existing synthetic insecticides for vector control and further risk of development of widespread insecticides resistance in disease vector; interest on possible use of environment friendly natural products such as extracts of plants or plant parts increased for vector control. (Das et al., 2007, Jawale et al., 2009), Sukumar *et al.* (1991) reported plants belonging to 99 families, 276 genera and 346 species to have insecticidal properties. Among the families reported 3 species of family Sapindaceae, namely *Koelreuteria paniculata* (extracts of seeds and leaves), *Poullinia fuscescens* (extracts of seeds and fruits) and *Sapindus saponaria* (extracts of seeds and fruits) were found to be effective against mosquito larvae. The present study was carried out in a laboratory to assess the larvicidal efficacy of the leaves extract of *Sapindus mukorossi* Gaertn. of family Sapindaceae, a medicinal plant widely distributed in the India, against *A. aegypti* larvae.

MATERIALS AND METHODS

Plant species: *S. mukorossi* leaves were collected from gardens at Nashik city, Maharashtra State, India, in December 2009. Leaves were shed dried and powdered. **Plant extraction:** The powdered leaves were sequentially extracted with hexane, ethyl acetate and methanol using percolation extraction. A portion of all extracts were tested for the presence of saponin using a standard method (Kokate 1999). The solvent were evaporated on rotary evaporator. Any extract exhibits significant larvicide activities were further fractioned by filtration in silica gel, eluted with Hexane, Ethyl acetate, Methanol and Water (HEMWat) solvent system of increasing polarity (Friesen and Pauli, 2005), 17 fractions were obtained.

Bioassay: Larvae were reared (Pelah *et al.*, 2002) and third instars larvae were selected for bioassay. Larvae were transferred into the test solution with pasture pipette (20 larvae / solution). As a solvent, DMSO is used to soluble the extract in test water. Mortality of each test extract and fractions were determined after 24 hours exposure at 28°C following the protocol of WHO (1981). Mortality was corrected using Abbot formula (Finney, 1971) and the concentration at which 50% of the test population were dies (LC₅₀) was determined by probit program (Finney, 1971).

RESULTS AND DISCUSSION

The experimental results are shown in Table 1 and 2. Among the Three extracts obtained by percolation method, methanol extract shows significant larvicidal activity causing 100% mortality in a concentration of 100µg/ml (Table 2). Jawale *et al.*, (2009), mentioned the higher efficiency of percolation method over soxhlet extraction for the larvicidal principles. This extracts was further fractioned and the fractions obtained (SMM1-SMM6) were tested for larvicidal activity. The fraction SMM2, 3 and 6 presented the best results (Table 1). SMM1, 5, 4 fraction didn't presented good activity in concentration lower than 350 µg/mL and rest of other fractions showed negative results (result not shown in table), The LC₅₀ of the methanol extract and its potent fraction (SMM3) is found 11 (± 0.2132) µg/mL and 5 (± 0.1212) µg/mL respectively (LC₅₀ values are presented as average of four observations ± SE).

Table 1: Lethal concentrations of Fractionated methanol extract of *S. mukorossi*

Fraction	HEMWat	Solvent system	LC ₁₀₀ (ug/ml)	Regression equation
SMM2	9:1:9:1		13	Y=1.9441X + 3.3592
SMM3	8:2:8:2		7	Y=2.1180X + 2.3457
SMM6	6:4:6:4		35	Y=1.4832X + 1.3753

Table 2: Laboratory evaluation of crude extracts of *S. mukorossi* against third instar larvae of *A. aegypti*

Solvent	LC ₁₀₀	Regression equation
Hexane	*	*
Ethyl acetate	124	Y=1.7386X + 2.0473
Methanol	29	Y=1.8441X + 3.2593

*indicate no larvicidal activity in concentration <350 µg/mL

In all larvicidal assays, the methanol extract of *S. mukorossi* leaves extracted with percolation and its fractions presented higher larvicidal activity. Various authors have evaluated larvicidal activity of *Sapindus* species on mosquitoes (Jawale 2014). Surendran *et al.*, (2007) found significant larvicidal activity of methanol extract of fruits of *Sapindus emarginatus* on *A. aegypti*. While Fernandes *et al.*, (2007) reported Larvicidal potential of *Sapindus saponaria* (Sapindaceae) against tick *Rhipicephalus sanguineus*. All crude extract showed the presence of saponin in initial testing. Major phytochemical evaluation of *Sapindus mukorossi* is done with the fruits, very less work has been done with the leaves phytochemistry which can be establish as valuable insecticidal resource. Some researchers have reported triterpenoid saponins from the fruits and galls of *Sapindus mukorossi* (Iqbal 1993, Huang *et al.*, 2008). Thus to establish active chemical of these saponin extract and their mosquito larvicidal activity, fractions will be further fractionated and purified also the efforts are going on to evaluate field potential of *Sapindus mukorossi* leaves as larvicide and their possible toxic effect upon the other organism.

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