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Phytochemical screening and larvicidal efficacy of extracts of *Gnidia glauca* (Fresen) Gilg

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ABSTRACT

Mosquitoes are the most important single group of insects acting as vector for many tropical and subtropical diseases such as dengue fever, yellow fever, malaria, filariasis, Japanese encephalitis and others. The present study was conducted to screen phytoconstituents and larvicidal potential of methanol, chloroform, ethyl acetate, acetone and petroleum ether extracts of *Gnidia glauca* (Fresen) Gilg. The preliminary phytochemical tests showed the presence of tannins, terpenoids, steroids, saponins and flavonoids. Larvicidal activity in terms of % larval mortality was performed using 2nd instar larvae of *Aedes aegypti*. A dose dependent larval mortality was observed. At concentration 20mg/ml, all the extracts showed 100% larvicidal mortality. The larvicidal potential of the solvent extracts could be mainly due to the presence of various phytoconstituents. Further studies are to be conducted to isolate active constituents and to find out their efficacy against larvae.

KEYWORDS

Gnidia glauca (Fresen) Glig.;
DPPH assay;
Larvicidal activity;
Agar well diffusion;
Anthelmintic activity.

INTRODUCTION

Plants have an almost limitless ability to synthesize aromatic substances, most of which are phenols or their oxygen derivatives[1]. The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive compounds of plants are alkaloids, flavonoids, tannins, and phenolic compounds[2]. Mosquitoes are the most important single group of insects acting as vector for many tropical and subtropical diseases such as dengue fever, yellow fever, malaria, filariasis, Japanese encephalitis and others[3]. The approach to combat these diseases largely relied on interruption of the disease transmission cycle by either targeting the mosquito larvae through spraying of stagnant water breeding sites or by killing the adult mosquitoes using insecticides[4]. Killing larvae of mosquitoes is a successful way of minimizing mosquito densities in breeding grounds before they reach adult stage. It largely depends on the use of synthetic chemical insecticides. But their repeated use has caused environmental problems and widespread development of resistance. Plants offer an alternative source of insect-control agents be-

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Figure 1 : *Gridia glauca* (Fresen) Gilg

cause they contain a range of bioactive chemicals, many of which are selective and have little or no harmful effect on non-target organisms and the environment[5,6].

Gnidia glauca (Fresen) Gilg. belongs to the family Thymeliaceae and locally known as Mukkadakana gida. It is a large shrub, leaves alternate, linear oblong, head inflorescence flower and fruit in January and February. Fruit is indehiscent. It is traditionally used as pesticide in the paddy fields to control insects and to treat skin diseases[7]. The present study was conducted to evaluate larvicidal potential of methanol, chloroform, ethyl acetate, acetone and petroleum ether extracts of *Gnidia glauca*.

MATERIALS AND METHODS

Collection and identification of plant

Gnidia glauca (Fresen) Gilg was collected in the Sharavathi river basin of Central Western Ghats of Karnataka. The plant was authenticated in Dept. of Studies and Research in Applied Botany, Jnanasahyadri, Shankaraghatta and voucher specimens (KU/AB/KSV/237) were deposited in the department for future reference.

Extraction of plant material using solvents

The leaves of *G. glauca* were washed thoroughly 2-3 times with running tap water and once with sterile water, shade dried, powdered and used for extraction. The powdered plant material (200g) was extracted with solvents namely methanol, chloroform, petroleum ether, ethyl acetate and acetone by soxhlet extraction and exhaustively extracted for about 48 hours. The extracts were filtered through Whatman filter paper No. 1 and concentrated in vacuum under reduced pressure using rotary flash evaporator and dried in the desiccator[8]. All the extracts were subjected to preliminary phytochemical screening to screen the presence of various secondary metabolites[9].

Screening of solvent extracts for larvicidal activity

Second instar larvae of *Aedes aegypti* mosquito were collected from water stagnated area and identified in the Dept. of Entomology, UAS, Shivamogga, Karnataka, India. The larvae were maintained under suitable temperature and humidity. Different concentrations of solvent extracts (5, 10, 15 and 20mg/ml) were prepared in 10% DMSO and added to sterile labeled beakers containing about 100ml of water. Twenty larvae were placed in each of the beakers containing extracts. A control was kept containing 10%DMSO. After adding the larvae, the beakers were kept in the growth room maintained at room temperature. The larvicidal effect of extracts was determined by counting the number of dead larvae after 24 hours. Dead larvae were identified when they failed to move after probing with a needle in siphon or cervical region. Each test was repeated thrice; the percentage of larval mortality was determined[10].

RESULTS AND DISCUSSION

Phytochemical screening of methanol extract revealed the presence of tannins, terpenoids, steroids, saponins and flavonoids. Alkaloids were not detected in the extract (TABLE 1).

The solvent extracts of selected plant have demonstrated promising activities against the larvae of *Aedes aegypti* in a dose depended manner. Over 50% mortality was observed in case of all extract concentrations. At extract concentration 20mg/ml, 100% mortality of larvae was observed in all the extracts. All extracts, except acetone and petroleum ether extracts, have shown 100% mortality at 15mg/ml concentration (TABLE 2). It is observed that the carbohydrates, saponins, phytosterols, phenols, flavonoids and tannins from plants are having mosquito larvicidal activity[10].

TABLE 1: Phytochemical constituents in the methanol extract of *G. glauca*

Phytochemical group	Methanol extract
Tannins	+
Terpenoid	+
Alkaloid	-
Steroid	+
Saponins	+
Flavonoids	+

TABLE 2 : Larvicidal activity of solvent extracts of *G. glauca*

Solvent extract	% larval mortality in different concentrations of solvent extracts (mg/ml)			
	5	10	15	20
Methanol	51	73	100	100
Chloroform	58	85	100	100
Ethyl acetate	56	75	100	100
Acetone	58	71	80	100
Petroleum ether	53	68	90	100

Prenylated xanthones, tetracyclic phenols and saponins are reported to be effective in controlling mosquito *A. aegypti*, the vector of yellow fever[11]. The larvicidal potential of the extracts could be mainly due to the presence of various phytoconstituents in the solvent extracts of *G. glauca*. Mosquitoes constitute a major public health menace. Several mosquito species belonging to genera Anopheles, Culex and Aedes are vectors for the pathogens of various diseases like malaria, filariasis, Japanese encephalitis, dengue and dengue haemorrhagic fever, yellow fever and chickungunya[12]. One of the approaches to prevent mosquito borne disease is by killing mosquito at larval stage. The current mosquito control approach is based on synthetic insecticides but they have created many problems like insecticide resistance, pollution, toxic side effect on human beings[13,14]. This has necessitated the need for a research and development of environmentally safe, biodegradable indigenous method for vector control.

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