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Larvicidal Activity and Phytochemical Investigation of *Albizia julibrissin* Durazz. Methanolic Leaf and Bark Extract against *Aedes aegypti* Linn. Larvae



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ABSTRACT

Albizia julibrissin Durazz. is a medium sized unarmed tree, 5-10 m tall, leaves 4-8 cm long found in outer Himalayan part of the India. The plant is traditionally used in Chinese medicine to treat the depression and anxiety. Pod extract of the plant shows antioxidant and antibacterial activity. Bark extract is applied to bruises, ulcers, abscesses, boils, hemorrhoids and fractures, and has displayed cytotoxic activity. Bark and root water extract showed anticancerous activity. Phytochemical investigation showed the presence of alkaloids, carbohydrates, proteins, flavonoids, glycosides, triterpenoids, saponins, steroids and tannins in bark and leaves methanolic extracts of the *Albizia julibrissin* Durazz. Resin and starch were absent in both the extracts of the plant. Larvicidal activity was recorded after 24 hr. of exposures. It revealed that the bark extract has high larvicidal activity than the leaves extract. As the source of the plant is very common and the formulation is not costly, the present study may open new approach towards the eco-friendly and effective larvicidal against *Aedes aegypti* Linn. larvae.

INTRODUCTION

Since the ancient time, peoples have been exploring nature particularly the plants in search of the new drug. This has been resulted in the use of a large number of medicinal plants to treat various diseases. According to World Health Organization, 65 - 80% of the world populations rely on traditional medicine to treat various diseases. Medicinal plants would be the best source to obtain a variety of drugs and therefore, such plants should be investigated to understand better about their properties, safety, and efficacy (Anantharaj and Tangavelou, 2015).

Albizia julibrissin Durazz. is a medium sized unarmed tree, 5-10 m tall, leaves 4-8 cm long found in outer Himalayan part of the India. The plant is traditionally used in Chinese medicine to treat the depression and anxiety (Gilhotra and Dhingra, 2008). Pod extract of the plant shows antioxidant and antibacterial activity (Karim and Azlan, 2012). Bark extract is applied to bruises, ulcers, abscesses, boils, hemorrhoids and fractures, and has displayed cytotoxic activity (Lau, *et.al.*, 2007). Bark and root water extract showed anticancerous activity (Jin, *et.al.*, 2012).

The study of phytochemical analyses is very important to understand the potent biological activity of the plant. Mosquitoes is well-known for their public health importance, since they act as vector for many tropical and subtropical diseases such as skin allergies, and they are vectors for a number of diseases, such as malaria, yellow fever, dengue, filariasis, and certain types of encephalitis such as West Nile Fever (Kaliyamoorthy, *et.al.*, 2012). Nowadays strategies based on the elimination of breeding sites and applications of chemical insecticides for larval and adult mosquito control. But these chemical insecticides are hazardous to the plants, animal and also to the human being. Apart from this, it is non-targeted, non-biodegradable and high cost of synthesis (Ghosh, *et.al.*, 2012). In the last 50 years, more than 2000 plants species has been reported to contain toxic principal, which is effective against the insects. Several plant derived compounds have important natural resource of insecticides (Rajasekaran and Duraikannan, 2012). Phytochemicals are advantageous due to their eco-safety, target-specificity, and no development of resistance, reduced number of applications, higher acceptability and suitability for rural areas (Govindarajan, 2009). Therefore, the present work was carried out to determine the larvicidal activity and to analyze the phytochemical investigation.

MATERIALS AND METHODS

Collection of Plant Material

Leaves and bark of *Albizia julibrissin* Durazz. was collected from Kinwat forest (19° 32.479''N 078° 14.543''E) in Nanded district of Maharashtra. Specimens were identified and authenticated by Herbarium, Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Accession No- 17396). Freshly collected leaves and stem bark of *Albizia julibrissin* Durazz. was dried in shade and pulverized to coarse powder. The powder was stored in an airtight container and kept in a cool, dark, and dry place (Hassan, *et al.*, 2014; Das, *et al.*, 2014).



Fig.1- *Albizia julibrissin* Durazz. Flower **Fig.2- *Albizia julibrissin* Durazz. Stem**

Method of preparation of methanol extract

The extraction was done by hot continuous method using Soxhlet apparatus. The 25 gm powder of leaves and bark were extracted using 250 ml methanol for 72 hours (Vijayalakshmi, *et. al.*, 2012). The methanolic extract of bark and leaves of *Albizia julibrissin* Durazz. were used for this study.

Preliminary phytochemical screening

The presence of various phytoconstituents such as steroids, alkaloids, terpenoids, glycosides, flavonoids and carbohydrates were screened in the methanolic leaf and bark extracts of *Albizia julibrissin* Durazz. (Harborne, 1973; Gomathi, *et.al.*, 2013; Santanu,*et.al.*, 2011; Ali, 2000; Jerald and Jerald, 2007).

Larvicidal Activity

Larvicidal activity was carried out according to “WHO Guideline for laboratory and field testing of Mosquito Larvicides” (Anonymous, 2005) with some modification. Batches of 25 third and fourth instar larvae of *Aedes aegypti* Linn. were used for the larvicidal activity. Mortality percentage was calculated with the help of following formula and probit analysis was carried out using NCCS software (Mathalaimuthu, *et.al.*, 2015, Kamaraj, *et.al.*, 2011).

$$\text{Mortality \%} = \frac{X - Y}{X} \times 100$$

Where, X = percentage survival in the untreated control and Y = percentage survival in the treated sample.

RESULTS AND DISCUSSION

Phytochemical investigation

Indian system of medicine has a long history of use of medicinal plants but they lack adequate scientific documentation, particularly in light of modern scientific knowledge. The medicinal value of plant lies in the bioactive phytoconstituents of the plant and which shows various physiological effects on human body. So through phytochemical investigation, one could detect the various important compounds which could be used as the base of modern drugs for curing various diseases (Sheikh,*et.al.*, 2013). The Preliminary phytochemical investigation of the plants is an important aspect in finding the future biological activity of the plant (Eswari,*et.al.*, 2013).

Phytochemical investigation was carried out using different test showed that the presence of alkaloids, carbohydrates, proteins, flavonoids, glycosides, triterpenoids, saponins, steroids and tannins in bark and leaves methanolic extracts of the *Albizia julibrissin* Durazz. Resin and starch were absent in both the extracts of the plant.

Table No. 1 - Qualitative analysis of phytoconstituents of leaves and bark of *Albizia julibrissin* Durazz.

Test	<i>Albizia julibrissin</i>	
	Bark	Leaves
Alkaloid		
1. Hager's	+	+
2. Wagner's	+	+
3. Mayer	+	+
Carbohydrate		
1. Anthrone	+	+
2. Fehling	+	+
3. Molish test	+	+
Protein		
1. Biuret's test	+	+
Flavonoid		
1. Shinoda	+	+
Glycosides		
1. Molish	+	+
Triterpenoids	+	+
Resin	-	-
Saponin	+	+
Steroids		
1. LibermanBuchard's	+	+
2. Salkawski	+	+
Tanins	+	+
Starch	-	-

Larvicidal Activity

Many of the medicinal plants have biologically active secondary metabolite and due to which they are possibly used in the chemotherapy. Recent studies are involved in the use of these medicinal importance plants for specific diseases (Mishra, *et.al.*, 2012). *Albizia julibrissin* Durazz. traditionally use as the remedy to cure a number of the diseases. The present work was carried out to check the larvicidal activity of the bark and leaves methanolic extract of the plant.

Table No. 2- Larvicidal activity of bark and leaves methanolic extract of *Albizia julibrissin* Durazz.

Part use	% mortality (500 PPM)	LC 50 PPM	95 % Confidence LFL -UFL	Regression equation ($Y = \alpha + \beta X$)	Chi- square (X^2)
Bark	58.67 ±1.63	316.24±9.5	302.2-329.11	$Y = 3.04 + 0.78 X$	0.57
Leaf	56 ±2.83	547.46±45.16	476.47-600.14	$Y = 1.91 + 1.13 X$	1.27

The result of larvicidal activity of the plant showed that bark methanolic extract (58.67 ±1.63) has more % mortality than the leaf extracts (56 ±2.83). LC 50 value for the bark extract was 316.24±9.5 PPM and for the leaf extract value was 547.46±45.16 PPM. Similarly 95% confidence LFL-UFL (LFL: Lower fiducial limit, UFL: Upper fiducial limit.) Lower for the bark extract was 302.2-329.11 PPM and 476.47-600.14 PPM for the leaves extract. The present study showed that the bark extract has more potent larvicidal activity than that of the leaves extract.

CONCLUSION

The phytochemical analysis revealed the presence of alkaloids, carbohydrates, proteins, flavonoids, glycosides, triterpenoids, saponins, steroids and tannins in bark and leaves methanolic extracts of the *Albizia julibrissin* Durazz. The present finding suggests that the methanolic bark extract of the plant shows the potential larvicidal activity against the third and fourth instar larvae of *Aedes aegypti* Linn. The plant extract contains effective larvicidal bioactive principles which may be needed for further purification to obtained natural product larvicidal drug.

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