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RESEARCH ARTICLE

PRELIMINARY PHYTOCHEMICAL SCREENING AND ANTIMICROBIAL ACTIVITY OF *AILANTHUS EXCELSA Roxb.* SEEM

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ABSTRACT

Plant parts like stem bark, leaves and fruits of *Ailanthus excelsa* Seem were extracted with different solvents such as methanol, ethyl acetate, alcohol, acetone, and water. The antimicrobial assay of *A. excelsa* extracts were evaluated on bacterial and fungal strains like *Pseudomonas aeruginosa, Bacillus subtilis, Candida albicans. Vibrio cholerae and Salmonella typhi.* Phytochemical screening was performed for alkaloids, terpenoids, tannins, saponins, steroids, cardiac glycosides and flavonoids. Various solvent extracts were examined using agar disk diffusion method against bacterial and fungal microorganisms.

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INTRODUCTION

Plants are the richest source of organic chemicals on the earth- Most of the medicinal plants were using in Indian traditional medicine to cure various diseases. The indigenous system of medicine namely ayurveda, unani and siddha have been in existence in several centuries. In India about seventy percent population residing in the villages and these people depend on herbal medicine to cure ailments. Nature has bestowed a rich botanical wealth with its diversity in varied topography and changed agro climatic conditions in different parts of country (Chaudhari, 1980). The world is looking towards India for new drugs to manage various challenging diseases because of its rich biodiversity of medicinal plants and abundance of traditional knowledge to cure different diseases (Cohen and Alcorn, 1991). In vidharbha Tahsil Umarkhed of Yavatmal district has numerous medicinal plants, rustics of the area using the *Ailanthus excelsa* for curing diseases like allergy, inflammatory problems, cancer etc. Therefore present study was planned to screen phytochemicals and assess the antimicrobial efficacy.

Plant Morphology

Ailanthus excelsa is a large deciduous tree with Yellow bark peeling in irregular woody', Leaves are pinnately compound, 6-12 inches long. Leaflets are 5-7, obovate or round elliptic, sometimes with a small blunt point. Leaflet blade is about 2.2-3 inches long and wide. Flowers are white, Pale borne in mostly 1-3 Raceme Flower stalk is 1/2 cm long. Sepal Pale green petals are White, Fruit is sizocarpic and flat. Locally it is termed as Maharukh flowering during Jan.-March. *'Uses* The *Ailanthus excelsa of* family simaroubaceae a traditional medicinal plant used in ayurvedic medicine for ectodermal diseses of human (Kirtikar, 1999). Leaf juice is also used for the treatment of diabetes.

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MATERIALS AND METHODS

Plant materials were collected from Umarkhed of Yavatmal district during January 2012. The identification is done with the help of standard floras (Naik, 1979; Naik *et al.,* 1'998 and Singh and Karthikeyan, 2001). The plant is shade dried, powdered and stored in airtight container.

Preparation of Extract

Powder obtained was subjected to successive soxlet's extraction with increasing order of polarity i.e. Acetone (56 to 60° c), distilled water (60-70° c) Alcohol (60° to 80° c), Ethyl acetate (60° to 80° c), Methanol (65,5° c - 70.5° c) (Daniel, 1991).

Test-Micro-Organism

The micro-organisms such as *Bacillus substili* MTCC (1091), *Pseudomonas aeroginosa* MTCC (708), *Candida albicans* MTCC 3971), *Vibrio cholerae and Salmonella typhi* were obtained frorn Microbial Institute of technology Chandigarh India and maintained on Mullar Hinton agar and potato dextrose agar slant for bacteria and fungi respectively 6°c until used. To prepare suspension, the slants were incubated at 37°c for 24 hours and inoculum was prepared by MacFarland turbidity standards.

Antimicrobial Screening of Extracts

The agar well diffusion method was used to test the antimicrobial activity of the extracts. The cultures were prepared and incubated at 37°c for 24 hours. The antimicrobial activity was observed on basis of inhibition zone that was compared with standard antibiotic. 0.2 ml broth culture of the test organism was put in a sterile petriplates and 18 ml of sterile agar was added. After solidification of agar, wells were punched and filled with respective solvent extracts- Streptomycin is used as the standard antimicrobial agent at a concentration of 10 mcg/disk. The plates were kept in sterilized inoculation chamber for 2 h to facilitate diffusion of the antimicrobial agents to the medium- The plates were then incubated at 37° c for 24 hours and the diameter of zone of inhibition of microbial growth was measured in the plates in millimeters.

RESULTS AND OBSERVATION

Phytochemical Screening

The preliminary phytochemical screening of leaf extracts *of A. excelsa* reveals that alkaloids are present in methanol and acetone extracts. Saponin is Obtained in aqueous, alcohol and ethyl acetate extract. Terpenoids found in aqueous and alcohol exuacts Tannins present in aqueous, methanol, alcohol and ethyl acetate extracts. Steroids present in aqueous. methanoL alcohol and ethyl acetate extract. Cardiac glycosides obtained in methanoL alcohol, acetone and ethyl acetate extract. Flavonoids are present in aqueous, methanol and alcoholic extracts (Table no 1).

Table 1. Phytochemical screening of various extracts of leaf

Chemical composition	Aqueous	Methanol	Alcohol	Acetone	Ethyl acetate
Alkaloid	--	+	--	+	--
Saponin	+	--	+	--	+
Terpenoid	+	--	+	--	--
Tannin	+	+	+	--	+
Steroids	+	+	--	+	--
Cardiac glycoside	--	+	+	+	+
Flavonoid	+	+	+	--	--

The preliminary phytochemical screening of bark extracts *of A. excelsa* reveals that the presence of alkoloids in methanol, alcohol and ethyl acetate extract. Saponins are present in aqueous and alcohol extracts. The terpenoids are obtained in aqueous, methanol, acetone and ethyl acetate extracts. Tannins are found in aqueous, methanol, alcohol and ethyl acetate extract. Steroids are absent in all extracts. Cardiac glycosides are present in all extracts except water. Flavonoids are found in aqueous, methanol, alcohol and acetone extract (Table no 2)

Table 2. Phytochemical screening of bark extract

Chemical composition	Aqueous	Methanol	Alcohol	Acetone	Ethyl acetate
Alkaloid	--	+	+	--	+
Saponin	+	--	+	--	--
Terpenoid	+	+	--	+	+
Tannin	+	+	+	--	+
Steroids	--	--	--	--	--
Cardiac glycoside	--	+	+	+	+
Flavonoid	+	+	+	+	--

The preliminary phytochemical screening of fruit extracts *of A. excelsa* reveals that the presence of alkaloids in methanol and alcohol extract. Saponins are present in aqueous, alcohol and ethyl acetate. Terpenoids found in aqueous and ethyl acetate extract. Tannins are obtained in methanol, alcohol and ethyl acetate extracts. Steroids are present in methanol and acetone extract. Cardiac glycosides are present in all extracts except water. Flavonoids are found in aqueous, methanol and acetone extract (Table no 3).

Table 3. Phytochemical screening of fruit extracts

Chemical composition	Aqueous	Methanol	Alcohol	Acetone	Ethyl acetate
Alkaloids	--	+	+	--	--
Saponins	+	--	+	--	+
Terpenoids	+	--	--	--	+
Tannins	--	+	+	--	+
Steroids	--	+	--	+	--
Cardiac glycosides	--	+	+	+	+
Flavonoids	+	+	--	+	--

Antimicrobial Assay

The acetone leaf extract exhibited more activity against *Salmonella typhi.* The ethyl acetate leaf extract exhibit more activity against *Candida albicans*. Whereas the leaf extracts were inactive against *Vibrio cholera, Bacillus subtilis* and *Pseudomonas aeroginosa,* as compared with standard antibiotic Streptomycin (Table no 4).

Table 4. Antimicrobial assay of leaf extract

		Zone of inhibition (mm) Plant extract					
		EAL	ACL	DTL	ALL	MTL	Control
1.	*S.typhi*	05	11	- -	07	07	08
2.	*V.cholerae*	09	- -	- -	- -	04	10
3	*B. Subtilis*	05	05	- -	06	05	11
4	*C.albicans*	11	09	09	06	07	09
5	*P. aeruginsa*	14	06	03	- -	10	14

Leaf Extract: EAL: Ethyl acetate; ACL: Acetone; DTL: Distilled water; ALL: Alcohol; MTL: methanol. The acetone, distilled water bark extracts are more active against *Salmonella typhi.* The methanol bark extract exhibited activity against *Vibrio cholerae* and *Pseudomonas aeruginosa.* The alcohol bark extract exhibited activity against *Candida albicans.* While bark extract does not exhibit any activity against *Bacillus subtilis* as comparable to antibiotic Streptomycin (Table no 5).

Table 5. Antimicrobial assay of bark extract

		Zone of inhibition (mm) Plant extract					
		EAB	ACB	DTB	ALB	MTB	Control
1.	*S.typhi*	06	11	10	07	06	08
2.	*V.cholerae*	09	- -	- -	05	14	10
3	*B. Subtilis*	06	05	12	08	05	13
4	*C.albicans*	- -	09	09	15	09	07
5	*P. aeroginsa*	09	06	07	06	11	09

Bark Extract: EAB: Ethyl acetate; ACB: Acetone; DTB: Distilled water; ALB: Alcohol; MTB: methanol

The distilled water and methanol fruit extract is more active against *Vibrio cholerae.* The acetone, ethyl acetate, alcohol, methanol fruit extract exhibit remarkable activity against *Candida albicans* Ethyl acetate and methanol fruit extract exhibited activity against *Pseudomonas aeroginosa.* While the fruit extract does not exhibit any activity against *Salmonella typhi* and *Bacillus subtilis* as comparable to standard antibiotic (Table no 6).

Table 6. Antimicrobial assay of fruit extract

		Zone of inhibition (mm) Plant extract					
		EAF	ACF	DTF	ALF	MTF	Control
1.	*S.typhi*	04	- -	07	05	05	08
2.	*V.cholerae*	06	- -	13	04	12	10
3	*B. Subtilis*	07	03	05	03	10	12
4	*C.albicans*	10	13	07	10	08	06
5	*P. aeroginsa*	13	05	05	05	12	11

Fndt Extracts: EAF: Ethyl acetate; ACF: Acetone; DTF: Distilled water; ALF: Alcohol; MTF: Methanol

DISCUSSION

The present work was carried out for preliminary phytochemical screening and antimicrobial activity of *A. excelsa.* The presence of alkaloids, flavonoids, tannins, saponins, terpenoids, cardiac "glycosides and steroids in different extracts of leaves, bark and fruit. Similar results were also obtained by Mungle *et al.,* (2012), The ethyl acetate leaf extracts exhibit activity against *Candida albicans,* while fruit extract is active against *Candida albicans* and *P. aeroginosa.* Whereas the bark extract does not show any activity against test organism. The acetone fruit extract shows inhibitory activity against *Candida albicans.* The leaf and bark extract exhibit activity against *Salmonella typhi.* The distilled water fruit extract exhibit activity against *Candida albicans* and *Vibrio cholerae* while bark extract against *Salmonella typhi* whereas the leaf extract does not exhibit any activity against test organism. The alcohol fruit and bark extract exhibit activity against *Candida albicans* whereas leaf extract does not show any liability activity against test organism. The methanol fruit extract exhibit inhibitory activity against *Vibrio cholerae, Candida albicans* and *P. aeroginosa.* Whereas the bark extract is active against *Vibrio cholerae* and *P. aeroginosa.* But the leaf extract does not show any activity against test organism. Antimicrobial assay of present study reveals that the fruit extract of *A. excelsa* shows considerable activity against *Candida albicans* and moderate activity against *P. aeruginosa* and *Vibrio cholarae.* The bark extract of *A. excelsa* show good inhibitory activity against *Salmonella typhi* and moderate activity exhibited against *Vibrio cholerae, Candida albicans* and P. *aeruginosa.* The leaf extracts exhibit moderate activity against *Salmonella typhi* and *Candida albicans.* The presence of phytochemical compounds has been known to show medicinal activity as well as exhibit and regulate some physiological activity (Sofovora, 1993 and Harbone, 1998). Tannin prevents development of micro-organism by precipitating microbial protein and making it into unavailable form (Ogunleye and Ibitoye, 2003). The tannins have been traditionally used on inflamed surface of mouth, in the treatment of catarrh and it also have antioxidant properties (Sodipo *et al.,* 1991 and Stephan *et al.,* 2009). The importance of steroids as a potent staring material in the synthesis of sex hormone was reported by Okeke (2003). From the phytochemical analysis it was found that steroid, flavonoids and tannins of several plants extracts are being used for the treatment of diabetes (Kokate *et al.,* 2003).

Conclusion

Ailanthus excelsa has highest significance for its valuable secondary metabolites. Plant extracts that inhibit the growth of pathogenic microorganisms without harming the host may have potential application as therapeutic agents. Hence, the present investigation attempted to evaluate antimicrobial activity of crude extracts from leaves, fruits and barks of *A. excelsa* against some human pathogenic and non-pathogenic bacterial and fungal strains. Successive water, acetone, alcohol, ethyl acetate and methanol extracts *of A. excelsa* leaf, fruit and bark extracts were tested for the screening of phytochemical constituents. Maximum diversity of chemical constituents was found in methanol, ethyl acetate and alcoholic extracts in leaf, bark and fruit. The methanol and alcohol extracts were found active against most of the tested pathogenic organisms as they showed potential phytochemical constituents- Among die tested species C. *albicans* showed greatest sensitivity against alcoholic bark extract. Finally it is concluded the fruit extract is active against *Vibrio cholerae, Candida albicans* and P. *aeroginosa* but it is not active against *Salmonella typhi* and *Bacillus albicans.* The bark extract is effective against *Salmonella typhi. Vibrio cholerae, Candida albicans* and P. *aeroginosa* and it is not effective against *Bacillus subtilis.* The leaf extracts shows inhibitory effect against *Salmonella typhi* and *Candida albicans* only. The fruit and bark extract of *A. excelsa* shows good zone of inhibition against all test organisms except *Bacillus subtilis.* The plant products plays an important role in the treatment of diseases without any side effects, there is a need to search new drugs from natural sources. India is a home to a variety of traditional medicine system that relay to a very large extent on native plant species for new drug materials (Ramdas *et al;* 2006). Therefore now there is a need to look back towards traditional medicine which can serve a novel therapeutic agent (Chitravadivu *et al.,* 2009). The pharmacognostical evaluations also give valuable information which is essential to standardize the drug.

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