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PHYTOCHEMICAL PROFILING AND ANTIMICROBIAL POTENTIAL OF *SANTALUM ALBUM* L., *MORINDA CITRIFOLIA* L. AND *MUCUNA PRURIENS* L.

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ABSTRACT: The present study deals with phytochemical analysis of aqueous, acetone and ethanolic extracts of *Santalum album, Morinda citrifolia* and *Mucuna pruriens*. Aqueous extract of *Santalum album* showed the presence of tannins, saponin, coumarin, proteins, amino acids, and cardialglycosides, ethanol extract contains tannins, coumarin, alkaloids, amino acids and diterpenes and acetone extract contains coumarin, alkaloids, amino acids, diterpenes, and phenols. Ethanolic extract of *Santalum album* found effective against *Bacillus cereus.* Aqueous extract of *morinda citrifolia* found with to have tannins, coumarin, alkalodis, proteins, carbohydrates and flavonoids. Its ethanolic extract shown presence of tannins, coumarin, alkaloids, and amino acids and acetone extract contain tannins, coumarin, alkaloids, amino acids, deterpenes and phenols. The acetone extract of *morinda citrifolia* found effective against *Bacillus cereus.* Aqueous extract of *Mucuna pruriens* found with to have tannins, coumarin, proteins, amino acids, carbohydrates, flavonoids, phenols and cardial glycosides. Its ethanol extract shown presence of diterpenes, phenol and amino acids and acetone extract contains tannins, saponin, coumarin, alkaloids, amino acids, diterpenes and phenols. Acetone and ethanolic extract of *Mucuna pruriens* showed antimicrobial activity against *Proteus vulgaris*, and acetone extract against *Bacillus cereus.*Thus, these results confirm the presence of antibacterial compounds in *Santalum album, Morinda citrifolia* and *Mucuna pruriens* while compounds in *Santalum album* shows higher zone of inhibition hence samples can be exploited in biomedical formulations.

KEYWORDS: *Santalum album, Morinda citrifolia, Mucuna pruriens*, Phytochemical and Antimicrobial potential**.**

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1.INTRODUCTION

The use of complementary and substitute medical therapies have become a common trend around the world and its utilization has been documented briefly over the last decade. In both developed and developing countries the use of products derived from plant in healthcare is common and this incorporates the use of botanical medicines either alone or in combination with prescription medicines [(1)]. Plants are the effective source of phytochemicals used in traditional as well as modern medicines and existence of most of living things is plants [(2)].*Santalum album* is also known as Indian sandalwood, a hemiparasitic tree, native to semi-arid areas of Indian subcontinent. It is the primary source of sandalwood and the derived oil. Its oil is widely used in folk medicine for treatment of common colds, bronchitis, skin disorders, heart ailments, in general weakness, urinary tract infection, fever and in inflammation of the mouth and pharynx [(3)]. Different in vitro and in vivo parts of the plant shown antimicrobial and antioxidant properties [(4)]. *Morinda* is a genus of the flowering plants who belongs from madder family, Rubiaceae. *Morinda citrifolia*. (Rubiaceae), commonly known as noni. The fruit and leaf of the noni tree have long been used in traditional medicine for the improvement of various conditions, including arthritis, colds, diabetes, inflammation, and pain [(5, 6)]. *Mucuna* is a genus of climbing vines and shrub species of the family Fabaceae, found worldwide. Mucuna pruriens has been reported to exhibit significant anti-diabetic properties [(7)]. It is used in urinary tract infection, neurological and menstruation disorders, constipation, edema, fever, ulcers and in Parkinson's disease [(5)].In recent years, secondary plant metabolites (phytochemicals), previously with unknown pharmacological activities, have been extensively investigated as a source of medicinal agents [(8).] Thus, it is anticipated that phytochemicals with adequate antibacterial efficacy will be used for the treatment of bacterial infections [(9)]. Since time immemorial, man has used various parts of plants in the treatment and prevention of various ailments [(10)]. The present research work was undertaken to phytochemical analysis of the *Santalum album, Morinda citrifolia* and *Mucuna pruriens* using different solvents like distilled water, ethanol and acetone along with its antibacterial activity.

2. MATERIALS AND METHODS

Sample preparation

Plant materials were collected from Department of Botany, Shivaji University, Kolhapur identified by Dr. S. R. Yadav. The collected leaves were washed with tap water and kept in oven at 40ºC for 1 hour, after drying leaves were crushed to make powder which is used to carry out phytochemical tests [(11)].

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Sample preparation for phytochemical activity:

1gm of leaves powder were taken of each plant and it is diluted with 25ml of D/W, ethanol and acetone respectively and kept the sample at 4°C for 72 hrs and filtered the sample by Whatmann filter paper and used it for phytochemical activities.

Phytochemical analysis

Phytochemical analysis was carried out to evaluate presence of secondary metabolites such as Steroid, Tannin, Saponin, Anthocyanin, Emodins, Coumarin, Alkaloids , Proteins, Amino acids, Carbohydrates, Flavonoids, Diterpenes, Phytosterol, Phenol Phlobatannins, Leucoanthocyanin, Cardialglycosides (Table 1) by using standard methods [10, 12-14].

Test organisms:

The standard test microorganisms were used in this study as following:

Proteus vulgaris, *Bacillus cereus*

Preparation of bacterial suspension

A loop full suspension of the test organisms were aseptically streaked on nutrient agar slants and incubated at 37°C for 24 hours. The bacterial growth was harvested from the respective slant and suspension was prepared using sterile 1ml saline. The suspension used for antibacterial activity.

***In vitro* testing of extracts for antimicrobial activity**

Antimicrobial activity of the aqueous, aceton and ethanolic extract of *santalum album, morinda citrifolia* and *mucuna pruriens* against various microorganisms was determined by using agar well diffusion method by using Nutrient agar medium [15].

3. RESULTS AND DISCUSSION

Phytochemical tests of aqueous, acetone and ethanolic extract of *santalum album, Morinda citrifolia* and *Mucuna pruriens* were tested and results are presented in Table No. 1. Aqueous extract of *Santalum album* contains tannins, saponin, coumarin, proteins, amino acids, and cardialglycosides, ethanol extract contains tannins, coumarin, alkaloids, amino acids and diterpenes and acetone extract contains coumarin, alkaloids, amino acids, diterpenes, and phenols. The aqueous extract of *Morinda citrifolia* shown presence of tannins, coumarin, alkaloids, proteins, carbohydrates and flavonoids, ethanol extract contains tannins, coumarin, alkaloids, and amino acids and acetone extract contains tannins, coumarin, alkaloids, amino acids, diterpenes and phenols. This result corroborates some previous studies on the phtyochemical screening of *Morinda lucida* which also revealed the presence of alkaloids and flavonoids [16] tannins, alkaloids, flavonoids and glycosides components [17]. Aqueous extract of *Mucuna pruriens* found with tannins, coumarin, proteins, amino acids, carbohydrates, flavonoids, phenols and cardial glycosides. Its ethanol extract shown presence of diterpenes,

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phenol and amino acids and acetone extract contains tannins, saponins, coumarin, alkaloids, amino acids, diterpenes and phenols. Medicinal plants which are rich in tannin, used as healing agents in a number of diseases. For the treatment of diseases like leucorrhoea, rhinnorhoea and diarrhea, formulations based on tannin rich plants have been used in Ayurveda [18]. Many *Mucuna* species have been reported processing medicinal value apart from nutritional value and as fodder crop [9]. Antimicrobial activity of aqueous, acetone and ethanolic extract of *santalum album, morinda citrifolia, Mucuna pruriens* were tested and results are presented in Table 2. Acetone and ethanolic extract of *Mucuna pruriens* showed antimicrobial activity against *Proteus vulgaris*, and acetone extract against *Bacillus cereus.* The acetone extract of *Morinda citrifolia* and ethanolic extract of *Santalum album* found effective against *Bacillus cereus.* Besides, drug discovery and development need not always be confined to new molecular entities, but traditional herbal formulations and botanical drug products with robust scientific evidence can also be alternatives [19] thus accelerating the clinical candidate development using reverse pharmacology approaches [20].

Table 1- Phytochemical analysis of AQ, acetone and ethanolic extract of *Santalum album, Morinda citrifolia* and *Mucuna pruriens.*

Sr. No.	Test	Santalum album			Morinda *citrifolia*			Mucuna *pruriens*		
		AQ E	EE	AE	AQ E	EE	AE	AQ E	EE	AE
1.	Steroid	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve
2.	Tannins	-ve	+ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve
	Condensed Tannins	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve	-ve
3.	Saponin	+ve	-ve	-ve	-ve	-ve	-ve	-ve	+ve	-ve
4.	Anthocyanin	-ve	-ve	- ve	-ve	-ve	- ve	-ve	-ve	- ve
5.	Coumarin	+ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve	+ve
6.	Alkaloids									
	Wagners test	-ve	+ve	+ve	+ve	+ve	+ve	-ve	+ve	+ve
7.	Proteins	+ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve	-ve
8.	Amino acid	+ve	+ve	+ve	-ve	+ve	+ve	+ve	+ve	+ve
9.	Carbohydrate									
	Benedicts test	-ve	-ve	-ve	+ve	-ve	-ve	+ve	-ve	-ve
	Iodine test	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve

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10.	Flavonoids Mg turning test Alkaline reagent test Zn test	 -ve -ve -ve	 -ve -ve -ve	 -ve -ve -ve	 ve +ve -ve	 -ve -ve -ve	 -ve - ve -ve	 -ve +ve -ve	 -ve -ve -ve	 -ve - ve -ve
11.	Diterpenes	-ve	+ve	+ve	-ve	+ve	+ve	-ve	+ve	+ve
12.	Phytosterol	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve
13.	Phenol	-ve	+ve	+ve	-ve	-ve	-ve	+ve	+ve	-ve
14.	Phlobatannins	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve	-ve
15.	Cardial glycosides	+ve	-ve	-ve	-ve	-ve	-ve	+ve	-ve	-ve

AQ- Aqueous extract, EE- Ethanolic extract, AE- Acetone extract.

Antimicrobial activity-

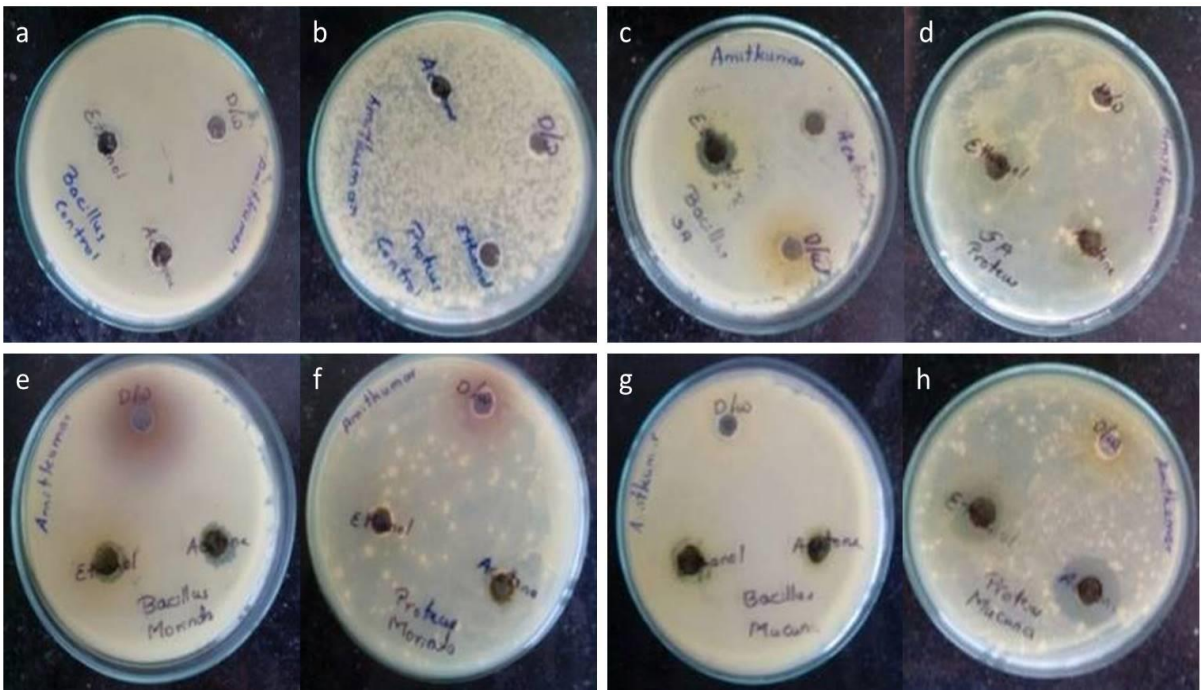

Fig 1- a: *Bacillus cereus* control plate, b: *Proteus vulgaris* control plate, c: *Santalum album* sample extract against *Bacillus cereus,* d: *Santalum album* sample extract against *Proteus vulgaris,* e: Morinda *citrifolia* sample extract against *Bacillus cereus,* f: Morinda *citrifolia* sample extract against *Proteus vulgaris* g: Mucuna *pruriens* sample extract against *Bacillus cereus,* h: Mucuna *pruriens* sample extract against *Proteus vulgaris.*

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4. CONCLUSION:

The result concludes that *Santalum album, Morinda citrifolia* and *Mucuna pruriens* are the rich source of valuable secondary metabolites which have shown significant antimicrobial properties. As per antimicrobial activity, ethanol and acetone extract of *Mucuna pruriens* showed significant activity against *Proteus vulgaris* and ethanol as well as acetone extract of *Morinda citrifolia* showed good antimicrobial activity against *Bacillus cereus* as compared to *Santlum album.* Hence these extracts can be exploited for various biomedical applications.

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