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ANTIMICROBIAL ACTIVITY OF PTERIDOPHYTES FROM BIRBHUM DISTRICT, WEST BENGAL

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ABSTRACT

The present study aims to study the antimicrobial activity of pteridophytes from Birbhum district, West Bengal, India, against some bacterial organisms like Bacillus subtilis MTCC121, Staphylococcus aureus MTCC96 (gram-positive) and Pseudomonas aeruginosa MTCC741, Escherichia coli MTCC 1667 (gram-negative). The experiments screened out the antimicrobial properties of these pteridophytes, which have ethnobotanical importance and many bioactive compounds. Among those pteridophytes, that produced ≥ 7.5. mm inhibitory zones are Lycopodiella cernua, Adiantum philippense, Marsilea minuta, Salvinia cucullata, and Salvinia molesta were showing effectiveness against gram-positive bacteria (Bacillus subtilis MTCC121 and Staphylococcus aureus MTCC96) only and Adiantum incisum, was effective against gram negative bacteria (Pseudomonas aeruginosa MTCC741 and Escherichia coli MTCC 1667) only. Cheilanthes tenuifolia, Azolla pinnata, Thelypteris interrupta and Ampelopteris prolifera produced ≥ 7.5 mm inhibitory zone against both gram-positive and gram-negative strength.

Keywords: Pteridophytes, antimicrobial, gram-positive, gram-negative, inhibitory zone.

INTRODUCTION

The study of drugs and drug plants has progressed steadily, and present pharmacology is an essential branch of medicine. Although the antimicrobial properties of the drugs are not mentioned in early literature, therapeutically, the properties of drugs may be due to the presence of chemical substances. Some of which are either individually or collectively effective as antimicrobials for gram-positive as well as gram-negative bacteria, fungi, actinomycetes, protozoa, etc.

MATERIALS AND METHODS

Freshly collected plant materials were dried under normal temperature for over ten days and then powdered. The plant extract is made from powdered specimens in ethanol. For each extract, 1 gm of powder specimens were used.

After the filtration, extracts were tested for antimicrobial activities against both gram-positive and gram-negative bacteria on the nutrient agar plate by disc diffusion method (Bauer et al., 1966). The bacteria like *Bacillus subtilis* MTCC121 and *Staphylococcus aureus* MTCC96 were used as standard gram-positive bacteria, and *Pseudomonas aeruginosa* MTCC741 and *Escherichia coli* MTCC 1667 were used as gram-negative bacteria.

RESULT AND DISCUSSIONS

The present experiment was done to screen out the antimicrobial properties of the pteridophytes that have ethnobotanical importance, as well as a good number of bioactive compounds. The experiment revealed that all fourteen (14) pteridophytes could show antimicrobial properties in ethanol extract, and the results are shown in Table and in Figure 1.3. Except for *Dicranopteris linearis* and *Lygodium, the* other twelve produced≥ 7.5 mm inhibitory zone (Minimum Inhibitory Concentration, i.e. MIC). They are shown in Table 1.2, and the former two possess antimicrobial properties but cannot produce ≥ 7.5 mm inhibitory zone. Among those pteridophytes, that produced ≥ 7.5. mm inhibitory zone*Lycopodiella cernua, Adiantum philippense, Marsilea minuta, Salvinia cucullata* and *Salvinia molesta* were showing effectiveness against gram-positive bacteria (*Bacillus subtilis* MTCC121 and *Staphylococcus aureus* MTCC96) only, and *Adiantum incisum* was effective against gram

negative bacteria (*Pseudomonas aeruginosa* MTCC741 and *Escherichia coli* MTCC 1667) only. *Cheilanthes tenuifolia, Azolla pinnata, Thelypteris interrupta* and *Ampelopteris prolifera* produced≥ 7.5 mm inhibitory zone against both gram-positive and gram-negative strength.

CONCLUSIONS

The pteridophytes present in Birbhum district were found to have several ethnobotanical importance, including ethnomedicinal also, and these findings were further supported by screening and total estimating of bioactive compounds present in them. Further, the presence of antimicrobial properties among these plants supported the idea that they would be helpful to cure various kinds of diseases. Further studies will be required in this field to produce effective drug formulation and protect our bio-resources.

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Table 1.1 Antimicrobial activities of different plant extracts (100 mg/ml) against tested bacteria.

Name of the plant	Bacterial organisms			
	B. subtilis	***S. aureus***	***P. aeruginosa***	***E. coli***
Lycopodiella cernua.	++	++	-	++
Dicranopteris linearis.	-	-	-	-
Lygodium flexuosum.	-	+	-	+
Cheilanthes tenuifolia.	++	++	-	++
Pteris vittata.	+++	+	-	+
Adiantum incisum.	+	+	-	++
Adiantum philippense.	+++	++	-	-
Marsilea minuta.	+	++	+	+
Ampelopteris prolifera.	+++	+++	-	++
Christella dentata.	++	+++	+	+++
Thelypteris interrupta.	++	++	-	++
Azolla pinnata.	++	++	+	+++
Salvinia molesta.	++	++	-	-
Salvinia cucullata.	++	-	-	-
DMSO	-	-	-	-
Streptomycin (25 µg/ml)	+++	+++	-	++

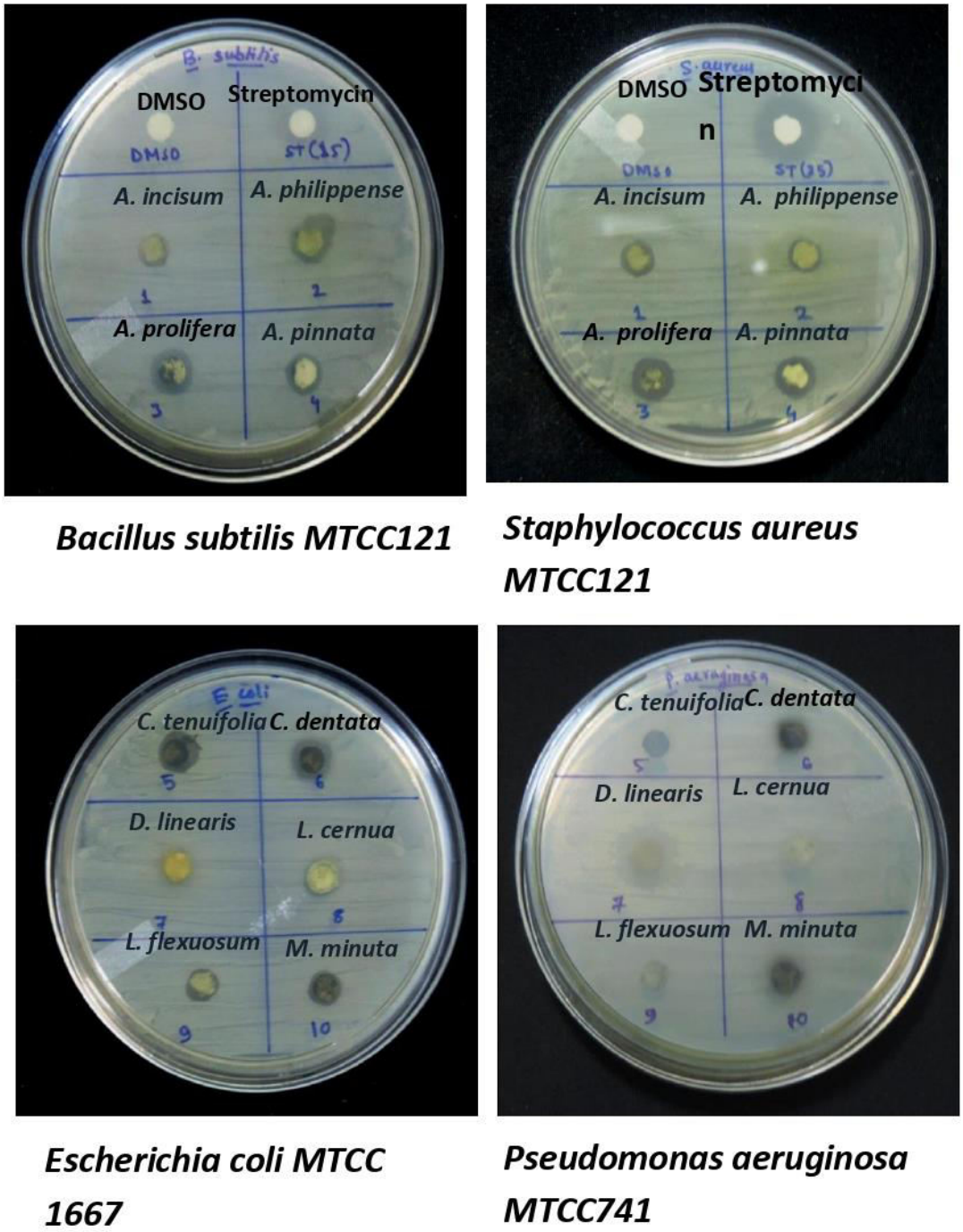
'+' = <7.5 mm zone; '++' = 7.5 – 8.5 mm zone; '+++' = >8.5 mm zone; '-' = No zone.

Table 1.2. Concentrations (mg/ml) of plant extract which were able to produce ≥7.5 mm zones of inhibition against bacterial strains.

Name of the plant	Bacterial organisms			
	B. subtilis	***S. aureus***	***P. aeruginosa***	***E. coli***
Lycopodiella cernua.	**40**	**30**	**-**	**-**

Dicranopteris linearis.	**-**	**-**	**-**	**-**
Lygodium flexuosum.	**-**	**-**	**-**	**-**
Cheilanthes tenuifolia.	**20**	**30**	**-**	**90**
Pteris vittata.	**40**	**-**	**-**	**-**
Adiantum incisum.	**-**	**-**	**-**	**70**
Adiantum philippense.	**70**	**70**	**-**	**-**
Marsilea minuta.	**-**	**60**	**-**	**-**
Ampelopteris prolifera.	**20**	**30**	**-**	**80**
Christella dentata.	**50**	**20**	**-**	**30**
Thelypteris interrupta	**60**	**30**	**-**	**90**
Azolla pinnata.	**40**	**70**	**-**	**30**
Salvinia molesta.	**60**	**70**	**-**	**-**
Salvinia cucullata.	**80**	**-**	**-**	**-**

'-' = unable to produce ≥ 7.5 mm zone even at a concentration of 100 mg/ml.



Bacillus subtilis MTCC121

Staphylococcus aureus MTCC121

Escherichia coli MTCC 1667

Pseudomonas aeruginosa MTCC741

Fig. 1.3. Zones of inhibition produced by plant extracts (100mg/ml) against tested bacteria.