

Lichen thalli of *Platismatia glauca* possesses a remarkable antimicrobial activity

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• Abstract:

The current study aimed to evaluate the antimicrobial properties of the methanolic extract of lichen thalli of *Platismatia glauca* against some referenced bacterial and yeast strains. Disc diffusion test, minimum inhibitory (MIC) and minimum bactericidal (MBC) or minimum fungicidal (MFC) tests were carried out to evaluate the antimicrobial activity of lichen. All tested microorganisms exhibited varying degrees of susceptibility ranging from 18.5±1.0 to 11.0±0.0 mm zone of inhibition. It also showed high antifungal activity against the yeast *Candida albicans* (22.5±0.5 mm). The MIC, MBC and MFC were promising, which were as low as 3.125 to 12.5 mg/ml for MIC and 6.25 to 12.5 mg/ml for MBC and MFC. Accordingly, this lichen could be considered as a source of potential antimicrobial agents.

Keywords: Antibacterial, Antifungal, Lichen, *Platismatia glauca*

• Introduction

Platismatia glauca (L.) is a lichen species belong to family Parmeliaceae, one of the most widely distributed families of lichen with about 80 genera and 2700 species, which represents approximately 15% of the known lichens in nature. Members of this family are characterized by foliose shape, cupulate exciple epihymenium, dorsi-ventral fruticose to sub-fruticose thallus and the color of the upper surface are varying from gray, yellow-green, brown to olive-brown [1]. *Platismatia glauca* are widely traded as a spice, this spice is called "Kalpaasi" in Tamilian cuisine, it is also known in the Middle East as "Shibah". The aim of this study was to evaluation of the antimicrobial capacity of a popular spice lichen (*Platismatia glauca*), which are traded worldwide and have entered in food recipes beside some applications in the traditional folk medicine.

• Results

The results of the antimicrobial activity of the methanol extract of *Platismatia glauca* using disc diffusion method are shown in (Table 1). This lichen showed wide-spectrum antimicrobial properties against all tested microorganisms. The results of the minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC) and minimum fungicidal concentration (MFC) are represented in (Table 2). Based on the MIC, MBC and MFC values, we could say that the methanol extract of this lichen (*Platismatia glauca*) was bactericidal or fungicidal against all tested microorganisms at 12.5 mg/ml, except with *Staphylococcus saprophyticus* and *Proteus vulgaris*, which was at 6.25 mg/ml.

• Discussion

The methanol extract of *Platismatia glauca*, a lichen widely consumed as a spice showed a remarkable antibacterial activity against all tested Gram-positive and Gram-negative bacteria and anti-yeast activity. Our findings are in agreement with previous studies, Mitrović et al. [2] cited that lichen species *Platismatia glauca* showed varying considerable degrees of antimicrobial and antibiofilm activity against 11 bacterial and 9 fungal strains. Gulluce et al. [3] stated that *Platismatia glauca* represented remarkable antimicrobial activity against different bacterial and fungal strains. Moreover, as represented in (Table 2), the MBC/MIC ratios were ranging from 1 to 2. It was reported that the extract is considered to have bactericidal characteristics when the ratio of MBC/MIC is ≤ 4 and assumed as bacteriostatic if the ratio of MBC/MIC is >4 [4]. Accordingly, the methanol extract of *Platismatia glauca* thalli has some bactericidal properties, indicating that it can be used as an antimicrobial drug.

• Conclusion

this lichen (*Platismatia glauca*) represents an interesting bactericidal properties, indicating that it could be used as an antimicrobial agents for drug industries and food preservation.

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Table 1: Antimicrobial activity of *Platismatia glauca* methanol extract with disc diffusion method*

Tested Compound	Gram-positive bacteria				Gram-negative bacteria				Fungi
	Sa	Ss	Sp	Bc	Ec	Sf	St	Pv	Ca
Methanol extract (300 mg/ml)	14.5	18.5	12.0	11.0	11.0	12.5	11.5	11.5	22.5
Chloramphenicol (2.5 mg/ml)	33.0	28.5	28.0	28.0	30.0	29.0	31.5	32.0	NA
Clotrimazole (5 mg/ml)	NA	NA	NA	NA	NA	NA	NA	NA	33.0

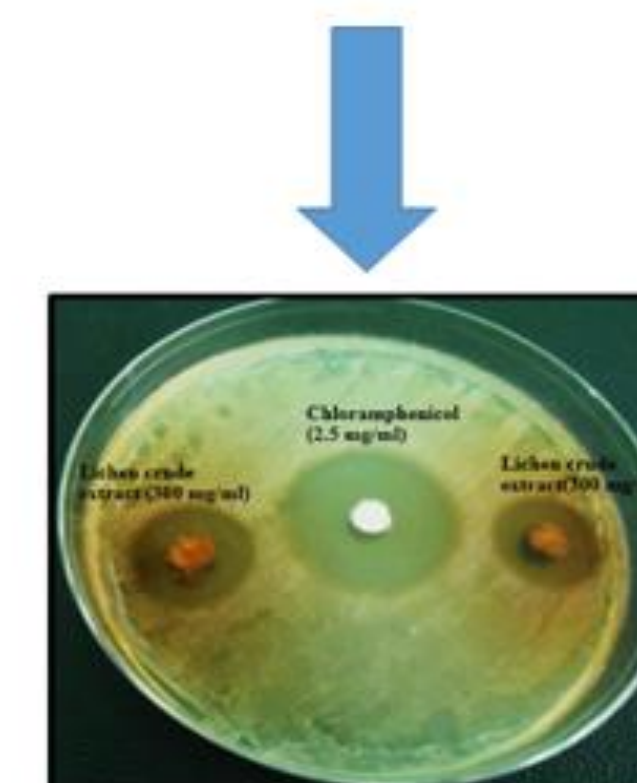
Table 2: MIC, MBC and MFC values of *Platismatia glauca* methanol extract against tested microorganisms*

Test	Gram-positive bacteria				Gram-negative bacteria				Fungi
	Sa	Ss	Sp	Bc	Ec	Sf	St	Pv	Ca
MIC (mg/ml)	6.25	3.125	6.25	6.25	12.5	6.25	6.25	6.25	6.25
MBC or MFC (mg/ml)	12.5	6.25	12.5	12.5	12.5	12.5	12.5	6.25	12.5
MBC/MIC or MFC/MBC	2	2	2	2	1	2	2	2	2

*Key: Diameter of blank paper disc= 6 mm, Sa= *Staphylococcus aureus* ATCC 25923, Sp= *Streptococcus pneumoniae* ATCC 49619, Ss= *Staphylococcus saprophyticus* ATCC 43867, Bc= *Bacillus cereus* ATCC 10876, Ec= *Escherichia coli* ATCC 10535, Sf= *Shigella flexneri* ATCC 12022, Pv= *Proteus vulgaris* ATCC 6380, St= *Salmonella Typhimurium* ATCC 14028; Ca= *Candida albicans* ATCC 1023, MIC= Minimum inhibitory concentration, MBC= Minimum bactericidal concentration, MFC=Minimum fungicidal concentration, NA= Not applicable.



Collection of lichen thallus and extraction using 80% methanol



Antimicrobial screening, followed by MIC and MBC evaluations



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