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Research Article

Evaluation of Antibacterial Activity of *Spirulina platensis* Extracts against Opportunistic Pathogen Model

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ABSTRACT

Spirulina platensis extracts were prepared in water, methanol, ethanol and acetone with different concentration and tested against *Staphylococcus aureus*. It was investigated that water extract of *Spirulina platensis* showed higher antibacterial activity than other extracts whereas acetone extract showed least amount of antibacterial activity. Methanol and ethanol extract of *Spirulina platensis* showed a reduced amount of antibacterial activity against *Staphylococcus aureus.* Water extract exhibited the highest zone of inhibition of 19 mm in diameter followed by methanol extract, ethanol extract and acetone extract which revealed zone of inhibition of 16mm, 13mm and 09mm in diameter respectively. Average minimum inhibitory concentration of water, methanol, ethanol and acetone extract had shown 2025mg/ml, 3600mg/ml, 6400mg/ml and 12800 mg/ml concentration respectively.

Key Words: *Spirulina platensis, Staphylococcus aureus,* Antibacterial activity, Minimum inhibitory concentration, Water extract, Ethanol extract

INTRODUCTION

Microalgae contains wide range of biologically active metabolites such as lyengaroside[1], polyhydroxylated-fuco-phlorethol[2], halogenated compounds[3], polyphenolic compounds[4], polysaccharides[5] and guaniane-sesquiterpene[6] which have already been proved for antibacterial activities.

Spirulina platensis (SP), a cyanobacterium, attracted attention to many scientists due to its beneficial medicinal applications. *Spirulina* or its extracts have been investigated for treatment of many diseases like diabetes, hypercholesterolemia and atherosclerosis[7-9] as well as in reducing the body weight in obese human subject[10]. Its extract contains compounds such as polyunsaturated fatty acids, phycocyanin and phenolics which revealed antioxidant properties[11-13]. It is well known for its rich nutrition also so it is used as nutraceutical agent. It contains high qualities proteins, carbohydrates, carotenoids, essential fatty acids, B-complex vitamins, vitamin E, copper, manganese, magnesium, iron, selenium and zinc[14]. Several strains of blue green algae have exhibited intracellular and extracellular metabolites with diverse biological activities such as antibacterial, antifungal, cytotoxic, algaecide, immunosuppressive[15] and antiviral activities[16].

Unsystematic uses of antibiotic terrorized multidrug resistance organisms like Methicillin resistant *Staphylococcus aureus* (MRSA) which causes food poisoning, blood infections in vital human organs[6, 17]. Therefore, there is an urgent surge for new kind of formulation which is affordable and less toxic. The aim of the present study was to investigate the antibacterial activity of different extracts concentration of SP against *Staphylococcus aureus.*

MATERIALS AND METHODS

Spirulina platensis and chemicals: Powder form of SP was purchased for all experiments. It was provided from Pondicherry Spirulina Farms, Chinna Veerampattinam, Pondicherry-60500, India. It is a spray dried powder, standard in quality and a part of bulk production by the industry. All other chemicals used in this experiment were of analytical grade.

Preparation of *Spirulina platensis* extracts*:* Five gram of spray dried SP powder was taken in a conical flask and dissolved with 100ml of distilled water and then kept for 24 hours. The mixture was shaken frequently during first 6 hours & allowed to stand for the next 18 hours. After that the solution was filtered. 25 ml of *Spirulina* filtrate was poured into clean china bowl and dried at 40^0C. The weight of china bowl with dry extract was measured and extract value were calculated. The same procedures were repeated with different solvent like acetone, methanol and ethanol. Various extracts were made using these solvents

Table 1: Average zone of inhibition against different extracts of *Spirulina platensis* against *Staphylococcus aureus*

Extracts	Zone of inhibition in diameter
Water extract	19 mm
Methanol extract	16 mm
Ethanol extract	13 mm
Acetone extract	9 mm

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Table 2: Average minimum inhibitory concentration of *Spirulina platensis* extracts against *Staphylococcus aureus*

Extracts	Concentration mg/ml				
Water Extract	16200mg/ml	8100mg/ml	4050mg/ml	2025mg/ml	1012.5mg/ml
	-	-	-	0*	+
Methanol	14400mg/ml	7200mg/ml	3600mg/ml	1800mg/ml	900mg/ml
Extract	-	-	0*	+	++
Ethanol	12800mg/ml	6400mg/ml	3200mg/ml	1600mg/ml	800mg/ml
Extract	-	0*	+	++	++
Acetone	0*	+	++	++	++
Extract					

-= no growth; 0 = MIC; + = light growth; ++ = moderate growth*.

and their extract values were noted after calculation[21].

Antibacterial activity assay: 1.9g of Mueller Hinton agar was taken in 100ml of flask and 50ml of distilled water was added to it and mixed well. Flask mouth was plugged by cotton plug and then it was autoclaved. Sterile petri plate was taken and about 20ml of media poured in it and allowed to solidify. After solidification, pure culture of *Staphylococcus aureus* was inoculated into the plate. Four different extract were placed in the plate[18, 19, 21] and incubated for 24 hours at 37^0C (Table 1).

Determination of MIC: Double fold dilutions of each extract were prepared. 10 ml of nutrient broth was added in 5 test tube and 1ml of extract added in first tube[20, 21]. 5ml of solution from previous test tube was taken and added in the next test tube in the same way so as to prepare two fold dilutions for further test (Table 2).

RESULT AND DISCUSSION

Antibacterial activity assay: The results obtained from the present study were recorded and analyzed using different solvents against *Staphylococcus aureus*. It is clear from the study that the diameter of the inhibition zone varies with the type of the solvent used and hence varies in antibacterial activity.

Water extract gave the highest zone of inhibition of 19 mm in diameter followed by methanol extract which gave zone of inhibition of about 16 mm in diameter, ethanol extract exhibited zone of inhibition of 13 mm in diameter and acetone extract provided the lowest zone of inhibition of 9 mm.

Determination of MIC: Average MIC of water extract, methanol extract, ethanol extract and acetone extract had shown 2025mg/ml, 3600mg/ml, 6400mg/ml and 12800 mg/ml of concentration respectively.

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