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Antimicrobial activity and nutritional analysis of *Tinospora cardifolia* miers

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ABSTRACT

In the present study, *Tinospora cardifolia* Miers.[Family: Menispermaceae] stems was extracted with methanol and the extract was studied for both antibacterial and anti fungal activities. The extract exhibited significant anti bacterial and anti fungal activities and Minimum Inhibitory concentration (MIC) was determined, further the powder was subjected to evaluation of nutritive factors and the plant serves to be a good nutritional supplement.

KEYWORDS

Tinospora cardifolia;
Antibacterial activity;
Antifungal activity;
Nutritional analysis;
Minimum inhibitory concentration (MIC).

INTRODUCTION

Tinospora cardifolia Miers. belonging to the family Menispermaceae, is available throught India as a climbing shrub and the stem is widely used in Sidda, Ayurveda for its properties like general tonic, anti allergic and anti diabetic[1]. Various other uses are reported such as anti-hyperglycemic[2,3], anti-angiogenic[4], immune stimulator[5], anti-ulcerogenic[6], anti-stress[7], preventive role in brain neurotransmitter[8] and treatment of allergenic rhinitis[9]. In this study the stems of *Tinospora cardifolia* was extracted with methanol and the extract was tested for antibacterial and antifungal activities by paper disk diffusion method. The dry powder was used for estimating the nutritive claims of the plant.

MATERIALS AND METHODS

The well matured stems of Tinospora cardifolia was collected from the outskirts of Chennai during the month of April. The extract was prepared by hot soxhlet method. Stems were washed with water, dried under shade and powdered with the help of electric pulverizer. The powder was used as such for estimation of nutritional constituents and extracted with methanol (AR grade) by soxhlet apparatus. The percentage yield of the extract was found to be 13.98. The extract was subjected to antimicrobial studies such as antibacterial activity using *Staphylococcus aureus* NCCS 2106, *Bacillus cereus, Escherichia coli* NCCS 2065 *and Pseudomonas aeruginosa* NCCS 2200 and antifungal activity using *Aspergillus niger* NCCS1196 *and Candida albicans* NCCS 3471. The Minimum Inhibitory concentration required for the inhibition of the growth of the organisms was also calculated.

Antimicrobial activity

The antimicrobial screening was performed by agar diffusion method using a paper disc[10]. The sterilized (autoclaved at 120^{0}C for 30 min) medium (40-50^{0}C) was inoculated (1ml/100ml of medium) with the suspension of the microorganism (matched with McFarland barium sulphate standard). The paper impregnated with the extract (250 and 500 µg/ml in dimethyl sulphoxide) was placed on the solidified medium. The plates were

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TABLE 1: Zone of inhibition and minimum inhibitory concentration of *Tinospora cardifolia* Miers. stems

Organisms	Standard (mm)	Zone of Inhibition (mm)		MIC (mg)
		MECO (250 µg) (nm)	MECO (500 µg) (nm)	
S.aureus	32	20	27	19
B.cereus	28	20	28	20
E.coli	38	19	26	21
P.aeruginosa	36	17	22	25
A.niger	30	22	26	17
C.albicans	32	22	26	16

TABLE 2: Nutritional content of *Tinospora cardifolia* Miers. stems

Sl. no.	Nutritional principles	Values / 100 g of root powder
1.	Carbohydrate	0 %
2.	Protein	0 %
3.	Fat	0.0042%
4.	Moisture	4.53%
5.	Vitamin- A	34.67 IU
6.	Vitamin- D_3	4.67 IU
7.	Vitamin- E	0 mg
8.	Vitamin- K	0.023 mg
9.	Thiamine	1.45mg
10.	Riboflavin	0.35 mg
11.	Vitamin- C	27.56 mg
12.	Calcium	21.23 mg
13.	Iodine	0.03 mg
14.	Magnesium	12.34 mg
15.	Potassium	2.23 mg
16.	Phosphorus	0.81 mg
17.	Sodium	2.23 mg
18.	Copper	0.15 mg
19.	Iron	3.23 mg
20.	Manganese	0.45 mg
21.	Zinc	5.10 mg
22.	Selenium	BDL
23.	Antimony	BDL
24.	Cadmium	BDL
25.	Chromium	BDL
26.	Cobalt	BDL
27.	Arsenic	BDL
28.	Mercury	BDL

BDL: Below detectable levels

preincubated for 1 h at room temperature and incubated at 37^{0}C for 24 and 48 h for antibacterial and antifungal activities respectively. Gentamicin (10 µg/disc) and Ketoconazole (10 µg/disc) were used as standards for antibacterial and antifungal activities respectively. The observed zone of inhibitions is presented in TABLE 1.

Minimum inhibitory concentration

The MIC for the above organisms was found by Agar streak dilution method[11]. Nutrient agar was used for bacterial pathogens and Sabouraud's dextrose for fungal strains. The media were sterilized by autoclaving at 15 lbs/sq inch pressure for 20 min. Stock solutions of the extracts were mixed with the known quantity of molten sterile agar media aseptically to provide the required concentrations. About 20 ml of the media containing the extract was poured into each sterile Petri dish and allowed for solidification. Thereafter Microorganisms were streaked one by one on the agar plate aseptically. After streaking all the plates were incubated at 37±1^{0}C for 24 and 48 h for antibacterial and antifungal activities respectively. Then the plates were observed for the growth of the microorganisms. The lowest concentration of the plant extract required for inhibiting the growth of the microorganism was considered as the MIC of the extract against bacterial and fungal strains. The MIC values of each extract against the tested microorganisms are presented in the TABLE 1.

Nutritional analysis

The amount of carbohydrate, protein, fat, crude fibre, minerals and vitamins were determined for every 100 g of dry powder of *T.cardifolia*. The amount of moisture, crude fibre and fat were determined by standardized procedure[12]. Proteins[13], calcium and magnesium[14] and sodium[15] were also estimated. Other trace elements were determined by Atomic-Absorption Spectroscopy (Perkin Elmer 2380)[16]. Few vitamins were estimated as per the procedure of Indian Pharmacopoeia[17] and thiamine using the procedure of United States Pharmacopoeia[18]. All the values are presented in TABLE 2.

RESULTS AND DISCUSSION

The antimicrobial screening implied that the extract was highly effective against the fungal organisms and the bacterial strains, which is indicating that this is a potential source for antimicrobial agent (TABLE 1). The antibacterial activity observed was significant and comparable with the standards. In the determination of MIC, the concentration of extract for the cessation of growth of the fungal organisms were needed lower than that of the bacterial organisms. The nutritive principles determined were tabulated and indicated that the roots of

T.cardifolia can be a suitable alternative for providing necessary nutrients to pregnant women, lactating women, young children and Geriatrics (TABLE 2).

From the above observed findings, it becomes evident that the drug *T. cardifolia* conforms as a potential antimicrobial agent and also posses a good role in the management nutritional deficiencies in all age groups and genders, when administered in a suitable composition.

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