ANTIBACTERIAL ACTIVITY OF METHANOLIC EXTRACTS FROM SOME SELECTED MEDICINAL PLANTS

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Abstract

The present study describes antimicrobial activities of medicinal plants *Jasminum grandiflorum* L., *Spinacia oleracea* L., *Coriandrum sativum* L. *and Zingiber officinale* Roscoe. In the present investigation the antibacterial activity of the methanolic extracts of these plants were tested against twelve Gram-positive and eighteen Gram-negative bacteria at 1000 µg/disc concentration by disc diffusion method. The methanolic extracts of leaves of *Jasminum grandiflorum* and *Spinacia oleracea* showed significant antibacterial activity against some of the bacteria tested.

Introduction

Plants and their extracts have been used extensively for a variety of purposes for several thousands of years. Antibacterial screening of medicinal plants for active compounds offers clues to develop newer drugs. These compounds after possible manipulation may provide new and improved drugs to treat the infectious diseases. Plant based products/extracts are cheaper alternatives as compared to the synthetic drugs.

Jasminum grandiflorum an essential oil bearing plant belongs to the family Oleaceae and commonly known as jasmine. It is native to Asia and its numerous parts such as the leaves, flower, bark, stem and roots are very beneficial and significant in pharmaceutical industries and have been reported to possess antiacne, antimicrobial, anti-inflammatory, anthelmintic, antiseptic, aromatherapy, chemopreventive, chronic constipation, diuretic, emmenagogue, leprosy, odontalgia, ring worm infection, spasmolytic, skin diseases, ulcer and wound healing properties (Sandeep and Paarakh, 2009; Sandeep *et al*., 2009).

Spinach oleracea (Spinach) a native plant of Southwest Asia has been used by humans for a long time. It is the most important leafy vegetable and also an important source of minerals. It is a rich source of ascorbic acid, betaine, calcium, carotene, copper, folate, iron, folic acid, manganese, magnesium, omega 3 fatty acids, potassium, phosphorous, protein, selenium, zinc and vitamin A, C, E, K, B6, B2. Spinach is also packed with a number of antioxidants like polyphenols, flavonoids and carotenoids which have been shown to possess anti-mutagenic potential, anti-inflammatory effects, anti-neoplastic effects as well as chemo-preventive activities (Citek and Sonmez, 2009; Rao *et al*., 2015).

Corriandrum sativum L. (Corriander), a herb of parsley family Apiaceae, is native to Mediterranean constituency. It is a culinary and medicinal plant which is also used in aromatherapy. Corriander fruits are comprehensively used in spices, condiments, pickling, seasonings and sausages and in the preparation of curry powder. In folk medicine it is used as carminative, digestive, galactagogue and spasmolytic (Shahwar *et al.*, 2012; Mandal and Mandal, 2015).

Zingiber officinale (Ginger) belongs to the family *Zingiberaceae* and is widely used as a spice in foods. It is also an important medicinal plant in Ayurveda and Unani system of medicine because of its therapeutic properties. It is native of South Asia and possesses many medicinal uses such as to cure headaches, nausea, rheumatism and colds (Bhargava *et al*., 2012; Aziz *et al*., 2015).

Keeping in mind the increasing importance of medicinal plants, the aim of this study was to evaluate the methanolic extracts of traditional medicinal plants *Coriandrum sativum, Jasminum grandiflorum, Spinacia oleracea* and *Zingiber officinale* against a diverse range of bacteria comprising twelve Gram-positive and eighteen Gram-negative bacteria using disc diffusion method.

Experimental

Material and Method

Collection of plant materials and preparation of extracts**:** Four medicinal plants were selected and their fresh parts were purchased from the local market and identified by an expert.

Extraction**:** The fresh plant materials (*Jasminum grandiflorum, Spinacia oleracea, Coriandrum sativum and Zingiber officinale*) were separately cut into small pieces and repeatedly extracted with methanol (5 times) at room temperature. The extracts were concentrated in rotary evaporator under reduced pressure to obtain residues marked as JG, SO, CS and ZO, respectively.

Determination of Antibacterial Activity**:** The disc diffusion method was used to determine the antibacterial activity. 100 mg/mL of each extract in DMSO were prepared and marked as stock solution. Sterile filter discs containing 10 µl of stock solution were used for screening. The Iso sensitest agar (Oxoid) plates were seeded with 24 hours old culture (containing approximately 1-2 x 10^8 CFU/mL) grown in Mueller Hinton broth (Oxoid). The prepared discs were positioned on to the agar surfaces at different positions and plates were incubated at 37 °C for 24 hours. Results were chronicled by determining the zone of inhibitions in mm. DMSO was used as negative control (Baur *et al.*, 1966). Streptomycin was used as reference drug.

Table:1. ***In vitro*** **antibacterial activity of methanolic extracts (zone of inhibition in millimeter).**

Bacteria Tested	JG	SO	CS	ZO	DMSO	*Streptomycin
Gram Positive						
Bacillus anthracis	9	0	0	0	0	0
Bacillus pumilus	11	12	0	0	0	0
Bacillus subtilis	0	0	0	0	0	18
Corynebacterium diphtheriae	13	0	0	0	0	18
Corynebacterium hoffmanii	15	0	0	0	0	22
Corynebacterium xerosis	15	10	0	0	0	22
Staphylococcus aureus	0	0	0	0	0	25
Staphylococcus citreus	14	15	0	0	0	0
Staphylococcus epidermidis	0	0	0	0	0	18
Staphylococcus faecalis	0	0	0	0	0	0
Staphylococcus lactis	0	0	0	0	0	0
Streptococcus pyogenes	0	0	0	0	0	0
Gram Negative						
Branhamella catarrhalis	11	0	0	0	0	0
Enterobacter aerogenes	0	0	0	0	0	22
Escherichia coli	0	0	0	0	0	10
Klebsiella ozaenae	0	10	0	0	0	0
Klebsiella pneumoniae	0	0	0	0	0	18
Proteus vulgaris	0	0	0	0	0	0
Pseudomonas aeruginosa	0	0	0	0	0	10
Pseudomonas fluorescens	0	0	0	0	0	0
Salmonella schottmuelleri	0	0	0	0	0	0
Salmonella typhi	0	0	0	0	0	15
Salmonella typhimurium	0	0	0	0	0	0
Salmonella paratyphi A	0	0	0	0	0	NT
Serratia marcescens	0	0	0	0	0	0
Shigella boydii	0	0	0	0	0	NT
Shigella dysenteriae	0	0	0	0	0	10
Shigella flexneri	0	0	0	0	0	0
Shigella sonnei	0	0	0	0	0	0
Vibrio cholerae	0	0	0	0	0	0

1000 µg/disc
*12.5 µg/disc
NT = Not tested

Results and discussion

In the present studies methanolic extracts from the leaves of *Jasminum grandiflorum* and *Spinacia oleracea*, aerial parts of *Coriandrum sativum* and roots of *Zingiber officinale* were tested against twelve Gram-positive and eighteen Gram-negative bacteria at 1000 µg/disc concentration using disc diffusion method. It is

revealed that *Jasminum grandiflorum* extract showed strong activity against six Gram-positive and one Gram-negative bacteria and *Spinacia oleracea* exhibited activity against three Gram-positive and one Gram- negative bacteria. However extracts of aerial parts of *Coriandrum sativum* (Cao *et al*., 2012) and rhizomes of *Zingiber officinale* (Ushimaru *et al*., 2007) were inactive against the bacteria tested (Table-1). It is reported that most of the antimicrobial medicinal plants are more effective against Gram-positive than Gram-negative bacteria (Lin *et al*., 1999). Phytochemical analysis of the *Jasminum grandiflorum* extracts revealed the presence of flavanoids, terpenes, glycoside, tannin and salicylic acid which may be responsible for antibacterial activity (Sandeep and Paarakh, 2009). *Spinacia oleracea* is very rich in the flavonoids including querecetin, myricetin, kampeferol, apigenin, luteolin, patuletin and spinacetin. The polyphenols para-coumaric acid, ferulic acid and ortho-coumaric acid also reported from this plant which may be responsible for antibacterial activity (Metha and Belemkar, 2014). Further investigations should be conducted in order to explore their application.

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