Screening For Antimicrobial Activity Of Weeds

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Abstract

The efficacy of leaf extracts (aqueous and ether-water extracts) of Clerodendron inerme, Eupatorium triplinerve, Lantana camera, Parthenium hysterophorus, Solanum xanthocarpum and Dathura stromonium on four different bacteria Staphylococcus aureus, Klebsiella pneumoniae, E.coli, Bacillus subtilis and major seed-borne fungi Aspergillus niger, Aspergillus awamori were studied in vitro and in vivo. Extracts of Dathura stromonium were effective against all the four bacteria(inhibition zone of 1.9, 2.0, 1.6, 1.7 cm). Extracts of Lantana camera and Dathura stromonium reduced the incidence of seed-borne fungi tested and increased seed germination when compared with the untreated control. Dathura stromonium extract was the most effective while Clerodendron inerme and Eupatorium triplinerve extracts were the least.

INTRODUCTION

The use of higher plants and their extracts to treat infections is an age-old practice. Traditional medicinal practice has been known for centuries in many parts of the world. Ayurveda, the science of life, prevention and longevity is the oldest and most holistic medical system available on the planet today. Herbal medicines are gaining growing interest because of their cost effective and eco-friendly attributes [Dwivedi,1998].

Even though pharmacological industries have produced a number of new antibiotics in the last three decades, resistance to these drugs by microorganisms has increased. Hence, more studies pertaining to the use of plants as therapeutic agents should be emphasized, especially those related to the control of antibiotic resistant microbes.

In recent years much attention has been given to nonchemical systems for seed treatment to protect them against seed-borne pathogens. Plant extracts have played significant role in the inhibition of seed-borne pathogens and in the improvement of seed quality and field emergence of plant seeds [Nwachukwe, 2001].

Contrary to the synthetic drugs, antimicrobials of plant origin are not associated with many side effects and have an enormous therapeutic potential to heal many infectious diseases.

If this medicinal or antimicrobial property resides in a weed that will be an added advantage. The present investigation is therefore, undertaken to test the efficacy of some of the common weed extracts against the bacterial pathogens like E. coli, Staphylococcus aureus, Klebsiella pneumoniae, Bacillus subtilis responsible for diseases like urinary tract infections, pneumonia, food poisoning, etc.

MATERIALS AND METHODS

PLANT MATERIALS

Some of the common weeds were collected from different parts of Davanagere District, Karnataka, India and are easily identified, as they are common weeds. Table 1 gives the list of plants used.

Figure 1

Table 1: List of weeds selected for study

Sl. No.	Common Name	Botanical Name	Parts Used
01	Vishampuri	*Clerodendron inerme*	Leaves
02	Garga (communist weed)	*Eupatorium triplinerve*	Leaves
03	Lantana	*Lantana camera*	Leaves
04	Congress Grass (Parthenium)	*Parthenium hysterophorus*	Leaves
05	Kadu Badane	*Solanum xanthocarpum*	Leaves
06	Dathura	*Dathura stromonium*	Leaves

MICROORGANISMS USED

Bacterial and fungal cultures used were obtained from NCIM, Pune.

E.coli, Staphylococcus aureus, Bacillus subtilis, Klebsiella pneumoniae were the bacteria used and Aspergillus niger

and the Aspergillus awamori were the fungi used.

Extract Preparation The collected plant materials were thoroughly washede and air dried.

a) For 20% aqueous extract preparation, 2g of plant material was crushed in 10ml. of sterile water and it was filtered using Whatman Filter Paper No.1. The filtrate was collected in sterile tube and was stored by refrigeration

b) For 10% Ether-water solvent extraction 1:3 mixture of ether and water was prepared and 30ml of this solvent was used. [Harbrne, 1998].

PRELIMINARY SCREENING FOR ANTIBACTERIAL ACTIVITY

In the preliminary screening was done by well in agar method i.e, the bacterial cultures were spread on the agar surface using sterile cotton swab. Then a well of 0.5cm. was made in the medium using sterile cork borer, 100µl. of each 20% aqueous and 10% ether-water weed extract were transferred into separate wells and plates were incubated at 37 C for 24 hours [Onkar, 1995].

Standard antibiotics like Penicillin, Streptomycin, Sulfasomidine were also tested against each test organism. Each disc of penicillin had concentration of 10 units/disc, streptomycin – 10µg /disc and Sulfasomidine – 300µg/disc.

SCREENING FOR ANTIFUNGAL ACTIVITY

The in vitro tests were carried out to measure the effects of the leaf extracts on radial growth of the seed-borne fungi. Potato dextrose agar (PDA) medium was used in the study. To every 15ml of sterile potato dextrose agar medium in Petri dishes, 5ml of either aqueous or ether-water extract of each plant were added. The solution in each Petri dish was gently swirled and allowed to solidify. The extract-amended medium in the Petri dishes were inoculated each alone at the centre with 5mm inoculum-disc of each test fungus and incubated at 25 °C for 14 days. The medium with inoculum disc but without any extract served as control

The invivo test was carried out using blotter method. The efficacy of the leaf extracts was tested using the blotter method. A total of 400 seeds were soaked per extract (aqueous or ether-water extract) and 10 seeds plated on blotter per Petri dish. The untreated seeds were soaked in distilled water for one hour and plated on moist blotters and used as control. The extract- treated and untreated seeds were incubated in an incubator at 20 °C for seven days. Seeds plated in blotter were examined for fungal growth and percentage seed germination after 7 days of incubation [Nwachukwe, 2001].

RESULTS AND DISCUSSION

Preliminary studies with the aqueous and ether-water extracts of weeds Lantana camera, Clerodendron inerme, Eupatorium triplinerve, Parthenium hysterophorus, Solanum xanthocarpum and Dathura stromonium gave varied results.Table2 shows the results of antibacterial activity of plant extracts.

Figure 2

Table 2: Antibacterial activity of different weed extracts

Sl. No.	Plant Name	Type of Plant Extract	Inhibition zone in cm.			
			E.coli	*B. subtilis*	*S. aures*	*K. pneumoniae*
01	*Lantana camera*	Aqueous	1.4	1.6	1.2	1.4
		Ether-water	1.2	1.4	1.0	1.2
02	*Clerodendron inerme*	Aqueous	-	-	-	-
		Ether-water	-	-	-	-
03	*Eupatorium triplinerve*	Aqueous	0.4	-	-	0.5
		Ether-water	0.3	-	-	0.4
04	*Solanum xanthocarpum*	Aqueous	1.0	0.8	0.6	1.0
		Ether-water	0.9	0.8	0.7	0.9
05	*Parthenium hysterophorus*	Aqueous	-	0.7	0.5	-
		Ether-water	-	0.8	0.6	-
06	*Dathura stromonium*	Aqueous	1.9	2.0	1.6	1.7
		Ether-water	1.6	1.8	1.4	1.5
07	***Standard antibbiotics***					
	Penicillin		0.2	0.7	0.8	1
	Streptomycin		-	0.2	1.1	1.3
	Sulfasomidine		1.2	-	0.6	2

Among the plant extracts tested Dathura stromonium showed the antibacterial activity against all the four bacteria. Extracts of Parthanium hysterophorus, Solanum xanthocarpum and Lantana camera were effective against one or two bacteria. The efficacy of plant extracts were comparable with standard antibiotics.

Table3 shows the results of invitro antifungal activity of the extracts. The extracts of Parthanium hysterophorus, Solanum xanthocarpum, Dathua stromonium and Lantana camera showed antifungal activity against both fungi used. Solanum xanthocarpum, Dathua stromonium and Lantana camera

extracts were most effective against the fungi used.

Table4 shows the results of invivo seed testing of extracts. Extracts of Dathua stromonium and Lantana camera showed significant inhibition of fungal growth on the seeds and in the seeds treated with these two extracts, the germination was also more than the control.

Dathura stromonium was found to be more effective against the microorganisms among the plant extracts used in the study.

Figure 3

Table 3: Invitro Antifungal activity of different weed extracts

Sl. No.	Plant Name	Type of Plant Extract	Colony diameter in cm	
			Aspergillus niger	Aspergillus awamori
01	*Lantana camera*	Aqueous	2.2	0.8
		Ether-water	1.4	1.0
02	*Clerodendron inerme*	Aqueous	2.5	1.5
		Ether-water	2.3	1.6
03	*Eupatorium triplinerve*	Aqueous	2.6	1.3
		Ether-water	2.6	1
04	*Solanum xanthocarpum*	Aqueous	2.4	1.0
		Ether-water	2.2	0.8
05	*Parthenium hysterophorus*	Aqueous	2.4	0.4
		Ether-water	2.3	1.3
06	*Dathura stromonium*	Aqueous	1.8	0.9
		Ether-water	1.9	1.0
07	*Control*		2.7	1.3

Figure 4

Table 4: Invivo Antifungal activity of different weed extracts

Sl. No.	Plant Name	Type of Plant Extract	% Inhibition of mycelial growth	Germination in cm
01	*Lantana camera*	Aqueous	No growth	11
		Ether-water	No growth	No germination
02	*Clerodendron inerme*	Aqueous	60	4
		Ether-water	55	4
03	*Eupatorium triplinerve*	Aqueous	63	5
		Ether-water	63	5
04	*Solanum xanthocarpum*	Aqueous	55	8
		Ether-water	52	8
05	*Parthenium hysterophorus*	Aqueous	62	6
		Ether-water	61	6
06	*Dathura stromonium*	Aqueous	50	13
		Ether-water	No growth	18
07	*Control*		63.3	7

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