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Antimicrobial Activity of Some Indigenous Plants

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Diethyl ether and methanol extracts of dried powdered, aerial parts of *Artemesia sieversiana* (Asteraceae), *Origanum majoram* (Lamiaceae), fruit peel of *Musa paradisiaca* var *sapientum* (Musaceae) and stem bark of *Moringa pterygosperma* (Moringaceae) were evaluated for antimicrobial activity against *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Candida albicans* and *Cryptococcus neoformans* by cup-plate method. Both the extracts of *Moringa pterygosperma* and methanol extract of *Musa paradisiaca* have shown significant activity in comparison with the standards benzyl penicillin and streptomycin. All others except ether extract of *Musa paradisiaca* are inhibitory to the tested human pathogenic fungi.

The growing worldwide resurgence in infectious diseases due to the AIDS pandemic and the increasing resistance to the newer antibiotics have become major hurdles in the management of infections[1]. Hence there is a need for newer, antimicrobial biomolecules. This study reports the antimicrobial evaluation of four medicinal plants selected on the basis of folklore indications.

Aerial parts of *Artemesia sieversiana* Ehrh. (Asteraceae) are used as a tonic and febrifuge[2]. It's essential oil is inhibitory to plant pathogenic fungi[3] and aqueous extract is reported be amoebicidal[4]. *Musa paradisiaca* Linn. var *sapientum* (Musaceae) fruit is a laxative. Fruit peel is indicated in hypertension and used as a dusting powder on wounds[5]. Its aqueous extract is reportedly antidiabetic[6] and antiulcerogenic[7]. Aerial parts of Origanum *majoram* Moench. (Lamiaceae) are used as an anthelmintic and expectorant[8]. It's essential oil is reported to be insecticidal[9], antifungal[3] and antiviral[10]. *Moringa pterygosperma* Gaertn. (Moringaceae) stem bark is used as an anthelmintic[11]. Leaf and flower extracts are reportedly antimicrobial[12]. Extracts of the plant parts have also been shown to be abortifacient[13]

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Aerial parts of *Artemesia seiversiana*, *Origanum majoram and Musa paradisiaca* fruits were purchased from the local market. Bark of *Moringa pterygosperma* was procured from a private vegetable garden. These were authenticated in the Botany Field Research Laboratory, Madras University, Maduravoyal, Chennai.

The dried coarse powder of the aerial parts, bark and fruit peel (50 g each) were extracted exhaustively and successively with diethyl ether and methanol (150 ml each), using a Soxhlet extractor. The extracts were concentrated to dryness in a Rotary vacuum evaporator. The antibacterial and antifungal activity of the prepared extracts was studied using cup-plate method[14]. Dimethylsulphoxide was used to

TABLE 1: ANTIMICROBIAL ACTIVITY OF THE EXTRACTS OF SELECTED MEDICINAL PLANTS

Material Tested	Diameter of the zone of inhibition in mm*± SE					
	S. aureus	*B. subtilis*	*E. coli*	*P. aeruginosa*	*C. albicans*	*Cr. neoformans*
As						
Ee	10.2±0.097	9.7±0.145	9.6±0.191	8.6±0.136	11.2±0.093	11.6±0.103
Me	nil	8.4± 0.124	8.6±0.112	nil	9±0.85	9±0.289
Om						
Ee	nil	8.6±0.058	nil	9.2±0.11	9.8±0.058	10±0.139
Me	14.6±0.052	14.5±0.058	17.1±0.115	17.1±0.036	15.3±0.093	12.1±0.036
Mp						
Ee	8.6±0.118	8.4±0.063	9.2±0.097	9.4±0.058	nil	nil
Me	10±0.026	10.6±0.106	10.6±0.063	9.5±0.097	12.7±0.093	12.1±0.132
Mpt						
Ee	11.8±0.058	15±0.097	19.3±0.026	12.5±0.165	17.8±0.077	16.2±0.165
Me	25.3±0.132	26.4±0.082	28.4±0.181	25.2±0.132	30.2±0.077	28.6±0.045
Streptomycin	28.5±0.052	27.6±058	33.5±0.118	25.4±0.036	-	-
Benzyl penicillin	32.7±0.118	35.2±0.103	-	- -	-	-
Ketoconazole	—	-	-	-	43.1±0.045	37.6±0.165

*Inclusive of bore diameter of 8 mm. Values average of six replicates. *As*– *Artemesia sieversiana, Om*– *Origanum majoram, Mp*– *Musa paradisiaca Mpt* – *Moringa pterygosperma.* Ee– diethyl ether extract, Me– methanol extract. Values showed significant difference from solvent control at P<0.001.

dissolve the extracts. Benzyl penicillin sodium, streptomycin and ketoconazole were used as standards. The loading dose of the extracts was 500 μg and that of the standards was 100 μg. The microorganisms used were *Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Candida albicans* and *Cryptococcus neoformans.* These were clinical isolates procured from the University Department of Microbiology. Results of the study are presented in Table 1.

Results obtained have indicated that the methanol extract of *Moringa pterygosperma* exhibited significant growth inhibition of the tested bacteria and human pathogenic fungi comparable with the standard drugs used. Ether extract of *Moringa pterygosperma* and methanol extract of *Musa paradisiaca* and *Origanum majoram* have good antibacterial activity. Both the extracts of *Artemesia sieversiana* and ether extract of *Origanum majoram* and *Musa paradisiaca* have feeble antibacterial activity. All other extracts except ether extract of *Musa paradisiaca* have shown antifungal activity. All the results were statistically significant (at P<0.001) using student's t-test. The antimicrobial principles of *Artemisia sieversiana* are in the non polar fraction and those of *Origanum majoram, Musa paradisiaca,* and *Moringa pterygosperma* are more in the polar fraction. The antibacterial and antifungal potential of the extracts needs to be further investigated.

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Development of Alginate Based Aqueous Film Coating Formula for Tablets

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Sodium alginate was selected as film-forming polymer because of its water solubility and low cost. Metronidazole tablets were coated to mask their bitter taste. The present work was carried out by initially developing aqueous film coating formulae with various concentrations of sodium alginate (4, 6 and 8% w/v). Secondly, the properties of the cast films were evaluated. When compared with dilute solutions, concentrated solutions gave thick films, as the density was more. UV light transmission, water vapour transmission and gas permeability of the films decreased with the increase in the thickness of the films. They were freely soluble in distilled water and simulated intestinal fluids but precipitated in simulated gastric fluid. Thirdly, 2 kg of tablets were coated using solutions of the above concentrations. Some tablets were withdrawn after application of 400, 600 and 800 ml of coating solutions, respectively. Coated and uncoated tablets were evaluated for weight variation, hardness and friability, which were all within the acceptable limits. Coating increased hardness and decreased friability. All the coated and uncoated tablets disintegrated within 10 min in water and complied with the USP and BP limits for the assay. The rate of drug release decreased as the concentration of sodium alginate increased. Only 400, 600 and 800 ml coats of 4% w/v solution and 400 ml coats of 6% and 8% w/v solutions in buffer pH 1.2 met USP dissolution requirements. Based on the results of above work along with statistical analysis and accelerated stability studies, 400 ml coat of 6% w/v solution was chosen as the best.

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