EVALUATION OF ANTIBACTERIAL ACTIVITY OF SOME MEDICINAL PLANTS FREQUENTLY USED IN RESPIRATORY AND GASTROINTESTINAL DISEASES IN NEPAL

A

Dissertation

Submitted to the Central Department of Microbiology

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In Partial Fulfillment of the Requirements for the Award of the Degree

of

Master of Science in Microbiology

(Environment and Public Health)

By

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RECOMMENDATION

This is to certify that **Miss Olivia Thapa** has completed this dissertation work entitled "***Evaluation of Antibacterial Activity of some Medicinal Plants Frequently Used in Respiratory and Gastrointestinal Diseases in Nepal***" as a partial fulfillment of M.Sc. degree in Microbiology under our supervision, to our knowledge this work has not been submitted for any other degree.

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ABSTRACT

In this study, antibacterial activity of 16 different medicinal plants were tested against 14 bacteria. Both, zone of inhibition (ZOI), and minimum bactericidal concentration (MBC) values were determined.

Medicinal plants were selected on the basis of their common use among the different ethnic groups for common disorder. The selected plants were *Achyranthes bidentata, Acorus calamus, Azadirachta indica, Cumminum cyminum, Glycyrrhiza glabra, Jasminum humile, Justicia adhatoda, Juniper indica, Mentha piperita, Myrica esculenta, Ocimum sanctum, Piper nigrum, Spilanthes calava, Syzygium aromaticum, Trachysperum ammi* and *Zanthoxylum armatum*. For the chemical extraction plants were subjected to soxhlet extraction with ethanol while *J. indica* and *M.piperita* to steam distillation. After removing the solvent under reduced pressure residues were suspended separately in water, DMSO, ethanol and methanol. *Myrica esculenta* gave the highest yield of 46.64%, yield obtained with essential oil was lowest.

The bacteria selected for the inhibition test were *Bacillus subtilis, Staphylococcus aureus, Streptococcus pneumoniae, Streptococcus pyogens, E.coli, Enterobacter aerogenes Klebsiella pneumoniae. Proteus mirabilis, Proteus vulgaris, Pseudomonas aeruginosa, Salmonella paratyphi, Salmonella typhi, Salmonella typhimurium* and *Shigella dysentriae.*

Among 16 tested plants, 12 plants(75%) showed activity against at least six or more test bacteria and 4 plants(25%) were active against 3 or less than 3 bacteria . *Syzygium aromaticum* was the most active plant as it was effective for all the test bacteria. *Acorus calamus* was the least effective against the test organisms.

Gram positive organisms were more sensitive to medicinal plants extracts than Gram negative bacteria. *Staphylococcus aureus* was most susceptible among the 14 test bacteria. It was inhibited by 13 out of 16 medicinal plants extracts tested. *Salmonella typhimurium* was found to be the most resistant species, being susceptible to only 5 plant extracts. The largest zone of inhibition (30mm) was observed with *M. piperita* (essential oil) against *B.subtilis* while lowest minimum bactericidal concentration (0.097mg/ml) was given by DMSO suspension of *Syzygium aromaticum* against *K. pneumoniae*.

Antibiotic sensitivity test showed that *Ps. aeruginosa* was resistant to Amikacin, Cortimoxazole, Ciprofloxacin, Tetracycline and Gentamicin, but inhibited by 10 plant extracts.

Glycyrrhiza glabra(Jethi madhu) was subjected to solvent extraction using solvent of increasing polarity into 4 fractions *viz*., hexane, chloroform, n-butanol and D/W. Among these n-butanol fraction was active against seven test bacteria that showed enhanced spectrum activity against *E.coli*, however, ethanolic extract didnot showed zone of inhibition. The result obtained in this study reveal the confirmation of the antibacterial potential of the plants investigated, and their usefulness in treatment of respiratory and gastrointestinal disease.

Key words: Medicinal plants, Antibacterial activity, Plants extracts.

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LIST OF ABBREVIATIONS

alc	-	alcoholic
aq	-	aqueous
BPC	-	British Pharmaceutical Codex
Conc.	-	concentrated
DCA	-	Deoxycholate Agar
DMSO	-	Dimethyl sulfo oxide
EMB	-	Eosin Methylene Blue
EHEC	-	Entero Hemorrhagic *Escherichia coli*
EIEC	-	Entero Invasive *Escherichia coli*
EPEC	-	Entero Pathogenic *Escherichia coli*
ETEC	-	Entero Toxigenic *Escherichia coli*
MA	-	Mac Conkey Agar
MBC	-	Minimum Bactericidal Concentration
mcg	-	microgram
MHA	-	Muller Hinton Agar
MIC	-	Minimum Inhibitory Concentration
MR	-	Methyl Red
MSA	-	Mannitol Salt Agar
NA	-	Nutrient Agar
NB	-	Nutrient Broth
UTI	-	Urinary Tract Infection
v/v	-	Volume by volume
VP	-	Voges-Proskauer
XLD	-	Xylose Lysine Deoxycholate Agar
ZOI	-	Zone of Inhibition
µg	-	microgram
µl	-	microlitre

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