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COMPARATIVE ASSESSMENT OF ANTIBACTERIAL POTENTIAL OF MUCUNA NIVEA (ROXB.) DC. AND MUCUNA PRURIENS (L.) DC

Tayade S.N[*1], More K.C[*2], Gawande P.A[*3], Manik S.R[*4]

[*1,2,3,4]Department of Botany, Sant Gadge Baba Amravati University, Amravati (M.S.) India.

ABSTRACT

Present investigation deals with the antibacterial activity of Mucuna nivea and Mucuna pruriens against pathogenic bacteria such as Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa and Bacillus subtilis. Significant zones of inhibition were observed in leaves of Mucuna nivea extracted with acetone (13.5mm) against Pseudomonas aeruginosa. However, the 12.5 mm zone of inhibition was observed in Mucuna puriens leaves extracted with acetone, ethanol and methanol against Staphylococcus aureus.

Acetone and chloroform leaves extracts of Mucuna pruriens showed 11.0mm and 10.0mm zone of inhibition against Pseudomonas aeruginosa and Escherichia coli respectively. Seed extracts of Mucuna pruriens were found to be 13.0mm zone of inhibition against Bacillus subtilis in both petroleum ether and ethanol, followed by 12.0mm in ethanolic extract against Escherichia coli. Moreover, 11.5mm zone of inhibition was found in methanolic extracts against Staphylococcus aureus and 11.0mm zone of inhibition was shown by seed extracted with chloroform and acetone against Pseudomonas aeruginosa, In case of Mucuna nivea seeds extracts in acetone showed 13.0mm and ethanol 12.0mm zone of inhibition against Pseudomonas aeruginosa, and 11.0 mm zone of inhibition found in ethanolic extracts against Escherichia coli.

KEYWORDS: Antibacterial, Mucuna Pruriens and Mucuna nivea.

I. INTRODUCTION

The medicinal plants are endowed with inherent property of synthesizing variety of chemical constituents to combat with unavoidable circumstances during their survival in natural habitat. These phytochemicals are being widely used for the well-being of human population. The traditional health care systems evolved among the individuals in villages also needs to be addressed for authentication through modern techniques and analysis. The medicinal uniqueness of particular plant species or groups is inconsistence with the concept that combination of secondary products in a particular plant is taxonomically distinct. (Wink et al, 1999). These phyto-constituents of medicinal plant needs to correlated with their pharmacological activities in order to authenticate the therapeutic potential of the plant species (Prachayasitical, 2008, Turker, Usta.2008). Plant produces a wide variety of secondary metabolites which are used either directly as precursors or as lead compounds in the pharmaceutical industry. The pharmaceutical industries have producing many antibiotic compounds. The microbes acquire resistance against drug produced by industries has been increased. (Cohen, M.L, 1992). The production of novel and effective medicine to cure the different diseases arose by microbial infection is a major challenge for public health researchers (Awouafack M.D et al., 2013). Therefore, it is important to find out the potential antibacterial compounds for the treatment of bacterial infections. From ancient time the significance of plant based antimicrobial has used against microbial infectious diseases. (WHO, 2002). Plants producing secondary metabolites as defense moleculaes like alkaloids, glycosides, terpenoids, saponins, steroids, flavonoids, tannins, quinones and coumarins against different stress (Das K, 2010). The use of crude extracts of plants parts and phytochemicals, of known antimicrobial properties, can be of great significance in the therapeutic treatments. In recent years, a number of studies have been conducted in various countries to prove such efficiency. Many plants have been used because of their antimicrobial traits. The active compounds from plants play a significant role and it has led to the invention of new medicinal drugs which have efficient protection and treatment roles against various diseases including cancer (Sheeja et al, 2007) and Alzheimer's diseases (Mukhurjee et al, 2007).

Plants under study

The genus Mucuna belongs to family Fabaceae, sub family Papilionaceae; it comprises approximately 150 species of annual and perennial legumes. Among the various under-utilized wild legumes, the Mucuna pruriens (velvet

bean) is widely distributed in tropical and sub-tropical regions of the world. It is the considerable viable source of dietary proteins (Janardhanan et al., 2003) because of high protein concentration (23–35%) and good digestibility, as compare to other pulses such as soybean, rice bean, and lima bean (Gurumoorthi et al., 2003). It is therefore regarded a good source of food. The Mucuna nivea belongs to family fabaceae commonly called as Kuyari. Cultivated in India and fruiting observed in month of December to January.

II. MATERIAL AND METHOD

Collection of plant material

The plant material leaves and dry pods of Mucuna pruriens (L.) DC was collected from Sant Gadge Baba Amravati University Campus, Amravati Maharashtra. The Leaves and dry pods of Mucuna nivea (Roxb.) DC. were collected from the area near Maltekdi congress nagar road, Amravati Maharashtra. The leaves and dry pods of Canavalia gladiata (Jacq.) DC. were collected from the field near power house Morshi road, Amravati, Maharashtra. The frequent visits were made to the field and wild habitat where the plants are grown. In order to collect the leaves and dry pods, visits were made according to phenological calendar of the individual plant species.

Identification of plant material

Identification of plant material was done with the help of standard floras; the flora of British India, Flora of Amravati District (Dhore, 2002). The herbarium specimen were prepared for individual plant and submitted to Department of Botany, Sant Gadge Baba Amravati University, Amravati.

Extraction for Antimicrobial Test

10 gm powder was filled in the thimble (made up of filter paper) and extracted successively with petroleum ether, chloroform, acetone, ethanol, and methanol solvent in 180 ml for 24 hours using soxhlet extraction assembly. The temperature of apparatus maintained at the boiling point for each solvent. The extractions were carried out using above different solvents with specific characteristics and in order of increasing values of their polarity. The obtained extracts were filtered through Whatman filter paper no.42 for free and clear extract. This extract then concentrated up to the 20 ml and resultant 20 ml extract stored in small sterile airtight bottles at 4^0 C temperature. The same procedure was performed for each sample.

Bacterial Culture

Antimicrobial screening of all the extract was done by using the standard four bacterial cultures two of gram positive (Staphylococcus aureus; Bacillus subtilis) and two of gram negative (Escherichia coli; Pseudomonas aeruginosa) were employed in the present study. The cultures were obtained from P. G. Department of Microbiology, Sant Gadge Baba Amravati University, Amravati.

Antimicrobial Test

The agar discs diffusion methods (Collins and Lyne, 1987) were employed for the antimicrobial test for all extracts of three plants.

A loop full of bacterial culture was inoculated into a nutrient broth medium and incubated for 24 hours at 37^0C. Nutrient agar (Himedia) was selected as the bacterial medium. 15 mm of the sterilized medium was poured in the pre-autoclaved petriplates and allowed to solidify. The cultured broth was swabbed on the agar surface. Sterile discs of 6 mm diameter were impregnated with 20µl of each extract then placed on the media and gently pressed down to ensure contact with the medium. Then petriplates with bacterial strains incubated at 37 ^{0}C for 24 hours. In this way thirty sample extracts were tested against the four bacterial strains for the antimicrobial test. The diameter of the inhibition zone including discs was measured after 24 hours.

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Observations:

Table-1: Zone of inhibition (mm) of Mucuna pruriens (L.) DC. Leaves extracts against human pathogens

Solvent	Zone of inhibition (mm).							
	Escherichia coli		Staphylococcus aureus		Pseudomonas aeruginosa		Bacillus subtilis	
	Control	Extract	Control	Extract	Control	Extract	Control	Extract
P. Ether	7.0	8.5	7.0	9.0	7.5	9.0	10.0	11.0
Chloroform	8.5	10.0	7.5	10.0	8.0	9.0	7.0	8.0
Acetone	7.5	8.0	6.5	12.5	7.0	11.0	8.0	11.5
Ethanol	8.0	10.0	7.5	12.0	7.0	8.0	15.0	17.0
Methanol	6.5	7.5	7.0	12.5	7.5	8.5	7.0	8.0

Table-2: Antimicrobial activity of Mucuna pruriens (L.) DC. Seeds extract against human pathogen

Solvent	Zone of inhibition (mm).							
	Escherichia coli		Staphylococcus aureus		Pseudomonas aeruginosa		Bacillus subtilis	
	Control	Extract	Control	Extract	Control	Extract	Control	Extract
P. Ether	7.5	10.0	7.0	9.5	7.5	8.5	10.0	13.0
Chloroform	9.0	10.0	7.0	10.0	7.0	11.0	12.0	12.0
Acetone	7.0	8.5	7.0	9.0	7.5	11.0	10.0	11.0
Ethanol	7.0	12.0	-	10.0	7.5	9.5	9.0	13.0
Methanol	7.0	8.0	7.0	11.5	7.0	8.0	8.0	11.0

Table-3: Antimicrobial activity of Mucuna nivea leaves extracts against human pathogen showing Zone of inhibition (mm)

Solvent	Escherichia coli		Staphylococcus aureus		Pseudomonas aeruginosa		Bacillus subtilis	
	Control	Extract	Control	Extract	Control	Extract	Control	Extract
P. Ether	7.0	8.0	6.5	8.0	7.0	12.5	10.0	11.0
Chloroform	8.5	9.0	7.5	9.0	8.0	9.0	7.0	8.0
Acetone	7.5	8.0	6.5	12.0	7.0	13.5	8.0	11.5

Ethanol	8.0	9.0	7.5	12.0	7.0	10.0	15.0	17.0
Methanol	6.5	7.0	7.0	12.0	7.5	9.0	7.0	8.0

Table-4: Antimicrobial activity of Mucuna nivea seeds extracts against human pathogen showing Zone of inhibition (mm)

Solvent	Escherichia coli		Staphylococcus Aureus		Pseudomonas aeruginosa		Bacillus subtilis	
	Control	Extract	Control	Extract	Control	Extract	Control	Extract
P. Ether	7.5	9.5	7.0	8.5	7.5	8.0	10.0	12.0
Chloroform	9.0	12.0	7.0	8.5	7.0	9.0	12.0	13.0
Acetone	7.0	9.5	7.0	8.5	7.5	13.0	10.0	13.0
Ethanol	7.0	11.0	-	7.5	7.5	12.0	9.0	12.0

III. RESULT AND DISCUSSION

Plant derived antimicrobial compounds have significant therapeutical potential as they can be used to heal many diseases without any side effects. The leaves and seed extracts of Mucuna pruriens and Mucuna nivea against human pathogen viz Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa and Bacillus subtilis were tested by using disc diffusion method. Highest zones of inhibition were observed in leaves acetonic extracts of Mucuna nivea (13.5mm) against Pseudomonas aeruginosa. Whereas, Mucuna pruriens shows 12.5mm zones of inhibition of leaves extracted with acetone, ethanol and methanol against Staphylococcus aureus.

Acetone and chloroform leaves extracts of Mucuna pruriens showed 11.0mm and 10.0mm zone of inhibition against Pseudomonas aeruginosa and Escherichia coli respectively. Seed extracts of Mucuna pruriens were found to be 13.0mm zone of inhibition against Bacillus subtilis in both petroleum ether and ethanol, followed by 12.0mm in ethanolic extract against Escherichia coli. Moreover, 11.5mm zone of inhibition was found in methanolic extracts against Staphylococcus aureus and 11.0mm zone of inhibition was shown by seed extracted with chloroform and acetone against Pseudomonas aeruginosa, Similar zone of inhibition i.e. 13mm was observed in which 750 ug/ml extract were treated against Staphylococcus aureus by Yerra R, (2005). The 10.0 mm zone of inhibition found in ethanol and chloroform seed extract of Mucuna pruriens against Staphylococcus aureus. In case of Mucuna nivea seeds extracts in acetone showed 13.0mm and ethanol 12.0mm zone of inhibition against Pseudomonas aeruginosa, and 11.0 mm zone of inhibition found in ethanolic extracts against Escherichia coli.

In the present investigation the antibacterial activity of Mucuna nivea against pathogenic bacteria such as viz Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa and Bacillus subtilis has been demonstrated for the first time. Mucuna puriens leaves extracted with acetone, ethanol and methanol were found to be 12.5mm against Staphylococcus aureus. Moreover, Seed extracts with antimicrobial potential of Mucuna pruriens were exhibited by 13.0mm zone of inhibition against Bacillus subtilis in both petroleum ether and ethanol, followed by 12.0mm in ethanolic extract against Escherichia coli. These might be due to presence of terpenoids, phenolic compounds, carotenoids, steroids and ketones (Kraus, 1995). Continued further exploration of plant-derived antimicrobials is needed today. Further research is necessary to determine the identity of the antibacterial compounds from within these plants and also to determine their full spectrum of efficacy. However, the present study of antibacterial evaluation of some plants creates a primary platform for further phytochemical and pharmacological studies to discover new antibiotic drugs.

IV. CONCLUSION

It was clear from the present results that the ethanol, methanol and acetone leaves and seed extract of Mucuna pruriens and Mucunanivea exhibited pronounced activity against the pathogenic bacteria under study.

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