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ANTIBACTERIAL ACTIVITY OF MAHOGANY (Swietenia mahogany (L.) Jacq.) SEEDS OIL AND ANALYSIS OF THEIR FATTY ACIDS

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ABSTRACTS :

Many pathogenic bacteria cause many serious diseases in human beings. Due to over use of drugs (antibiotics) multiple drug resistant strains are very big problem in today's life. Various medicinal plant are used to prevent or cure infectious diseases. The aim of this study was antibacterial activity of swietenia mahogany (L.) Jacq. Seeds Oils against certain strain of bacteria like salmonella typhi, Streptococcus pheumoniae, staphylococcus aureous and Escherichia coli by disk diffusion method. They all are drug resistant bacteria. The fatty acids were extracted by soxhlet using diethyl ether and n-hexane. Free fatty acids analyzed by GC- MS.

The oil content was 38 to 41.6% and major fatty acid compositions were Palmitalic acid (0.58 to 0.53%), Palmitic acid (14.36 to 13.51%), stearic acid (16.54 to 15.46%), Oleic acid (17.71 to 21.02%), and Linoleic acid

(38.11 to 36.49%) for diethyl ether and n-hexane respectively. The antibacterial activity among seed oil was extremely broad and inhibition zones ranged from 0 to 19 mm. These results showed the potency of S. Mahogany seeds oil as antibacterial agent of certain type of bacteria such as S. typhi.

Keywords : Swietenia mahogany (L.) Jacq., antibacterial activity, Fatty acids Pathogenic bacteria.

INTRODUCTION :

Antibiotic medications are used to kill pathogenic bacteria, which can cause serious and acute diseases.. Overuse of antibiotics multiple drug resistant strains are big problem of today's life. According to (WHO, 2011) the inappropriate and irrational use of antibiotics led some bacteria to become resistant to commonly antibiotics. Natural products have been important source of new drug (Suganya et.al. 2012). Swietenia mahogany (L.) Jacq. is a plant belonging to family Meliaceae family. It is grown natively throughout the tropical regions of the Americas such as Mexico, Bolivia, Peru and in West India, Malaysia and Southern China. The fruits commonly known as "sky fruit" because it seems to point up towards the sky (Masoud et.al., 2012). This economical timber tree is traditionally used for the treatment of a number of diseases including: Cardio Vascular, diabetes and hypertensions etc. The cruds extract from seeds of mahogany posses

biological activities such as antibiotic, an inflammatory and antimutagenic (Guevara et.al., 1996), antimalarial (Soediro et.al., 1990), anti-diarrheal (Maiti et.al., 2007), antioxidant (Sahgal et.al., 2009), anti-diabetic (Dewanjee et.al., 2009; Kalaivanan and Pugalendi, 2011) and antitumor (Goh and Abdul Kadir, 2011). In this study aimed to probe the oil content, chemical compositions of oil extracted from S. mahogany seeds as well as its antibacterial screening against four multiple drug resistant strains namely, salmonella typhi, streptococcus pneumoniae, staphylococcus aureous and Escherichia Coli.

MATERIAL AND METHODS :

Plant Material :

The fruit seeds of Swietenia mahogany were collected from local market. The colour of seeds is dark brown. The seeds were removed from matured fruits and dried (34^0C) at open area with active ventilation until attained constant weight (3 to 4 weeks).The kernels of seeds were removed from the seed and then grind in the grinder.

Extraction of seed oil :

The grounded seeds of S. Mahogany (10g) were extracted by soxhlet apparatus for 6 h by two solvents namely n-hexane and diethyl ether for qualitative and quantitative comparison. This procedure was repeated until at least 10ml oil was recovered. The organic solvent was evaporated by the

rotary evaporator and further dried under open air. Then the percentage of seed oil was calculated (w/w/ %); and stored in a dark bottles and kept of 4^0C until analysis or evaluated for antimicrobial activity as described as follows:

Fatty acid methyl esters (FAMEs) :

Accurately, 100mg seed oil was dissolved in 10ml hexane (Merck, HPLC grade) in test tube 1ml of 2M methanolic KOH was added and then the tube was vortex occasionally. After 20 min, the fatty acid methyl ester-rich upper layer was removed, washed with water and analyzed by GC-MS.

GC-MS analysis :

GC-MS analyses were performed on an Alilent 6890 series with cabillary column HP-5 (30m x 0.25 mm 1D, 0.25 μm). The carrier gas was hydrogen flow rate: 1 ml/min, injection volume : 1 lel, injector temperature was 250^0C. Oven temperature initially maintained at 50^0C for 3 min. and then programmed at the rate of 25^0C/min. up to 200^0C for 2 min, then again programmed at rate of 4^0C up to 230^0C and finally raised up to 280^0C for 20 min. The identification of the components was based on the comparison of their mass spectra with those in the system's spectral library.

Test concentrations and anti-microbial investigation :

Five test concentrations of S.mahogany seed oil were prepared. Stock solution of 1% oil was prepared by dissolving 100mg of seed oil in 10ml of

solution solvent (9ml H_2O+1 ml DMSO). The stock solution was diluted to 10, 20, 50, 100 and 1000 µg/ml labeled and stored for further anti-microbial assessment. The anti-microbial assessment. The antimicrobial activity of S. mahogany seed oil was tested by disk diffusion method. The filter paper disk is impregnated in to sample solution in this method and then the impregnated disk was placed on the nutrient agar media seeded with the pathogenic organism.

Preparation of medium (Nutrient agar) :

Nutrient broth and Mueller-Hinton agar were used for liquid and solid media respectively. To prepare required volume of each medium the amount of each of the constituents was calculated from the composition chart given for 1000 ml. liquid and solid media were weighing in two conical flasks. Distilled water was added to complete the final volumes, and then the media was mixed well and boiled to make sure the media are dissolved totally. After this the conical flask was plugged with cotton and sterilized by autoclave at temperature 120^{0}C for 15 min.

Preparation of Microbes (Bacteria), Qualitative antibacterial activity :

Salmonella typhi, Streptococcus pneumonia, Staphylococcus aureous and Escherichia coli were prepared from Department of Botany and Biotechnology of College. The micro organisms were cultured on Muller-Hinton agar at 38^{0}C for 24 h. A colony of single bacteria was transferred in

to test tube contained 2 ml. sterile so line, the saline tube was vortexes to make smooth suspension.

The antibacterial efficacy of S. manogany seed oil was tested against S. typhi, S. pneumonia, S. aureous and E. coli, by disk diffusion method. Sterile 6 mm what man No., filter paper disk was placed gently on MH agar freshly seeded with bacteria with the help of a sterile forceps to ensure complete contact with the agar surface and seed Oil of S. mahogany was applied on to each paper disk, followed by incubated at 38^0C for 24 h. The antibacterial activity was evaluated by measuring the diameter of inhibitory zone in term of millimeters and recorded. The Amoxicillin belongs to class of drugs called penicillins, was used as positive control while DMSO was used as negative control. Testing was done and the average values were calculated.

RESULTS AND DISCUSSION :

The oil content of S. mahogany seed which was extracted by diethyl ether and n-hexane were 38 and 41.6% respectively. The oil obtained by n-hexane is slightly higher than that extracted by diethyl ether. Table-1. Shows the free fatty acids composition of S. mahogany seeds oil for both solvents; no significant difference in terms of quality of free fatty acid compositions'. Mahogany contains high proportion of linaleic acid (36.49 to 38.11) and oleic acid (17.71 to 21.02%).

The abundance of Poly Unsaturated Fatty Acid (PUFA).Such as linaleic and Oleic acids in S. mahogany seed oil indicate for many healthy benefits. It is very much beneficial for high cholesterol, diabetic and cardiovascular patients. It can be paid some attention for the oil has such properties. The probability of oxidation for the oil with PUFA will be high and this will produce rancid flavour and decrease quality of oil.

In previous reports, Authors reported that the oil content of seeds which was extracted by petroleum ether from two species of Swietenia namely. S. macrophylla king and S. mahogany jacq. were 65.7 and 64.9% respectively. The fatty acid compositions were linoleic (29.3 and 30.5%).

Table-1 Fatty acids composition (%) of the S. mahogany seed oil.

Fatty acid	n-hexane	Diethyl either
Palm italic acid (C15:0)	0.58	0.53
Palmitic acid (C15:0)	14.36	13.51
Stearic acid (C:170)	16.54	15.46
Oleic acid (C:171)	17.71	21.02
Linoleic acid (C:17:2)	38.11	36.49

Oleic (14.4 and 27.4%), stearic (both 14.4%), linoleic (11.9 and 12.5%), palmitic (11.6 and 12.0%), arachidic (both 1.5%), palmitalic (both 0.3%) and eicosenoic (both 0.1%) respectively (kleiman and payne Wahl, 1984).Again research conducted by Chakraborty and Chowdhuri (1957)

showed that the fatty acid composition of the seed fat from Indian S. macrophylla were linoleic (33.87%), oleic (25.30%). Stearic (16.42%), plastic (12.50%) linolenic (11.32%) and arachidic (0.56%). These values for linoleic and linolenic acid differ considerably from those previously reported for oil from the same species grown in Maxico (Chakraborty and Chowdhuri, 1957). Ping et.al. (2012) in their investigation on the effect of pretreatments on chemical and antioxidant properties of S. mahogany seed oil showed that different pretreatments significantly ($P<0.05$) affected yield and peroxide value of the extraction oils. Mustafa et.al. (2011) studied that the comprehensive analysis of the composition of seed cake and its fatty oil from S. mahogany jacq. growing to Bangladesh, reported that the seed cake contain 19.42% fats and the major (>1%) constituents of the methylated fatty esters were linoleic (26.00%), elaidic (24.39%), stearic (14.32%), pamitic (12.97%), 10 methyl-10-nonadecanol (5.24%), eicosanoic acid (2.48%), 3-heptyne-2,5-dial-6-methyl, 5-(1-methylethyl) (2.03%) octadeconoic acid, 9, 10, 12-trimethoxy (1.90%), 1, 3-dioxalane, ethyl-4-methyl-2-pentadecyl (1.89%) and 2-furapentanoic acid, tetrahydro-5-nonyl (1.03%).

Antibacterial activity of seed oil of S. mahogany:

The antibacterial activity of S. mahogany seeds oil against S. typhi., S. pneumoniae, S. aureous and E. coli was evaluated by disk diffusion method and the result shown given below in Table-2 The obtained results showed

that the antibacterial activity of the oils was extremely broad against test organisms. The zone of the inhibition of the oils with concentration ranged from 10 to 1000 µg/ml, were 4 to 10, 3 to 19 and 4 to 10 mm for these three microbes namely S. aureous, S. typhi, S. pneumoniae, where as E. coli completely resistance to the oils and not observed any inhibition zones. On the basis of these results. It can say that E. coli is most resistance and S. typhi is most sensitive of the tested organism to these oils.

In other report it is shown that the E coli was the most resistance to the tested oil and inhibition zones were less in mm to the other organism (Ugbogu and Akukwe 2009).

CONCLUSION :

The oil contents of lipids extracted by soxhlet from S. mahogany seeds with namely two solvents diethyl ether and n-hexane were 38 and 41.6%, respectively. The major fatty acids compositions were palmitolic acid (0.58 to 0.53%), Palmitic acid (14.36 to 13.51%) stearic acid (16.54 to 15.46%), Oleic acid (17.71 to 21.02%) and Linoleic acid (38.11 to 36.49%).

Table-2 Antibacterial activity of S. mahogamy seed oil. Numbers indicate the mean diameters (mm) of inhibition of triplicate experiments - indicate no growth inhibition.

Bacterial Inhibition zone (mm)					
	Concentration (µg/ml)	**S. typhi**	**S. pneumoniae**	**S. aureous**	**E.coli**
Seed Oil	10	3	4	4	-
	20	5	4	7	-
	50	8	5	7	-
	100	9	5	8	-
	1000	9	10	10	-
Amoxicilin	10	10	5	6	4
	50	16	7	10	5
	1000	35	17	19	29

The antibacterial activity among seed oil was extremely broad against test organism. The results showed the potential or ability of S. mahogany seed oil as antimicrobial agent for certain type of organism, S. typhi.

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