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Study of the Physicochemical Analysis and Antimicrobial Activity of Leaves of *Salix alba* L. (Moe-ma-kha)

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Abstract: *From thousands of years, different species of plants serve the health needs of Larger number of human beings. Salix alba L. (Moe-ma-kha) has been traditionally used to relieve pain from injuries and illness with great success. In the present work, the leaves of Salix alba L. (Moe-ma-kha) was chosen for determination of physicochemical values and investigation of antimicrobial activity that may be helpful for the manufacturing of new drugs. Determination of physicochemical values of Leaves of Salix alba L. including the determination of some nutritional values such as moisture, ash, protein, crude fiber, crude fat, carbohydrate contents and energy value were carried out by AOAC method, resulting 19.69% of moisture, 11.07% of ash, 22.26% of protein, 16.64% of crude fiber, 2.59% of crude fat, 27.75% of carbohydrate and 227 KCal/ 100 g energy value on the basis of dry sample. The qualitative determination of some elements was carried out by EDXRF technique. From the result of elemental analysis, K, Ca, S, Fe, Mn, Zn, Cu, Sr and Rb were found to be present in the sample. The extractable matter contents in pet-ether, ethylacetate, ethanol, methanol and water solvents were determined by solvent extraction method to give 0.097%, 0.193%, 0.534%, 0.594% and 1.135% in Leaves of Salix alba L extracts respectively. And then, the antimicrobial activity of polar and non polar extracts: pet-ether, ethylacetate, ethanol, methanol and water from Leaves of Salix alba L were investigated against six microorganisms by agar well diffusion method. According to the zone diameter, the ethanol and methanol extracts showed mild antimicrobial activities against all tested microorganisms. Pet-ether, ethylacetate and water extracts (inhibition zone diameter ranged in 11mm to13 mm, 11 mm to 17 mm and 11mm) were observed to exhibit antimicrobial activities against some of the tested microorganisms.*

Key Words: *Salix alba L, nutritional values, elemental analysis, extractable matter content, AOAC, EDXRF, solvent extraction method, antimicrobial activity, agar well diffusion method.*

1. INTRODUCTION :

Plant is an important source of medicine and plays a key role in world health. Medicinal herbs or plants have been known to be an important potential source of therapeutics or curative aids. Human diseases have been treated with plants for thousands of years still nowadays, many currently used medicines are derived from natural sources. Myanmar traditional medicine in general is a mixture of plants. A wide range of plants are known and many still used. In most use area of the world and in Myanmar herbal medicine has remained the mainstay of therapy because of cost and availability and perhaps cultural preference. Hence, it is necessary to identify the actural activity of the medicinal plant claimed by traditional medicine practitioners as being efficacious. *Salix alba* L (White willow), is a willow belongs to the genus Salix and family Salicaceae. It has been used for its health benefits for many years. The purpose of this study was to determine the nutritional values, the minerals present in the sample, the extractable matter contents and antimicrobial activity of various crude extracts from Leaves of *Salix alba* L. and to promote Myanmar traditional medicines for world wide application. Thus, this study was undertaken to be explored the effectiveness of medicinal plants and herbal drugs can lead to the discovery of new therapeutic benefits.

2. MATERIALS AND METHODS :

In this study, the leaves of *Salix alba* L. (Moe-ma-kha) was collected from Yankin Township, Yangon Region, in Myanmar. After collection, the scientific name of Moe-ma-kha was identified by authorized botanist at Botany Department, Dagon University. After cleaning, the sample was cut into small pieces. After being air dried at room temperature for one month, the part was made into powder by using grinding machine. The powdered sample was used for the determination of nutritional values, minerals contents and extractable matter contents by using AOAC method, EDXRF technique and solvent extraction method respectively. In addition, the antimicrobial activity of pet-ether, ethylacetate, ethanol, methanol and water extracts of Leaves of *Salix alba* L. was investigated by agar well diffusion method on six microorganisms which include *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Bicillus pumilus*, *Candida albicans* and *Escherichia coli*.

3. RESULTS AND DISCUSSION :

The quantitative analyses such as determination of the nutrient values: moisture, ash, protein, crude fibre, crude fat and carbohydrate were carried out according to AOAC method. The results obtained are shown in Table 1 and figure 1. According to the results, the sample was found to contain 19.69% of moisture, 11.07% of ash, 22.26% of protein, 16.64% of crude fiber, 2.59% of crude fat, 27.75% of carbohydrate and 227 Kcal/ 100g of energy value respectively. The relative abundance of elements present in *Salix alba* L. was determined by EDXRF spectrometer. From the result of elemental analysis, the macrominerals (2.089% of K, 1.914% of Ca, 0.875% of S), microminerals (0.035% of Fe, 0.019% of Mn, 0.008% of Zn, 0.002% of Cu) and trace elements (0.002% of Sr, 0.001% of Rd) were observed in the sample. The relative abundance of elements in the sample and EDXRF spectrum of element contents are shown in Table 2 and Figure 2 respectively. These minerals are known to be essential for humans and considered as nutrients. The soluble matter contents in some organic solvents and water were determined by the method given in "The British Pharmacopoeia" . In these experiments, the organic solvents used were pet-ether, ethylacetate, ethanol and methanol. In the determination of water soluble matter, the addition of small amount of chloroform was necessary to prevent the fermentation of extract. The soluble matter contents in some organic solvents such as pet-ether, ethylacetate, ethanol, methanol and water calculated on dried weight of the sample were found to be 0.097%, 0.193% 0.534%, 0.594% and 1.135% respectively. The results are shown in Table 3 and Figure 3. The data suggested that the soluble matter contents increase with increasing polarity of the solvents. From the observation of antimicrobial activity, the ethanol and methanol showed moderate antimicrobial activity with the inhibition zone diameter ranged between 11mm to 15mm on all tested microorganisms. And then, ethyLacetate extract (inhibition zone diameter ranged in 11mm to 17mm) pet-ether extract (inhibition zone diameter ranged in 11mm to 13mm) and water extract (inhibition zone diameter ranged is 11mm) were observed to exhibit antimicrobial activity against some of the tested microorganisms. The result from the study suggest that the Leaves of *Salix alba* L. showed antimicrobial activity against different microorganisms. The inhibition zones of crude extracts against six microorganisms test are shown in Figure 4, 5 and the observed data are summarized in Table 4.

Table 1. Some Nutritional Values of *Salix alba* L. (Moe-ma-kha) Leaves

No.	Nutrients	Content (%)
1	Moisture	19.69
2	Ash	11.07
3	Protein	22.26
4	Crude Fiber	16.64
5	Crude Fat	2.59
6	Carbohydrate	27.75
7	Energy value (kCal/100 g)	277

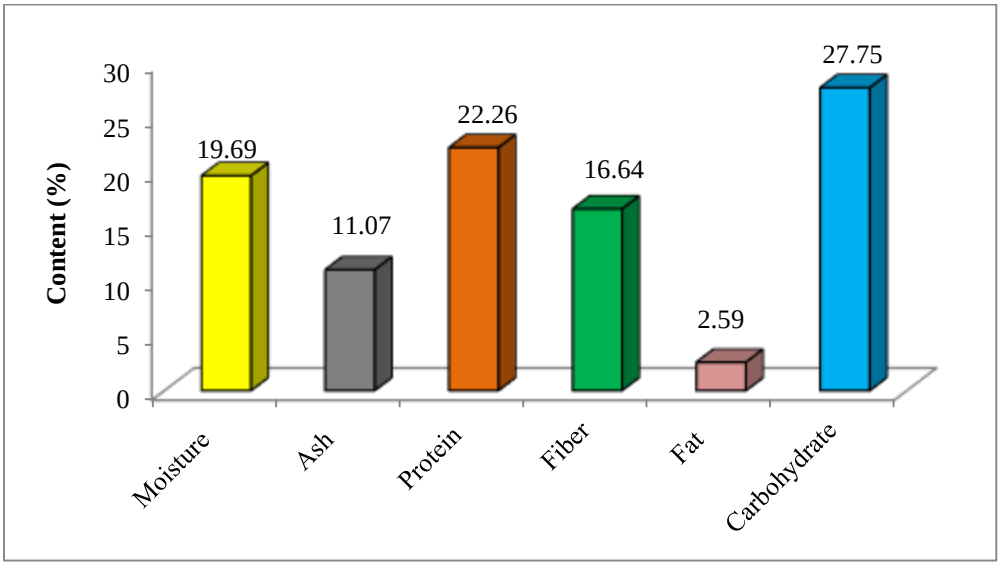

Figure 1. Histogram of nutritional values of *Salix alba* L. (Moe-ma-kha) leaves

Table 2. Elemental Contents of *Salix alba* L. (Moe-ma-kha) Leaves by Energy Dispersive X-ray Fluorescence Method

No.	Elements		Relative Abundance (%)
1	Potassium	K	2.089
2	Calcium	Ca	1.914
3	Sulphur	S	0.875
4	Iron	Fe	0.035
5	Manganese	Mn	0.019
6	Zinc	Zn	0.008
7	Copper	Cu	0.002
8	Strontium	Sr	0.002
9	Rubidium	Rb	0.001
10	Hydrocarbon	C H	95.055

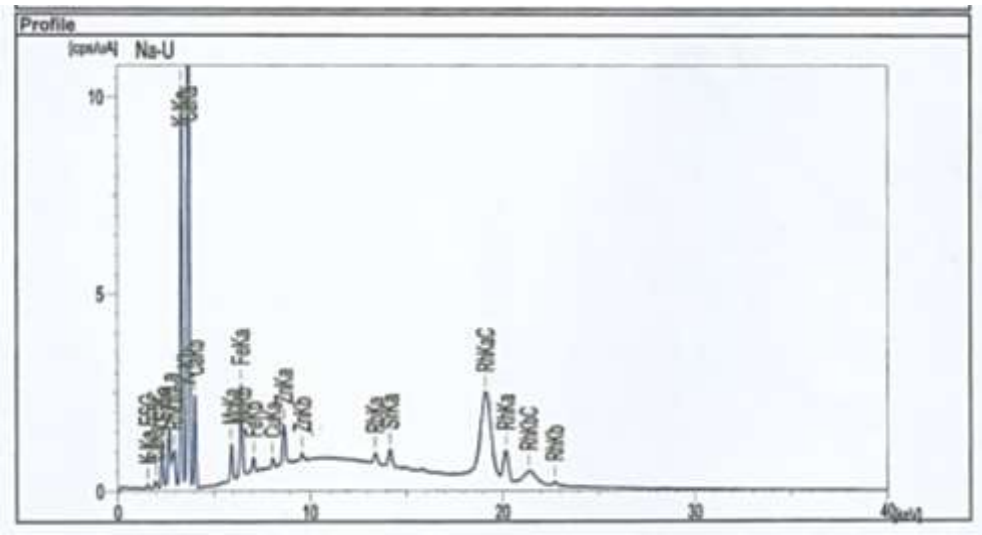

Figure 2. A bar graph diagram of elemental contents of leaves of *Salix alba* L. (Moe-ma-kha) by EDXRF method

Table 3. Extractable Matter Contents of Leaves of *Salix alba* L. (Moe-ma-kha) in PE, EtOAc, EtOH, MeOH and H_2O

Sample	Extractable matter contents (%)				
	PE	EtOAc	EtOH	MeOH	H_2O
Leaves	0.097	0.193	0.534	0.594	1.135

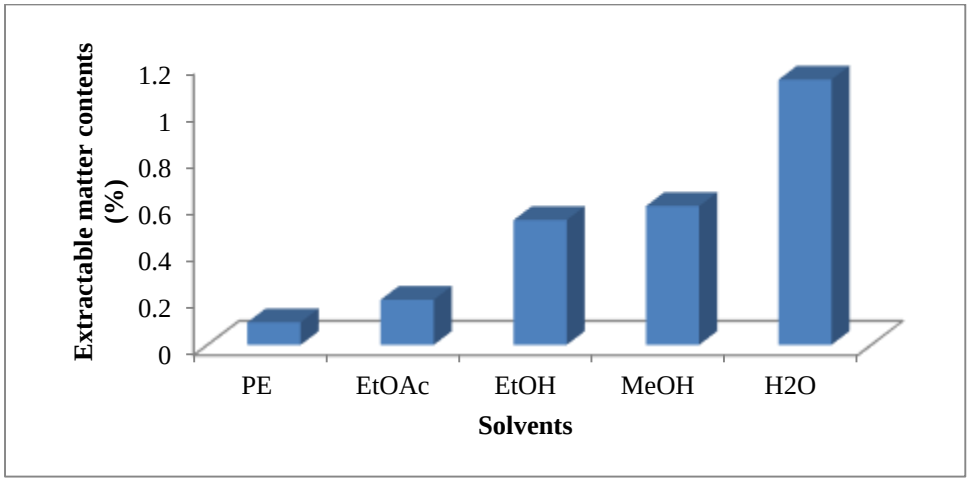

Figure 3. PE, EtOAc, EtOH, MeOH, and H_2O extractable matter contents of leaves of *Salix alba* L. (Moe-ma-kha)

Table 4. Antimicrobial Activity of Various Crude Extracts from Leaves of *Salix alba* L. (Moe-ma-kha) by Agar Well Diffusion Method

Organisms used	Diameter of inhibition zone (mm) in various crude extracts				
	PE	EtOAc	MeOH	EtOH	H_2O
Bacillus subtilis	11	12	14	11	-
Staphylococcus aureus	12	11	14	12	-
Pseudomonas aeruginosa	-	17	14	13	-
Bacillus pumilus	11	11	12	15	-
Candida albicans	13	-	14	15	-
Escherchia coli	12	12	14	12	11

Agar Well – 10 mm
10 mm ~ 14 mm - lower activity
15 mm ~ 19 mm - higher activity
20 mm ~ above - highest activity

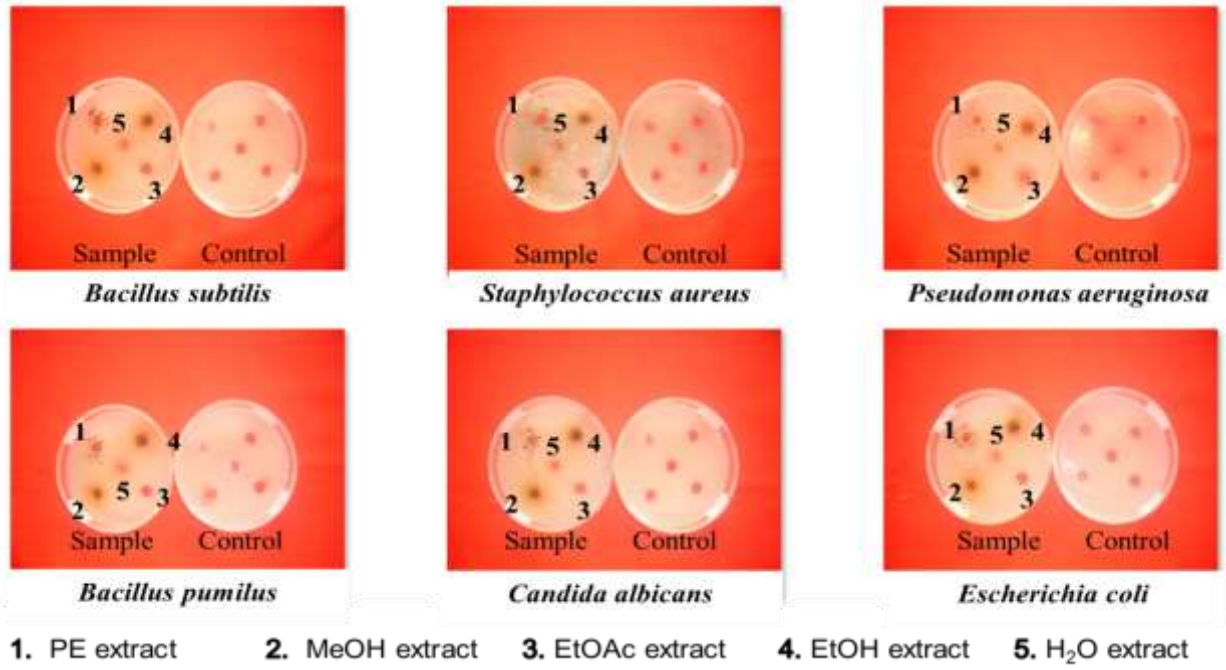

Figure 4. Antimicrobial activity of various extracts of *Salix alba* L. (Moe-ma-kha) leaves on six microorganisms

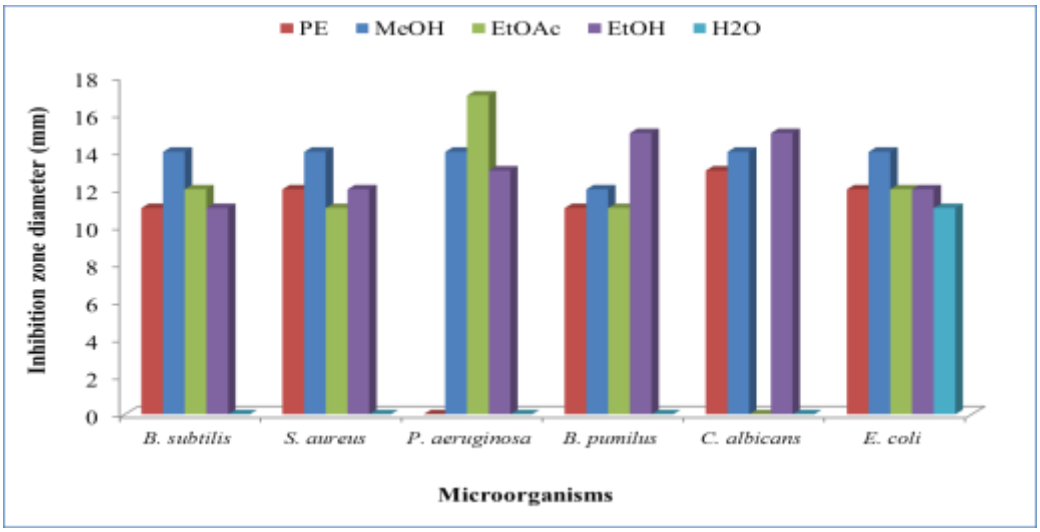

Figure 5. Histogram of inhibition zone diameters of different extracts of *Salix alba* (Moe-ma-kha) leaves against six microorganisms by agar well diffusion method

4. CONCLUSION:

The leaves of *Salix alba* L. (Moe-ma-kha) is one of the main types of nutrients. he distribution of minerals and nutrients in Leaves extract has important application for the health of people in addition to the basic need of developing countries. From the result of the study, it is expected that this study would lead to the establishment of some active compounds extracted from plants in order that new and more potent antibioactive drugs may be put into use for treatment of diseases.

REFERENCES:

1. AOAC (1970). *Official and Tentative Methods of Analysis*. Association of Official Analytical Chemists, Washington : 11th Edn., 526.
2. British Pharmacopoeia, (1963). The Pharmaceutical Press, London, 858.
3. Cruickshank. R. (1975). *Hand Book of Bacteriology*. 11th Edn., London : E & S. Living Stone Ltd, 980.
4. Grieken. R.V., A. Markowicz and S. Toorks. (1986) "Energy Dispersive X-ray Spectrometry". Department of Chemistry, University of Antwerp (UIA) B. 2610. Antwerp- Wilnjk, Beigisum, 11-15.
5. Highfield, E. S. and K. J. Kemper. (1999). "White Willow Bark (*Salix alba*)". The Center for Holistic Prediatric Education and Research 1-12.
6. Houston Durrant, T., D. de Rigo and G. Caudullo. (2016). "*Salix alba* in Europe : Distribution, Habitat, Usage and Threats".
   Available on: forest.jrc.ec.europa.eu/media/atlas/Salix_alba.pdf
7. WHO(1998), "Quality Control Method for Medicinal Plant Materials, In; Determination of Extractable Matter", Geneva, 30.
8. Zarger, M. S. S., F. Khatoon and N. Akhtar. (2014). "Phytochemical Investigation and Growth Inhibiting Effects of *Salix alba* Leaves Against Some Pathogenic Fungal Isolates". *World Journal of Pharmacy and Pharmaceutical Sciences*, **10** (3), 1320-1330