

Physico-chemical and qualitative analysis of certain plant-based gums and resins found in Ranchi district

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Abstract- The two selected Plant-based gums and resins namely Albizia procera (Roxb.) Benth. and Vachellia nilotica (L.) P.J.H.Hurter & Mabb. were found to be responsible for curing a variety of human disorders, in terms of qualitative analysis. The subjects of the current study is focused to analyze the physicochemical (organoleptic, extractive values and ash values) and phytochemical screening of gums of two selected plant samples. For the determination of the extractive value of the selected two samples, cold extraction method was followed and was done in five different organic solvents such as Methanol, Ethanol, Aqueous, Chloroform and Acetone. The highest percentage of extractive value was found to be highest in the Albizia procera gum i.e. 6.00% (6.00 ± 2.00) in the Aqueous extract but interestingly the lowest percentage in the three different solvents i.e. Methanol, Ethanol and Acetone i.e. 2.67% (2.67 ± 0.67). In the case of Vachellia nilotica gum (Acacia gum), the highest percentage of extractive value was found to be in the aqueous extract i.e. 86% (86.00 ± 0.00) and lowest percentage in the two different solvents (Methanol and Acetone) *i.e.* 2.00% (2.00 ± 0.00). So as to determine the quality as well as the purity of the sample so collected, ash value was done. In the case of gums of Albizia procera (Albizia gum), the % of Total Ash Value, % Acid Insoluble Ash Value and % Acid Soluble Ash Value was found to be (3.58 ± 0.33) , (2.27 ± 0.33) (0.29) and (1.31 ± 0.34) respectively. The % of Total Ash Value, % Acid Insoluble Ash Value and % Acid Soluble Ash Value was found to be (4.92 ± 0.58) , (3.28 ± 0.32) and (1.64 ± 0.34) respectively in the Vachellia nilotica (Acacia gum). The preliminary phytochemical analysis of the above two mentioned samples revealed the presence of bioactive compounds such as Alkaloids, Flavonoids, Carbohydrates, Phenol, Tannins, Resins, Steroids and Proteins in the three different solvents. Hence, the determination of these parameters will find scope in the industrial, culinary, and medicinal sector.

Key words: Gums, Resins, *Albizia procera, Vachellia nilotica*, Physicochemical Analysis, Qualitative Analysis INTRODUCTION

Ranchi, the capital of Jharkhand (The Land of Forests), which is one of the state's main districts, which is situated 654 meters above sea level and is situated between 22° 30'N and 23° 30'N latitude and 85° E and 86° E longitude. As the entire district is covered with red sandy soil, it has a diverse range of flora. The current study will focus on the plants that secrete gums and resins, such as *Albizia procera* gum and *Vachellia nilotica* gum, which

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are found in the Ranchi district. This is because of the district's mountainous terrain and extensive, brilliant tropical forest cover, which are the site to a large number of gums and resin-secreting plants.^{1,2}

Since the beginning of time, humans have been aware of gums and resins, which are considered to be among the best Non-Wood Forest Products (NWFP/NTFP). Located in tropical moist and dry deciduous forests, gum trees are commercially significant and yield a large amount of gum that has been used widely in India for industrial, culinary, and medicinal applications.^{3,4}

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The three categories of natural resins and gums (NRGs) obtained from plants are natural resins, natural gums, and gums-resins.Gums are metabolic byproducts of plant tissues that occur naturally or frequently as a result of illness or damage to a plant's bark or wood.⁵

The White Siris tree, *Albizia procera* (Roxb.) Benth., commonly called as the White Siris tree acts as a valuable species of the family Fabaceae that offers a host of social, economic, and ecological advantages. Additionally, the gum has been found to be useful in the traditional medicine, which may present a chance for new findings and advancements in the field of science. Examining *Albizia procera* gum in comparison to other gums can reveal important insights on their similarities and differences.^{6,7}

Vachellia nilotica (L.) P.J.H.Hurter & Mabb. (Babul/ Babool tree) commonly known as *Acacia nilotica* (L.) Willd. Ex Delile, belonging to Fabaceae family and is a major source of gum arabic, a natural adhesive and thickening agent used in the food industry, for making desserts like "Gond Laddu," and the pharmaceutical industry, which offers various benefits to both human societies and the environment too.⁸

MATERIALS & METHODS

Study Area: Ranchi district

The current study area was undertaken in different areas of Ranchi district. (Map:1)



Source:https://images.app.goo.gl/gr9pWaHfiPzAjTm67 Map 1: Study area of Ranchi district

Identification and Authentication of the plant sample

Plant-based gums and resins were collected from different areas/blocks of Ranchi district in different seasons on the basis of their availability. The collected plant twigs bearing fruits/flowers were brought to the laboratory for studying each and every characteristic of the plant specimens was noted down and identification was done by using 'The Flora of Ranchi district'⁹, 'The Botany of Bihar and Orissa', H. H. Haines (1922)¹⁰. Collected plant twigs were also authenticated by the Taxonomists of the University Department of Botany, Ranchi University, Ranchi. Also, from e-flora of Botanical Survey of India (BSI)¹¹, the authenticity was checked.

Collection of Plant Sample

Albizia procera gum and *Vachellia nilotica* gum were collected from different areas/ localities of Ranchi district (Table:1).

 Table 1- Date and place of collection of selected

 Plant-based gums and resins for my present study

Sl.	Botanical Name	Date of	Place of
No.		Collection	Collection
1.	Albizia procera	21.03.2022	Morabadi,
	(Roxb.) Benth.		Ranchi
2.	Vachellia nilotica (L.)	26.04.2022	BAU
	P.J.H.Hurter & Mabb.		CAMPUS,
			Ranchi

Preparation of Plant Extract

The shade/air dried gums of both the plants which was stored in an air tight container was taken and powdered with the help of mortar and pestle. Cold Extraction Method¹² was employed for preparation of various extracts of powdered plant samples. The filtered extracts were then dried at 30°C. The dried samples were stored in an air tight bottles till further use.

Organoleptic Characteristics

The organoleptic characteristics of *Albizia procera* gum and *Vachellia nilotica* gum was studied along with their solubility which is described in detail. (Table:2)

Table 2- Organoleptic Characteristics of two plantbased gums and resins

SI. No.	Botanical Name	Organoleptic Characters of gums of the selected plant	Solubility
1.	<i>Albizia</i> <i>procera</i> (Roxb.) Benth.	Pale white in colour, odorless and freely soluble in warm water yielding a clear, viscous solution.	Soluble in organic solvent like methanol, ethanol
2.	Vachellia nilotica (L.) P.J.H.Hurter & Mabb.	Usually white, pale-yellow, and sometimes creamish brown to red in colour. Powder has off- white appearance, pale yellow; odourless, bland and invariably opaque; mucilaginous in taste.	Soluble in water, shows very less solubility in organic solvent.

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Physico-chemical Analysis

As per World Health Organization (WHO) guidelines¹³, the physicochemical analysis of the selected plant-based gums and resins was carried out.

Extractive Value

Cold Extraction Method¹² was followed for the determination of the extractive value of the *Albizia procera* gum and *Vachellia nilotica* gum. The Extractive Value was done in five different organic solvents such as Methanol, Ethanol, Aqueous, Chloroform and Acetone.

Preliminary Phytochemical Screening of different extracts of two different plant samples

The extracts of both the plant samples *i.e. Albizia procera* gum and *Vachellia nilotica* gum for different solvents namely Ethanol, Methanol and Aqueous were subjected to qualitative analysis with slight modification¹⁴ so as to determine the bioactive compounds present in the two different plant samples. The extracts were subjected to test for eleven bioactive compounds such as alkaloids, flavonoids, cardiac glycosides, terpenoids, carbohydrates, steroids, tannins, saponins, phenols, resins and proteins.

RESULTS & DISCUSSION

Organoleptic Characteristics

The organoleptic characteristics which indicated characteristics colour, odour, taste as well as its solubility of both the plant-based gums and resins were shown in Table 2.

Physicochemical Analysis

Various Physicochemical parameters of selected plant samples viz. Albizia gum and Acacia gum of Ash Value was estimated (Table 3; Graph: 1,2). Ash values was done to check the quality and purity of the samples. It indicates presence of various adulterant such as carbonate, oxalate and silicate *etc*. Similarly, the extractive values of *Albizia procera* gum and *Vachellia nilotica* gum was performed (Table:4; Graph:3,4) which is essential to evaluate the chemical constituents present in the plant samples and also help in evaluation of specific constituents soluble in a particular solvent.

 Table 3: Determination of % Ash Value of selected

 Plant-based gums and resins

Sl. No.	Plant Sample Name	% Total Ash Value	% Acid Insoluble Ash value	% Acid Soluble Ash Value
1.	Albizia procera (Albizia gum)	3.58 ± 0.33	2.27 ± 0.29	1.31 ± 0.34
2.	Vachellia nilotica (Acacia gum)	4.92 ± 0.58	3.28 ± 0.32	1.64 ± 0.34



Graph 1: Percentage of Ash Value of gums of Albizia procera



Graph 2: Percentage of Ash Value of gums of *Vachellia nilotica* (Acacia gum)

 Table 4: Percentage Extractive Value (%w/w) of Selected

 Plant-based gums and resins in five different solvent.

SI.	Plant	Methanol	Ethanol	Aqueous	Chloroform	Acetone
No.	Sample					
	Name					
1.	Albizia	2.67 ± 0.67	2.67 ± 0.67	$6.00\pm\!\!2.00$	4.67 ± 1.76	2.67 ± 0.67
	<i>procera</i> (Albizia					
	gum)					
2.	Vachellia	2.00 ± 0.00	4.00 ±1.15	86.0 ± 0.0	2.67 ± 0.67	2.00 ± 0.00
	nilotica					
	(Acacia	 				
	gum)	l !		 		





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Qualitative phytochemical analysis of different extracts of plant-based gums and resins

The preliminary phytochemical analysis gives an idea about the chemical nature of the plant samples. The screening of phytochemicals revealed the presence for alkaloids, flavonoids, phenols, proteins, tannins. Several studies have been reported the presence of similar phytoconstituents.

Graph 4: % Extractive value of gums of vachelia	
<i>nilotica</i> (Acacia gum)	

Table 4: Phytochemical	analysis of Albizia procera	gum in three different solvent

Sl. No.	Constituents	Chemical Tests	Methanol Extract	Ethanol Extract	Aqueous Extract	
1	Alkaloids	Dragendroff's Test	+	+	+	
2	Flavonoids	Alkaline Reagent Test	+	+	+	
3	Cardiac Glycosides	Keller Kelliani's Test	+	+	+	
4	Terpenoids	Salkowski Test	+	+	+	
5	Carbohydrates	Mollisch's Test	+	+	+	
6	Phenol	Ferric Chloride Test	+	+	-	
7	Saponin	Foam Test	-	-	+	
8	Tannins	Bromine Water Test	+	+	+	
9	Resins	HCl Test/ FeCl3 Test	+	+	+	
10	Steroids	Salkowaski Test	+	+	+	
11	Proteins	Biuret Test	+	+	+	
Note: - +ve sign indicates Present: - ve sign indicates Absent						

Table 5: Phytochemical analysis of Vachellia nilotica gum in three different solvents

Sl. No.	Constituents	Chemical Tests	Methanol Extract	Ethanol Extract	Aqueous Extract		
1	Alkaloids	Dragendroff's Test	+	+	+		
2	Flavonoids	Alkaline Reagent Test	+	+	+		
3	Cardiac Glycosides	Keller Kelliani's Test	-	-	+		
4	Terpenoids	Salkowski Test	+	-	+		
5	Carbohydrates	Mollisch's Test	+	+	+		
6	Phenol	Ferric Chloride Test	-	-	-		
7	Saponin	Foam Test	-	-	+		
8	Tannins	Bromine Water Test	+	+	+		
9	Resins	HCl Test/FeCl ₃ Test	-	-	+		
10	Steroids	Salkowaski Test	+		+		
11	Proteins	Biuret Test	+	+	+		
	Note:- +ve sign indicates Present ; - ve sign indicates Absent						

CONCLUSION

The usage of the gums from both plant samples namely *Albizia procera* gum and *Vachellia nilotica* gum in many medical fields is supported scientifically by their organoleptic properties. Both plant samples' physicochemical properties could serve as standardizing parameters. Three distinct extracts were subjected to a preliminary phytochemical study, which found many

phytochemicals that support their use in numerous Ayurvedic formulations.

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