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Physiochemical Characteristics of the From Albiziz Amara Gum

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ABSTRACT

Twenty six authentic samples from Albizia amara gum were collected as natural exudates from two locations in Sudan, (Central Darfur-1, West Darfur-2) December of 2012, 2013. Characterization of Albizia Amara was undertaken so that physical and chemical properties such as moisture content, ash content, nitrogen , protein content, acid equivalent weight ,total Glucoranic acid, pH , cationic composition , and Intrinsic viscosity mLg^{-1}. Results show insignificant differences within each location in, almost all, parameters studied.

Keywords: *Physiochemical characteristics Albizia .amara Gum exudates. Leguminosae*

1. INTRODUCTION

Gum Arabic the oldest and best known tree gum exudates and has been used as article of commerce in a wide over 500 years [21]. The most recent specification of gum Arabic was drawn up at the March 1998 meeting of the Codex Committee on Food Additive and Contaminants. This specification defines gum Arabic as "the dried exudation obtained from the stems and branches of acacia Senegal or acacia seyal, of the family leguminosae''. [12] Albizia gum is derived from trees of the genus Albizia and is formed as round elongated tears of variable size and color, ranging from yellow to dark brown [19]. The genus Albizia (family leguminosae, Sub-family Mimosoideae, tribe Ingeae) consists of at least 150 species [1] 72 of which occur widely in Africa. The family includes gum-producing genera of Acacia and Prosodies. Gum is either hydrophobic or hydrophilic .hydrophobic gums are insoluble in water and include resins, rubber...ect. Whereas hydrophilic gums are soluble in water and can be subdivided in to natural, semi synthetic and synthetic gums [11].the uses of Gum Arabic include confectionery, flavors ,pharmaceuticals ,bakery ,beverages .ink, and for environmental protection including soil stabilization improvement.[6] in the pharmaceutical industries gum is used as an effective suspending agent for insoluble drugs[16] .in which the gum prevents the precipitation of heavy metals by forming colloidal suspensions Osborn, [10]. Gum also is used as demulcent and soothing by in non containing sugar pharmaceutical syrups [16] since gum is non toxic and free from dermatological and allergic reaction, it has been extensively used in the cosmetic formulation as an emulsifying and formulating agent in lotions and protective creams. In medicine gum is used as an effective oral laxative Knight, [20]. And for the treatment of low blood pressure caused by hemorrhage or surgical shock. Gum Arabic is effective when it is used as intravenous injection for the treatment of nephritic oedema [26] gum Arabic is effective in the preservation of vitamin A and c. it also decreases blood cholesterol and increases breath hydrogen excretions gum have adverse effects by absorbing cat ions and causing an ionic imbalance.

2. MATERIAL AND METHODS

2.1 Sampling

The gum samples used in this work were relatively pure; however, impurities such as wood pieces and sand particles were carefully removed by hand. Then each sample was reduced to a fine powder using a mortar and pestle and kept in labeled self sealed polyethylene bags.

2.2 Methods, Moisture content:

According to the FAO paper 2 g of the samples were heated in an oven at 105 ^{o}C to constant weight.

2.3 Ash Content

The Ash percentage was determined according [8]. 2 g of gum sample were weighed on dry porcelain crucible and ignited in heroes electric muffle furnaces at 550 ^{o}C for 5 hours, and then the ash content was determined.

2.4 Nitrogen Content

Nitrogen content was determined using a semi – micro Kjeldahl method according to [4]. Hence protein was determined by multiplying Nitrogen content by the 6.25 as factor [2].

2.5 pH Measurement

pH meter was calibrated by using three different buffer solutions was adjusted at pH = 4. 7 and 11. Then the pH of gum sample 1 g / 100 H_2O was measured.

2.6 Apparent Equivalent Weight

Apparent Equivalent Weight was determined according to the method reported in the [7] with some modifications. Albizia Amara gum solution 0.5 % w/v was introduced through separated column containing Amberlite Resin (120: H^+) the eluted solution was titrated against 0.01M sodium hydroxide solution using phenolphthalein as an indicator.

2.7 Uronic acid

Uronic acid percentage was determined by multiplying the molecular weight of uronic acid (194) by 100 and dividing by the apparent equivalent with 5%

(w/v) gum powder in distilled water .using a glass rod electrode pH meter

2.8 Specific Optical Rotation

the specific optical rotation was measured for 3% solution (on a dry basis)using an optical activity Bellingham and Stanley ltd. Polar meter fitted with a sodium lamp and with a cell of path length of 20cm.

2.9 Intrinsic Viscosity

The viscosity was assessed using a Cannon–Ubbelohde (MI30) semi micro-dilution viscometer size 75.

2.10 Determination of Sugar Composition

HPLC is widely considered to be a technique mainly for biotechnological, biomedical, biochemical research, and for the pharmaceutical industry, is as well widely used in a lot of fields such as cosmetics, energy, environmental, and food industries [18]. The samples were hydrolyzed to liberate the sugar residues. Sample was weighed out (100mg, accurately weighed out – including allowing for moisture content) and added to $10cm^3$ of 4% H_2SO_4 and incubated at 100^oC for 6 hours.

Following this ,1g of $BaCO_3$ added to the solution and left overnight (minimum of 12 hours) to neutralize the solution .After $BaCO_3$ treatment ,universal indicator strips were used to ensure that the sample was neutral before proceeding to the next stage . The solution was the centrifuged at 2500rpm for 10 minutes to allow the Barium Sulphate (formed from neutralizing the H_2SO_4) TO settle. The supernatant was removed and filtered through a 0.45 µm what man nylon filter and then diluted 1:1with 70/30 Acetonitrile /buffer. This constituted the final solution of which 1ml was analyzed using HLPC. The purpose of analyzing the sample by HPLC was to determine the relative concentration of each sugar residue present in the sample .namely rhamnose (Rha) ,arabinose (Ara) ,galactose (Gal) and glucuronic (GlcA).

Before analysis of the gum samples, calibration curves of these sugar were prepared .Stock concentration of 5 mg cm^3 for each sugar were made up by hydrating in 70/30 Acetonitrile /buffer for 2 hours .Dilutions of the stock solution achieved six different concentration for each sugar over a range of 2.5 -0.5 mg cm^3 .this allowed six levels for the calibration curve and an average of replicates for each level was used to ensure accuracy .this calibration allowed the determination of the unknown sugar content for the gum samples. The concentration of each sugar was calculated by beak height and expressed as % of the total sugar content.

2.11 Mineral Composition

The mineral content was determined technique of in house Method CHEMITFL/WI/CHEM-TM/001/Based on AOAC999. Determine mineral of Sodium (Na), (Manganese (Mg), Calcium(Ca), Manganese (Mn), Iron (Fe), Copper (Cu) Zinc (Zn) and Cadmium (Cd) in Albizia amara gum samples.

3. RESULT AND DISCUSSION

The moisture content of Albizia amara gum collected in central Darfur ranged between 10.50- 14.10% with a mean value 12.4% as show in table 1. Albizia amara gum collected in west Darfur ranged between 10.68-13.30% with a mean value 12.71% as show in table 1. The result show less than moisture content reported by (9) the value 16%, but similar with the result obtained by [17] A. Senegal to be 11.07. The Ash content of Albizia amara gum collected in central Darfur ranged between 2.01- 3.56% with a mean value 2.63% as show in table 1. Albizia amara gum collected in west Darfur ranged between 1.80-3.34% with an mean value 2.67% which is almost similar to those result obtained by [17] of A .Senegal. The result show less than Ash content reported by [9], the value 5.5%. Table 1 show the pH of Albizia amara gum collected from central and west Darfur are almost similar , which agreed with those obtained by [15], which was found to be 4.1 for A. nilotica var and similar to those result obtained by [9]. The nitrogen content are useful parameters in distinguishing gums from different species .In fact the [13] introduced a specification for the nitrogen content (0.26-0.39%) in the definition of gum Arabic to ensure identity and purity of the gum. the immune responses, which are important in providing evidence for the safety of food additives, are customarily accredited to the protein aceous component of the food component. The nitrogen content of Albizia amara gums obtained in this work are the same as those reported previously [17] A. Senegal to be 0.37%. for the values obtained by equivalent weight were found to be in the range of 1701± 26.61 in sample [1]whereas the values obtained for uronic acid contents for the same sample were 11.40±0.18 for the other hand the values obtained by equivalent weight were found to be in the range of 1705± 50.50 in sample [2] whereas the values obtained for uronic acid contents for the same sample were 11.31±0.24 all those values for equivalent weigh and uronic acid contents obtained for Albizia amara in similar with values obtained by karamalla (1965).Anderson et al.(1991) and siddig(1996). All the Albizia. Amara gums analyzed in this study are laevorotatory. [3] And Gaspar S. Mhizi gave values of -16 and -11for the specific rotations of Albizia. Amara respectively. In this study, obtained to be range (-21.33) - (-21.50). Such a variation in magnitude may be ascribed to the variation between the exuding trees as has been reported previously by [5] who obtained specific rotation which varied from -21 to -62 for 75 A .Senegal gum sample. Refractive indices of central and west Darfur gums are almost similar, which those obtained by [14]. Table 2 show the sugar content of Albizia amara gum were measured using HPLC technique and were found to be 9% rhamnose ,arabinose range to be 21-23% and galactose range to be 3-5%. The result similar to those result obtained by [3].The intrinsic viscosity for central Darfur 18.82mlg^{-1} and west Darfur 21.66 mLg^{-1}. Cationic composition of Albizia amara gum samples average values are depicted table 3. The major

elements were in the order Ca < Mg < Fe < Cu < Zn < Cd < Na. Calcium, magnesium and iron recorded high values indicating that the gum is a salt of Calcium, magnesium andiron.

Table 1: physicochemical of Albizia amara gum

sample	1	2
Moisture	12.14±1.04	12.71±0.75
Ash	2.63±0.55	2.67±0.47
pH	4.14±0.38	4.07±0.34
Nitrogen	0.38±0.05	0.37±0.06
Protein	2.55±0.38	2.39±0.37
Acid Equivalent Weight	1701±26.61	1705±50.50
Uronic Acid%	11.40±0.18	11.31±0.24
Specific rotation	-21.33	-21.50
Intrinsic viscosity mLg^{-1}	18.82	21.66

Table 2: Sugar content of Albizia amara gum

Sugar composition after hydrolysis, (%)	1	2
Rhamnose	9	9
Arbinose	23	21
Galactose	5	3

Table 3: cationic composition of Albizia amara gum

Element	ppm	PPm
Na	0.07	40
Mg	2558	1600
Ca	7971	4256
Mn	0.04	75.145
Fe	292	61.45
Cu	85	104
Zn	8	2.872
Cd	0.15	0.079

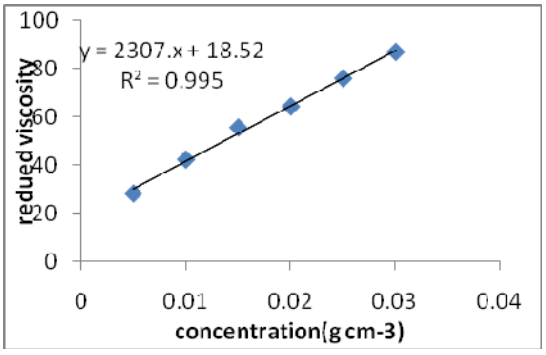

Fig 1: Intrinsic viscosity

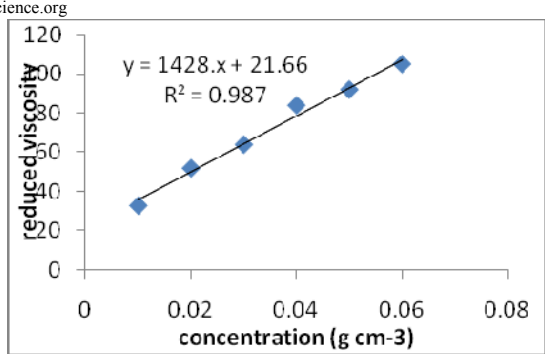

Fig 2: Intrinsic viscosity

Fig 3: Albizia Amara Tree

Fig 4: Albizia Amara Tree For Gums

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