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Identification of natural gum extracted from Okra Fruits

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ABSTRACT

Background: Gums and mucilage's are highly viscous in nature. its valuable utility of versatile uses for pharmaceutical formulations and value addition of the medicinal plants is very much essential for commercial exploitation as well as the medicinal value of the raw drugs.**Objective:** Gum was extracted and purified from locally cultivated Okra fruit in Iraq and identifiedusing several analytical methods, like, thin layer chromatography (TLC), X-ray diffraction spectrometry (XRD), differential thermal analysis (DTA) and spectrophotometrically analysis, like, FTIR, proton NMR, and carbon -13 NMR. **Results:** Results obtained from analytical analysis were as follow: TLC appeared clearly that Gum consist of polysaccharide, while XRD pattern of Gum indicate a complex amorphous nature, thermo gravimetric analysis suggested that gum has good thermal stability.In other hand spectrophotometrically analysis result gives the following information's: FT-IR gives the major functional groups includes, 3441cm-1(-OH), 1632 cm-1 (-COO-), 1414 cm-1 (-COO-), and 1219 cm-1(-CH3CO). Proton –NMR and Carbon-13-NMR indicate the presence of polysaccharide and sugar.**Conclusion:**The present paper reviews about how to obtain the purified Okra fruit Gum and it isproperties to utilize in various developments.

KEYWORDS: *Keyword:*Gum, Okra Fruits, TLC, XRD, DTA, Spectrophotometrically, physicochemical characteristics, bioactive compounds

INTRODUCTION

Nowadays, around the world, aromatic, natural medicinal plants and plant derived polymers have evoked tremendous interest due to their diverse pharmaceutical applications in pharmaceutical industry as binding agents, disintegrate, sustaining agents so have received a rising attention [1, 2]. Natural gums are thick substance produced by a number of plants and some microorganisms; it plays major rules in the storage of water and food [3]. In recent years plants gum have evoked tremendous interest due to their diverse pharmaceutical applications, such as, thickeners in Oral liquids, paints and papers making[4], textiles, gelling agents in gel and bases in suppository[5],diluents,binders and disintegrate in tablet. Various researcher group studied some natural gums (extracted from various plants) in different pharmaceutical dosage forms, like, Nanoparticles [6], suspensions, microspheres and film coating agent[7,8].

Many natural gums have been used in sustained-release tablets, these gums include: gaur gum,sesbania gum,tamarind seed gum[9], gum copal and dammar agar etc. In general, the natural gum are water soluble polysaccharide .have enormously large and broad applications in both food and non foodindustries [10], their uses depends in the unique physical and chemical properties that they provide often at costs below those of industrial gums.

While others, demand gums in the food industry for natural ingredients to fabricate 'clean label' products, which provides a review of recent studies on the identification, characterization, and utilization of natural food-grade emulsifiers, such as proteins, polysaccharides, phospholipids, and saponins [11].

In order to provide additional scientific information, present study was focus on identification of natural gum extracted from Okra by spectrophotometricallymethods, i.e., FT IR, Proton NMR, carbon-13 NMR, and some analytical methods likeTLC and DSC[12].Incontinuous with previous study of extractionsGum from Okra and study some physicochemical properties of these gums.

MATERIAL AND METHOD

Okra fruits were collected from the forest of our friend in Erbil; it was washed twice with distilled water and dried then crushed in to small species.

Extraction of Gum:

100 gm of Okra fruit was macerated in 500 cm^3 distilled water; the mixture was heated at 60^0C for 3 hours with stirring.Later filtered through a white muslin cloth to extract the gum and acetone was added to precipitate the extracted gum. The filtered gumwasdried under vacuum and desiccators.

Paper chromatography (TLC):

TLC was carried on a sheet glass coated with silica gel, using n-Butanol: acetic acid: distil water (80:20:20 cm3) as elutionand arabinose, fructose, mannose, rahmnose, xylose and glucose as reference standard.

Powdered X-Ray diffraction:

Powderedx-ray diffraction (XRD) patterns of gum was recorded using x-ray diffraction (Goniometer B1-200sm).

Differential thermal analysis:

Differential thermal analysis (DTA) of gum was carried on differential analysis (linseisGermany, stapt – 1600) in which accurately weight 5 mg sample were placed in a platinum cups and sealed at a heating rate 15ºC/min.

Fourier transforms analysis (FTIR):

FTIR spectra of gum were recorded on a FT-IR, spectrometer (thermo scientific).

Nuclear Magnetic Resonance (NMR):

NMR spectra of proton and carbon -13 was recorded in Iran by using anNMR (400MHz) spectrometer (Bruker Advance 11 400).

RESULTS AND DISCUSSION

Thin layer Chromatography:

Paper chromatography analysis was performed using n-Propanol: Acetic acid: water 4:1:1 as solvent system and using Arabinose, Fructose,Mannose,Ramones, Xylose and Glucose as reference (Standard). Flow rate Rf calculation appeared clearly, that gum contain all saccharine mention above with different value of Rf.X-Ray diffraction: Powder XRD analysis of gum was appeared in Fig.(1)From these figure, one could observe no characteristic peaks in the spectrum, indicating that .the gum is completely amorphous in nature. Natural Gaur gum and Arabic Gum also show amorphous nature [15].

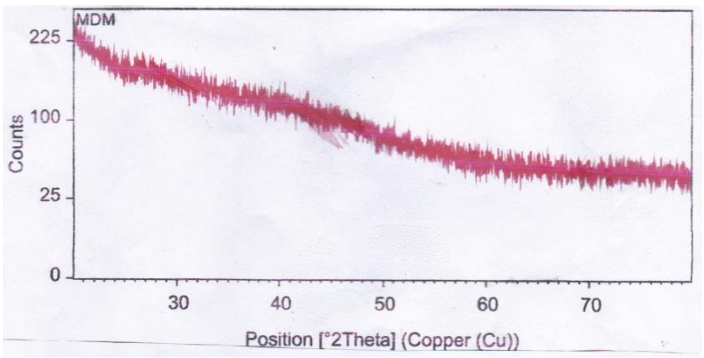

Fig. 1: TGA Spectre of Gum Extracted from Okra

TGA Analysis:

Fig.(2) show the TGA spectra of Gum extracted from Okra, from this figure . One could observe the following:

1.Weight loss in sample about 36.6% at temperature range 221-234 C0.which may explained as desorption of moister as hydrogen bound water to the succharide structure.

2. Weight lost 6.6% at335-394 C0 is attributed to the polysaccharide decomposition.

3. Weight loss 32% at temperature 394-563 C0 is representing the onset of oxidation of Gum.

This result suggests that gum extracted from Okra has good thermal stability.

FTIR Spectra: Fig.(3) show the FTIR spectrum of Gum, from these spectrum one could observe the following bands :

Fig. 2: Powder X-Ray diffraction Spectre of Gum Extracted from Okra

1. Bands at 3556cm-1 refers to the presence of N-H and C=O stretching.
2.Broad band's at 3200-3500cm-1, indicating the presences of –OH group of carboxylic acid .
3.Band at 2885-2770 cm-1, due to CH stretching of CH_3 group.
4. Adsorption band between 1618and 1430 are typical of carboxylate group of galacturonic acid [16].
5.Absorption peak at 1740 and 1285 cm-1,are typically of Acetyl group.
6.The wave number between 1200-800 cm^{-1} represents the finger printing region for carbohydrate.

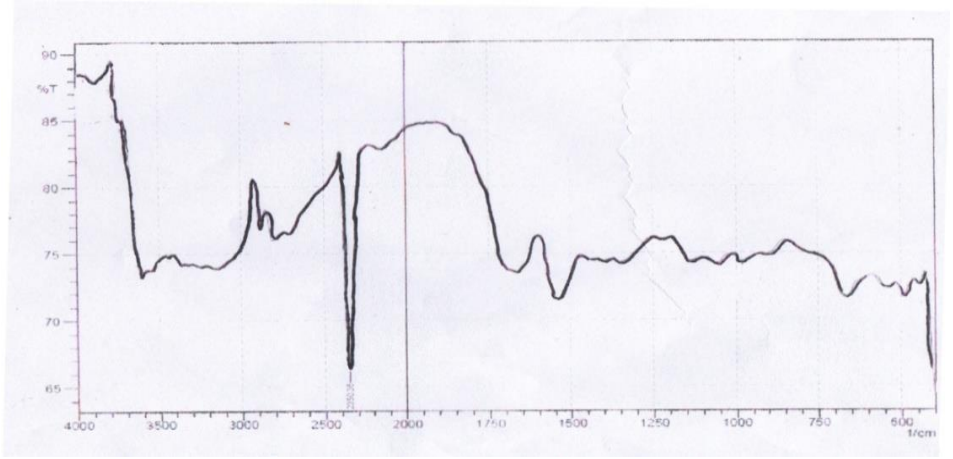

Fig. 3: FTIR Spectre characterization of Gum Extracted from Okra

1H-NMR Spectra:

NMR is most powerful tool for study of microstructure and chain configuration of polymers, both in solution and in solid state. The importance of NMR as a technique from the fact that NMR signals can be assigned to specific atoms along the polymer backbone and side chain.Fig.(4) show the proton NMR of Gum, from these figure, one could observe the following signals;

1.Signals at chemical shift equal to 3.65-3.60ppm assigned to –OH and CH of mannose.

2. Signals at chemical shift equal to 3.81-3.55 ppm, assigned to CH2 group of Arabinose .

3. Signals at chemical shift equal to 1.19 and 1.96 ppm assigned to the environment of methyl group of Rahmnose.

4.Signals at chemical shift equal to 3.65 and 3.70 ppm, assigned to the proton linked to C6 and C4 of Galactose.

5.Signals at chemical shift equal to 3.98 and 4.28 ppm, which suggest existence of different Galactose.

6.Signal at chemical shift equal to 4.92-4.96ppm assigned to proton of beta-sugar.

7. Signals at chemical shift equal to 5.1-5.3 ppm. assigned to proton alpha-sugar.

8.Signals at chemical shift equal to 4.03 and 3.84 ppm, assigned to protons of Glucose .

9.Narrow region between 3 and 5 assigned to polysaccharide.

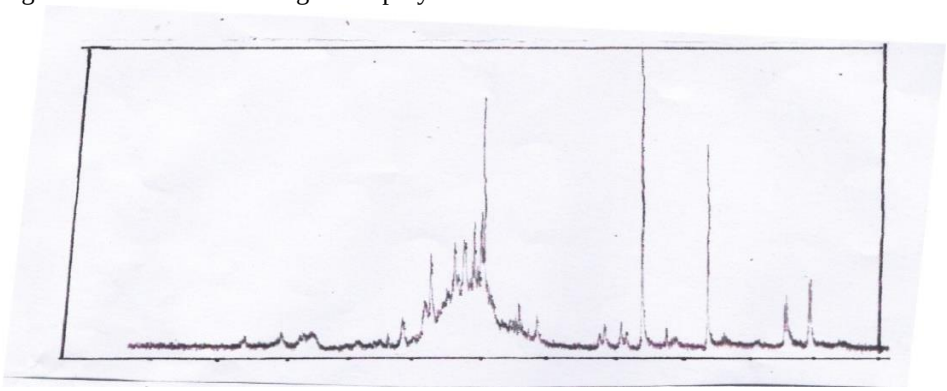

Fig. 4: proton-NMR Spectre characterization of Gum Extracted from Okra

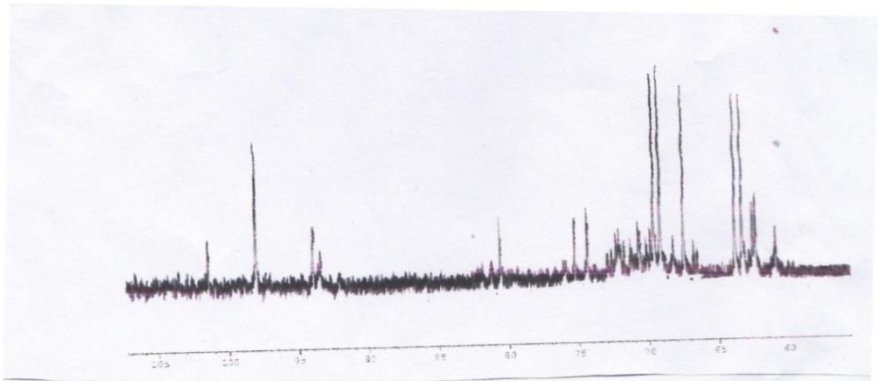

Fig. 5: 13C-NMR Spectre characterization of Gum Extracted from Okra

Carbon -13 NMR:Cabon-13 NMR spectrum of Gum was shown in Fig.(5), it gave line widths, which are typical of an amorphous natural polymer with broad band signals. There are resonance spectra due to the methyl group of rahmnose (chemical shift 16.67ppm) as reported in literature [9].

Given the obtained characterizationof purified Okra fruit Gum agreed with results of others studies [17,18] on pharmaceutical plant products and it is properties to utilize in various developments.

REFERENCES

[1] Mohammed Bouzouina, NesrineOudaAmari, AbdellahBerkani, BrahimLotmani, MerbouhaHanafi, Abdelghani Lazizi, 2016 Total Phenolics Contents, Flavonoïds Contents, andFatty Acids Compositions in ThymelaeahirsutaL.Aerial Parts, Grown in Western Algeria.Advances in Environmental Biology, 10(1): 16-22.

[2] Manmohan Singh Jangdey, Anshita Gupta, Chanchal Deep Kaur and Swarnlata Saraf, 2016. Assessment of Utilization, Value addition and characterization of Tamarind:A Natural Gum of Chhattisgarh.Int. J. Pharm. Res. Allied Sci., 5(2): 323-334.

[3] Krishna, L.N.V., P.K. Kuulkarni, M. Dixit, D. Lavanay and P.K. Raavi, 2011. Brief introduction of natural gums,Mucilage and their applications in novel drag delivery systems, International Journal of Drug formulation and Research, 2(6): 54-71.

[4] Figueroa, S.D. and A.S.B. Sombra, 2004. On the physicochemical and dielectric properties of glutaraldhyde cross linked galactomannan- collagen films. Carbohydrate.poly., 56.

[5] Xiacodong, M., P.I. Marek, 2007. Interstice viscosities and hugging constant of Gaur gum in alkali metal chloride solution, carbohydrate. Poly, 70: 15-24.
[6] Thimma, R.T., T. Shekharam, 2004. Free radical degradation of Gar gum, polymer Degrad. Stabil., pp: 455-459.
[7] Chamarthy, S.P., Pinal, R. Plasticizer, 2008. Concentration and the performance of a diffusion –controlled polymeric drug delivery system,physicochemical. Eng.Aspect., 331: 25-30.
[8] Alonso-Sande, M., D. Teijero and R. Lopez, 2009. polysaccharide for biopharmaceutical purpose, Eur .J. pharm. Biopharm., 72: 453-62.
[9] Elijah, I.N., Barbara and R.C. site, 2010. Characterization of grewia gum, a potential pharmaceutical excipient, J. Exciplents food chemistry, 1: 30-40.
[10] Singh, S., 2012. acute studies of natural materials extracted from indigenously edible fruits available in Chhattisgarh, plant acta., 4: 1-3.
[11] BenguOzturk and David Julian McClements, 2016. Progress in natural emulsifiers for utilization in food emulsions. Current Opinion in Food Science, 7: 1-6.
[12] Sabri, M.H., Al –Maraoumi, Fouad Hussein Kamel, Qotebh Fadel. D. Nafe, 2016. Isolation and characterization some organic compounds from brick land thyme. International Journal of Advanced Research, 4(5): 1170-1174
[13] Okafor, I.S., and K. Udela, 2001. some physicochemical properties of Grewia gum. Nigerian J. polym., 2: 161-167.
[14] Figueiro, S.D. and J.C. Goes, 2004. on the physicochemical and dielectric properties of glutaraldhyde, Carbohydrate poly., 56: 323-320.
[15] Varma, A.J., and S.D. pradhan, 2009. Thermal behavior of galactomannan guar gum and its periodating oxidation products, carbohydr. Poly., 32: 111-114.
[16] Malik, G.K., 2006. Anisotropic electrical conductaning, material science enG., 20: 215-18.
[17] Farida Benmeziane, AbdouMoussaAbdourhamane, Assia Guedaoura, 2016. Nutritional Quality and Bioactive Compounds of SomeFruit Juices.Advances in Environmental Biology, 10(4): 242-249.
[18] Ali, W., N.N. Mahmood, A.M. Hasan and R.S. Abbood, 2016. Effect of some natural preservatives on somehomemade fresh fruits juices. Advances in Environmental Biology, 10(3): 23-27.