

بسم الله الرحمن الرحيم

استهلال

قال تعالى :

قَالَ فَرَمَنَ رَبُّكُمْ يَا مُوسَىٰ (49) يَا رَأْسَ جَبَلٍ نَّذِي كُلِّ شَيْءٍ خَلَقَهُ ثُمَّ هَدَىٰ (50)

سورة طه الآيات 49 - 50

قال تعالى :

وَالَّذِينَ جَاهَدُوا فِينَا لَنَهْدِيَنَّهُمْ سُبُلَنَا وَإِنَّ اللَّهَ لَمَعَ الْمُحْسِنِينَ (69)

سورة العنكبوت الآية 69

صدق الله العظيم

Dedication

To my family

Acknowledgment

I would like to thank Allah for giving me strength to complete this work. My sincere gratitude and appreciation to my supervisor's Professor Mohamed Elmubarak Osman and Dr. Elfatih Ahmed Hassan for their encouragement, continuous guidance and invaluable support throughout this work.

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Abstract

Thirty samples of the gum from *Acacia oerfota* were collected from two locations (15 sample from each location) from around Senga - Sinnar state and Wadel hadad - Aljazeera state - Sudan, during season 2015. Four composite sample was made for the fifteen samples for each location by mixing. Chemical, physicochemical, rheological behavior, molecular weight and molecular weight distribution, and emulsification properties of *Acacia oerfota* gum were conducted.

The results show the ranges for moisture content (11.8 - 13.1%), Ash content (1.12 - 1.40%), pH (4.55 - 5.28), specific optical rotation (+65 to +80), color Gardena (0.1 - 0.3), nitrogen content (0.35 - 0.77), hence protein% (2.19 - 3.93%), tannin (268 - 292 ppm), acid equivalent weight (2941 - 5357), total uronic acid% (3.62 - 6.60%), intrinsic viscosity (3.94 - 10 cm³g⁻¹), and calorific value (~ 4 kJ/mole). Cationic composition % of Senga location are Calcium 0.287, Potassium 0.131, Strontium 0.004, Iron 0.010. While the caionic composition % of Wadel hadad location are Calcium 0.242, Potassium 0.145, Strontium 0.005, Sulphur 0.002, and Iron 0.001. The rheological behavior of *A. oerfota* gum show a Newtonian behavior (the molecular shape is reestablished when applied stress is removed). The values of number average molecular weight (Mn) of *A. oerfota* gum ranges between 1.68x10⁵ and 1.80x10⁵ g/mol for the two composite of Senga and Wadel hadad locations respectively. The molecular weight determined by gel permeation chromatography (GPC-MALLS) for the two location was found to be 6.23x10⁵ and 9.59x10⁵ g/mole. *Acacia oerfota* gum samples collected from Senga location show three fractions; Arabinogalactan protein (AGP) with molecular weight of 4.77x10⁵ mass%

1.11, and Rg 50 . The second and third fractions are (Arabinogalactan AG + Glycoprotein GP) have molecular weight of 5.76×10^5 g/mole , mass% 98.89. GPC-MALLS for *A. oerfota* gum samples collected from Wadel hadad shows an AGP with a molecular weight of 4.19×10^5 , mass% 0.84, and Rg 187. The second and third fractions are (AG +GP) have a molecular weight of 8.24×10^5 g/mole , mass% 99.16 . All emulsions show large droplets size, exhibit a typical bimodal droplet size distribution with a pronounced shoulder reflecting bad uniformity and unstable emulsions.

المستخلص

تم جمع ثلاثين عينة من صمغ اللعوت من منطقتين (15 عينة من كل منطقة) من حوالى سنجه - ولاية سنار و ودالحداد - ولاية الجزيرة - السودان خلال موسم 2015. تم عمل أربعة مخلوطات للخمسة عشر عينة لكل منطقة. تمت دراسة الخواص الكيميائية، الفيزيوكيميائية، الريولوجي، الوزن الجزيئي وتوزيعات الكتلة الجزيئية و الخواص الاستحلابية لصمغ اللعوت.

النتائج أوضحت أن مدى محتوى الرطوبة (11.8 - 13.1%)، محتوى الرماد (1.12 - 1.40%)، درجة الحموضة (4.55 - 5.28)، الدوران الضوئي (+65 الي +80)، درجة اللون (0.1 - 0.3)، محتوى النيتروجين (0.35 - 0.77%)، محتوى البروتين (2.19 - 3.93%)، محتوى التانين (268 - 292 جزء من المليون)، الوزن المكافئ للحامض (2941 - 5357)، حامض اليورنيك الكلي (3.62 - 3.935%)، اللزوجة (3.94 - 10 سم³/جرام⁻¹) والقيمة السعيرية (~ 4 كيلوجول/مول). التركيب الكاتيوني % لمنطقة سنجه هو كالسيوم 0.287، بوتاسيوم 0.131 استرانسيوم 0.004 ، حديد 0.010 . بينما التركيب الكاتيوني % لمنطقة ودالحداد هو كالسيوم 0.242، بوتاسيوم 0.145، استرانسيوم 0.005 ، كبريت 0.002، وحديد 0.001. دراسة الريولوجي لصمغ اللعوت اظهرت خصائص نيوتونية (شكل الجزيئي يعود الي وضعه الطبيعي بعد زوال الجهد المسلط عليه). وجد ان متوسط الرقم الجزيئي لصمغ اللعوت هو 1.68×10^5 و 1.80×10^5 لمنطقتي سنجة وودالحداد علي التوالي. تم تقدير الوزن الجزيئي عن طرق كروماتوجرافيا الاستبعاد بالجل للمنطقتين ووجد انه يساوي 6.23×10^5 و 9.59×10^5 جرام/مول. اظهرت كروماتوجرافيا الاستبعاد بالجل لعينات منطقة سنجه ثلاثة أجزاء: الارينوجالاكتان بروتين، بوزن جزيئي 4.77×10^5 ، وكتلة % 1.11، و 50 Rg. والجزء الثاني والثالث (الارينوجالاكتان و جلايكو بروتين) بوزن جزيئي 5.76×10^5 جرام/مول، وكتلة % 98.89. اظهرت كروماتوجرافيا الاستبعاد بالجل لعينات منطقة ودالحداد ايضا ثلاثة اجزاء: اربينوجالاكتان بروتين، بوزن جزيئي 4.19×10^5 ، وكتلة % 0.84، و 187 Rg. والجزء الثاني والثالث (اربينوجالاكتان و جلايكو بروتين) بوزن جزيئي 8.24×10^5 جرام/مول، وكتلة % 99.16. كل المستحلبات اظهرت اقطار كبيرة للقطرات وبتوزيعات مختلفة، الشيء الذي يفسر عدم تجانس وعدم ثبات المستحلبات.

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