

Dedication

To my parent and family with special love

ACKNOWLEDGMENTS

To whom I should, pay my thanks and prayers for finishing this work, Allah the Almighty, praise be to him. I would like to express deep appreciation and gratitude to my supervisor Dr.Mohammed Elmubarak Osman for his constant encouragement, keenness to follow this study and friendly guidance throughout the course of this work. Thanks and appreciation is extended to Dr. Malik Abdalla Abdelrhman Co- supervisor for his invaluable help, directives and assistance. I would like to acknowledge the permission of Dr. Azhari Hamid Nour University Malaysia PAHNG, for allowing me to do part of this research at the Faculty of Industrial Sciences and Technology laboratories. Finally, my thanks go to Dr. Alfatih Ahmed Hassan, Dr. Amira Satti, and the staff of chemistry laboratories Sudan University of Sciences and Technology. Thanks are due To Dr. Aminah Abdulla UK Malaysia for their technical support. The financial support of the Ministry of Higher Education and the University of Zalingei is appreciated.

Abstract

The Results show insignificant differences within each location in, almost, all parameters studied. The Average value of moisture was 12.44 % (w/w) and the ash content was 2.45%. The nitrogen content was 038%, and the protein content was 2.53%. Specific optical rotation was -21.12° . The acid equivalent weight and glucuronic acid content were found to be 1701 and 11.45 respectively. The number average molecular weight was found to be 4.6730×10^5 g/mole, the Molecular weight was found to be 5.637×10^5 , 4.04911×10^5 . Cationic composition studies showed that Calcium was 6114 ppm followed by magnesium 2079 ppm, iron 177 ppm, copper 95 ppm, manganese 38 ppm, sodium 20 ppm, zinc 5 ppm and cadmium 0.111 ppm in the decreasing order. The Sugar composition for Galactose was found to be 4.25, 21.15 for Arabinose and 8.75 for Rhamnose. Emulsion stability indexes of four composite samples using three refined oils were 1.0925 for groundnut, 1.101 and 1.2253 for sesame and corn oil, respectively. Antioxidant activity studies showed that mean values were 18.3 mg/100g for TPC, 101.1 mg/100g and 25.95% for FARAP and ABTS, respectively. The Thermodynamic studies of the three composite samples of the years 2012, 2013 and 2014 gave average values of 1.46 g cm³, $1.0087 \text{ cm}^3 \text{ g}^{-1}$, 0.396 and 0.6042, of average density, partial specific volume of the gum solution, solvent water and the volume fraction respectively. Chemical potential at different concentrations of the three composite

gum solutions were -2.1691×10^{-3} to $-3.4879 \times 10^{-3} \text{ Jg}^{-1}$, -2.4733×10^{-3} to $-3.7833 \times 10^{-3} \text{ Jg}^{-1}$ and -3.1515×10^{-3} to $-4.4781 \times 10^{-3} \text{ Jg}^{-1}$ respectively. The Second virial coefficient was found to be 0.36×10^{-5} . The ranges of the free energy of mixing of the three samples were -0.7911×10^{-3} to $-6.93644 \times 10^{-3} \text{ Jg}^{-1}$, -0.20426×10^{-3} to $-6.81718 \times 10^{-3} \text{ Jg}^{-1}$ and -4.83635×10^{-3} , $-9.8978 \times 10^{-3} \text{ Jg}^{-1}$, respectively.

المستخلص

تمت استخدام الطرق الفيزيوكيميائية في توصيف صمغ البيزيا امارا و وجد انه يحتوى على نسبة رطوبة تبلغ في المتوسط 12.44 بالمائة ويبلغ محتوى الرماد 2.45 بالمائة. يبدى صمغ العرد دوران ضوئى نوعى سالب يبلغ في المتوسط - 21.12^0 . ووجد ان محتوى النتروجين يبلغ في المتوسط 0.38 بالمائة (وزن/ وزن) ووجد ان محتوى البروتين يبلغ 2.53 بالمائة . ووجد ان الوزن المكافئ ومحتوى حمض الجلوكرونك يبلغان 1701 و 11.45% بالتوالي . تم حساب الوزن الجزيئى عن طريق قياسات الضغط الإزموزي ووجد أنه يساوي 4.673×10^5 وأيضاً تم حساب الوزن الجزيئى لصمغ العرد من نتائج قياسات التشتت الضوئى بإستخدام نظام ضوء الليزر متعدد الزوايا، وقد وجدت كل من متوسطات العددالذري والوزن الذري لصمغ العرد 5.6370×10^5 , 4.04911×10^5 . أظهرت دراسة محتوى بعض العناصر الفلزية باستخدام تقنية طيف الامتصاص الذري إن عنصر الكالسيوم سجل أعلى قيمة يليه الماغنسيوم ثم الحديد ثم النحاس ثم المانجنيز ثم الصوديوم ثم الخارصين واخيراً الكاديوم . تم تقدير محتوى السكريات باستخدام تقنية HPLC وأظهرت النتائج أن محتوى سكر الجلاكتوز و الاربينوز والرامنوز لصمغ العرد 4.25 و 21.75 و 8.75 علي التوالي . تم تحديد درجة ثبات المستحلب للعينات تحت الدراسة باستخدام كل من زيت الفول والسمن و زيت الذرة تساوي بين 1.0925 و 1.1018 و 1.2253 علي التوالي . تمت دراسة محتوى مضادات الاكسدة لصمغ العرد ووجدت أن محتوى TPC, FRAP, ABTC 18.3 مل /جرام 101.1 مل /جرام 35.95 % علي التوالي . في الدراسة الثيرموديناميكية لثلاث المخاليط عينات مو اسم 2012- و 2013 حتي 2014 تم ايجاد متوسطات كثافة الصمغ والحجم النوعي للجزيئ للصمغ والحجم النوعي للجزيئ للمذيب والكسر الحجمي لصمغ البيزيا امارا وكانت 1.46gcm^3 و $1.0087 \text{cm}^3 \text{g}^{-1}$ و 0.396 و 0.6042 علي التوالي . تمت ايجاد الجهد الكيميائي من قياسات الضغط الاسموزي لتراكيز مختلفة وقد وجد كمايلي - , 2.1691×10^{-3} - 3.4879×10^{-3} :

و -3.7833×10^{-3} , -2.4733×10^{-3} و -4.4781×10^{-3} , -3.1515×10^{-3} علي التوالي . تم حساب معدل طاقة الحركة الاسموزي الثاني 0.36×10^{-5} وطاقة جيبس الحرة للخلط - 6.93644×10^{-3} , -0.79118×10^{-3} - 0.20426×10^{-3} و -4.83635×10^{-3} , -0.5975×10^{-3} علي التوالي .

Abbreviations

ABTS	2, 2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid
AG	Arabinogalactan
Ara	Arabinose
Comp	Arabinose
DNA	Deoxyribonucleic acid
FRAP	Ferric Reducing Antioxidant Power
Gal	Galactose
Gallic	3, 4, 5-Trihydroxy benzoic acid
GLCA	Glucuronic acid
GP	Glycoprotein
GPC-MALLS	Gel permeation chromatography- Multi- angle Laser Light Scattering
HPLC	High Performance Liquid Chromatography
Mn	Number Average Molecular Weight
Mw	Weight average Molecular Weight
Rha	Rhamnose
RI	Refractive Index
ROS	Reactive Oxygen Species
SCD	Sample from central Darfur
SWD	Sample from west Darfur
TPC	Total Phenol Content
Trolox	6-hydroxy-2, 5, 7,8-Tetra methylchroman-2-carboxylic acid

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