

APPROVAL PAGE

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Dedication

I dedicate this work to...

My parents...

My husband and children

My brothers and sisters ...

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I thank Allah the most gracious the most merciful for giving me the health and patience to accomplish this work.

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ABSTRACT

Twenty samples of *Combretum glutinosum* gum were collected from Blue Nile state in Sudan during the seasons 2007 and 2008. Different physicochemical methods were used to characterize these gums. A representative composite sample for season 2007 and composite sample for season 2008 was used to evaluate the toxicity of *Combretum glutinosum* gum.

Parameters such as moisture content, ash content, pH value, nitrogen and protein content, acid equivalent weight and total uronic acid, intrinsic viscosity, tannin and starch and dextrin content were determined. Results obtained show no significant differences within samples. The mean values obtained for the properties studied are as follows: moisture content 7.96%, ash content 4.51%, pH 4.5, nitrogen content 0.37%, protein content 2.43%, acid equivalent weight 1524.15, total uronic acid 15.53%, intrinsic viscosity 11.2 ml g⁻¹, tannin and starch or dextrin were not detected in *Combretum glutinosum* gum.

Solubility of *Combretum glutinosum* gum showed that it had low solubility in water (30%), but it dissolved perfectly in basic media where solubility reached 96.3% in Na₂CO₃, 40% in EDTA.

Acid hydrolysis of *Combretum glutinosum* gum followed by HPLC measurements revealed its sugars content, arabinose 56.1%, galactose 33% and rhamnose 10.9%. Cationic composition studied using Atomic Absorption technique showed that Calcium, potassium and magnesium are the most abundant elements present with the mean values in (p.p.m) are 46.73, 35.97 and 17.36 respectively. Iron, cobalt, nickel, cadmium, lead, copper, zinc, chromium and aluminum (in p.p.m) have mean values of 0.55, 0.065, 0.07, 0.2, 0.163, 0.015, 0.06, 2.07 and 1.272 respectively. This indicates that the *Combretum glutinosum* gum is a salt of calcium, magnesium, and potassium. FTIR spectra of *Combretum glutinosum* samples showed the presence of hydroxyl, carbonyl, alkanes, alkenes and Phenols as functional groups. The number average molecular weight of *Combretum glutinosum* gum determined from osmotic pressure was 1.8×10^4 Dalton.

Toxicological study using in vitro cytotoxic methods involving *Combretum glutinosum* gum on different types of normal and cancer human cell lines was

undertaken to assess the safety of using the gum as food additive. The results showed that *Combretum glutinosum* gum differed in toxicity profile from gum arabic.

The mean values of IC_{50} on normal human cell line; were found to be 108.25 $\mu\text{g/ml}$ using baby hamster normal kidney fibroblast cell line (BHK), while it required doses higher than 500 $\mu\text{g ml}^{-1}$ on normal melanocytes cell line (HFB4). The mean IC_{50} values on the two cancer cell lines; were found to be 51.75 $\mu\text{g ml}^{-1}$ on human hepatocellular carcinoma cell line (HEPG2) and 44.5 $\mu\text{g ml}^{-1}$ on human colon carcinoma cell line (HCT116).

Prediction of LD_{50} starting doses was estimated from the values of IC_{50} using Halle's RC prediction model and was calculated and found to be in the range 0.03-0.02 g/Kg body weight on both normal and cancer cell lines respectively.

الخلاصة

جمعت عشرون عينة من صمغ الكومبريتم قلو تنوسم من ولاية النيل الأزرق بالسودان خلال موسمي 2007 و 2008 في هذه العينات تم توصيف صمغ كومبريتم قلو تنوسم باستخدام الطرق الفيزيوكيميائية بعد ذلك اختبرت عينه ممثله من كل موسم حيث تم استخدامها في تقييم سمية الصمغ . تم تحديد محتوى الرطوبة، محتوى الرماد، قيمة الأس الهيدروجيني، محتوى النيتروجين و البروتين، وزن المكافئ الحمضي و حمض اليورنيك الكلي، اللزوجة الضمنية، محتوى التانين والنشا والدكسترين. أظهرت النتائج اختلافات طفيلة بين العينات التي تم جمعها من الموسمين المختلفين ، متوسط القيم المتحصّل عليها للخصائص التي تم دراستها باستخدام الطرق الفيزيوكيميائية كالآتي: محتوى الرطوبة 7.96%، محتوى الرماد 4.51%، قيمة الأس الهيدروجيني 4.54، محتوى النيتروجين 0.37%، محتوى البروتين 2.43%، وزن المكافئ الحمضي 1524.15، حمض اليورنيك الكلي 15.53%، اللزوجة الضمنية 11.2 مل/جرام ولم يوجد التانين والنشا والدكسترين. أظهرت نتائج ذوبانية صمغ كومبريتم قلو تنوسم أنه قليل الذوبانية في الماء (30%) فقط ولكنه يذوب جيداً في القواعد لمدى 96.3% في كربونات الصوديوم و 40% في الادتا. كشف التحلل الحمضي لعينات صمغ الكومبريتم قلو تنوسم متبوعاً بقياسات كروماتوغرافيا السائل ذات الأداء العالي أن محتوى السكر كالآتي: أرابينوز 56.1%، جالاكتوز 33% و رامنوز 10.9%. و أظهرت دراسة محتوى العناصر الفلزية الأيونات الموجبة باستخدام تقنية الامتصاص الذري ان الكالسيوم و البوتاسيوم و المغنيزيوم أعلى قيمة بين الأيونات الموجبة التي درست وكان متوسط النتائج (كجزء من المليون) 46.73، 35.97 و 17.36 على الترتيب بينما كان متوسط قيم الحديد، الكوبالت، النيكل، الكادميوم، الرصاص، النحاس، الحارصين، الكروم و الألمونيوم كجزء من المليون 1.27، 2.07، 0.06، 0.015، 0.16، 0.2، 0.07، 0.065، 0.55 على الترتيب . أظهرت دراسة التحليل الطيفي للصمغ باستخدام الأشعة تحت الحمراء بأن مجموعة الهيدروكسيل، الكربونيل، الالكانات، الالكينات والفينولات تعد من الزمرات أو المجموعات الرئيسية بجميع عينات صمغ الكومبريتم قلو تنوسم التي تناولتها الدراسة . تم حساب متوسط الوزن الجزيئي من قياسات الضغط الازموزي 1.8×10^4 Dalton . لمحول الصمغ وقد وجد أنه تمت دراسة سمية صمغ الكومبريتم قلو تنوسم باستخدام الخلايا المعزولة داخل المختبر على نوعين من الخلايا السليمة و نوعين من الخلايا السرطانية. فكان متوسط قيم تركيز الصمغ الذي يعمل على تثبيط نمو عدد 50% من الخلايا الحية

فى نوع من الخلايا السليمه على النحو التالى 108.25 ميكروجم/مل فى خليه سليمه معزوله من كليه لجرذ هامستر
و500 ميكروجم/مل لخليه الجلد السليمه . فى حين أن متوسط النتائج على الخلايا السرطانيه جاءت على النحو
التالى 51.75 ميكروجم/مل فى خليه كبد سرطانيه معزوله من الانسان و44.5 ميكروجم/مل فى خليه قولون
سرطانيه معزوله من الانسان .

تم تقدير الجرعه البادئه المتوقعه للجرعه القاتله من قيم التركيز التى تعمل على تثبيط نمو عدد 50% من الخلايا حيث
تراوحت النتائج بين 0.02 و0.03 جم/كجم من فى الخليه السليمه و0.015 جم/كجم فى الخليتين المسرطنتين
الممثلتين .

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