

International University of Africa
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**Physiochemical properties and biological activity of coffee
seed fixed oil**

A Thesis Submitted for the Partial fulfillment of the requirements of
the M. Sc. Degree in Industrial Chemistry

By

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Dedication

I dedicate this work to the soul of my father passed away before seeing the value of this research.

To my dearest mother, the greatest women whom I ever Known, the candle which had brightened my life.

Special dedication to my dear husband (Nzar Azrag), my daughter Maysam and My son EL saeed .

It also extend to my grandmother, sisters and uncles with gratitude and love .

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ABSTRACT

The research was performed to investigate the physiochemical properties, oil constituents and biological activity of coffee obtained from Masaodia market, Northern El Gezira State, Sudan.

The results showed that oil content of coffee seeds was (3.6617 %), Oil moisture content (0.3863%), Refractive index (1.4643), Viscosity (215.47), Density (0.9081), Colour; Blue (4.7), Red (6.1) and Yellow (17). The chemical compositions of coffee seeds oil, acid value (0.7854). Saponification value (172.5075). Peroxide value was found to be (2.25 meg/g). Unsaponification was found to be value (4.7%). Iodine value was (101.52 meg/g). The oil composition showed that coffee seeds oil exhibit 23; the major constituents (more than 10) are Linoleic acid (C18:2) (35.77%) found as 9, 12-octadecadienoic acid (Z, Z) methyl ester (35.30%) and 9, 12-octadecadienoic acid (Z, Z) (0.47%), followed by Palmatic acid (C16:0) (29.84) found as Hexadecanoic acid, methyl ester (29.35%) and n- Hexadecanoic acid (0.49%), followed by Oleic acid (C 18:1) found as 9-octadecadienoic acid-(Z), methyl ester (14.37%) and Stearic acid : Octadecanoic acid : C18:0 which was found as Methyl stearate (10.40%). Minor oil constituents were Arachidic acid (C20:0) found as Eicosanoic acid methyl ester (4.83%). Minor proportion as arachidic acid (C20: 0) with (1.89%). All the other oil constituents are traces elements (less than 1). Biological activity of coffee seed oil results showed that 50, 25 and 12.5 % concentrations have the same inhibitory zone (1.5) and the less in 100% against *E. coli*. While in *Pseudomonas* showed inhibitory zone of (0.5), (1) and (1.5) for concentration 100%, 50% and 25% respectively. For *Klebsiella* showed only inhibitory zone of (1.7) in 100% concentration. *Candida* and *Staphylococcus* showed no inhibitory zone under all concentrations. The increase in inhibitory effect with dilution may be due to methanolic alcohol a antiseptic with synergisms of coffee seed oil.

ملخص الاطروحة بالعربية

هذا البحث اجرى لفحص الخواص الفيزيائية والكيميائية ومكونات الزيت المستخلص من حبوب البن الخضراء، تم الحصول عليها من السوق المحلي للمسعودية، بولاية الجزيرة، السودان.

اوضحت النتائج ان نسبة الزيت في البن كانت (3.6617%)، والخواص الفيزيائية كانت: رطوبة الزيت (0.3863%)، معامل الانكسار (1.4643)، اللزوجة (215.47)، الكثافة (0.9081)، اللون: الازرق (4.7)، الاحمر (6.1)، والاصفر (17).

الخواص الكيميائية لزيت بذرة البن الخضراء كان رقم الحمض (0.7854)، رقم التصبن (172.5075)، المواد غير المتصبنة (4.7)، رقم اليود (101.52 ملجم / جم)، رقم البيروكسيد (2.25 ملجم / جم).

مكونات الزيت باستخدام كروماتوغرافيا الغاز السائل مع الكتلة الطيفية أعطى 23 مركب. المركبات الرئيسية (اكبر من 10%) كانت حمض اللينوليك (35.30%)، يليه البالماستيك (29.35%)، ثم الاوليك (14.37%)، والاستيريك (10.40%). المركبات الثانوية (1- 10%) منها حمض الاراشيديك (4.83%). والبقية كلها توجد في شكل آثار (أقل من 1%) اشهرها حمض البهنيك.

النشاط البيولوجي لزيت بذرة البن الاخضر بتراكيز 50%، 25%، 12.5% اعطت أعلى فاعلية في مجال قدره 1.5 مم والاقل في تركيز 100% كان في مجال 0.5 مم بالنسبة لبكتريا (*E. coli*). وبالنسبة ل (*Pseudomonas*) في تركيز 12.5% لم تعطي اي تأثير، وتركيز 25% أعطى مجال تأثير وقدره 1.5 مم ، في 50% كان مجال تأثيره 1مم، وبتركيز 100% كان مجاله الاقل 0.5 مم. اما في باكتريا (*Klebsiella*) أعطت معدل تأثير (1.7) في تركيز 100% بينما بقية التراكيز لم تعطي اي تأثير. في حالة بكتريا (*Staphylococcus*) وفطر (*Candida*) لم يكن للزيت أي تأثير في جميع التراكيز.

ونخلص الى ان الزيت يمكن إستخدامه مضاد ضد انواع البكتريا الثلاثة الاولى.