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Extraction and physiochemical analysis of essential oil from ginger (*zingiber officinale*) using steam Distillation

**A Thesis submitted in Partial Fulfillment of the Requirements of the Degree
of Master in Industrial Chemistry**

By

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى:

{وَيُسْقَوْنَ فِيهَا كَأْسًا كَانَتْ مِزَاجُهَا زَنْجَبِيلًا}

صدق الله العظيم

سورة الإنسان الآية 17

DEDICATION

*I dedicate this work to my beloved
parents*

*Brothers and sisters, my lovely wife Ifrah
Abdi Bashir and my all Friends.*

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Abstract

Medicinal plants have gained an important role in production, pharmacy and export due to their increasing use as raw materials in the pharmaceutical industry and in daily life. Ginger is one of the most common and widely used medicinal plants in the world, widely used as spices and herbal remedies and is available on the market. The main objectives of this study were to extract the essential oil from ginger root powder (*Zingiber officinale*) using steam distillation method and to identify some of the physical and chemical properties of the extracted oil, as well as to identify the chemical components of this oil using a gas chromatograph with GC / MS. The oil was extracted from the ginger root using steam distillation method. The study showed the following results were obtained 5.10% oil yielded, moisture content (7.39%), crude protein (8.40%), crude fibers (18.39%), total ash (1.67%). In addition the physiochemical properties of extracted essential oil the density were 0.90g/cm^3 , Refractive index 1.49 nDt, Viscosity 25.18g^2 , Color degree (red - yellow - blue) 0.1 – 25.03 – 0.0, Acid value 0.38, Peroxide value 1.74%, Saponification value 186.31, unsaponification value 0.79 and Iodine value 113.76. The chemical composition of essential oil was investigated by GC-MS in which the chemical constituents were identified, showed Carvone (18.70%), cyclohexadiene, β -Sesquiphellandrene (16.77%), ([alpha-Zingiberene](#)) (12.20%) (alpha-Curcumene)(8.46%), .beta.-bisabolene (6.71%), .alpha.-farnesene, (3.89%), as major component, where other minor component ranging from (1 to 0.03%) such as Gamma.-muurolene (2.90%), D-limonene (2.63%), EndoBorneol(1.31%), Eucalypol (1.10%).

مستخلص البحث

قد اكتسبت النباتات الطبية دوراً هاماً في الإنتاج والصيدلة والتصدير بسبب ازدياد استخدامها كمواد خام في صناعة الأدوية وفي الحياة اليومية , والزنجبيل هو من أحد النباتات الطبية الأكثر شيوعاً ووجوداً في العالم تستخدم بصورة واسعة كتوابل وفي العلاج بالأعشاب وهو متوفر في الأسواق . والهدف من هذه الدراسة هو استخلاص الزيت الطيار من جذور الزنجبيل والتعرف على بعض الخواص الكيميائية والفيزيائية لزيت المستخلص , وكذلك التعرف المكونات الكيميائية لهذا الزيت باستخدام بواسطه جهاز كروماتوغرافيا . وتم استخلاص الزيت من جذور الزنجبيل GC/MS الغاز المزود بمقدر مطياف الكتله (5) 10 باستخدام طريقة التقطير البخاري , واطهرت الدراسة النتائج التالية: نسبة الزيت (%) (وكذلك نسبة 7.39% (ونسبه البروتين الخام (8.40%) ونسبه الرماد (1.67%) والرطوبة . بالإضافة الي ان الخواص الكيميائية و الفيزيائية للزيت (18.39%) الألياف الخام المستخلص فقد وجدت كما يلي : كثافه الزيت (0.90), اللزوجة (25.18), معامل الانكسار (, درجه اللون (احمر 0.1-اصفر 25.03 – ازرق 0.0), القيمة الحموضة (038), 1.49), رقم البيروكسيد (1.743), قيمه المواد المتصبينه (186.31), قيمه المواد الغير المتصبينه (وتم GC/MS). وتم تحليل الزيت المستخلص عن طريق (113.76) (0.79), رقم اليود (والمركبات الأساسية كما يلي: ; التعرف على المكونات الكيميائية في الزيت ونسبها

Carvone(18.70%) , (β -Sesquiphellandrene) (16.77%) ([alpha-Zingiberene](#)) (12.20%) (alpha-Curcumene)(8.46%) , .beta.-bisabolene (6.71%) , .alpha.-farnesene , (3.89%) , Gamma.-muurolene (2.90%) , D-limonene (2.63%) , Endo-Borneol(1.31%) , Eucalypol (1.10%).

(Alpha – pinene) مثل المركبات 1-0.03 بينما المركبات الثانوية توجد بنسب متقاربة ما بين (%) Comphene(0. 61) Isoborneol(1.1) و Eucalypol (1.10) و pinene(0.25)

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