

# **International University of Africa**

## **Deanship of Postgraduate Studies**

### **M.Sc. Research Thesis Entitled**

**The capacity of resolution, interpretive efficiency and the  
quantitative capabilities of GC.MS instrument.**

**A Thesis in Partial Fulfillment for the Requirement of Master Degree in  
Industrial Chemistry**

**BY**

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الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(وقل رب زدني علما)

صدق الله العظيم

سورة طه الآية (114)

## *Dedication*

*To my father, mother, wife, Children,  
who always behaved and believed on me.*

## **Acknowledgements**

I would like to thank Allah, Almighty, for giving me health to do this .Thanks for my supervisor professor *Younis Mohammed AlhassanYounis* for this tireless support to gain my master degree in industrial chemistry for drawing me a map and showing me a road and for his time and patience during the most critical times

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## Abstract

In the present study a fast and efficient GC/MS-analysis of a number of volatile and semi-volatile, different classes of organic compounds ranging from simple to complex molecules have successfully been separated, identified qualified and quantified. These compounds are also obtained or extracted from different kinds of naturally occurring origin or industrially manufacture sources e.g. natural products, essential oils, fatty acids in seed oils, pharmaceuticals, drugs, environmental pollutants, pesticides residues, residual solvents in locally manufactured drugs, alkaloids and flavonoids.. In the present study the GC/MS efficiency in terms of resolution of the components of mixtures of these natural products extracts have been tested and the precision of the instrument was confirmed and validated via its ability to identify compounds at level of 1 ng. Moreover the wide range of analytical applications via its capacity to analyzed. In the current research work the following natural products have been analyzed such as caraway oil (*Carum Cavi*) and *Cuminum* for essential oils *Sesamun seeds* oil for fatty acids composition,,Lupin (*Lupinus termis*) (*Cannabis*) for alkaloids,*Acacia Nilotica* for flavonoids ,(Omega 3),(VitaminA) for food supplements, *Petrol fraction* for hydrocarbons,(*Fade Cream*),(*Sivo Clear*), (*Max beauty*) for cosmetics, (*Valproic acid*) for drugs, (*fish and human serum sample*) for pesticide residue. Performing these tests by applying different types of extraction procedures, samples preparation and temperature programs. The laboratory results have revealed the precision capacity, the high resolution capability and accurate structural elucidation power of this highly recommended analytical laboratory technique. The GC-chromatograms and mass spectra of these representative examples have been reported in this research manuscript.

## المستخلص

في هذه الدراسة المعروضة تم استخدام جهاز كروماتوغرافيا الغاز ومطياف الكتلة في تحليل عدد كبير جدا من العينات المختلة البسيطة والمعقدة ذات المحتوى العضوي المتطاير وشبه المتطاير باستقلال الكفاءة العاليه والسرعه في التحليل لهذا الجهاز ,وقد تم وبنجاح كبير فصل عدد كبير من المركبات العضويه والتعرف عليها وتحليلها تحليلا كيميا وكيميا. هذه المركبات تم استخلاصها من انواع واجزاء مختلفه من المنتجات الطبيعيه او الصناعيه على سبيل المثال التحاليل البيئيه وابحاث الأغذيه وتحليل الأحماض الدهنيه في الزيوت الثابته وكذلك تحديد المركبات العضويه في الزيوت الطياره والأساسيه ومتبقى المذيبات العضويه المصاحبه للصناعات الصيدلانيه والمسح العام للمستخلصات النباتيه المختلفه ومتبقى الأسمده والمبيدات في العينات المختلفه, كذلك تحديد المواد الفعاله في الأدوية والمكملات الغذائيه والنكهات ,من الأمثله للمركبات العضويه التي توجد في هذه العينات مثلا التربينات والفلافونات والقلويدات في المنتجات الطبيعيه .تم من خلال هذه الدراسة التقييم العملي للجهاز من ناحية الكفاءه في الفصل والدقه والمصداقيه في تراكيز ضعيفه جدا حتى في حدود النانوغرام .تضمن هذا البحث تحليل عينتان لزيوت طياره مختلفه وهما زيت الكمون (حبة البركه) وزيت الكراويه , وعينه لزيت ثابت وهو زيت السمسم لتحديد نسب الأحماض , أيضا تضمنت الدراسة تحليل عينتان مختلفتان لمستخلصات نباتيه وهى عباره عن نبتة الحشيش وحبوب الترمس لتحديد نسب القلويدات , كذلك تم تحليل عينه لستخلص حطب السنط لمعرفة المواد الدايعه والتانينات , كذلك تضمن البحث تحليل عدد عينتان من المكملات الغذائيه المصنعه(أوميقا 3) و(فايتامين أ) , كذلك تضمن البحث تحليل عينه بتروليه لتحديد نسب الهيدروكربونات الموجوده فيها , وثلاثه عينات مختلفه من مستحضرات التجميل , كذلك تحليل عينه لخاص دوائى(صوديوم فالبرويت) , كذلك عينتان لتحديد متبقى المبيدات وهما عينة سمك وعينة دم لإنسان. وقد مرت هذه العينات خلال هذا البحث على معالجات كثيره ومختلفه من طرق إستخلاص وتحضير أيضا ظروف مختلفه خاصه بعمل الجهاز. كل النتائج العمليه أكدت ثبات وكفاءة ودقة ومصداقية الجهاز. تقارير النتائج مدونه في باب النتائج .

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<b>List of Abbreviations</b>	<b>Page No</b>
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<b>(TLC)</b> Thin Layer Chromatography	<b>1</b>
<b>(HPLC)</b> High Performance Liquid Chromatography	<b>1</b>
<b>(RT)</b> Retention Time	<b>2</b>
<b>(Ng)</b> Nonogramme	<b>3</b>
<b>(He<sub>2</sub>)</b> Helium	<b>4</b>
<b>(N<sub>2</sub>)</b> Nitrogen	<b>4</b>
<b>(CPU)</b> Central Processing Unit	<b>5</b>
<b>(O)</b> Oven	<b>6</b>

<b>(I)</b> Injector	<b>6</b>
<b>(W)</b> WCOT Column	<b>6</b>
<b>(TL)</b> Transfer Line	<b>6</b>
<b>(IS)</b> Ion Source	<b>6</b>
<b>(E)</b> Electron Beam	<b>6</b>
<b>(EI)</b> Electron Impact	<b>6</b>
<b>(CI)</b> Chemical Ionization	<b>6</b>
<b>(A)</b> Analyzer	<b>6</b>
<b>(D)</b> Detector	<b>6</b>
<b>(T)</b> Terminal	<b>6</b>
<b>(S)</b> Data Storage Devise	<b>6</b>
<b>(QP)</b> Quadruple	<b>8</b>
<b>(FID)</b> Flame Ionization Detector	<b>19</b>
<b>(TCD)</b> Thermal Conductivity Detector	<b>20</b>
<b>(ECD)</b> Electron Capture Detector	<b>21</b>
<b>(NPD)</b> Nitrogen Phosphorus Detector	<b>22</b>
<b>(SIM)</b> Selective Ion Monitoring	<b>12</b>
<b>(TIC)</b> Total Integration Chromatogram	<b>12</b>
<b>(NIST)</b> National Institute of Standards and Technology	<b>17</b>
<b>(OC)</b> Organo chlorine	<b>32</b>
<b>(MeCNA)</b> acetonitrile	<b>32</b>