Detection measurements of some drugs materials in fingerprints Using Gas Chromatography–Mass Spectrometry (GC-MS)

Fatimah Mohammed Jasim[1]*, Samira A. Mahd[2]
[1,2] Physics Department, College of Science, Babylon University, Iraq
Email: fatima.jasm.scihigh90@student.uobabylon.edu.iq
Email: sci.samira.adnan@uobabylon.edu.iq

Abstract
The major goal of this project is to use the Gas Chromatography–Mass Spectrometry (GC-MS) instrument to evaluate the fingerprints of illicit amphetamine. Samples of amphetamine were obtained from the Iraqi Narcotics Control Bureau. The fingerprints were examined before and after contamination with anesthetic powder. The results showed a clear difference between the spectrum of the pure fingerprint and the spectrum of the contaminated fingerprint with amphetamine. The highest peak of the drug sample was recorded at the time (6.80) minutes and Abundance 120000, and in contrast the appearance of the same peak in the fingerprint sample at the time (6.80) and Abundance 120000, and thus we find that the (GC-MS) device is sensitive for a small amount of drugs and can be used to detect it in the fingerprints.
Keywords: GC-MS device, Amphetamine, Drug.

1. Introduction

The identification of illegal substances, particularly the alkaloids heroin, cocaine, and amphetamine, is a major source of worry. The volume of illicit substances flooding Iraq is enormous, and it is predicted to become considerably more in the future. Many government agencies and commercial businesses do drug testing.
The number of drug samples seized by drug squads or societies and suspected of containing restricted components is steadily rising [1].
The use of fingerprints to identify people has grown routine, and this identifying function is a valuable tool all around the world. Some people are unaware that the usage of friction ridge skin impressions as a form of identification dates back thousands of years and has been practiced in a variety of cultures. Friction ridge skin imprints have been used as confirmation of identity in China from at least 300 B.C., Japan since A.D. 702, and the United States since 1902 [2].
The hyphenated analytical technique Gas Chromatography–Mass Spectrometry (GC-MS) combines the separation capabilities of gas-liquid chromatography with the detection feature of mass spectrometry to identify distinct compounds within a test sample. The volatile and thermally stable substitutes in a sample are separated by GC, whereas the analyte is fragmented by GC-MS and identified by its mass. The inclusion of a mass spectrometer transforms it into GC-MS/MS. Single and triple quadrupole modes provide superior performance [3,4].
Esters [5], fatty acids [6], alcohols, aldehydes [7], terpenes [8], and other compounds are all analyzed using GC-MS. GC-MS is also used to detect and measure pollutants [9], food deterioration and adulteration [10], oil, butter [11], and ghee, which are potentially dangerous and should be regulated by government bodies. Piperine spearmint oil [12], lavender oil, essential oil, fragrance reference standards, perfumes, chiral compounds in essential oils, fragrances, menthol, allergens, olive oil, lemon oil, peppermint oil, yiang oil, straw berry syrup, butter triglycerides, residual pesticides in food and wine are all tested with it [10,13].The particles from the suspect can be analyzed using GC-MS to determine his involvement in the case. The American Society for Testing Materials (ASTM) standard for fire debris analysis can be used to determine the analysis of fire debris using GC-MS. It's also employed in forensic toxicology to look for poisons and steroids in biological materials from suspects, victims, or the deceased [14]. Amphetamines are stimulants that boost the body's metabolic rate. Some are lawfully prescribed and used to treat A.D.H.D. Amphetamines were originally sold as Benzedrine in an over-the-counter nasal decongestant inhaler in the 1930s. By 1937, prescription-only amphetamines were available in tablet form for the treatment of narcolepsy and attention deficit hyperactivity disorder (ADHD). The usage and abuse of illegally synthesized amphetamines has grown over time. Amphetamine production in secret laboratories has exploded in recent years, and the drug's usage has skyrocketed. Narcolepsy (regular and uncontrollable episodes of sleep) is treated with amphetamine, while methamphetamine is used to alleviate obesity in the short term. Both medicines are stimulants of the central nervous system, and both have the potential for abuse. Their mechanism of action in the treatment of ADHD is unknown [15].

Experimental Procedure mass spectrometro

The principle of mass spectrometry is based on the

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displacement of chemical compounds in order to generate charged particles and determine the mass-to-charge ratio. The process begins with the sample being placed in the mass spectrometer, where the compounds are ionized in various ways (for example, by bombarding them with an electron beam), resulting in charged ions. The mobility of these ions inside electromagnetic fields is used to calculate the mass-to-charge ratio of these particles.The GC-MS device Figure(1) consists of three parts:-

1. Injector.
2. Mass Analyzer.
3. The oven.

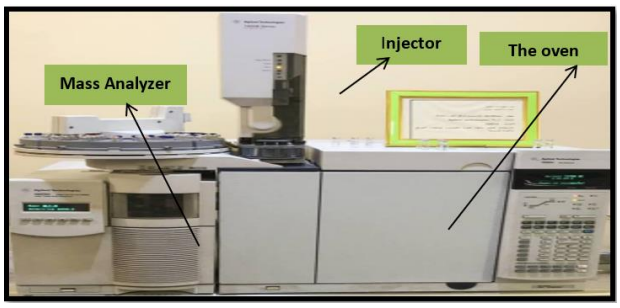

Figure 1 : The GC-MS Spectrometer.

Preparing Samples

The General Directorate for Combating Drugs and Psychotropic Substances provided an amphetamine sample. Amphetamine tablets are 167mg in weight, and molecular formula is C9H13N and chemical constructor as shown in Figure (2).

Figure 2: chemical constructor of amphetamine[1]

The samples taken from the General Directorate of Narcotics Control in the form of tablets, An electric crusher was used to crush the amphetamine pill. First, the powder of the narcotic substance was examined to ensure that it was actually amphetamine by taking 0.05 g of the substance and dissolving it with 0.5 ml of methanol using the Vortx Mixer device, and then diluting it with 5 ml of the same substance. Then 2 ml were taken of the diluted solution is equivalent to a whole vial, and 1 ml of it was injected into the GC-MS device. Second, a fingerprint was taken on a special slide before contaminating it with amphetamine. Next, between 1 and 2 mg of amphetamine powder was placed on a clean glass slide. The finger was washed well with soap and water, dried, then contaminated with anesthetic powder, and excess powder was removed with a clean brush, then the imprint was placed on another slide, the place of the imprint was wiped before and after contamination with the drug, and each of them was placed in 2 ml of methanol, and 1 ml of Each of them it was injected into the Gc -Ms device.

2. Results and Discussion

Chemical analysis using gas chromatography (GC) and mass spectrometry (MS) is a powerful combo. Gas chromatography separates compounds into complicated mixtures, whereas mass spectrometry identifies the molecular weight and ionic fractions of individual components, assisting in compound identification. Because it is a particular test, GC-MS is a fantastic technique for professionals to learn about the material in a sample. A specific test determines the presence of a specific drug in a sample in a positive manner. The GC analytical process produces a chromatographic result that is representative. The sample is injected into the GC instrument's injection port by the analyser. The injected sample is evaporated, and the individual components are separated by GC. Each component in the sample produces a distinct peak, which is electronically recorded. The retention time, which is the time elapsed and recorded between the injection of the sample and the washing procedure, is measured by the GC (separating one substance from another). The retention time aids scientists in distinguishing certain substances the peaks recorded are often proportionate to the amount of material present in the studied sample.

Figure (3a, b) shows the spectrum of the real amphetamine stored in the device, and the spectrum of the examiner substance. The appearing results are identical of both tests all about 83%. Also, the substance that was examined is amphetamine (or what so called cbtagone) with the formula Molecular (C9H13N) and molecular weight (135.10 g).

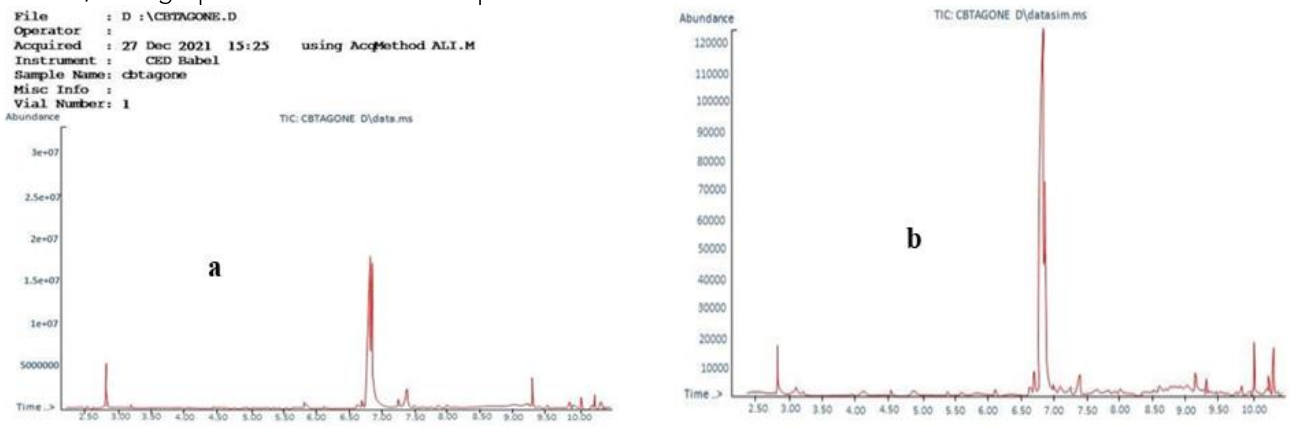

Figure 3 (a) The spectrum of the real amphetamine stored in the device, (b) the spectrum of an examining material.

Figure (4a, b) shows the spectrum of the real pure fingerprint stored in the device (before smearing it with anesthetic powder) and the spectrum of the same fingerprint that was examined by the device, where the congruence between the two spectra indicates that the fingerprint is pure.

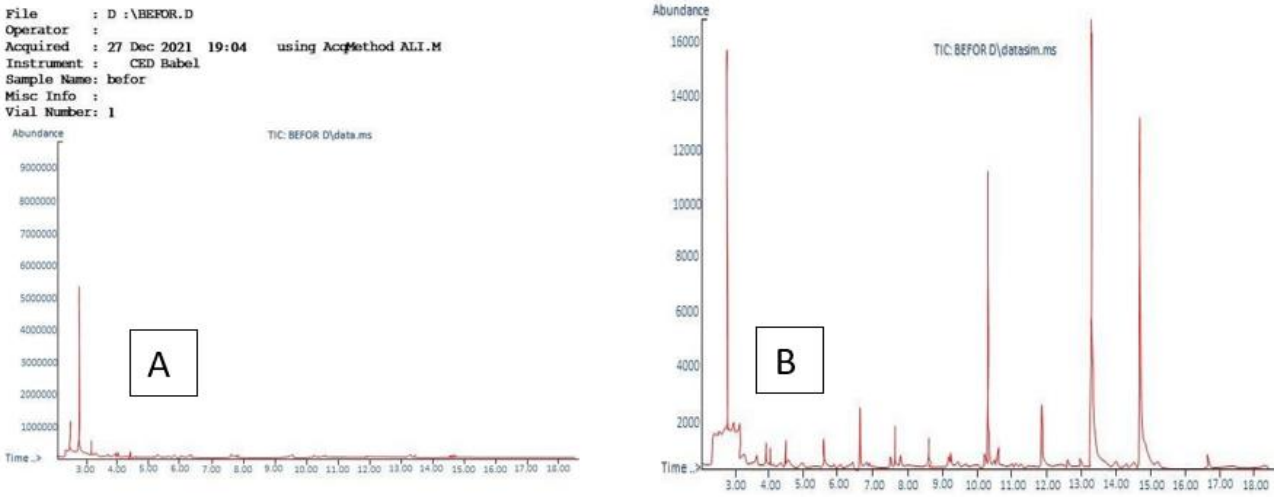

Figure 4 (a) the spectrum of the real pure fingerprint stored in the device, (b) the spectrum of the same fingerprint that was examined by the device.

On the other hand, Figure (5a,b) shows the spectrum of the fingerprint contaminated with the real narcotic substance powder stored in the device, and the spectrum of the fingerprint itself that was examined by the GC-MS device. When a contaminated fingerprint was examined in the GC-MS device, amphetamine with the molecular formula (C9H13N) and molecular weight (135.10 g) was detected. This fingerprint spectrum indicates that the substance is clearly amphetamine, as the matching ratios between the two spectrums were 83% .

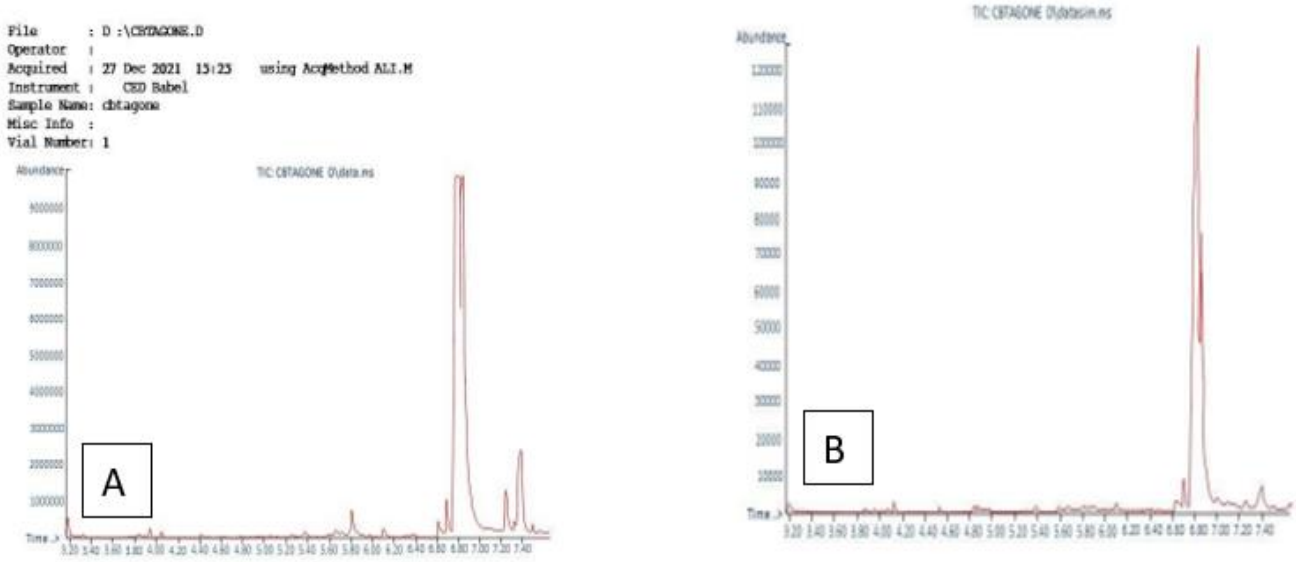

Figure 5(a) the spectrum of the fingerprint contaminated with the real narcotic substance powder stored in the device, (b)the spectrum of the fingerprint itself that was examined by the GC-MS device.

3. Conclusion

GC-MS is a powerful and adaptable analytical technique with a wide range of applications, particularly in forensic medicine. able to tell if narcotics have an effect on fingerprints Its automated technique is simple and quick to use, and it produces quick, repeatable, and effective findings that are critical in Forensic Advance. The results obtained in this research using the GC-MS device showed a clear match between the real samples represented by the drug powder sample and the fingerprint sample contaminated with the drug powder.

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