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Applications of GC-MS Used In Herbal Plants

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ABSTRACT-Most drug based on herbal plants for manufacturing of chemicals; hence herbal plants are major importance in biotechnology research. Many herbal constituents used as flavours, fragrances, pharmaceutical chemicals and food colors in India. The most of the herbal product were prepared from plant extracts, which contain different Phytochemical constituents (plant secondary metabolite). The amount and identity of produced compound was correlated with therapeutic effect. The GC-MS used to analyze the extracted extract, that is useful for the determining the quantity of active principles in herbal plants used in cosmetics, medicines, food industries and pharmaceutical. The purpose of this study was to use gas chromatography and mass spectroscopy to identify the bioactive compound from entire plants. The GC-MS analyze the presence of various alkaloid, terpenoid, flavonoidal and glycoside phytoconstituents in herbal plants.

Keywords- Gas chromatography-mass spectroscopy.

I. INTRODUCTION-

Plants have been used to treat diseases since the dawn of civilization, and complementary medicine continues to perform most valuable role in the treatment of a variety of ailments. Complementary medicine, in general, has a long history of helping people from all over the world. Folk medicine has risen in prominence in recent years, owing to historical, cultural, and other factors, particularly in developing countries. The lack of scientific assessment of medicinal plants, on the other hand, may have significance consequences. (1) Herbal research include isolating and elucidating the structures of plant chemicals in order to better understand and assessment of their therapeutic effect. An increasing approach towards immediate identification of active phytochemical constituents from various matrices and the exact analysis of these phytoconstituents necessitated the improvement of the experimental design in order to obtain higher recoveries, less solventintake, and a more precise study of these active herbal constituents. Spectrophotometry, high-performance liquid chromatography, capillary electrophoresis, and gas chromatography are only a few of the extraction and analytical methods that have been developed to research plant active chemicals. (2)

Herbal medicine was the life-saving drug in comparison to contemporary medicine. Just 6% of the 4, 00,000 plant species have been researched for biological function, and only a few have been explored phytochemicals. This demonstrates that many medicinal plants require further research into their activity and pharmacological qualities. For phytochemical analysis, Gas Chromatogram Mass Spectrometric technique was used, followed by qualitative and quantitative assessment of the components. (3)

Principle of Gas chromatography-

Chromatography is a process that causes the separation of mixtures of components by the partitioning performance between mobile and stationary phase. It is one of the most widely used chromatography process for separation of volatile substances. Helium is used as mobile phase, and high boiling point liquid as stationary phase that is absorbed on a solid. It is most important tool in analytical chemistry. Mixtures of various substances are partitioning between mobile and stationary phase. Substance in mobile phase attracted towards stationary phaseand passes through it. (4)

- **Principle of Mass spectroscopy-**

It is analytical process that detects the mass to charge ratio of electrically charged species. It is play very important role in determine the mass of various species. The principle of MS consists of chemical components that are ionized to produce charged species or molecules or their fragments and detect their mass to charge ratio by applying various process. (5)

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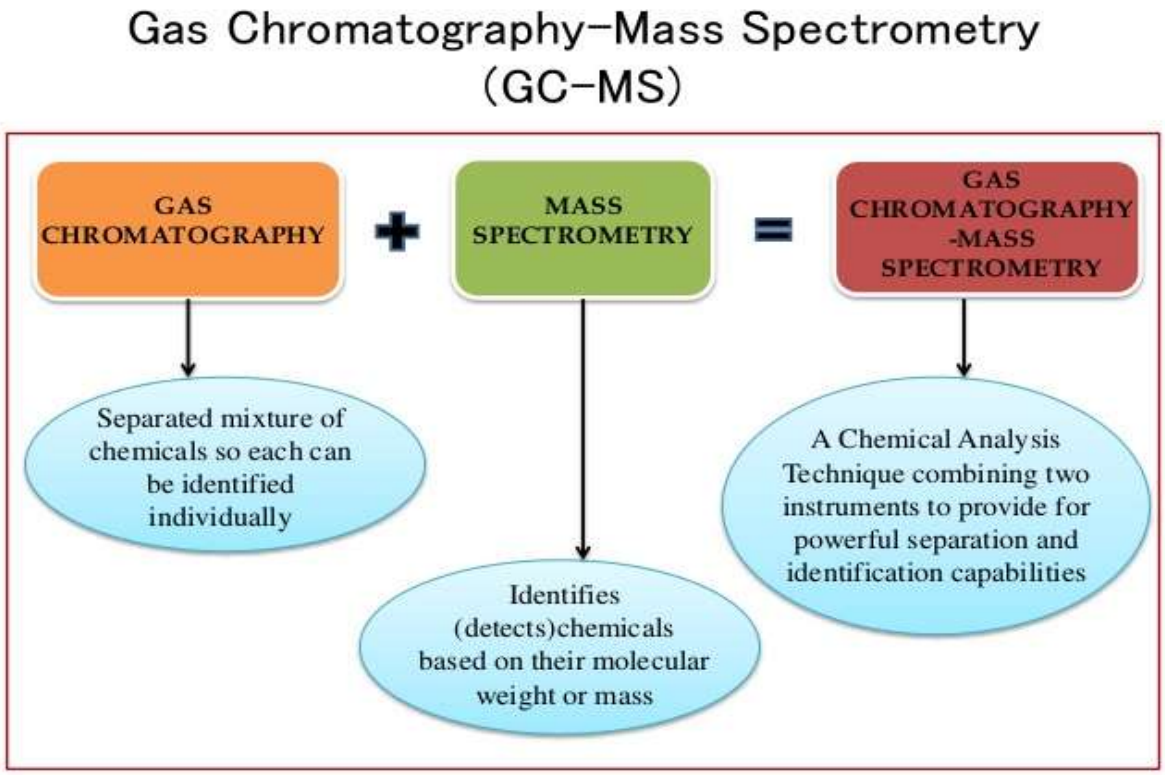
- **Principle of GC-MS:**

1. The injection of sample solution into inlet of GC, and the carrier gas vaporizes it and sweeps it onto a chromatographic column.
2. The interactions of compounds that make up the mixture of interest with the column coating (stationary phase) and the carrier has distinguish the compounds as the sample moves through the column (mobile phase).
3. The final segment of the column passes through a heated transfer line before arriving at the inlet of the ion source, where the eluting chemicals are converted to ions.

- **Applications of GC-MS in determination of phytoconstituent in herbal plants-**



1. Determinations of alkaloids

i. The leaves of Datura stramonium were dried for fifteen days at room temperature, and the fine powder was then packed in an airtight container to prevent the effects of humidity, and this container stored at room temperature. The ethanol extract of Daturastramonium was put through GC-MS analysis using a (Agilent 7890A series, USA). (6) From Amaryllidaceae alkaloids identified as narcissus contain galanthamine, lycoramine, narwedine, haemanthamine, tazzetine. (7)

ii. Withania somnifera and withania obtusifolia was used Perkin Elmer Clarus 500 gas chromatography system with an Elite-5 capillary column (30nm X 0.25mm) and a turbo mass gold mass detector and helium was used as carrier has.The injector temperature was set at 200^{0}°C, and the oven temperature was set at 600°C for 15 minutes before progressively increasing to 270^{0}°C after 3 minutes. The mass Spectra were compared to those in the Wiley and NIST Libraries to identify the components.(8)

iii. Fumariaagraria contain iso-quinoline alkaloids. The determination or identification of iso-quinoline alkaloid in Fumariaagraria was done by gas chromatography and mass spectroscopy indicates the presence of protopine, cryptopine, sinactine, stylopine, bicuculline, adlumine, parfumine, andfumariline. (9)

iv. Determination of Pyrrolizidine alkaloid in honey was done on an 7890 A GC system with a 5975 C VL MSD mass spectrometry

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detector. The injection port was heated to 250^0C, while the interface, source, and quadrupole were heated to 300, 230, and 150^0C respectively. With ionization by electron collision was 70 eV. The compound separation was performed on a DB-5 MS column with two microliters of material injected at a split ration 10:1. Helium was used as carrier gas. (10)

v. Alkaloids isolated from epipremnu maureum using Shimadzu GC-MS-2010 instrument operating in EI mode at 70ev. The column utilized was a Restek-5MS column (30m x 0.25mm x 0.25µm). The temperature of oven was set at 100^0 to 250^0C at 5^0C min-1 and held for 5 min at 250^0C and from 250^0C to 280^0C at 10^0C min-1 and held for 10 min at 280^0C. In typical injection mode, the injector temperature was 250^0C. As a carrier gas, helium is used alkaloids were discovered by matching mass spectral data with data from genuine substances and literature. (11)

2. Determinations of flavonoids-

i. Isoflavonoids determined by using GC in seven Red Cuban Propolis sample which contain isoliquiritigenin, liquiritigenin, formononetin, vestitol, neovestitol, and medicarpin.(12).

ii. Flavonoids in amaranthus caudatus by using PerkinElmer GC CLARUS 500 equipment was used for the analysis with column elite fused silica capillary operating at 70 eV electron impact mode and helium was used as carrier gas and volume of injection was 0.5 EI (split ratio of 10:1) temperature of injector was set at 250°C; temperature of ion-sourcewas 280°C. The temperature of oven was set to rise from 110°C (isothermal for 2 minutes) to 200°C, then 5°C/min to 280°C, with a 9-minute isothermal at 280°C. The pieces ranged in size from 40 to 550 Da, and the spectrum of mass was taken at 70eV with a 0.5 s scan interval. (13)

iii. Flavonoids in human plasma determined by GC-MS technique after consumption of cranberry juice contain anthocyanins. (14)

3. Determinations of Terpenoids –

i. Terpenoids content in cannabis sativa analyzed by using GC-MS which contains monoterpene, myrcene, sesquiterpenes, β-caryophyllene and α-humulene. (15)

ii. Terpenoid indole alkaloid determined in Rhazya Stricta where GC-MS was used to determine the alkaloid. (16)

4. Determination of Glycosides-

i. Quantitative determination of the saponins content in Cassytha fiiformis leaves by GC–MSD apparatus and split (50:1) injection system. An Agilent 19091S-433HP-5MS capillary column (30.00 m 0.25 mm inner diameter, 0.25 micrometer phase thickness) was installed in the gas chromatography. The GC oven was configured to go from 100 °C for 4 minutes to 300°C at a rate of 4 °C/min, and helium was used as a carrier gas. (17)

II. CONCLUSION-

Herbal plants, which have been the basis of traditional herbal medicine, in the passed ten years have been used for very useful pharmacological studies; this has been guide about acceptance value of herbal plants as effective sources of new chemicals which having therapeutic effect. In this the identification of biologically active compound in herbal plant was carried by using GC- MS analysis which identified the presence of alkaloid, flavonoidal, terpenoid, glucosidal compounds. On the basis of this study it can be assumed that herbal plants may play as a new effective source of chemicals due to availability of these phytoconstituents and biologically active compounds identified by gas chromatographic technique.

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