



ANALYSIS OF MAJOR CONSTITUENTS PRESENT IN CLOVE OIL EXTRACT BY GC-MS ANALYSIS

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ABSTRACT

Cloves are the aromatic flower buds of a tree in the family Myrtaceae, *Syzygium Aromaticum*. They are native from Maluku Islands in Indonesia. Indonesia is the largest producer of clove in the world, about 75% of global production is done in Indonesia. The present study was aimed to analyze the major constituents present in clove oil extracted from clove buds. The clove oil was extracted from clove buds using steam distillation and later on analyzed using GC-MS technique. It was found that eugenol was the main component present in clove oil sample alongwith eucalyptol, caryophyllene and many other minor constituents.

KEYWORDS: *Syzygium Aromaticum*, Myrtaceae, steam distillation, GC-MS.

INTRODUCTION

Aromatic plants are those which contain a characteristic odorous or aroma. These have been used in the Middle East since approximately 5000BC for their medicinal, preservative and flavoring properties. Aromatic plants are used as herbs, spices and enhance the aroma and flavour of foods.^[1-3] According to World Health Organization (WHO) around 80% population of our planet is still highly dependent on aromatic plants for healthcare and medicine.^[4-5] These plants also exhibit antioxidant and antiseptic properties^[2,6] and lessen the risk of various life threatening diseases such as cancer and cardiovascular diseases.^[7-8] Aromatic plants contain odorous, highly concentrated, volatile compounds known as essential oils obtained from various parts of the plant (like leaves, buds, flowers, seeds, twigs, barks, etc.).^[9-10] This study is aimed to analyze the major constituents present in a very precious species of aromatic plant- Clove.

Cloves (*Syzygium Aromaticum*)^[11] are the aromatic flower buds of a tree in the family Myrtaceae. They are native from Maluku islands, Indonesia.^[12] Zanzibar & Madagascar are major exporters of clove globally. The clove tree is an evergreen tree cultivated preferably in coastal areas at altitude 200m above sea level. The height of trees generally goes up to 8-12 meters with big round leaves (refer *Img.1*) and clove buds (refer *Img.2*) grouped together like a flower also called clove flowers. These buds are collected when the plants get matured by

mechanical or manual collection methods. It is one of the most ancient species dates back to first century. Han dynasty^[13] of China (250BC-220AD) firstly used clove as fragrance. In India, cloves were introduced by British East India Company in the spice garden of Courtallam, Tamilnadu.

Eugenol is the major component of clove oil. It has a variety of uses, used as an antispasmodic to treat gastrointestinal issues. In addition, it also possess antioxidant^[6], anti-inflammatory and cardiovascular properties^[14], antimicrobial^[15] properties. It is also used as an analgesic and anesthetic^[16-17] for frogs and fishes (amphibians). It also has a wide application in dentistry^[18] as an analgesic for toothache (refer *Img.3*), used in dental mouthwashes & used to fill dental cavities by a mixture of zinc oxide-eugenol cement.



(Image 1: Clove plant)



(Image 2: Clove buds)



Image 3: Commercial clove oil used as a remedy for toothache.

METHODS AND MATERIALS

Sample collection-The sampling of clove buds was done from local spice market of city.

Extraction of oil- The equipment used in the study was Clevengers apparatus. The isolation of clove oil from clove buds is done using Clevengers apparatus (ref *Img.4*) which operates on the principle of steam distillation. The clove buds (200grams) were taken in a

R.B.flask and 1200ml of water is poured accordingly, then the apparatus is turned on and temperature was slowly increased. After a couple of hours the clove oil started accumulating on the receiver tube of apparatus (ref. *Img.5*). The sample of oil is collected in a glass bottle (ref *Img.6*)

Agilent 8890/5977B is used for Gas chromatography-Mass spectroscopy (GC-MS) analysis.



Img. 4: Clevengers Apparatus.



Img. 5: Accumulation of clove oil in receiver tube.



Img. 6: Clove oil sample.

GC-MS ANALYSIS

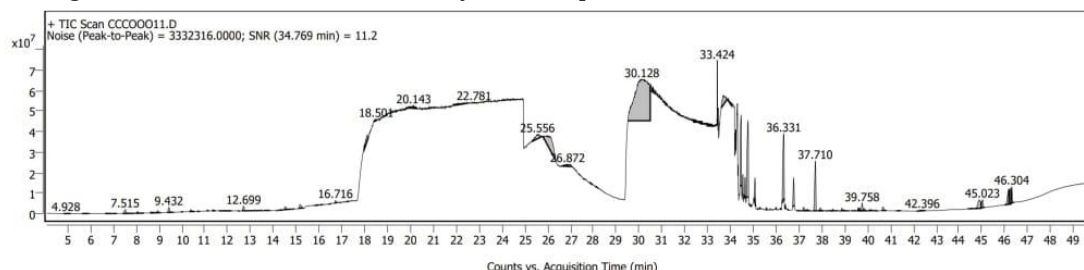
The GC-MS analysis of clove oil sample was carried out using Agilent 8890/5977B. The compound identification

was conducted using Masshunter GC/MS acquisition software by comparing the Wiley library data.

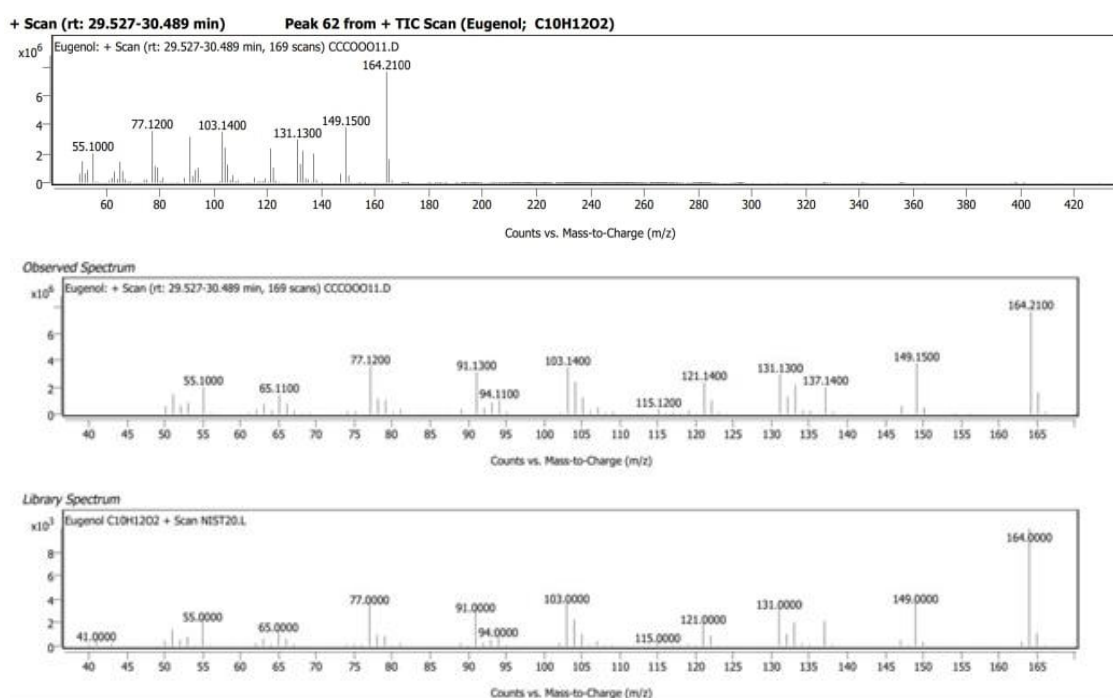
The major constituent of the isolated clove oil is Eugenol (41.60%). Some other compounds which are identified are- Eucalyptol (0.23%), Isothiocyanato cadinene (0.43%), Glycopyrrolate (0.05%), Coniferyl aldehyde

(1.78%), Benzyl benzoate (3.95%), Vanillin (1.78%), 2,3,4-Trimethoxyacetophenone(5.77%), N-ethyl-N-methyl-4-nitrosobenzenamine (4.96%).

The chromatogram obtained from the GC/MS analysis of sample oil:



The major component Eugenol is obtained at retention time 30.128 and is about 41.60%. The observed peaks and chromatogram and the observed and library spectra of eugenol are as follows:



RESULT

Many compounds are discovered by GC-MS analysis of the clove oil sample isolated from clove buds out of which it is discovered that Eugenol is the major component of the clove oil which is about 41.60% of total composition. Other components discovered are eucalyptol, glycopyrrolate, benzyl benzoate, vanillin, cadinene. According to various studies^[19-21] conducted on clove oil it was found that eugenol concentration is about 60-70% but in our sample we noticed 41.60% of eugenol. The concentration of eugenol depends upon the variety, purity, influence of climate, soil conditions, influence of fertilization and varies from species to species.

CONCLUSION

In this study, we analyzed the major constituents of clove oil sample which was isolated using steam distillation

method by Clevengers apparatus. The GC-MS study of clove oil sample provided information about the constituents present in it. The major component discovered is Eugenol (41.60%).

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