**eISSN 2581-8996**
[Date]
**THE INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN MULTIDISCIPLINARY SCIENCES (IJARMS)**
A BI-ANNUAL, OPEN ACCESS, PEER REVIEWED (REFEREED) JOURNAL
Vol. 4, Issue 01, Jan 2021

# Volatile Constituents and GC-MS Analysis of essential oil of Zingiber officinale (Ginger) by Cold Grinding Method

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Received: 20 Nov 2020, Accepted: 30 Nov 2020, Published with Peer Review on line: 31 Jan 2021

## Abstract

Herbal medicines formulated as oils were believed to possess more powerful effects than their original plants in Iranian Traditional medicine[1] Ginger has long been used in traditional medicine. The part of the plant that's used for these purposes is called the rhizome Ginger oil is greenish to pale yellow in colour with a characteristic warm and aromatic odour. It is widely used in food, pharmaceuticals and cosmetic industries. Grinding is an important step in processing because it involved the additional problem of volatility and loss of aroma giving essential oil present it. A low temperature grinding is much more effective to achieve flavour principles studied by practical way.

A comparative study of the control sample with that of cold grinding was performed qualitatively and quantitavely by GC-MS analysis. The quality nature of oil obtained was found to enhanced in terms of its number of constituents as well as its percentage and also showed that the oil content increased from 0.21- 39%. The percentage of the essential oil and the chemical composition of the cold ground sample showed the superiority of the product. Thus this cold grinding method may positively be used in the flavour industry to obtain better result and improve the product quality.

**Keywords:** *Zingiber officinal, Traditional, ginger oil, cold grinding, GC-MS analysis*

## Introduction

Oils are old forms of medication used in Iranian Traditional Medicine (ITM) and they are believed to have presented more powerful effects than their original plants[2]. Oils have been suggested as the most useful and suitable formulations for treatment of brain, nerve, utreus and stomach diseases; oils have been proved to be effective as pain relievers and temperament (called Mizaf in ITM) modulators[3]. Zingiber officinal Roscoe is one of the species and medicinal plants used world wide by the cosmetics pharmaceutical and the food industries. Ginger is the rhizome of zingiber officinals (family-zingiberaceae). It is used as spice for ever 200 years at is a common additive in many food preparation, beverages and is valued for its pungency and flavours properties[4]. The peculiar fragrance and flavour of ginger come from the volatile oils zingerane shogaols and gingerols bioactive phenolic compounds. Gingerol is the main compound that is responsible for the pungency. Raw ginger (adrak) or dried ginger (saunth) has been. extensively used for culinary (condiment) as well as home (herb) remedial purposes

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since ages due to its therapeutic properties such as calmative, anti inflammatory, anti-nausea, anti-carcinogenic, cardio-vascular and other disease preventive effects[5] Neuroinflammation simply referred to as inflammation of the nervous tissue is caused by variety of result to the brain ranging from infection, traumatic brain injury, toxic metabolites, or autoimmunity[6]. Recently it has been reported to contribute to the pathogenesis of neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease and multiple sclerosis[7]. In Ayurveda system, ginger and milk or water in the form of paste are used externally for treatment of infantile colic. The combination of ginger with honey is used for asthematic bronchitis, cough hiccups and respiratory cold.[8]

The objective of the present paper was to enrich the valuable oil content by cold extraction. Identify and compare the main constituents of the oil with that of control sample.

**Materials and Methods:**

A fresh lot of ginger sample purchased from local market Rawatpur, Kanpur and Chakarpur Mandi Kanpur U.P. was used as raw material for processing. Moisture content was estimated by toluene distillation method and volatite oil by hydrodistillation in a clevenger apparatus for 4-5 hours. The experimental sample was prepared by grinding with ice in different proportion (Sample: ice-1:02, 1:04, 1:06, 1:08, and 1:1) The oil sample were dried over anhydrous sodium sulphate.

**Gc-Ms Alanysis:**

Gc.-Ms analysis was carried out in a shimadzu Gc-Ms QP-2018 fitted with 50m□0.2 mm DB 0.17 mm thickness fused silica capillary coloumn with FID detector and a built in electronic integrator that was temperature programmed from 80UC (1min). to 220UC (20min) at 5U/min Helium was used as carries gas (2ml/min) with detector and injector temp. was 300 Uc and 250UC respectively. The constituents were observed by retention time[7]

**Result and Discussion:**

The essential oil waste extracted by hydrodistillation method. Experiment was carried out with the crushed rhizomes with and without ice and the constituents were analyzed by Gc-Ms. The volatile oil obtained by normal temperature of grinding was found to be 0.21% and after cold grinding process the oil content has increased to 0.37% in cold grinding process various proportion of ice tried were sample: ice 1:02, 1:04, 1:06, 1:08, 1:1, 1:1 and 1:08/ was found to be the excellent for oil yield and flavourt ever 1:06 was having also very good oil content and flavour yield.

The high temperature generated during the process of grinding resulted in the loss of aroma or flavor. At elevated temperature changes may occur in the volatile constituents which are of terpenoids. The aroma of the spice, which is constituted by terpenic compounds, undergoes many structural modifications during processing. This can be eliminated by cold grinding before the extraction of oil. The study of cold ground sample observed lot of compositional differences in their values (Table-1) GC-MS analysis of the experimental sample showed a number of additional compounds compared with that of control sample. The analysis resulted in the identification of 42 compounds in cold ground sample while 25 in case of normal ground sample. The major constituents are monoterpenes 7% in the experimental sample and 2.21% in control sample, which are the main aroma contributors for the fresh

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flavor. Experimental data clearly showed that quality improvement of the process in terms of its volatile oil content and flavour components. As the extraction procedure used for the essential oil by hydrodistillation, the new techniques of cold grinding is very effective.

Table-1 Comparison of chemical composition of fresh ginger oil by cold grinding & ordinary grinding.

| S.No. | Constituents | % in cold sample | % in control sample |
|---|---|---|---|
| 1. | α-Pinene | 0.27 | 0.10 |
| 2. | Sabinene | 3.00 | 1.40 |
| 3. | Linalool | - | 0.40 |
| 4. | Camphene | 1.21 | 0.56 |
| 5. | Barneole | 0.41 | 0.39 |
| 6. | Citral | 6.00 | 6.01 |
| 7. | α-Fenyl acetate | 0.99 | - |
| 8. | α-Terpeneol acetate | 0.32 | 0.22 |
| 9. | Copane | 0.42 | - |
| 10. | α-zingiberence | 38.21 | 37.22 |
| 11. | β-Sesquiphellandrene | 14.10 | 14.71 |
| 12. | Fernesol | 0.14 | - |
| 13. | α-Patchoulene | 0.43 | 0.39 |
| 14. | Germacrene | 1.00 | 0.80 |
| 15. | α-Farnesene | 11.35 | - |
| 16. | Elemol | 0.11 | 0.21 |
| 17. | Farnesal | 0.14 | 0.12 |
| 18. | Nerolidol | 0.23 | 0.10 |
| 19. | Bisabolene | 0.23 | 0.77 |
| 20. | α-Eudesmol | - | 0.43 |
| 21. | α-Curcumene | 0.41 | 6.50 |
| 22. | α-Bisabolol | 8.00 | 0.30 |
| 23. | 2-Butanone | 0.70 | 0.30 |
| 24. | Azulene | 0.11 | - |
| 25. | Eplglobulol | 0.10 | - |
| 26. | Juniper comphor | 0.33 | - |
| 27. | t cary ophyllene | 0.27 | 0.12 |
| 28. | Eremophilene | 0.08 | 0.06 |
| 29. | t- nerolidol | 0.53 | 0.42 |
| 30. | β-bisabolol | 0.50 | 0.47 |

**Conclusion:**

Processing of ginger into essential oil play an important role to improve the economy of country and also enhancing the standard of living of the people. traditionally[10]. In this study the result showed that extraction of ginger oil by cold grinding method gave excellent result and their aroma and flavour was having great constituent value. By applying this method we will improve the quality.

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