

Cultivation, Oil Extraction and Chemical Composition of Sweet basil (*Ocimum basilicum*) in Kannauj Region

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ABSTRACT: The place of Kannauj is very popular for the cultivation of aromatic crops. Sweet Basil is one of the valuable aromatic crops for this region. This study was carried to investigate the essential oil yield and contents of Sweet Basil plants grown in this region. Moreover, the main components of essential oil as well as oil yield and percentage of these components were also examined as a result of ideal cultivation in specific region. The sample for essential oil extraction was collected from cultivated region of Kannauj. The essential oil was extracted and consequently its percentage was calculated. The composition of the Sweet Basil essential oil was occurred by using GC-MS. The results of this study showed that the percentages of main components were improved and overall oil yield of Sweet Basil essential oil were 0.79%. Moreover, the percentages of the main components and oil yield improved as a result of traditional cultivation process of Kannauj region. The recovered essential oil was richer in Methyl chavicol (76.36%), linalool (17.61%), γ cadinene (1.89%). Apart from these, several other components were also present.

KEYWORDS: *Ocimum*, Essential oil, Methyl-chavicol, Linalool

I. INTRODUCTION

The plants which belongs to the basil genome or *Ocimum* genus of the Lamiaceae family are aromatic ^[1] and are considered to be a rich source of essential oils. Humans have learned to use the essential oils for food preservation, flavoring, and as medicine. The essential oils of basil are usually extracted from the leaves and flowering tops of basil plants. In the most of the centuries basil was cultivated for culinary and medicinal purposes, which created a great diversity of species within the *Ocimum* genus. According to the recent and past research studies more than 150 species of the genus *Ocimum* are present and this considered as one of the largest genera of the Lamiaceae family.

It is known, that different methods of cultivation in different regions cultivars have the genetic ability to generate and keep differences in the chemical compounds of essential oil. The role of environmental components like temperature, rainfall, relative humidity and soil moisture affect on the variation of oil content under the agro-climatic condition. The monsoon span is characterized by higher oil content, while the winter and autumn by comparatively lower oil content According to some valuable investigations ^[2], the essential oils extracted from various basil cultivars can contain alcohols (linalool), oxides (1,8-cineole), phenols (eugenol, methyl eugenol, methyl isoeugenol, thymol), esters (methyl cinnamate), aldehydes (citral), and camphor. The 1,8-cineole, methyl cinnamate, methyl chavicol, and linalool chemical constituents which are responsible for the distinct aroma of basil plants ^[3].

Lawrence ^[4] named four major chemotypes of basil: methyl chavicol-rich, linalool-rich, methyl eugenol-rich, and methyl cinnamate-rich and known to possess antioxidant and antimicrobial activity ^[5]. According to Marotti et al. ^[6] the European basil has mostly of linalool and methyl chavicol types, whereas tropical basil has methyl cinnamate as

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 6, Issue 11, November 2017

their major constituent. Methyl eugenol chemotype of basil found growing in North Africa, Eastern Europe, and parts of Asia^[7].

Several research papers have been published on the antimicrobial and antioxidant properties of essential oils of basil. Koeduka et al.^[8] and Zabka et al.^[9] investigated the antimicrobial activity of eugenol with analgesic properties for humans. Liu et al.^[5] reported that the antioxidant and antimicrobial activities of linalool and geraniol. While Soković et al.^[10] and Huang et al.^[11] investigated the usage of linalool, methyl chavicol, and thymol for skin protection against all sources of environmental skin aggressors and treatment of various dermatological disorders.

Since the biological activity and chemical composition of essential oils extracted from the plants belonging to the same species may vary significantly, depending on the variety of cultivars, climate conditions, and cultivation methods. In the present study the analysis of cultivation process and the chemical composition of essential oil of sweet basil has been done in specific region i.e. Kannauj. The purpose of this study was also to study the biological activities of basil essential oil and to evaluate their potential using in medicine.

II. LITERATURE SURVEY

Kruger H, Wetzel SB and Zeiger B, 2002 reported that the chemical variability are found in *Ocimum* species due to different region and climate condition^[2].

Klimankova E et al, 2008 reported that aroma profile of five different basil (*Ocimum basilicum* L.) cultivars grown under conventional and organic conditions^[3].

Lawrence BM, 1988 examined that the variation of *Ocimum basilicum* with flavors and fragrances^[4].

Marotti M, Piccaglia R, and Giovanelli E, 1996 investigated that differences in essential oil composition of basil (*Ocimum basilicum*) in Italian cultivars related to morphological characteristics^[6].

Joshi RK, 2014 reported that Chemical composition and antimicrobial activity of the essential oil of *Ocimum basilicum* L. (sweet basil) from western Ghats of north west Karnataka, India.

III. METHODOLOGY AND DISCUSSION

The sweet basil was grown from the seeds sown in the selected specific field; the plants of sweet basil were propagated through seeds because direct sowing of seeds in the field is not reasonable. Seedlings were first raised in the nursery and then transplanted to the field in the Kannauj region of India. The sweet basil was planted in mid of April.

Climate and Soil condition

Generally crops come up well in warm and humid climate. The climate of Kannauj region was well warmed and full of humidity condition. The temperature (20-30°C) and humidity was high which is favorable for basil plant growth and high oil production. The soil condition of selected field was wide range of soils, from moderately fertile, well drained loamy to sandy loam soils with a pH ranging from 7.0 to 7.5.

Land preparation and Transplanting

Approx six weeks old seedlings of sweet basil, which having a height of 10-15 cm were transplanted in the main field. Before transplanting the field was well plowing and applied 10 tons per hectare farmyard manure in soil. After that NPK was also added in 30:40:30 ratios. So we were transplanted the basil plants in evening time to avoid transplantation shock with spacing of 50cm between plants line and 40cm between plants which is an ideal process for basil cultivation^[12] Irrigate the field at the time of completed transplanting process.

Isolation of lemongrass essential oil

After 65 to 70 days of planting in field, the basil herbs were harvested and sun dried for 24 hours to reduce the moisture from the plants^[12]. Then these herbs were used for the steam distillation to isolate the essential oil present in the herbs.

Essential oil extraction

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Vol. 6, Issue 11, November 2017

The extraction of essential oil of sweet basil was extracted from air dried plant material by hydro-distillation, using a Clevenger-type apparatus. The distilled essential oil had been stored at 4 °C in dark airtight bottles until further analysis [13].

Assessment of oil components

The determination of the sweet basil oil components were carried out by gas chromatography mass spectrometry (GC-MS) on a gas chromatograph Agilent 6890 coupled to selective mass detector Agilent 5976 using ultra performance HP-5Methyl Silicone column (50 m × 0.25 mm i.d; 0.25 μm film thickness) and a split/splitless injector at 40 C/ min ramp rate and the Library NIST Mass Spectral Search Program. Split injection ratio 70:1, injecting 0.2 μl. The test was carried out at 250°C, the oven at initial 50°C for 2 minutes increasing 10 °C per minute till 200°C was reached. The flow was of 0.7 μl/min at a constant speed of 30 cm/s with a 250°C interface.

DISCUSSION

This study suggests that, the production of the sweet basil was ideal and the yield of the oil is equal to an ideal ratio. There were 21 different chemical components identified in Basil oil, the Methyl chavicol content of the oil was 76.36%. There is no research available to conclude the production and the component of Basil oil in the Kannauj region. This study can help both farmers and industry to know the total percentage of oil and chemical composition of the basil oil.

IV. RESULTS

The basil was successfully planted in the field. In one year total 4 harvesting was done. An average yield of 50-60 tons of fresh herbage had been obtained per hectare. 320 kg per hectare essential oil was obtained From these harvesting t. After harvesting herbage were leaved in field for 24 hours to improve the oil content. The sweet basil of kannauj region contains total 0.75% oil.

Assessment of oil component

The basil oil was identified with its different types of components through gas chromatography mass spectrometry (GC-MS). There are around 21 chemicals were recorded which are mention in the table. The total percentage of Methyl chavicol was about 76.36%.

| Sr. No. | RT* | Name of the oil components | Percentage of components |
|---------|-------|----------------------------|--------------------------|
| 1. | 2.41 | 1-octen-3-ol | 0.07 |
| 2. | 7.97 | 6-methyl-5-hepten-2-one | 0.19 |
| 3. | 9.28 | 1, 8- cineole | 0.06 |
| 4. | 17.92 | Linalool | 17.61 |
| 5. | 17.95 | Fenchone | 0.10 |
| 6. | 18.31 | Sapthulenol | 0.61 |
| 7. | 18.44 | terpinen-4-ol | 0.47 |
| 8. | 20.11 | β- eudesmol | 0.12 |
| 9. | 20.56 | 1, 10-di-epi-cubenol | 0.17 |
| 10. | 21.03 | Methyl chavicol | 76.36 |
| 11. | 21.20 | trance caryophyllene | 0.46 |
| 12. | 21.49 | trans-α- bergamotene | 0.62 |
| 13. | 21.61 | α – humulene | 0.10 |
| 14. | 22.10 | germacrene-D | 0.15 |

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Vol. 6, Issue 11, November 2017

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| 15. | 22.26 | Bicyclogermacrene | 0.06 |
| 16. | 22.50 | germacrene-A | 0.61 |
| 17. | 23.40 | γ cadinene | 1.89 |
| 18. | 25.54 | trans- α -bisabolene | 0.07 |
| 19. | 30.05 | epi- α -cadinol | 0.06 |
| 20. | 32.71 | caryophyllene oxide | 0.05 |
| 21. | 36.40 | humulene epoxide II | 0.06 |

* Retention time

V. CONCLUSION

The results obtained indicate that, the production of the sweet basil was higher and Methyl chavicol content in the oil was also impressive in Kannauj region. It must be borne in mind that this study was only conducted on a small area of Kannauj region over a short period of time. Further research is hence needed to calculate the total production of oil in different area of Kannauj region for the longer period of the time for the medicinal and other perfumery industry.

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