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Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India
Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.ror.isrj.org

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PHYTOCHEMICAL STUDIES ON *OCIMUM BASILICUM* L. PLANT (LAMIACEAE)

Nidhi Tiwari[1] and Shashi Tiwari[2]

[1]Research Scholar, Department of Botany,
[2]Head of Department, Microbiology,
Govt. MH College of Home Science & Science for Women, Autonomous, Jabalpur (M.P.)

Abstract:- The present study is concerned with histological features of Tulsi plant (*Ocimum basilicum* L.). Various organs of vegetative growth; namely, the main stem (represented by shoot apex, apical, median and basal internode) and different foliage leaves developed on the main stem and on lateral shoot; including lamina and petiole were investigated fortnightly throughout the whole growing season. Histological features of various vegetative organs of Tulsi plant were analysed microscopically and photomicrographed. Scanning electron microscope for the adaxial and abaxial surfaces of Tulsi leaf blade was also investigated. Moreover, volatile oil analysis of Tulsi herb at full blooming stage was carried out.

Keywords:*Ocimum basilicum* L., Tulsi , Lamiaceae, Vegetative organs, Volatile oil.

INTRODUCTION

The genus *Ocimum* Linn. belongs to the tribe Ocimeae, subfamily Nepetoideae, family Lamiaceae and the order Lamiales. It is one of the economically important groups of aromatic herbaceous plants extensively used in perfumery, flavouring and pharmaceutical products (Khosla,1993). There are about 150 species in this genus broadly dispersed over the warm regions of the globe (Evans, 2001 and Kumar,2009). Many species of *Ocimum* have been grown by local people as medicinal plants, culinary herbs and insect controlling agents (Grayer et al., 1996). *Ocimum* species differ in growth habit, physiological appearance and chemical and aromatic composition. They grow in wide variety of soil and climatic conditions. All Ocimum species yield essential oils which are responsible for the medicinal uses including antimicrobial, antioxidant, antifungal and antiinflammatory activities; yet their taxonomy and nomenclature are in a bit of muddle (Nahak *et al*., 2011). Therefore, any new botanical information about Ocimum plants are urgently to be wellcomed. In this concern, *Ocimum basilicum* L. (Tulsi or Sweet Basil) was chosen to be the subject of the present investigation because of its economic importance as an ornamental, spice, culinary and medicinal herb; yet anatomical structure of Tulsi herb and its volatile oil composition are poorly investigated.

Thus, it is aimed in this study to bring to light more information about the anatomical structures of vegetative organs of Tulsi plant throughout the consecutive stages of its entire life span. Moreover, the analysis of essential oil of Tulsi herb at flowering stage was carried out. Such knowledge may fulfill the lack in information concerning the anatomical and phytochemical characteristics of such important economic species in the genus *Ocimum* of the family Lamiaceae.

MATERIALS AND METHODS :

The present investigation was performed on *Ocimum basilicum* L. (Tulsi) of the family Lamiaceae (Labiatae). Seeds were procured from the Experimental Station of Medicinal plants, Govt. MH College of Home Science & Science for Women, Autonomous, Jabalpur (M.P.). The field work was carried out in the Agricultural Experiments and Researches Station, Faculty of Microbiology, Govt. MH College of Home Science & Science for Women, Autonomous, Jabalpur (M.P.) during the summer growing season of 2014 to provide the experimental plant

material. Date of cultivation was March 18th, 2014. The trial includes five replicates, each represented by one plot. The plot was eight ridges, four meters long, 60 cm apart. Seeds were sown in hills spaced 20 cm, the plants were thinned to two plants per hill. All field practices were carried out as recommended for Basil in the vicinity.

Analysis of the volatile oil: A chemical analysis was carried out to gain information about the volatile oil of Basil herb at full blooming stage. Hydrodistillation of the volatile oil were conducted using the technique described by Denys and Simon (1990). Plant material was placed in a 2-liter roundbottomed flask with distilled, deionized water (400 ml for 200 g fresh material) and the volatile oil was extracted by water distillation using a modified Clevenger trap (ASTA, 1968) for smaller plant samples, the distillation period was 1 hour (fresh samples), and the volatile oil content was determined on an oil volume to tissue weight. GC – MS technique was used to separate and detect the volatile oil constituents. Analysis was performed at Govt. MH College of Home Science & Science for Women, Autonomous, Jabalpur (M.P.).

Conditions used are as follows:

Instrument : Gas Chromatography Mass Spectrometry (Hewlett Packard) HP 6890 series (Agilent). Carrier Gas : Helium
Capillary Column : Thermo Scientific TR – 5 MS (5% phenyl polysil phenylene siloxane). 30 m × 0.25mm ID × 0.25 um film
Conditions : Injector Temperature : 250 deg ℃ Detector Temperature : 250 deg ℃ Detector : MSD

Oven Programming :

Initial	Rate (℃ / min)	Temp (℃)	Hold time (minutes)
-	-	50	3
Ramp	5	180	10

Gas Flow Rate (ml / min): He : (1ml / min) Mass Spectrometer HP 5973 (Agilent).

RESULTS AND DISCUSSION

Analysis of the volatile oil : The volatile oil of Basil herb at full blooming stage was obtained by means of water-steam distillation. Basil herb at flowering stage yielded 0.6 % of volatile oil. Using GC-MS technique in analyzing volatile oil of Basil herb (Fig.18) proved the presence of 39 components. Data presented in Table (1) clearly show that the major constituents present are linalool (constitute 32.69% of the volatile oil), geranial (constitute 17.41% of the volatile oil) and neral (constitute 14.77% of the volatile oil) followed by 4-terpineol (4.02%), germacrene–D (3.27%) ,cis-alpha–bisabolene(3.06%), trans-caryophyllene (2.60%) and bicyclo (3.1.1) heptane (2.28%). In addition, some constituents were detected at the percentage of 1.17 to 1.78% such as cyclofenchene (1.78%), nerol (1.55%), gamma- terpinene (1.24%) and alpha-caryophyllene (1.17%). Other constituents (the remainder which comprised 27 components) were found at the rate of less than 1.0% (from 0.13% , beta –bisabolene, to 0.98%, eucalyptol).

From the aforementioned results it could be stated that Basil herb at full blooming stage yielded 0.6 % of volatile oil. The main constituents are linalool which comprised 32.69% of the volatile oil followed by geranial which comprised 17.41% of the volatile oil and neral which comprised 14.77% of the volatile oil. Such three main components comprised 64.87% of the volatile oil of Basil herb. The rest 36 components comprised 34.65% of the volatile oil of Basil herb. In this respect, Hiltunen (1999) reported that Basil herb (*Ocimum basilicum* L.) contains 0.5 -1.5% essential oil of varying compositions. Özcan and Chalchat (2002) identified 49 components , using GC-MS technique, accounting 88.1% of the essential oil isolated by hydrodistillation of the overground parts of Ocimum basilicum L. from Turkey. It was found that the essential oil of *Ocimum basilicum* L. was characterised by its high content of methyl eugenol which comprised 78.02% of the essential oil. At the same time, lee et al. (2005) stated that the major aroma constituents of Basil essential oil were linalool (39.8%), estragole (20.5%) , methyl cinnamate (12.9%), eugenol (9.1%) and 1,8-cineole (2.9%). Likewise, Ismail (2006) using GC-MS in analysing the essential oil of Ocimum basilicum L. grown in Egypt and reported that the major terpenes present are linalool (44.18%), cineole (13.65%), eugenol (8.59%), α-cubebene (4.97%), methyl cinnamate (4.26%) and isocaryophyllene (3.10%). In this connection, Sajjadi (2006) found that the yield of the essential oils obtained from aerial parts of *Ocimum basilicum* L. cv. purple and *Ocimum basilicum* L. cv. green (cultivated in Iran)were 0.2 and 0.5 % (V/W); respectively. Twenty compounds of the oil of Basil cv. purple and twelve components of Basil cv. green oil were identified (98.5 and 99.4% of the total essential oils ; respectively). The main constituents found in the oil of basil cv. purple were methyl chavicol (52.4%), linalool (20.1%), epi-a-cadinol (5.9%), trans-a-bergamotene (5.2%) and 1,8-cineole (2.4%). In the oil of Basil cv. green, methyl chavicol (40.5%), geranial (27.6%), neral (18.5%),

caryophyllene oxide (5.4% and humulene epoxide II (1.8%) were the major components. In this respect, Al-maskari *et al*. (2011) reported that Omani Basil herb contains 0.17% of essential oil. Linalool was identified as the major component comprised 69.9% of the essential oil of Omani Basil herb. All, being partially, in accordance with the present findings. Worthy to mention that the observed differences in composition of volatile oils of Basil genotypes recorded in the literature may be probably due to different environmental and genetic factors, different chemotypes and the nutritional status of the plants as well as other factors that can influence the oil composition.

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