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OIL QUANTITY ANALYSIS OF *LAVENDULA OFFICINALIS* CHAIX. GROWN ACROSS ASHMIR VALLEY

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ABSTRACT

Essential oils (EOs) are volatile, natural, complex compounds characterized by a strong odour and are formed by aromatic plants as secondary metabolites. The essential oil of Lavendula officinalis was extracted using hydrodistillation process. Hydro-Distillation is potentially a very useful method to extract essential oil from various plants and from their different parts. The principle of extraction is based on the isotropic distillation. The yield is dependent on various parameters like weight of raw material, volume of water, size of raw material and nature of raw material. Samples from aerial parts of three Lavendula ecotypes were analyzed for essential oil content to find out as to which ecotype excels in oil content and which ecotype gave the minimum essential oil output. Air dried leafy stalks and stems of L. officinalis were taken and submitted to Hydro distillation for 4 hrs using Clevenger type apparatus. Briefly, the samples were immersed in water and heated to boiling, after which the essential oil was evaporated together with water vapour and finally collected in a condenser. The distillates (EOs) were isolated and dried over anhydrous sodium sulphate. The oils were stored in the sealed vials at 2°C for further studies. Each extraction was performed at least three times. The oil content was determined on an oil volume to tissue weight basis.

Estimated oil content was lowest in Srinagar ecotype to a highest in Pulwama ecotype. Pulwama ecotype was followed by Budgam ecotype. This could be due to the variation in altitude and location.

Keywords: Bacteria, Fungi, Contaminants, Tissue-culture.

INTRODUCTION

Nearly all cultures from ancient times have used plants as a source of medicine. In many developing countries traditional medicine is still the mainstay of healthcare and most of the drugs and cures usedcome from plants. In developed countries too, people are turning to herbal remedies. Besides, modern scientific medicine still depends on plants, and the knowledge gained from them, for some essential drugs. People in India and China are known to have used plants for healthcare for over 5,000 years (Petrovska, 2012). The role of medicinal plants is particularly important in Himalayan regions. These areas are richly endowed with a variety of plant species, many of which have medicinal properties. A large proportion of rural population in these areas depend on locally available plants to meet their health care requirements. The Valley of Kashmir being a reservoir of rich biodiversity has been using many plants and plant products in ameliorating various disorders. More than 50 percent of the plant species described in British Pharmacopeia is reported to grow in Kashmir Valley. Kashmir region is rich in medicinal plants and the studies of ecotypes have been carried out by various researchers (Mushtaq and Modi, 2019). Literature indicates that 572 plant species belonging to 109 different families have medicinal value (J&K Forest Department, 2020). Over the past few years, the medicinal plants have regained a wide recognition due to an escalating faith in herbal medicine in view of its lesser side effects compared to allopathic medicines and the necessity of meeting the requirements of medicines for an increasing human population.

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The Lamiaceae family consists of 236 genera. A well-known member of this family, the genus Lavandula comprises 39 species, 30 subspecies and varieties as well as 17 hybrid taxa **(**Blažeković, B. et al., 2018**).** It is native to southern Europe and the Mediterranean area and is commercially cultivated in France, Spain, Portugal, Hungary, the UK, Bulgaria, Australia, China, India and the USA (Verma et al, 2010). Chromosome counts in *L. angustifolia* vary considerably in the literature with 2n (diploid) estimates ranging between 36 and 75, (Urwin et al., 2007). The consensus is around 2n = 50 for the species and hybrids thereof. Chromosome number estimates suggest that the species is ancient polyploid (Upson and Andrews, 2004). Natural polyploidy is present within the Lamiaceae, for example within Thymus (Lopez-Pujol et al., 2004), Glechoma (Widen and Widen, 2000) and Lavandula (Upson and Andrews, 2004). The chromosome size in species of Lavandula is relatively small, so although the genome size is unknown it is likely to be small. Many members of the Lavendula genus are cultivated extensively in temperate climates grown mainly for their essential oils**.** All the Lavandula taxa are highly aromatic plants due to the presence of a complex mixture of essential oil produced in the glandular trichomes on the surface of their flowers and leaves **(**Blažeković et al., 2012; Blažeković et al., 2018) which are used in perfumery, cosmetics, food processing and nowadays also in 'aromatherapy' products. However, only three taxa, *L. angustifolia* Mill. (lavender), *L. latifolia* Medik. (spike lavender) and their *hybrid L. X intermedia* (lavandin), are commercially important and widely grown for essential oil production (Woronuk et al., 2011; Kıvrak, 2018)**.** Lavendula is regarded as 'crown' in the world of aroma. The dried flowers have also been used from time immemorial in pillows, sachets etc. for promoting sleep and relaxation. Numerous lavender plants are also sold as ornamental plants for the garden; these include *L. latifolia, L. pinnata, L. lanata, L. dentate*and *L. stoechas* and their numerous cultivars.

Lavendula officinalis Chaix (syn. *Lavendula spica, Lavendula vera, Lavendula angustifolia*) commonly known as English lavender, common lavender, true lavender is found in continents North America, Europe and Australia (Schutte, 2008). The main growing countries are Bulgaria and France and on smaller areas in Morocco, the former republics of Yugoslavia, Hungary, Italia, Russia, Spain, Romania, Ukraine, Turkey, and others (Zheljazkov, 2012; Jianu et al., 2013). It grows at a latitude of 30-40 degrees north, at an altitude of 3000 ft. It requires hot, dry and sunny climate and grows best in an alkaline soil with a pH of 6.4 to 8.2. The Lamiaceae plant family has been described to be rich in essential oil (Adorjan and Buchbauer, 2010). Essential oils are plant-based volatile oils with strong aromatic components that could be biosynthesized in different plant organs as secondary metabolites (Khan and Dwivedi, 2018). They are complex mixtures of volatile compounds such as terpenes (mostly monoterpenes and sesquiterpenes), phenolics and alcohols (Lucchesi et al., 2004). Lavender is one of the most commonly grown plants rich in essential oils used in the pharmaceutical, food and cosmetic industries (Kara and Baydar, 2013).

MATERIALS AND METHODOLOGY

Collection of plant material

Leaves and stems of *Lavendula officinalis* Chaix. were collected at full flowering stage in the month of June-July from natural populations at three different locations of Kashmir region. First collection was from the city of Srinagar, another was from district Budgam and the third was from Bonera, district Pulwama. The collection was done by simple random process. Fresh plant material was taken and then washed with distilled water to remove dust and other impurities. The plant material was dried in the shade for preparation of plant extract.

Essential oil extraction and Quantity analysis

Essential oil content was estimated by the method devised by Agranosa *et al*. (1998). Leaves and stems of the plant (*Lavendula officinalis* Chaix.) were used for estimation of essential oil content.

The raw material (dried stems or leafy stalks) was pounded in a mortar immediately prior to isolation of essential oils. Next, weighed sample of plant material (20 g) was placed in a 1000 mL round-bottomed flask, immersed in 400 mL distilled water and submitted to Hydro distillation for 4 hrs using Clevenger type apparatus. Briefly, the samples were immersed in water and heated to boiling, after which the essential oil was evaporated together with water vapour and finally collected in a condenser. The distillates (EOs) were isolated and dried over anhydrous sodium sulphate. The oils were stored in the sealed vials at 2°C for further studies. Each extraction was performed at least three times. The oil content was determined on an oil volume to tissue weight basis.

The formula used for calculating oil per centage is: Y/X ×100

where,

Weight of sample used	=	X
Number of units of oil	=	Y
Value of 1 unit	=	0.1 ml
Amount of oil	=	Y x 0.1 ml=0.Y ml

RESULTS

Samples from aerial parts of three Lavendula ecotypes were analyzed for essential oil content to find out as to which ecotype excels in oil content and which ecotype gave the maximum essential oil output. Estimated oil content for three ecotypes ranged from a lowest (2.65 per cent) in Srinagar ecotype to a highest (4.63 per cent) in Pulwama ecotype. Pulwama ecotype was followed by Budgam (3.32 per cent), Srinagar (2.65 per cent). Srinagar ecotype had the lowest oil content among all ecotypes.

DISCUSSION AND CONCLUSION

On the basis of the present investigation, it could be concluded that *Lavandula angustifolia* plant is rich in essential oils. Jainu et al. used the methods of Craveiro et al., 1976 and isolated 22 components which were identified in the EO obtained from *L. angustifolia* Miller, representing 99.9% of the total, the major components being caryophyllene 24.12%, beta-phellandrene 16% and eucalyptol (1,8-cineol) 15.69%. The EO of *Lavandula × intermedia* has as major component camphor 32.7% and eucalyptol 26.9%, 24 components being identified in this case representing 98.26% of the total. Similar studies were carried out by Abroomand et al., Bouzouita, et al., De Martino et al., and Imelouane. All the results suggest the potential oil content in Lavandula species.

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