



Aromatic Profiling and Bioactive Potential of *Lavendula angustifolia*: A Review

Nishtha^{a#} and Ravneet Kaur^a

^aDepartment of Botany(Biosciences), Division-UIBT, Chandigarh University, Mohali (140413), India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Plants are the vital source around which human life revolves. Starting from our food to medicine we obtain, all such valuable resources come from resilience creatures called plants. Plants are gifted with certain properties that make them precious in all aspects of life. They produce bioactive substances that make them medicinally important for pharmaceutical use. The aromatic plants which are important as industrial raw material are used as essence material in various baking and brewing industries because of their pleasant aroma. These plants undergo distillation processes to extract the essential oils from oil secreting glands. The present review deals with review on aromatic profiling and bioactive potential of *Lavendula angustifolia* plant and its commercial importance as a plant material.

Keywords: Aromatic; bioactivity; *Lavendula angustifolia*; essential oil.

1. INTRODUCTION

Aromatic plants are significant and great importance because of their wide commercial uses. Growing use of aromatic flowers as cut flowers and their use in perfumery products lead

to their flourishing as a raw material. Angiosperms are distributed all around the globe and there are about 3,00,00 spp and 427 families around globe while in India about 251 angiosperm families exist as per present statistics of BSI, Kolkata. Angiosperms are plants

[#]Assistant Professor

^{*}Corresponding author: E-mail: nishtha_088@yahoo.in;

that are rich in aroma while it contains certain families rich in essential oils such as Lamiaceae, Lauraceae, Myricaceae etc. to name a few. The largest genera include *Salvia*, *Stachys*, *Plectranthus*, *Scutellaria*, *Thymus*, *Vitex*, *Nepeta* [1]. The family is important as it has ornamental and condimental herbs which are commercially vital. The present plant belongs to one such family Labiatae which is also called sage or **mint** family [12-6]. The important species of this genus that are *Lavendula latifolia* and, *Lavendula angustifolia* Mill. which are native to Mediterranean region from Africa to Asia [7]. In India it is well marked from Uttarakhand to Kashmir valley [8]. The plant holds great importance since ancient period as Iranian folk medicine [9].

1.1 Classification

Kingdom:Plantae
Clade:Tracheophyta

Order:Lamiales
Family:Lamiaceae
Genus:*Lavendula*
Species:*angustifolia*

2. PLANT DESCRIPTION

The plant is a semi-woody, evergreen, perennial plant with lanceolate leaves covered by tomentum, square stem curled at edges. The inflorescence is spike like and has bright purple flowers that are important ornamental blooms. The plant is native to Spain, and some neighboring countries but now naturalized in India. This plant requires fertile loamy soil, and it is propagated vegetatively as well as by seed. The flowers have excellent flavor properties and sell as sachets. The plant possesses majestic flowers that are known for their aroma and used as cut flowers and have various bioactive compounds of economic importance. [Heral et al. 2020]



Fig. 1. Plant morphology

(Source: https://commons.wikimedia.org/wiki/File:Lavandula_angustifolia_002.JPG)

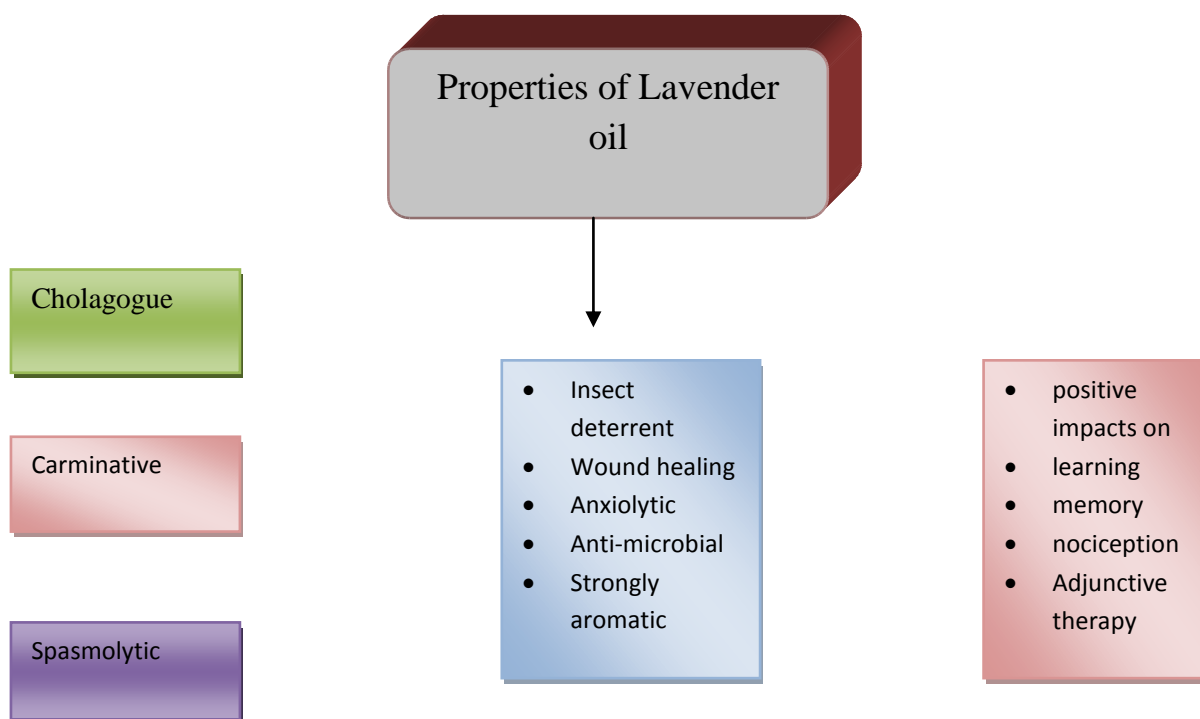


Fig. 2. Pharmacological positively impacting properties of *Lavendula angustifolia*

3. BIOACTIVE POTENTIAL

Lavender augustifolia Mill. is a member of Lamiaceae which is a family rich in *polyphenols* and other bioactive substances. Flowers are the economical part of the plant that yield phenolic compounds and other active constituents. Cardia et al. [10] used GC-MS chromatography and NMR spectroscopy to examine the bioactive compounds like 1,8 cineole, linalool, camphor which help to control acute inflammatory response and Lavender oil induced the leukocyte chemotaxis *in vitro* by just varying the concentration of bioactive compounds [11,12]. Linalool, p-cymene, limonene, and camphor were known impart the anti-inflammatory activity which was observed in lavender by lipoxygenase inhibitory activity as reported by Carrasco *et al.* 2015. Terpenoids found in Lavender oil are known to play predominant role in plant-insect communication which was examined by cytological investigation of TPS-TPS, TPS-CYP450 linked to substances that function as attractants and repellants [13]. Characterization of the genetic diversity were examined in *Lavender angustifolia* Mill. using sequence related amplified polymorphism which showed higher genetical diversity as reported by Rusanov et al. [14]. Cristina et al. [15] examined the volatile oils from the tea samples of *Lavendula angustifolia* Mill. Using GC-MS

spectroscopy. The dominant bioactives were Linalyl acetate and linalool which corresponds to 1.05% essential oil in the given species, and it shows subsequent amounts of Chlorogenic acid and Rosmarinic acid using its alcoholic extracts was reported [16].

4. AROMATIC PROFILING IN *Lavendula angustifolia*

Highlighting the aromatic profiling of this plant, lot much research have done significant work on the oil of this plant and explored its phytoconstituents. *Lavendula angustifolia* Mill. is rich in various aromatic compound that makes it a majestically useful and mainstay herb in the gardens worldwide. It's also called as English lavender and it finds its place in all the restaurants and kitchens where it is used as a flavoring agent and for seasoning purposes and cosmetic industry. Wang et al. [17] evaluated the volatile or odor characteristics [LE] with lavender essential oil [LEO] using Gas chromatography-Mass chromatography [GC-MS] and Principal chemical analysis [PCA]. The study found out the LE contains high number of bioactive substances like lavendulyl acetate, linalool oxides I and II than LEO, and has herbal and clove like odor, whereas more earthy green and watery odor of LEO was due to higher amount of Linalool and camphor and finally he concluded that LE is

better than LEO in terms of odor characteristics. Methanolic extracts of Lavender were used to estimate flavone content by using UV-vis spectroscopy as reported by Margaoan et al. 2017. Lazari et al. [18] elucidated the antiviral and scavenging activity while Gezizi et al. 2018 reported the Anti-proliferative property of Essential oils. Roj et al. 2019 used Box-Behnken method to extract the phenolic compounds under controlled conditions and found highest phenolic content was found in *Lavender angustifolia* Mill. at 54.5°C.

Table 1. Aromatic profiling

S. No	Volatile compounds	Total % in lavender oil
1.	α - terpineol	1.35
2.	Camphor	9.67
3.	Sebinene	0.5
4.	Myrcene	0.68
5.	Limonene	0.24
6.	1,8 cineole	8.6
7.	Linalool acetate	3.75
8.	Cryptone	0.98
9.	Terepiene-4-ol	3.8
10.	Linalool	47.55

Predoi et al. 2018 examined the aromatic potential of plants based on the compounds present in it and using Gas chromatography they found that dominant compounds in the essential oil of basil and lavender are oxygenated monoterpenes responsible for the characteristic essence. The other compounds were in trace amounts and the plant is researched in its infancy stage and other properties are yet to be unveiled. The antimicrobial activity of the *Lavendula angustifolia* Mill. was seen by Aires et al. 2017 who used HPLC-DAD and minimum inhibitory concentration [MIC] to characterize phenolic substances and flavonoids in lavender and they found out that Hydroxycinnamic acid [Chlorogenic and, rosmarinic acids]and, flavonoids were responsible for high antibacterial activity against *Staphylococcus aureus* isolated from diabetic foot ulcers. Lavender due to its characteristic aroma and beauty was indiscriminately used which led to its overexploitation and therefore certain strategies and tools under biotechnology were used to revive it such as micropropagation vis meristem proliferation and organogenesis as reported by Romamno et al. 2013. Ayaz et al. [19] examined the essential oils of lavender to provide protection against neural disorder like Alzheimer disease and dementia, it shows improved

cognitive performance against epilepsy and convulsions in animals and human subjects and they are cheap, easy to obtain and safe to use with good efficiency. Oran et al. [20] inferred the methanolic extracts of *Lavendula angustifolia* Mill. used to control the diabetic dyslipidemia using the hormone sensitive lipase and pancreatic lipase potential which was imparted by Rosmarinic acid and gallic acid in Lavender oil which protects a person from cardiovascular diseases. Souri et al. [21] reported the Apoptotic activity using ELISA and TTC staining by targeting oxidative stress. Silva et al. [22] demonstrated the antinociceptive, antioxidant and anti-inflammatory properties using 1,1-diphenyl-2-picrylhydrazyl radical decolorization assay in the LEO.

Anxiolytic property of LEO using network-meta-analysis (NMA) was performed using Silexan capsules and the significance of this study was to know whether the Silexan capsules are safe to be used for patients who are undergoing anxiety attacks [23]. Lopez et al. 2017 reported the impact of LEO on the central nervous system using well established receptors such as MAO-A, SERT, GABA and NMDA receptors which shows that LEO has bind to glutamate NMDA-receptor at specific dose with IC₅₀ value of 0.04 µl/mL. Lavender oil extracted from this plant showed remarkable property as a cardioprotective against myocardial infarction achieved by targeting oxidative stress and inflammation.

5. CONCLUSION

Lavender oil is a known element which has found place in cosmetic, perfumery, and culinary industry due to bioactive potential and characteristic aroma of the flower and leaves. It is important plant from time immemorial when it was used in bath by romans in ancient time, so we can trace back its importance as a plant. Lavender is being researched at an infant stage because of localized occurrence and it is only reviewed for bioactive and pharmacological basis that too on a small pace and much more research is required in this part to flourish its literature about other such potentials and secrets that are to be unraveled in the coming time. The present study reviewed the aromatic profiling and bioactive substances that impart the plant certain useful properties that make it a mainstay herb in the gardens and adds to its economic production as a plant. So, there is a lot of scope of this plant to be researched and reviewed as with time and

better understanding, we can explore the plant on a large scale based on new properties and can make it a multifarious drug.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no conflict of interest exist.

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