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Prelimnary Phytochemical Analysis and Antioxidant Activities of Lemongrass and Lavender

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Abstract

Lemongrass has been evaluated for its antioxidant properties. Lemongrass is native to India, Southeast Asia, and Oceania. It is widely used as a medicinal herb in India. It has a subtle citrus flavor and can be dried and powdered, or used fresh. It is commonly used in teas, soups, and curries. It is often used as a tea in African countries such as Togo and the Democratic Republic of the Congo and Latin American countries such as Mexico. Lemongrass oil is used as a pesticide and a preservative. Lavender oil on the other hand is an essential oil obtained by distillation from the flower spikes of certain species of lavender. Two forms are distinguished, *lavender flower oil*, a colorless oil, insoluble in water, having a density of 0.885 g/mL; and *lavender spike oil*, a distillate from the herb *Lavandula latifolia*, having density 0.905 g/mL. Lavender flower oil is a designation of the National Formulary and the British Pharmacopoeia. The purpose of my research is to compare the antioxidant effects of lemongrass and lavender using the oil extracts from these herbs.

INTRODUCTION :

Lemongrass or Citronella grass is native to India, Southeast Asia, and Oceania(1,2). It is widely used as a herb in Asian cuisine and also as medicinal herb in India. It has a subtle citrus flavor and can be dried and powdered, or used fresh. It is commonly used in teas, soups, and curries. It is generally used in households to ward off insects and repel mosquitoes. Citronella grass (*Cymbopogon nardus* and *Cymbopogon winterianus*) grow to about 2 m (6.6 ft) and have magenta-colored base stems. These species are used for the production of citronella oil, which is used in soaps, as an insect repellent (especially mosquitoes) in insect sprays and candles, and in aromatherapy, which is famous in Bintan Island, Indonesia, and the Philippines. Therefore, its origin is assumed to be Indonesia(12,13). The principal chemical constituents of citronella, geraniol and citronellol, are antiseptics, hence their use in household disinfectants and soaps. (12) Besides oil production, citronella grass is also used for culinary purposes, as a flavoring. Citronella is usually planted in home gardens to ward off insects such as whitefly adults. Its cultivation enables growing some vegetables (e.g. tomatoes and broccoli) without applying pesticides.(12) Intercropping should include physical barriers, for citronella roots can take over the field. Lemongrass oil, used as a pesticide and preservative, is put on the ancient palm-leaf manuscripts found in India as a preservative. It is used in many other manuscript collections in India. The oil also injects natural fluidity into the brittle palm leaves, and the hydrophobic nature of the oil keeps the manuscripts dry so the text is not lost to decay due to humidity. East Indian lemon grass (*Cymbopogon flexuosus*), also called Cochin grass or Malabar grass (Malayalam: (*inchippullu*), is native to Cambodia, Vietnam, India, Sri Lanka, Burma, and Thailand, while West Indian lemon grass (*Cymbopogon citratus*) is native to maritime Southeast Asia. It is known as *serai* in Malaysia and Brunei, *serai* or *sereh* in Indonesia, and *tanglad* in the Philippines. While both can be used interchangeably, *C. citratus* is more suitable for cooking. In India, *C. citratus* is used both as a medical herb and in perfumes. *C. citratus* is consumed as a tea for anxiety in Brazilian folk medicine, but a study in humans found no effect. The tea caused a recurrence of contact dermatitis in one case. Lemon grass is also known as *gavati chaha* in Marathi, and is used as an addition to tea, and in preparations such as *kadha*, which is a traditional herbal 'soup' used against coughs, colds, etc (14,16) . It has medicinal properties and is used extensively in Ayurvedic medicine. It is supposed to help with relieving cough and nasal congestion.

Lavandula (the common name lavender) is a genus of 39 known species of flowering plants in the mint family, Lamiaceae.(13) It is native to the Old World and is found from Cape Verde and the Canary Islands, southern Europe across to northern and eastern Africa, the Mediterranean, southwest Asia to southeast India.(15)(2)Many members of the genus are cultivated extensively in temperate climates as ornamental plants for garden and landscape use, for use as culinary herbs, and also commercially for the extraction of essential oils(8,9). The most widely cultivated species, *Lavandula angustifolia* is often referred to as lavender, and there is a colour named for the shade of the flowers of this species. Medicinal plants have been used for centuries as remedies for human diseases because they contain components as therapeutic value. Historically many plant oils and extracts have been reported to have antimicrobial properties.(1) There are about eight thousand naturally occurring plant phenolics and about half this number are flavonoids.(16) Phenolics possess a wide spectrum of biochemical activities such as antioxidants, antimutagenic, anticarcinogenic as well as ability to modify the gene expression. Phenolics are the largest group of phytochemicals that accounts for most of the antioxidant activity in plants or plant products .(2) The essential oils

known as volatile oils evaporate in contact with air possess a pleasant fragrance. Chemically the essential oils are very complex. All aromatic plants contain essential oils.(3) The genus cymbopogan comprises 140 species that are widely distributed in the world. Cymbopogan citratus known as West Indian Lemon grass is an important species of poaceae family. The leaf blade is linear tapered at both ends and can grow to a length of 50cm(4) Both Lavender and Lemon grass oil are essential oil obtained by distillation from the flower spikes of Lavender and leaves of Lemon grass respectively. The current study aims at phytochemical analysis of Lavender oil and Lemon grass oil and a comparative study on total phenolics, flavonoids and antioxidant activity of both the oils.

METHODS:

Tannins

To 5ml of the sample, a few drops of 0.1% Ferric chloride were added. The presence of a brownish green or blue black color indicated that the material possessed Tannins.

Phlobatannins

Ten ml of the sample was boiled with 1% HCl in a test tube. The presence of Phlobatannins was confirmed by the deposition of red precipitate in the tube.

Saponins

To 10 ml of the sample, 3 ml of distilled water was added and shaken well, so as to obtain froth. To the froth formed, a few drops of Olive oil were added. The formation of emulsion indicates the presence of saponins.

Flavonoids

A few drops of 1% liquor ammonia were taken in test tubes, to which the sample was added. Yellow coloration of the solution confirmed the presence of Flavonoids.

Terpenoids

Around 2 ml of chloroform and 3 ml of concentrated sulphuric acid were added consecutively to 5 ml of the sample. A reddish brown interface in the solution denoted the presence of Terpenoids.

Cardiac Glycosides

To 5 ml of the sample, 2 ml of glacial acetic acid containing a drop of Ferric chloride was added. This was followed by the addition of 1 ml of concentrated sulphuric acid. The brown ring, thus obtained, yield positive result for the test.

Steroids

A couple of grams of the plant powder were mixed with 10 ml of chloroform, followed by boiling and filtration. To the above 2 ml of the filtrate 2 ml acetic anhydride and a few drops of concentrated sulphuric acid was added. Stable presence of blue-green ring in the solution confirms the presence of steroids.

DETERMINATION OF TOTAL PHENOLIC CONTENT

Folin-Ciocalteu method was followed for the determination of the total phenolic content of the sample. Distilled water (500 µL) and Folin-Ciocalteu reagent (100 µL) were added to 100 µL of the plant extract and incubated for 6 min at room temperature. The final volume of the solution was made up to 3 mL after addition of 1.25 mL of 7% sodium carbonate. The absorbance was measured at 760 nm using UV- Visible spectrophotometer after an incubation period of 90 min. The total phenolic content was expressed as mg TAE (Tannic acid equivalents) per g of the dry weight (mg TAE/g DW) of the sample, using a standard plot of Tannic acid

DETERMINATION OF TOTAL FLAVONOID CONTENT

The sample (200 µL) was taken in a test tube and the solvent was allowed to evaporate. To the residue, 5 mL of 0.1 M Aluminium chloride was added and shaken well. This was

followed by incubation for forty minutes at room temperature and the absorbance value was measured at 415 nm using UV- Visible spectrophotometer. A standard plot of Quercetin at varying concentrations was used to evaluate the total flavonoid content, expressed as mg QE/g DW of the sample.

DPPH FREE RADICAL SCAVENGING ASSAY

The sample was taken at various concentrations (10, 20, 30, 40 and 50 µg/mL), in small tubes and made up to 1 mL using methanol. One mL of DPPH was added to all the test concentrations and maintained in the dark for 30 minutes, at room temperature. The absorbance of the solutions was read at 517 nm. The percentage inhibition and the IC50 values were calculated with DPPH as the control and Butylated Hydroxyanisole (BHA) as the reference. The concentration in µg of dry material per mL of solvent (µg/mL) that inhibits the formation of DPPH radicals by 50% is defined as IC50 value.

% Inhibition= (Absorbance of the control−Absorbance of the sample)∗100Absorbance of the control

2,2'-AZINO-BIS(3-ETHYLBENZOTHIAZOLINE-6-SULPHONIC ACID (ABTS) ASSAY

A solution of 7 mM ABTS [2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid)] and 2.45 mM potassium persulphate was incubated in the dark for 12-16 h, after which the solution was diluted with ethanol till the absorbance reached 0.7±0.02 at 734 nm. One mL of the diluted solution was mixed with 100 µL of the sample and the absorbance was evaluated at 734 nm after 6 min. The percentage reduction against ABTS was calculated with reference to the standard, Tannic acid

% Inhibition= (Absorbance of the control−Absorbance of the sample)∗100Absorbance of the control

RESULTS :

Phytochemical analysis

Phytochemical	Lavender oil	Lemon grass oil
Tannins	+	+
Saponins	+	+
Terpenoids	-	-
Flavonoids	+	+
Cardiac Glycosides	-	-
Steroids	-	-
Philobatannins	-	-
Phenols	++	++

Total phenolic content(mg TAE/g DW)

Lavender oil - 0.6431± 0.0012

Lemongrass oil -0.7242 ± 0.0008

Total flavanoid content (µg QE/g DW)

Lavender oil -0.0989±0.0102

Lemongrass oil-0.1241 ± 0.0081

DPPH free radical scavenging assay

%Inhibition

Concentration	Lavender oil	Lemongrass oil
10	9	13
20	15	21
30	23	28
40	30	37
50	36	50

	IC 50 (µg/ml)
Lavender oil	**>50**
Lemon grass oil	**50**
BHA	**25.78**

2,2'- Azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS) assay
%Inhibition

Lavender oil - 62.57
Lemongrass oil -71.46

DISCUSSION:

Lemongrass oil and Lavender oil were tested for their phytochemical and antioxidant properties. Lemon grass oil and lavender oil contain phytochemicals like tannins,saponins ,terpenoids etc. Flavonoids the phytochemical confirmed to be present in lavender oil have antioxidant activity. Flavonoids are becoming very popular because they have many health promoting effects. Some of the activities attributed to flavonoids include: anti-allergic, anti-cancer, antioxidant, anti-inflammatory and anti-viral. The non-sugar part of saponins have also a direct antioxidant acitivity, which may results in other benefits such as reduced risk of cancer and heart diseases. Tannic acid has anti-bacterial, anti-enzymatic and astringent properties. Apart from this tannic acid has very good antioxidant properties that is very beneficial. The presence of these phytochemicals in lavender oil and lemon grass oil explains the antioxidant properties and its beneficial effect. More research may be required to throw light on the phytoconstituents in the oils.

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