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Extraction and Formulation of Perfume from Lemongrass Leaves

Lingesh.K.[1], Sankaranarayanan.S[2], Veerapathirakumar.K[3], Mr. Anbu.A[4]

[1,2,3] Student, Department of Chemical Engineering, VSB Engineering College (Autonomous), Karur – 639 111, Tamil Nadu, India
[4]Assistant Professor, Department of Chemical Engineering, VSB Engineering College (Autonomous), Karur– 639 111, Tamil Nadu, India

ABSTRACT

Aromatic Chemicals are extracted from raw materials in the process of making perfume utilizing techniques like solvent extraction and distillation. Depending on the amount of waxes in the product, the extracts are either essential oils, absolutes, or butters. Here, essential oil from lemon grass was extracted using solvent extraction, the Enfleurage method, hydro distillation, and steam distillation techniques. For the extraction of essential oils from plant sources. Distillation based recovery techniques including steam and vacuum distillation are preferred. Expression, Enfleurage, and solvent extraction are additional techniques. Solvent extraction, hydro distillation, enfleurage and filtration are the four oil extraction techniques used in current study. The yield of essential oil produced by solvent extraction was 2.07%. With the enfleurage process, we got a yield point 1.957% oil. Oil yield from the steam distillation process was 0.70%. Due to decreased exposure to heat and air, solvent extraction produced the maximum yield according to the analysis, which supports what has been written in the literature. A fixative and carrier solvent were used to create perfume using the extracted essential oil.

Key Words: Perfumes, Lemon grass, Solvent extraction, separating funnel.

1. INTRODUCTION

1.1. Perfume:

A fragrant liquid known as perfume is created by distilling an extract in alcohol and water. The word “perfume” is derived from the Latin “per” which means “through” and “fume” or “smoke”. Utilizing locally accessible materials like lemongrass leaves, perfume can be made. Perfume has been produced using a wide variety of common and man-made components. By pressing and boiling plants to extract their inherent oils, several old perfumes were created. The majority of contemporary fragrances are alcohol-based and include artificial scents. In the more technical jargon of the perfumer, a perfume must include more than 15% of fragrance oils in alcohol, even though the name “perfume” generally refers to perfumes in general. Solvent extraction, distillation, and the effleurage method are among the techniques used in the extraction of fragrance from plants.

1.2. Lemongrass:

It is sometimes referred to as the Graminae (Poaceae) family and genus plant, Citratus Cymbopogon. The plant is mostly grown as a medicinal plant and has long, thin leaves. Due to its citral concentration, lemongrass leaves and oil taste like lemons. Lemongrass's dry leaves have 1%–2% essential oil content. The color of the oil is a pale yellow. With regards to agronomic practices, environmental factors, and geographic regions, lemongrass does have a variable essential oil composition. Citral is widely used in cosmetics, bath salts, perfumes, and as a flavor. The leaves have a very high amount of citral (70-80%).

Lemon grass is a monocotyledonous perennial grass that can reach heights of 6 feet and widths of 4 feet. It develops in clumps. It has three-foot-long, long, thin, bright green leaves that range in width from 1.3 to 2.5 cm. Simple leaves have complete edges. On spikes, flowers sprout. It has a long inflorescence that measures between 30 and 60 cm. This fragrant grass gets its name "Cymbopogon" from its floral arrangement. Southeast Asia is home to many Cymbopogoncitratus.3,4,6 The following are this herb's taxonomic details:

Kingdom : Plantae

Division : Magnoliophyte

Class : Liliopsida

Order : Poales

Family : Poaceae

Genus : Cymbopogon

Species : Citrates.

1.2.1Bio-active Compounds Present in Lemon Grass and its Oil

There are already a plethora of ethnopharmacological uses for lemon grass. Its ability to restore health may be attributed to the variety of secondary metabolites it generates. Fats, carbs, fibre, minerals, and other beneficial substances were discovered in the grass after analysis (table 1-3). These can be classified as alkaloids, terpenoids, flavonoids, phenols, saponins, and tannins, among other types. Additionally, reports have indicated that lemon grass contains anthraquinones, steroids, pholobotannis, and cardiac glycosides.

2. METHODS AND MATERIALS

2.1 Methods of Extraction

The process of extracting aromatic chemicals from raw materials by means of distillation, solvent extraction, expression, or enfleurage is referred to as fragrance extraction. All of these methods have the tendency to somewhat alter the fragrance of the aromatic compounds produced from the raw materials. The aromatic compounds are denatured during the extraction process by heat, chemicals, or exposure to oxygen, either modifying their smell or making them odorless.

The odorants used in diverse perfume compositions must first be acquired before perfumes may be created. Purification and organic synthesis are used to create synthetic odorants. Natural odorants need to be extracted from their raw materials using a variety of techniques**.** Depending on the amount of waxes in the extracted product, the products of the extraction are essential oils, absolutes, concretes, or butters.

2.1.1 Solvent Extraction

In the modern perfume industry, this method of extracting aromatics is the most popular and economically significant. The desired aromatic compounds are dissolved in a solvent that is submerged in the raw ingredients. Woody aromatic compounds and fibrous plant materials, as well as all aromatics from animal sources, are frequently acquired in this way. Additionally, odorants that are too volatile for distillation or quickly denatured by heat can be extracted using this method. Hexane and dimethyl ether are common solvents used for solvent extraction and maceration. A "concrete" is what this technique produces.

A. Oil Extraction

In a medium-sized Soxhlet apparatus, 300g of the powdered sample was placed in a thimble, and 600ml of the solvent, n-hexane, was gently heated at 65 °C with the help of a heating mantle. The condenser condensed the vapour flowing through the vapour tube, and the hot condensed solvent dropped into the thimble containing the sample. It syphoned over into the flask as it got to the top of the tube. Up till a complete extract was obtained, the operation was repeated. The extract was cooked on a water bath at 60 °C for two hours in order to eliminate the superfluous solvent from the original essential oil.

2.1.2 Enfleurage Method

A dry sample of lemongrass weighing about 130g was mashed with a mortar and pestle to reveal the inner, more compact stem. Warming the aluminium foil and mixing it with around 70 cc of light-flavored olive oil allowed the lemon grass to disperse throughout the oil. For proper absorption, it was then left to stand for 24 hours at room temperature. To remove the lemon grass residue while absorbing the essential oil, 140ml of ethanol was added. To vaporise the ethanol and leave the essential oil behind, the ethanol can be diluted and placed on a water bath heated to 780°C. Weighing on an electronic weighing balance was used to determine the yield oil. The variations between the beaker's final weight.

2.1.3 Distillation

The application and removal of heat is used to separate a liquid or vapour mixture of two or more substances into its component fractions of desired purity. The process of distillation is frequently used to extract fragrant components from plants, including rose and orange blossom petals. The aromatic chemicals are recovered from the source material by condensation of the distilled vapour. For extraction, there are two methods of distillation. both hydro- and steam-distillation.

A. Steam Distillation

The majority of their volatile aromatic components are driven out of the raw material by passing it through boiling water's steam for 60 to 105 minutes. Water and aromatics are both present in the distillation condensate, which is 42 settled in a florentine flask. Due to the oil's tendency to float to the top of the distillate and be removed, leaving the watery distillate behind, this makes it simple to separate the fragrant oils from the water. Hydrosol is the name given to the water extracted from the condensate that still contains part of the raw material's aromatic compounds and oils. It is occasionally sold for both personal and professional usage. Fresh plant materials including flowers, leaves, and stems are the ones most frequently processed using this procedure.

B. Hydro-Distillation

When using water or hydro distillation, which is primarily utilised by small-scale manufacturers of essential oils, the plant material is suspended in suspension in the still, which is mounted on a furnace, and is nearly completely covered with water. Boiling water causes essential oil to transfer with the steam to the condenser. It is helpful for distilling spices, minced herbs, and other powders. An illustration of this approach is the copper still-based Deg Bhabka process from India. Some extraction methods, like hydro distillation, which is frequently employed in developing nations, are becoming obsolete. A burnt-smelling essential oil could come from the still running dry or becoming overheated, which would burn the aromatics. A 120 ml beaker containing 5 ml of methanol and 5 ml of the fixative was filled with 10 ml of lemongrass essential oil extract, and the combination received 5 ml of the fixative to increase the fragrance's longevity. After shaking the solution, a 50ml bottle was filled with it.

According to the above four methods, Solvent Extraction method gives high yield. so, we used this solvent extraction method for this process.

2.2 FORMULATION OF OIL TO PERFUME

A blend of substances made in a certain method and utilised for a particular purpose is called a formulation. A 120 ml beaker containing 5 ml of methanol was filled with 10 ml of lemongrass essential oil extract. To increase the perfume's duration, 5ml of the Fixatives were added to the mixture. Shaking the mixture before pouring it into a 50ml bottle.

3. PROCEDURES

3.1 Solvent Extraction

Fig 1: Soxhlet Method

1.From the sample of sliced lemongrass, weigh 150g of the dry material and put it in a 1-liter flask with a flat bottom.

2. Fill the flask with 500 ml of N-Hexane solvent.

3. The flask and its contents are left to stand for 36 hours in order to completely extract the oil from the lemongrass.

4. Since essential oils can be extracted using ethanol, decant the extract into a second 1 litre beaker and add 200 ml of ethanol.

5. The liquid/liquid separation procedure is used to separate the mixture once it has been transferred to a 500ml separating funnel. The separation's content allowing the funnel to reach equilibrium causes the two levels to split based on their distinct densities.

6. The upper Hexane layer and the bottom Ethanol extract are combined into two separate 250 ml beakers and set in a 78 °C water bath. By doing this, the ethanol is eliminated, leaving only the pure essential oil. Weighing the extract on an electronic weighing balance yields the amount of oil it will produce. The weight of the essential oil was determined by comparing the ultimate weight of the beaker containing the extract to its original weight.

4. SOURCES OF PERFUMES

4.1 Aromatics sources

Fruits: Fresh fruits such as apples, strawberries, cherries unfortunately do not yield the expected odors when extracted; if such fragrance notes are found in a perfume, they are synthetic. Notable exceptions include litsea cubeba, vanilla, and juniper berry.

The most commonly used fruits yield their aromatics from the rind; they include citrus such as oranges, lemons, and limes. Although grapefruit rind is still used for aromatics, more and more commercially used grapefruit aromatics are artificially synthesized since the natural aromatic contains Sulfur and its degradation product is quite unpleasant in smell.

Leaves and twigs: Commonly used for perfumery are lavender leaf, patchouli, sage, violets rosemary, and citrus leaves. Sometimes leaves are valued for the "green" smell they bring to perfumes, examples of this include hay and tomato leaf.

4.2 Animal sources

Ambergris: Lumps of oxidized fatty compounds, whose precursors were secreted and excelled by the sperm whale. Ambergris should not be confused with yellow amber, which is used in jewelry. Because the harvesting of ambergris involves no harm to its animal source, it remains one of the few animalic fragrance agents around which little controversy now exists.

Hyraceum: Commonly known as "Africa Stone", is the petrified excrement of the Rock Hyrax.

4.3 Synthetic sources

4.3.1 Aroma compound

Many modern perfumes contain synthesized odorants. Synthetics can provide fragrances which are not found in nature. For instance, Calone, a compound of synthetic origin, imparts a fresh ozonous metallic marine scent that is widely used in contemporary perfumes. Synthetic aromatics are often used as an alternate source of compounds that are not easily obtained from natural sources.

One of the most commonly used classes of synthetic aromatic by far are the white musk. These materials are found in all forms of commercial perfumes as neutral background to the middle notes.

5. ESSENTIAL OIL

Essential oils, or volatile oils, are found in many different plants. These oils are different from fatty oils because they evaporate or volatilize on contact with the air and they possess a pleasant taste and strong aromatic odor. They are readily removed from plant tissues without any change in composition.

Essential oils are very complex in their chemical nature. The two main groups are the hydrocarbon terpenes and the oxygenated and sulphured oils.

These oils do not have any obvious physiological significance for the plant. They may represent byproducts or metabolism rather than foods. The characteristic flavor and aroma that they impart are probably to some advantage in attracting insects and other animals, which play a role in pollination or in the dispersal of the fruits and seeds. When in high concentration, these same odors may serve to repel enemies of the plants (pest).

The oils may also have some antiseptic and bactericidal value. There is some evidence that they play an even more vital role as hydrogen donors in oxide reduction reactions, as potential sources of energy, or in affecting transpiration and other physiological processes.

Almost any part of a plant may be the source of the oil. Examples are flowers (rose), leaves (mint), fruits (lemon), bark (cinnamon), wood (cedar), root (ginger) or seeds (cardamom), and many resinous exudations as well.

Some of the most important essential oils used in the manufacture of perfumes are rosemary, violet, calamus, otto of roses, geranium, grass oils, lavender, jasmine, oak moss, lemon-grass oil.

6. ANALYSIS TECHNIQUES

6.1Determination of functional groups using FT - IR analysis:

1. Using an FTIR Spectrometer from Buck Scientific, the functional groups in the lemongrass oil is determined below.

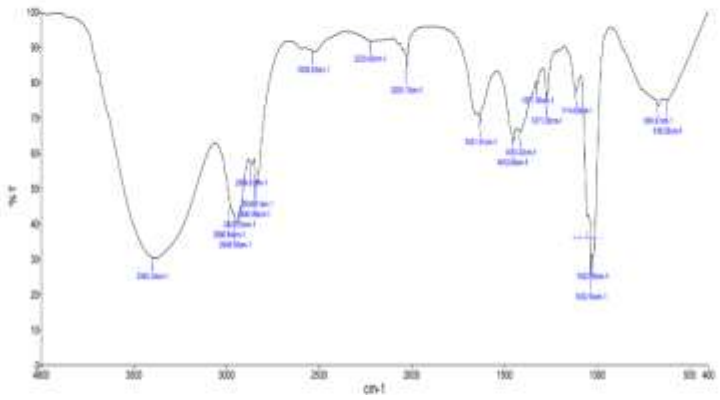
2. A deuterated Triglycine Sulphate detector and a beam splitter for potassium bromide is fitted to the apparatus.

3. To get spectra, Gramme A1 programme is used. On the salt pellet, 1.0g of sample will fit perfectly.

4. After that, the FT-IR spectrogram is created using 32 scans with a resolution of 4 cm-1 and a frequency range of 4,000 to 600 cm-1.

5. With the aid of IR correlation tables, the functional groups were assigned numbers.

The lemongrass oil FTIR spectra analysis is carried out, and the absorptions is compared with standard IR spectrum table and chart using frequency range. The lemongrass oil spectra confirm the presence of functional groups such as alcohols, carboxylic acid, isothiocyanates, sulphates, alkenes, and aromatic compounds.



6.2 Determination of lemongrass oil composition using UV– analysis:

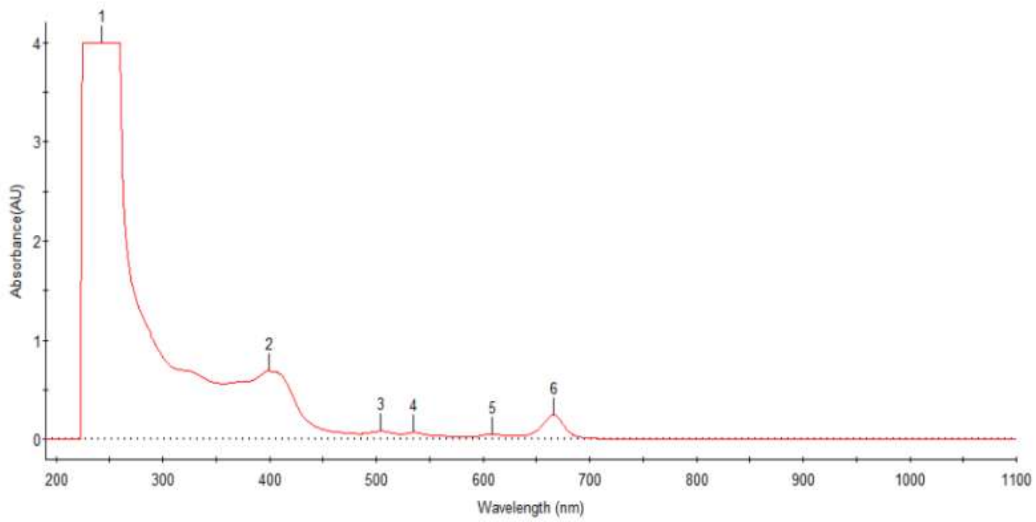
1.From the IR Spectrum analysis, we assumed that one of the bioactive compounds to inhibit corrosion is Citral. The analysis of this compound also can be detected by using UV-Vis

Spectrophotometer to determine the wavelength and absorbance of the compound.

2.Based on the spectrum obtained in below graph, the λmax is shown at 273.50 nm at absorbance 0.850, which is the highest peak. According to Miron *et al.* 2014, they obtained 270 nm for λmax of the Citral compound.

3. From this prior study, we conclude

that the λmax, or the first peak on the spectrum was the Citral compound as it is the major compound in lemongrass. Next, the absorption was used for the calibration curve to determine the concentration of the phenolic compound and flavonoid.

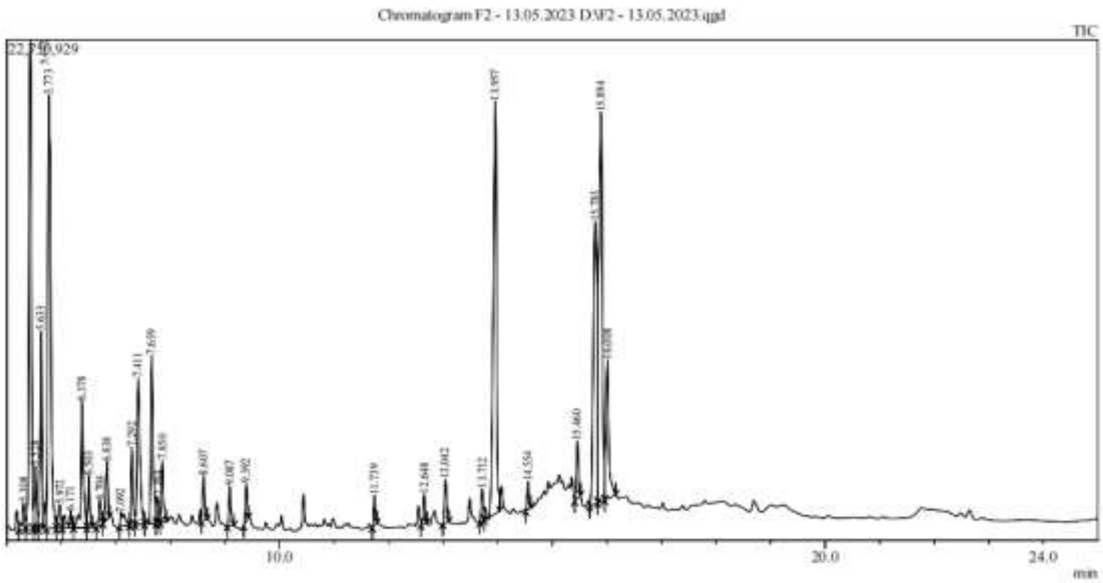


6.3 Determination of lemongrass oil composition using GC – MS analysis:

1.A fragrance mixture (FM) standard that had roughly 30 mM each of limonene, linalool, geraniol, and eugenol as well as 15.2 mM of coumarin dissolved in methanol was utilised during the development of the GC-MS method to optimise the GC separation.

2.By pipetting 10 mL of perfume into a GC vial and adding 1 mL of methanol to the final volume, a 1% perfume solution was made in order to create a library of the components found in the male perfume.

3.The cotton swatch was added to a 1.5 mL glass vial for the examination of fragranced garments after 1 mL of methanol was added to extract the fabric's constituents. After that, the solvent was put into a single-use 1.5 mL Eppendorf tube and centrifuged for GC-MS analysis, the sample was transferred into a GC vial after being spun for 2 minutes at 12,000 rpm in a VWR Galaxy 14D micro centrifuge.



Peak Report TIC

Peak#	R.Time	Area	Area%	Height	Height%	A/H	Name
1	5.308	3870758	0.66	1213647	0.75	3.19	Oxiranecarboxaldehyde, 3-methyl-3-(4-methyl
2	5.432	69892309	11.93	22222937	13.68	3.15	Z-Citral
3	5.528	7740607	1.32	2854174	1.76	2.71	2,6-Octadien-1-ol, 3,7-dimethyl-, (Z)-
4	5.633	22212214	3.79	8977280	5.53	2.47	3,6-Dimethyl-3-octene-2,7-dione
5	5.773	76330305	13.03	19703889	12.13	3.87	Ethanone, 1-[3-methyl-3-(4-methyl-3-pentenyl
6	5.972	4002057	0.68	1063872	0.65	3.76	2-Undecanone (CAS) 2-Hendecanone
7	6.171	4205615	0.72	764631	0.47	5.50	3,6-Dimethyl-3-octene-2,7-dione
8	6.378	19593582	3.35	5736934	3.53	3.42	3,6-Dimethyl-3-octene-2,7-dione
9	6.503	5742395	0.98	2344551	1.44	2.45	6-Octenoic acid, 3,7-dimethyl-, methyl ester
10	6.704	3403638	0.58	1141656	0.70	2.98	LIMONENE DIOXIDE 1
11	6.838	7496234	1.28	2612210	1.61	2.87	Geranic acid
12	7.092	3487056	0.60	583408	0.36	5.98	2,6-Octadien-1-ol, 3,7-dimethyl- (CAS) 3,7-D
13	7.292	9432502	1.61	3550847	2.19	2.66	LIMONENE DIOXIDE 1
14	7.411	24339402	4.16	6668718	4.10	3.65	7-Octen-2-one
15	7.659	23496659	4.01	7648250	4.71	3.07	3-Cyclohexen-1-carboxaldehyde, 3-methyl-
16	7.764	3536914	0.60	1218217	0.75	2.90	3,5-Heptadienal, 2-ethylidene-6-methyl-
17	7.850	7333914	1.25	2849198	1.75	2.57	Cyclohexane, 1,4-bis(methylene)- (CAS) 1,4-I
18	8.607	5357367	0.91	2047977	1.26	2.62	7-Oxabicyclo[4.1.0]heptane, 1-methyl-4-(2-m
19	9.087	4900435	0.84	1820687	1.12	2.69	2-Furanmethanol, 5-ethenyltetrahydro-.alpha.,
20	9.392	3921774	0.67	1717420	1.06	2.28	Dodecanoic acid
21	11.739	3183323	0.54	1361609	0.84	2.34	Tetradecanoic acid
22	12.648	3259304	0.56	1389232	0.86	2.35	2-Undecanone, 6,10-dimethyl-
23	13.042	5536157	0.95	1993818	1.23	2.78	1-Hexadecanol (CAS) Cetal
24	13.712	3951071	0.67	1462606	0.90	2.70	7,9-Di-tert-butyl-1-oxaspiro(4,5)deca-6,9-dien
25	13.957	80271909	13.71	18761919	11.55	4.28	n-Hexadecanoic acid
26	14.554	3096697	0.53	1263071	0.78	2.45	Heptadecanoic acid
27	15.460	6601681	1.13	2624193	1.62	2.52	Phytol
28	15.783	67666412	11.55	12840425	7.90	5.27	9,12-Octadecadienoic acid (Z,Z)- (CAS) Linol
29	15.894	78551241	13.41	17687478	10.89	4.44	9,12,15-Octadecatrienoic acid, (Z,Z,Z)-
30	16.008	23262707	3.97	6338365	3.90	3.67	Octadecanoic acid
		585676239	100.00	162463219	100.00		

7.CONCLUSION

In the experiment, lemongrass essential oil which has a high citral concentration and is employed in perfume production was extracted. Essential oils were extracted to determine how much oil each technique generated and how much oil is used in a perfume. According to the experiment, oil extraction utilizing petroleum spirit as a solvent in the soxhlet produced the most oil, followed by extraction using water and steam distillation. The process of extraction mainly determines the yield of oil. An essential oil's ability to resist heat, water, and alcohol determines its extraction via the distillation method. Steam distillation is only possible with oil that is steam volatile. Most commercially available essential oils are steam volatile, which means they are relatively stable under heat action and essentially insoluble in water, making them ideal candidates for steam processing. Essential oils, resins, hydrocarbons, and other heat-sensitive compounds, which are insoluble in water and may break down at their boiling point, are all separated using one of these extraction processes. The steam's temperature must be high enough to evaporate the essential oil but not so high that it destroys or burns the oil. Chemical engineering separation and evaporation processes were employed in these approaches.

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