

Research Article



Preparation And Evaluation Of Polyherbal Scented Candle Using Volatile Oils Extracted By Enfleurage Method

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ABSTRACT

Background: Medicinal plants serve dual roles, offering remedies for various diseases and income-generation opportunities. Ancient Indian texts, including Ayurveda, extensively document plant use in healthcare. Globally, medicinal plants are vital resources in the fight against severe diseases. Essential oils in plants provide distinct aromas, flavors, and pathogen protection. Tithonia erecta flower oil boasts a complex composition with diverse beneficial properties. Exocarp extract from Citrus sinensis differs from juice or leaf extracts, containing more lipophilic compounds but fewer glycosylated compounds and lacking cyanidins and sterols. Eucalyptus globulus oil acts as an antiseptic and anti-spasmodic stimulant for respiratory issues. Scented candles are a popular relaxation method, promoting well-being through ambient lighting. This study aims to create practical scented candles using natural materials like soy wax, beeswax, and essential oils.

Methods: The desired candle should offer a long burn time, be cost-effective, and pose no health risks to users. The candle composition includes gel wax, vegetable or animal fat, eucalyptus leaves, marigold petals, and orange peels. This study involves preparing and evaluating polyherbal scented candles using volatile oils extracted through the enfleurage method.

Results: The phytochemical analysis of these extracts revealed the presence of volatile oils, alkaloids and proteins. The FTIR analysis reveals the presence of OH group in these extracts.

Conclusion: This research successfully developed a natural polyherbal scented candle with extended burn time, cost-effectiveness, and user safety. Antioxidants prevent undesired changes during production and use. The candle contains gel wax, vegetable or animal fat, eucalyptus leaves, marigold petals, and orange peels. Evaluation tests confirmed safety and effectiveness. Among formulations, F1 is fragrance-minimal and allergy-free, while others may cause counter-irritation. This eco-friendly product provides a fresh herbal fragrance for stress relief and is competitively priced.

Keywords: scented candles, soy wax, beeswax, essential oils, enfleurage method

INTRODUCTION

In the contemporary context, relaxation has emerged as a crucial process for alleviating both mental and physical stress. Amid the diverse array of relaxation methods available today, aromatic candles have gained prominence. Scented candles serve as a vital component in health spas, effectively relieving symptoms associated with bronchitis, high blood pressure, tension, and insomnia. Moreover, they offer holistic approaches to address emotional and mental stress, grief, and trauma. These scented candles incorporate a range of natural additives, including essential oils, herbs, spices, citrus fruits, berries, musk, oatmeal, and sea breeze. In the present day, the mass production of scented candles often relies on petroleum-derived sources like paraffin and benzene homologues, potentially posing health risks (1-4) Hence, it becomes imperative to craft aromatic candles from natural sources such as soy wax, beeswax, and natural essential oils to deliver the most practical benefits to users.

The primary objective of this study is to create scented candles that emit delightful fragrances. This is achieved using carriers, specifically sugars such as sucrose, dextrose, levulose, mannose, and glucose. (5-6) The current approach involves a process for producing scented and/or colored candles, which comprises (a) forming numerous individual particles of candle wax; (b) blending the coloring and scenting agents with these particles; (c) enveloping the particles with the chosen agent(s) through agitation; and (d) situating the coated and dried particles around a candle wick. Various

additives are employed in candles to impart desirable attributes, including color, aroma, texture, and stability (7-9) The quantity of diluent required is precisely the amount needed to dissolve the fragrance or antioxidant. Scented candles incorporate a fragrance agent, typically scented oils, incorporated into the candle wax during the manufacturing process. This agent releases its aroma when the candle burns, and candles may offer varying concentrations of these scents. There is a growing trend towards highly scented candles with a potent concentration of the scenting agent. Fragrance-dispersing candles are readily available and are commonly used to infuse spaces with pleasant scents.

However, very few studies have focused on the production of scented candles using a combination of beeswax, soy wax, and self-distilled lemongrass essential oil. (10-12). Notably, this product is crafted entirely from natural materials. (13-14) To enhance the longevity of the scented candles and maintain the consistency of their aroma during storage and transport, antioxidants are employed. The objectives of this study encompass three main areas: (i) investigating the factors influencing the distillation process of lemongrass essential oil; (ii) developing candles that are durable, affordable, and free from health concerns; and (iii) assessing certain physicochemical properties and conducting sensory evaluations of the end product. Aromatherapy's ability to influence human emotions has led to a widespread demand for aromatic candles, which are not only valued for their therapeutic benefits but also for

their capacity to create diverse and pleasing aesthetic experiences, whether for religious, celebratory, or relaxation purposes.

Materials & Methods:

Collection of the plant material (Hien TT ,2018; Tran TH ,2018; Rajeswari G, Walter de Gruyter ,2002; Favela-Hernández J ,2016; Egbuonu A ,2016).

Marigold flower petals:

Fresh and healthy flower petals i.e., Marigold (*Tagetes erecta*) is collected from flower market of Tirupati. The flower petals washed thoroughly with distilled water.

Orange peels:

Fresh and healthy orange (*citrus sinensis*) peels collected from market of Tirupati and washed thoroughly with distilled water.

Eucalyptus leaves:

Fresh leaves of eucalyptus (*Eucalyptus globulus*) are collected from S V University campus and washed thoroughly with distilled water.

MATERIAL AND METHODS

Extraction technique of volatile oil:

Extraction is a separation process consisting of separation of substance from a matrix. It may be defined as the removal of soluble constituents from a solid or liquid or semisolid with means of suitable solvents. The products obtained from plants are relatively impure liquids, semisolids or powders intended only for oral or external use (Tran TH ,2018).

These include Steam distillation, Fractional distillation and Enfleurage method.

Enfleurage Method (Abdo BM ,2019):

It is technique that extracts scents and oils from plants. The most fragile plants can be used. The plants that are chosen are placed in a fat with which the plants are heated. It is this oil that carries the fragrance. The process of enfleurage:

1. Cold effleurage
2. Hot effleurage



Fig: 1 Fat adsorbent bed

1. Preparation of fat adsorbent:

Adsorbent was prepared using any vegetable fat or animal fat (which should be in semi hard surface). This fat was heated up to 60°C further stirring for 15 minutes. It should be absolutely of uniform consistency, free of water and practically order less.

2. Effleurage process:

The herbs were weighed accurately about:

1. Eucalyptus leaves (21.92 g) and make into small pieces.
2. Orange peels (sufficient) break into small pieces.
3. Marigold flower petals (12g).

Place all the above leaves, peels, and petals on the surface of fat adsorbent for 1,3,5,7,9,11 days. The process was repeated with changing the upper layer of bed for every 24 hours with fresh leaves, peels, and petals up to 2-3 months day by day. Fig: (2) Fat bed with orange peel, Eucalyptus leaves, Marigold petals.



Fig: 2 Enfleurance bed

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Extraction of oil from bed:

After 2-3 months once the process is completed scrape all the fat and cover with alcohol (ethanol or isopropyl). Leave fat in alcohol for 1-2 months fig (3). Strain from alcohol and allow alcohol to evaporate fig (5). After alcohol has evaporated, we will get the absolute oil. Store in small amber bottle.



Fig. 3: Fat in alcohol



Fig. 4: Filtration of fat



Fig. 5: Evaporation of alcohol

PRELIMINARY PHYTOCHEMICAL STUDIES:

Phytochemical constituents have played a major role as basic source for the establishment of several pharmaceutical industries. Many medicinal plants occurring in India are yet to be subjected to various chemical investigations, which may help in the discovery of several new drugs. To investigate such chemical constituents from plants, extraction, purification, and characterization steps are involved. Broadly, chemical constituents in plants may be divided into major groups viz., primary, and secondary chemical constituents. Primary constituents are the basic metabolites of plants such as carbohydrates, proteins, lipids, cellulose, and chlorophyll which are distributed in almost all plants. Secondary chemical constituents are selective and vary considerably from plant to plant and even within the species or varieties of same genus, secondary chemical constituents are chiefly responsible for the therapeutic activities of plants or drugs (15) The plant material was subjected to preliminary photochemical screening for the detection of various photochemical constituents. It involves the extraction of plant material and qualitative chemical examination.

UV –SPECTROSCOPY (Titao O ,2019):

UV absorption spectra of oils (orange peel, eucalyptus leaves, marigold flower

petals) was monitored by measuring the UV-visible spectrum of the reaction medium after diluting the solution to a range of 200-900nm UV-visible spectrophotometers. The UV-visible spectra were recorded by a UV-visible jasco V -5 50 spectrophotometer were shown in Fig. 9-11.

FTIR analysis (Abdo BM ,2019):

Fourier transform infrared (FTIR) is one of the preferentially implemented methods of infrared spectroscopy. The IR method involves the principles of allowing the IR radiation to pass through a sample. During the process, the sample absorbs some of the radiations, while some of it will be transmitted through sample the resulting IR spectrum represented as the molecular absorption and transition spectrum, providing a clear idea regarding the molecular composition or fingerprints of the sample. They are referred fingerprints because of uniqueness of the IR spectrum, i.e. each molecule spectrum has its unique infrared spectrum. The FTIR done to the orange peel extracted oil, eucalyptus oil and marigold petals were shown in Fig. 12-14.

Candle preparation:

Melt Gel:

Fill a medium sauce pan with gel wax and melt over medium heat. Using thermometer to monitor the temperature, heat until gel reaches 200o Fahrenheit (do not exceed the temperature it will lose clarity and become yellow). keep up to the gel melt and became smooth.

Add wick:

Using toothpick, place wick in the

center of the candle with metal tab touching the bottom.

Add gel:

Shake a few drops of essential oil (eucalyptus oil, orange oil and marigold Petals) into melted gel and powder of green camphor, stir very carefully, then pour wax into the glass jar (Palithya S, 2022). To prevent bubbles, pour slowly and cover ¼ - inch from the tip of the jar as shown in fig-7 and the formulation is tabulated in table-1.



Fig. 6: Candle gel

Table:1 Constituents in the polyherbal scented candle.

Constituents	F ₁	F ₂	F ₃
EUCALYPTUS LEAVES OIL	1 ml	1ml	1ml
ORANGE PEEL OIL	1.5 ml	1.5 ml	1 ml
MARIGOLD PETALS OIL	1.5 ml	1.5 ml	1.5 ml



Fig: 7 Formulation of polyherbal scented candles

Results & Discussion:

Preliminary Phytochemical Screening:

Table :2 Preliminary Phytochemical Analysis of Volatile Oil Extract (Orange Peel, Eucalyptus Leaves and Marigold Petals):

S. No	Phytochemical	Orange peel	Eucalyptus leaf	Marigold petals
1.	Alkaloids	+	+	+
2.	Glycosides	+	-	+
3.	Sterols	+	+	-
4.	Flavonoids	-	+	+
5.	Saponins	+	+	-
6.	Carbohydrates	+	+	-
7.	Tannins	-	-	-
8.	Resins	-	-	-
9.	Proteins	+	+	+
10.	Volatile oil	+	+	+



Fig: 8 Test for volatile oils

UV-result for orange peel:

From orange peel volatile oil extract, the spectrum of this solution was run in 230 nm range in UV - Spectrophotometer.

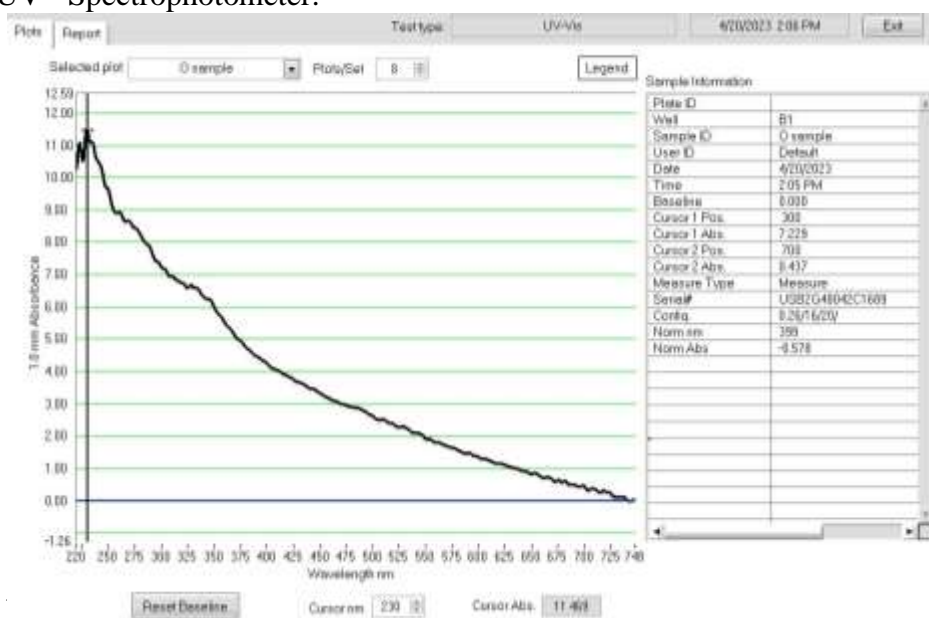


Fig:9 Indicated the UV - Spectroscopy spectrum of orange peel extracted volatile oil

UV-result for eucalyptus leaf:

From eucalyptus leaf volatile oil extract, the spectrum of this solution was run in 229 nm range in uv-spectrophotometer.

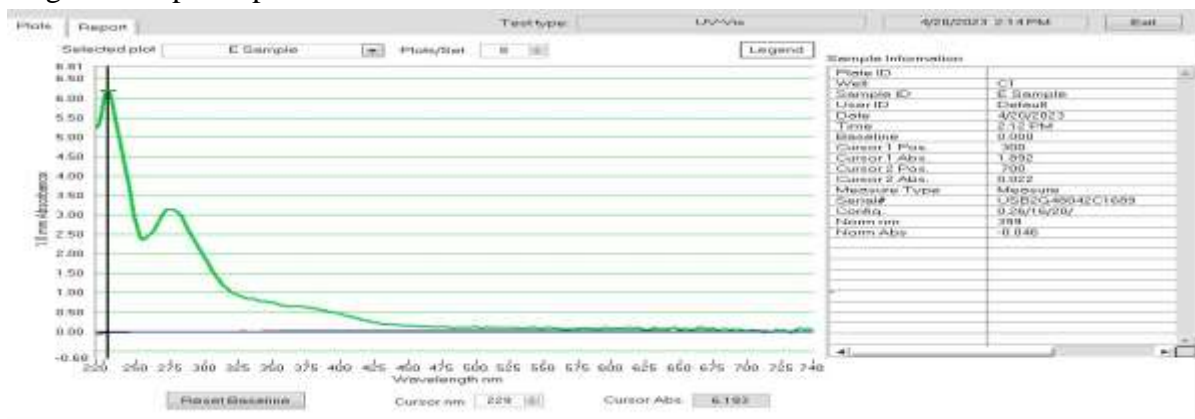


Fig: 10 Indicates the UV - Spectroscopy spectrum of Eucalyptus leaf extracted volatile oil

UV-result for Marigold petals:

From marigold petals volatile oil extract, the spectrum of this solution was run in 282nm range in uv-spectrophotometer.



Fig: 11 Indicates the UV - Spectroscopy spectrum of Marigold petals extracted volatile oil

FTIR ANALYSIS RESULTS:

FTIR spectra for orange peel extract:

The FTIR of orange (citrus) shows the peaks in wave numbers of 2921.72 and 2855.09 which has bond of CH stretching in methyl and methylene group. The next peak shown in the range of 1740.90 this shows the presence of C=O stretching in unconjugated ketones, carbohydrates, aldehydes, and ester groups. The peak at 1456.34 contains C-H

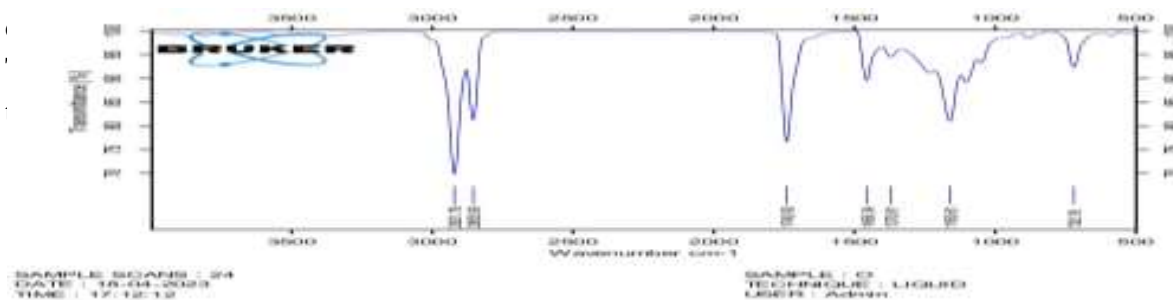


Fig:12 FTIR peak of orange peel volatile oil.

FTIR spectra for Eucalyptus:

The FTIR of Eucalyptus shows the peak at 3331.18 it indicates the presence of OH stretching of alcohols, phenols, and acids at 2971.30 / 2921.11 C-H stretching in methyl and methylene groups. At 1740.72 C=O stretching in conjugated ketones, carbonyls, aldehydes, and ester groups. At 1451.61 C-H deformations (asymmetric) the peak at 1381.37 shows CH₂ bending in cellulose and hemicelluloses. And at 1087.05 / 1046.03 shows C-H and C-O deformations. At 881.15 shows C-H deformation of cellulose and hemicelluloses. At peak 636.91 shows C-Cl.



Fig: 13 FTIR peak of Eucalyptus leaves

FTIR spectra for Marigold:

The FTIR of marigold shows the peak at 3328 shows OH and carbohydrates, proteins and polyphenones. At the peak of 2971.14 shows the presence of C-H; C-H₂ lipid region aliphatic groups. The peak at 2921.25 shows C-H, CH₂ stretching aliphatic group. At 1739.93 it shows C=O ester fatty acid group. At 1086.90 =CH₂ fatty acids group. At 1086.90 shows PO₂ stretching asymmetric, mainly phospholipids. At 1045.68 shows N-H alkylamine and at 881.11 shows in =CH₂ stretching inorganic carbonate and lastly 635.63 peak shows C-H aromatic bond.

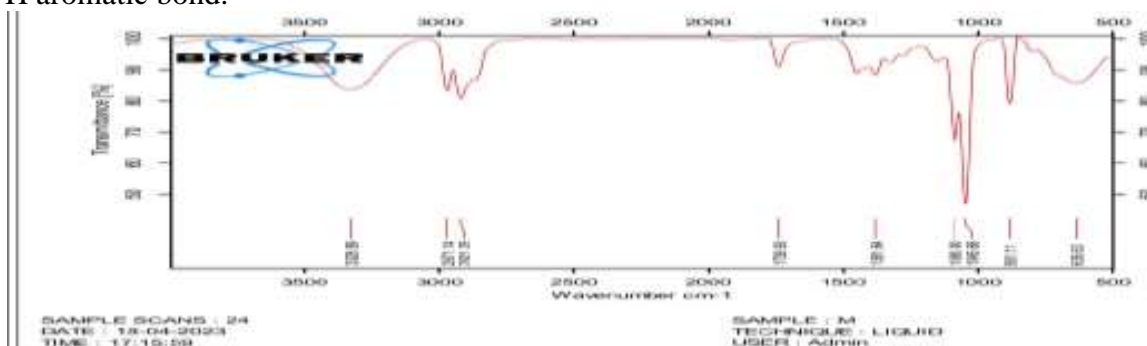


Fig: 14 FTIR peak of Marigold petals extracted volatile oil.

After extraction and evaluation of volatile oils conducted for the fragrance test for all the candle formulations. Every candle was tested in laboratory by lightening and contrasting with the same size aromatic herbal candle and flammability rate, the test show same as to other commercialized candle. Out of these 3 formulations F₁ shows minimum fragrance which could not cause any allergic reaction and the other 2 formulations has high fragrance levels and it might cause counter-irritation effects.



Fig: 15 & 16 Fragrance test

CONCLUSION

Natural base poly herbal scented candle was successfully developed in this research work. The ideal outcome for the produced candle should encompass the following attributes: it should have a prolonged burn time, be cost-effective, and have no adverse health effects on users. Antioxidants are highly effective in preventing undesired changes during the manufacturing process, storage, and burning of the candles. The composition of scented candles includes gel wax, vegetable fat or animal fat, eucalyptus leaves, marigold petals and orange peels. Evaluation tests found that the drug was very effective and safe to use. Statistically it indicates that the commodity being offered is successful. Out of these 3 formulations F₁ shows minimum fragrance which could not cause any allergic reaction and the other 2 formulations has high fragrance levels and it might cause counter-irritation effects. No complaints

about allergic effects and this is healthy product. While the formulation gives a fresh fragrance of herbs it will relieve the stress. Even the wording was climate conscious, competitive and wallet safe.

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