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Production of Body Perfume Using Lemongrass Essential Oil

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Authors' contributions

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

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ABSTRACT

The aim of this study is the extraction of essential oil from lemongrass and its utilization in the production of body perfume. The lemongrass samples used in the study were collected from Eke-Awka market Anambra State, Nigeria and were oven dried, grinded into powder and the oil extraction was carried out using soxhlet extractor with Normal hexane as solvent in the extraction process while AOAC, 2010 method of Analysis was employed in the determination of the physiochemical properties of the oil. The result obtained from the analysis showed that orange peel has a light yellow oil with percentage yield of 1.67% pH of 5.5, refractive index of 1.0321, specific gravity of 0.94, Saponification value of 527.35mgKOH/g, peroxide value of 17mgKOH/kg, iodine value of 20.20gI/100g, and acid value of 33.34mgKOH. 100ml of lemongrass essential oil extracted were used in the production of perfume while 100ml of Methanol and 100ml of the Fixatives were added to the mixture (to improve the longevity of the perfume), and finally the solution were shaken, allowed to stand for 48hrs and poured into different 50ml spray bottles. The result of the

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comparative analysis of the lemongrass oil body perfume and commercial body perfume showed the ph as 6.8 and 6.1, and the lemongrass oil body perfume lasted for 8hrs when sprayed. Lemongrass oil body perfume competes favorably with commercial available body perfume.

Keywords: Lemongrass; perfume; chemicals; plants.

1. INTRODUTION

A fragrant liquid or oil known as perfume is created by distilling an extract with water and alcohol [1]. Since the dawn of recorded history, people have tried to enhance or conceal their personal odour by using perfume, which mimics the pleasant scents of nature. Perfume has been manufactured from a wide range of natural and synthetic materials and is used to fragrance the air, cleansers, and cosmetics, as well as to be applied to the skin and clothes. No two persons will smell the same when wearing a perfume due to variations in body chemistry, temperature, and body odour (Saati et al*.,* 2021).

Three notes make up a scent. The scent of a fragrance after it has dried is known as the base note. The middle note is the scent that emerges when the perfume combines with your particular body chemistry. The first scent one detects while in an aroma is known as the top note. There are several fundamental procedures in the creation of scent, however each perfumery has its own favoured method [2].

The extraction of scent from plants involves several techniques, such as solvent extraction, distillation, and the effleurage process. These techniques alter the aromatic chemicals' smell that is extracted from the raw materials to some degree [3]. It's important to remember that there are three essential ingredients you'll need to make perfume: essential oils. These are extracted from a variety of plants, both organic and nonorganic, and when combined, they give your perfume its desired scent [4].

Lemongrass, which goes by other names such as citronella, fever grass, serai, sereh, and takrai, is a perennial plant that is extensively grown in tropical and subtropical regions. It is classified into two species: Cymbopogon citratus, which is West Indian, and Cymbopogon flexuosus, which is East Indian [5]. Citral makes up the majority of the chemical components in Cymbopogon citrates, including terpenoids. According to Ejimofor et al*.* [6] this species also contains relatively little myrcene and other terpenoids such as nerol, limonene, linaloale, and β-caryophyllene. Lemongrass essential oil is frequently used as a scent in cosmetics like soaps and creams as well as fragrances. Since ancient times, it has also been utilised medicinally. Garlic has been linked to a number of health advantages, including the treatment of arthralgia, the avoidance of cardiovascular illnesses, headaches, leprosy, TB, epilepsy, coughs, and digestive issues (Benjilali et al*.,* 2020). Antimicrobial properties against several viruses, bacteria, fungi, and parasites were also demonstrated by it. The most significant organosulfur component in lemongrass essential oil, citral has been linked to some of the oil's therapeutic qualities. The characteristic and strong smell of lemongrass is caused by this molecule, which is especially prevalent in lemongrass essential oil [7]. Alliin, also known as S-allylcysteine sulfoxide, is the colourless and odourless precursor of allicin in fresh garlic [8]. The challenge in perfume formulation is figuring out how much essential oil and other ingredients to combine in order to prevent skin irritation and boost the scent's strength and duration. The majority of imported perfumes are made of synthetic odorants, which are dangerous when applied since they are not made of pure chemicals. There aren't many perfume-producing factories, imports of perfume may result, which would reduce foreign reserves and increase unemployment.

1.1 Statement of the Problem

The search for a sweet-smelling material, or perfume, began in antiquity, and perfumery continues to this day to preserve its timeless quality as a "sweet-smelling fragrance."

Because body perfume is used for so many different purposes in the nation, there is a growing trend in the trade to produce it using locally sourced raw materials in order to lower the cost of imports, which is then significant.

Therefore, the goal of this initiative is to provide a substitute supply of raw materials for the perfume industry. This would largely help to lessen, if not completely eliminate, the current significant

condition that not only has a severe negative impact on our economy but has also made our nation a fertile field for both low quality and out dates perfumery and it will also create job opportunities in the countries.

This work is aimed at production of liquid and vaporized perfume using lemongrass essential oil with objectives; Extraction of essential oil from lemongrass**;** Production of liquid and vaporized perfume using the lemongrass oil**;** Comparing the quality of the perfumed produced with commercial perfumes.

2. MATERIALS AND METHODS

2.1 Apparatus and Solvents

- A retort stand
- 500ml Separation funnel
- 250ml and 100ml Beakers
- Electronics weighting balance (500g/0.01g. DT-500B)
- Water bath(KW 1000DC)
- Mortar and pestle
- 500ml Round bottom flask
- Knife
- Aluminum foil
- Electric heater
- Distilled water
- N-hexane
- Ethanol

Fume binder

- Pipette
- Funnel
- Perfume bottle
- Fixatives (Surprise and Dream)
- Methanol
- Distilled water

Colourant.

2.2 Sample Source and Preparation

Fresh lemongrass sample was collected from the garden in ABCD lodge Uli, Anambra State and was allowed to dry for about three days in the laboratory. The leaves were later cut into slices to reveal the tighter inner stem. Till when ready for use.

2.3 Solvent Extraction Method

From the sample of lemongrass, 130g of the dried sample were weighed and put into a 500ml clean flask with a flat bottom. After adding 600 ml of N-hexane solvent to the 500 ml flask, the reaction was halted. For the purpose of fully extracting the oil from the lemongrass, the flask and its contents were let to stand for a full day. The extract was then poured into a second 500 ml beaker. Since essential oil is soluble in ethanol, 200 millilitres of ethanol were added to extract the essential oil. After that, the mixture was put into a 500 ml separating funnel and separated using a method known as the liquid/liquid separation procedure. After the separating funnel's contents reached equilibrium, they split into two layers (depending on their different density). Two distinct 250 ml beakers containing the upper layer of hexane and the lower layer of ethanol extract were submerged in a water bath set at 780C. By doing this, the ethanol was eliminated, leaving just the pure essential oil. By weighing the extract on an electronic weighing scale, the oil yield was ascertained. The weight of the essential oil was determined by subtracting the beginning weight of the empty beaker from the end weight of the beaker containing extract.

2.4 Characterization of the Lemongrass Oil

The following physicochemical characteristics were analyzed in the oil, Specific gravity, Refractive index, PH, Viscosity, Acid value, Saponification value, Iodine value, Ester value, Free fatty acid value, Peroxide value.

Determination of specific gravity: The oil's density was measured using a density bottle. Weighed as (W0), a dry, clean specific gravity container was then filled with oil and reweighed to yield (W1). After the bottle was cleaned, dried, and weighed, water was used in place of the oil to produce (W2). The specific gravity formula is

$Sp.gr = (W_1 – W_2)$ = Mass of the substance

$(W_2 – W_0)$ Mass of an equal volume of water

Where

W_0 = weight of the specific gravity bottle.
W_1 = Weight of the oil + specific gravity bottle
W_2 = weight of water + specific gravity bottle

2.5 Determination of Viscosity

The fluid to be tested had a flow duration of more than 200 seconds, hence a dry, clean viscometer

was used. To remove dust and other solid contaminants from the liquid sample, a sintered glass (fine mesh screen) filter was used. By submerging the tube's thinner arm into the liquid sample and applying suction force up to the viscometer's upper timing mark, the viscosity metre was filled with the sample. The device was then rotated to its standard upright position. After inserting the viscometer into a holder and setting the bath to a constant temperature of 290C, the sample took around ten minutes to reach that temperature. After that, the thinner arm received the suction force, which caused the sample to be drawn just above the top time mark. By timing the sample fault as it moves freely from the top timing mark to the lower timing mark, the afflux time was determined.

2.6 Determination of Refractive Index

For this determination, a refractor was used. A small amount of the material was transferred onto the refractometer's glass slide. To maintain a consistent temperature, water heated to 300°C was tipped around the glass slide. The dark area observed was aligned with the cross intersection at zero parallax error using the refractometer's eyepiece. The refractive index was shown via the scale's pointer. The refractive index was calculated by repeating this process and noting the mean value.

2.7 Determination of PH

A clean, dry 25 ml beaker was filled with 2 g of the oil sample, and it was gently swirled with 13 ml of hot, distilled water. After that, it was chilled to 25 oC in a cold water bath. After standardising the PH electrode with butter solution, the electrode was submerged in the sample, and the PH value was noted and recorded.

2.8 Determination of Acid Value

The acid value was obtained using Pearson's 1970 tittrametric technique. A conical flask was filled with 5 millilitres of the oil sample, which was precisely weighed. 10 millilitres of carbon tetrachloride were then added, along with a few drops of phenolphthalain indicator. The mixture was then titrated with 0.1 millilitres of alcoholic potassium hydroxide until a pink colour appeared and lingered for a short while (ten seconds). The titration process was repeated twice, and an average titer was determined.

This is how the acid value was determined:

$$\text{Acid value} = \frac{\text{vol of KOH x Normality x Molar mass}}{\text{Weight of the oil}}$$

2.9 Determination of Saponification Value

Indicator method was used as specified by 1S0 3657 (1988) was used. 2g of the oil sample was weighed into a conical flask. 2.5ml of 0.1N ethanolic potassium hydroxide was then added. The content which was constantly stirred was allowed to boil gently for 60min. a reflux condenser was placed on the flask containing the mixture. Few drops of phenolpthalain indicator was added to the warm solution and then titrated with 0.5n HC to the end point until the pink color of the indicator just disappeared. The same procedure was used for other samples and blank. The formular for saponification value is given by:

$$\text{Saponification value} = \frac{(\text{Vo} - \text{V1}) \text{ x Normality x molar mass}}{\text{Sample weight}}$$

Where

V_0 = sample titration
V_1 = Blank titration
N = Normality of HCL
Molecular weight of KOH = 56.1

Determination of iodine value: The iodine value was calculated using the titrametric method of Pearson (1970): 1g of the oil sample was weighed into a dry glass stopper bottled with a capacity of 250 ml, and 1 ml of carbon tetrachloride was added to the oil. Afterwards, 20 ml of wigs solution (iodine monochloride) was added, and the mixture was left in the dark for 30 minutes. Following this, 15 ml of (10%) potassium iodide and 100 ml of water were added, and the mixture was titrated with 0.1N sodium thiosulphate solution just before the end points. A blank was also prepared alongside the oil samples, and the iodine value was obtained using the formula.

$$\text{Iodine value} = \frac{(\text{V1} - \text{V2}) \text{ x M x } 12.69}{\text{Weight of sample}}$$

Where

V_1 = Titre value for blank
V_2 = titre value of the sample
M = morality of the standard thiosulphate solution
12.69mg = 1cm3 of 0.1m sodium thiosulphate.

2.10 Determination of Peroxide Value

One gramme of powdered potassium iodide and twenty millilitres of a solvent mixture (glacial

acetic acid and chloroform) were put to a conical flask that had been weighed out. For thirty seconds, this was submerged in boiling water. Next, the contents were transferred into a flask holding 20 millilitres of a 5% iodine solution. Next, using starch as an indicator, the flask was titrated with 0.002m sodium thiosulphate solution after being cleaned off with 25ml of distilled water. Along with the oil samples, a blank was also created.

The following formula provides the peroxide value:

$$\text{Peroxide value} = \frac{(V0 - V1) \text{ x M x } 1000 \text{ meq/kg}}{\text{Weight of oil}}$$

Where

V_0 = titre value for blank
V_1 = titre value for sample
M = motality for ($Na2SO.5H_20$)

2.11 Formulation of Perfume with Essential Oil Produced

Chemicals

1. Methanol 400ML
2. Propylene Gylcol/Glycerine 100ml
3. lemongrass oil Fragrance 500ml
4. Mentol a pinch

Process of Perfume

STEP 1: Pour the Methanol into a dark colored bottle.

STEP 2: Add propylene glycol 100ml to the Methanol mixture and shake it gently to blend for 5 minutes. Do not shake it strongly.

STEP 3: Add fragrance combination one after the other into the mixture and shake gently.

Cover your dark bottle tightly and leave it to settle and blend very well for at least 72 hours after production before you package into containers.

3. RESULTS

The result of the physiochemical properties of the lemongrass oil extracted is given in Tables 1-4.2. The result obtained from the analysis showed that orange peel has a light yellow oil with percentage yield of 1.67% pH of 5.5, refractive index of 1.0321, specific gravity of 0.94, Saponification value of 527.35mgKOH/g, peroxide value of 17mgKOH/kg, iodine value of 20.20gl/100g, and acid value of 33.34mgKOH.

Table 1. Physical properties of lemongrass oil

Properties	Lemongrass oil
Oil yield (%)	1.76
pH	5.5
Colour	Yellow
Refractive index	1.0321
Specific gravity	0.94

Table 2. Chemical properties of lemongrass oil

Properties	Lemongrass oil
Acid value (mgKOH/g of oil)	3.34
Saponification value (mg KoH/g of oil)	527.34
Peroxide value (meq/kg)	17.00
Iodine value (g I_2/100g of oil)	20.20

Table 3. Quality of lemongrass oil perfume

Parameters	Lemongrass oil perfume	Commercial perfume
Colour	Light yellow	Colorless
Lasting ability	8hrs	12hrs
PH	6.80	7.00
Staining effect	Does not stain	Does not stain
Consumers acceptability	Accepted	Accepted

The quality of the perfume produced from lemongrass oil was compared with commercial body perfume and the result is presented in Table 2.

4. DISCUSSION

Using essential oil from lemon grass, the study has successfully created body perfume that rivals well with store-bought body perfume on the market. Table 1's results indicate that lemongrass has a 10% oil output. This demonstrated that, in comparison to other oil seeds, lemongrass had very little oil. This study's poor yield is comparable to that of previous studies that have been published in the literature.

The oil's physical and chemical characteristics indicate that it is a light yellow liquid with a pleasant smell and that it complies with vegetable oil specifications. The specific gravity was 0.94 and it showed that orange peel oil is dense than water and would be useful in cream production as it will make the oils flow and spread easily on the skin [4]. The oils extracted by solvent extraction using n hexane as solvent has percentage yield of 1.67%, which is quite low when compared with the previous studies on the oil compositions of orange peel. This shows that the orange peel is made up of litter oil when compared with the seeds. The results of this study are comparable with that of avocado pear peel 2.1%, [2], but is below that of groundnut oil 50%, cashew oil (49.1%) [3]. Alalwan et al. [3] state that while determining the purity of oil, specific gravity is frequently employed in combination with other metrics.

The acid value of oil provides a measure of the quality of the fatty acids. The oil has an acid value of 3.34 mg/KOH based on Table 1. However, these results took into consideration the existence of free fatty acids in the oils, which serves as a sign of oxidation and the degree and presence of hydrolysis by lipolytic enzymes [9]. Low acidity in oil is a sign of stability and protection against peroxidation and rancidity over an extended length of time. This may be explained by the seeds' inherent antioxidants, which include vitamins C and A, as well as other potential phytochemicals like flavonoids. According to Karmous et al. [10], acid value serves as a gauge for an oil's edibility and appropriateness for usage in the paint and soap industries. The oil's high acid value indicated that it could not be edible for cooking, but it could be beneficial for making paints, liquid soap, and shampoos [11]. Additionally, a plant's notable acid value suggests that it may be toxic to animals [12].

According to Oktavianawati et al. [13], the iodine value is a measure of the degree of unsaturation and is a distinguishing feature of seed oils, making them great raw materials for the soap and cosmetics sectors.

The iodine value of the oil was 20.20g. The number of double bonds in the oil, which indicates how susceptible it is to oxidation, may be measured using the iodine value. Non-drying oils are those whose iodine value is less than 100 g I2/100 g of oil.

According to Oktavianawati et al. [14], an oil's sensitivity to oxidative rancidity decreases with decreasing iodine levels since there are less unsaturated bonds in the oil. Because of this, non-drying oils cannot be used to produce ink or paint; nonetheless, they can be considered liquid oils and may be helpful in the making of soaps. An optimal drying oil should possess an iodine value of 130 or above. Because bush mango oil is classified as a drying oil due to its iodine levels, it can be used as an alkyl resin in paint composition or varnish. An oil with a high iodine value indicates that it contains a high percentage of unsaturated fatty acids. As a result, the amount of iodine absorbed by the unsaturated acids will be higher [15], making oils with this characteristic valuable as raw materials for the production of ice cream made with vegetable oil [16].

The oil had a saponification value of 527.34 mg KOH/g. According to Ejimofor et al., [5] the results are relatively high when compared to cotton seed oil (194.3), shear butter oil 195.20, and nutmeg seed oil 194.7. Oil saponification properties are a crucial factor in assessing an oil's appropriateness for soap production. In water, the resulting oil provided a transparent solution. This kind of oil is categorised among those that produce soaps with a gentle texture. Therefore, as shaving cream calls for oils with a soft consistency, the oil might be utilised to make it.

17.0 mg KOH/kg was the peroxide value that was found for the oil. Determining if the oil is easily prone to oxidative rancidity is made easier with the use of the peroxide value. Determining if the oil is easily prone to oxidative rancidity is made easier with the use of the peroxide value. The analysis's result was less than what [11] had stated. This demonstrated that the oil will not

quickly get rancid. The analysis's result is less than what [11] stated. The equivalent amounts for avocado and native pears are 28.8 mg/kg and 126.4 mg/kg. This indicates that orange peel oil will not quickly go rancid. Based on the outcome, both oils have amazing cosmetic value and are utilised as skin conditioners and moisturisers in body and hair care products. Oil may be used as fuel (biodiesel, for example) and has also been used as a foundation for perfumes.

All of the basic ingredients used to formulate the body perfume were detailed in Table 2. The scent is dispersed by the methanol employed in the formulation, and the product's longevity is extended by the fixative. The present study employed methanol as the dispersion solvent, which aligns with the findings of Alalwan et al. [3], who indicated that primary alcohol is a good choice for scent creation due to its rapid dispersion and broad coverage. Njem et al. (2021) similarly used ethanol as the dispersion agent to create perfume. Fixative was employed in the work to increase the shelf life. According to Karmous et al. [10], the best fixative suggested for making perfume is glycol. We boost the perfume's staying power in our work by using 5% glycol as a fixative.

The raw perfume used in this project was made from essential oil of lemon grass. According to Edwards [9], a typical perfume set should be unique. To make our product unique, we mix the lemon grass oil in various ratios 1:1 and 1:2, for example before letting it dissolve in alcohol. This gives the product a distinct scent that might not have been produced by any other company.

The results of the comparison test between the commercial body perfume and the lemongrass body perfume indicate that the latter is slightly acidic (6.1) and the created product has a ph value of 7.4, which is somewhat alkaline (Table 3). The addition of water to the formulation to boost yield and hence buffer the ph value may be the cause of the prepared product's higher pH. The study's pH result falls between the SON standard range of 6.00 and 8.00 for cosmetic products.

The amount of raw perfume used determines how long a perfume lasts when sprayed, according to Watanabe et al. [1]. For this study, 10 millilitres of lemon grass oil and 5 millilitres of commercial fragrance were utilized in the formulation. This was comparable to the research done by Ejimofor et al. [6], who used 10ml of lemon seed oil to make perfume. In our work, we employ 10% of the raw lemon grass oil, but SON states that commercial perfume should contain at least 20% of the raw scent.

The study has demonstrated that lemongrass essential oil may be used to produce body scent. In addition, it was noted that the body perfume deters insects when applied, which distinguishes it from most commercial body perfumes that have no insect repellent properties.

Essential oils are in great demand for a variety of uses, including perfumery, medicine, soap manufacturing, and pesticides, to name a few. To fulfill the need of our local consumer industries, we must acquire and synthesis essential oils from local sources, especially lemon grass, as imported essential oils are highly expensive. Body perfume may be manufactured locally using lemon grass essential oils, which will create jobs. When compared to body perfume sold in stores, the created aroma and quality are superior.

5. CONCLUSION

The experiment was conducted to extract the high essential oil content of lemongrass, which was intended to be employed in the production of body scent. The manufacture of body perfume utilising the generated essential oil was one of the analyses done to ascertain the oil yields through the use of soxhlet extraction techniques. The researcher came to the conclusion that the body perfume made from lemongrass oil competes favourably with body fragrances sold in stores and has an 8-hour spray-lasting power. This was determined through a variety of methods and real-world performance.

6. RECOMMENDATION

The suggestions that followed were made in light of the findings: For optimum yield, it is advised that the solvent extraction process be used while extracting essential oils. It is advised that the right amount of essential oil and other fixatives be used while creating body perfume in order to prevent skin reactions and boost the scent's strength. Additionally, investigations into the large-scale enzymatic oil extraction from lemongrass are required, as are feasibility studies examining the process's economic viability.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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