

# METHODOLOGY TO EXTRACT ESSENTIAL OILS FROM LEMONGRASS LEAVES: SOLVENT EXTRACTION APPROACH

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**Abstract**—Perfume extraction is the extraction of aromatic compounds from raw materials, using methods such as distillation, solvent extraction etc. The extracts are essential oils, absolutes, butters, depending on the amount of waxes in the extracted product. Here, in this work solvent extraction and steam distillation methods were used to extract essential oil from lemongrass leaves. Solvent extraction method yielded 1.85% and steam distillation methods yielded 0.86% essential oil respectively. From the analysis solvent extraction method gave the highest yield because of the less exposure to air and heat.

**Keywords:** Lemongrass, solvent extraction, steam distillation.

## I. INTRODUCTION

Essential oils are extracts of various plant materials and do not originate from flowers, but from herbs, trees and various other plant material. It is estimated that the global number of plants contains about 10% of essential oils and could be used as a source for their production. Their extracts are formed by combination of diverse and complex volatile mixtures of chemical compounds. In industry, the essential oils are extracted from fresh or partially dried leaves using various method of extraction like hydro

distillation. The use of plants extracts is part of a competitive market, which includes pharmaceuticals, food, cosmetics, and perfumery markets. The Asian continent with its diversity of climates appears to be the most vital producer of essential oils. Lemongrass (*Cymbopogon Citratus*), a perennial plant with long, thin leaves, is one of the largely cultivated medicinal plants for its essential oils in parts of Asia, Africa and America. It contains 1-2% of essential oil on dry basis and the chemical composition of Lemongrass (*Cymbopogon Citratus*) essential oil is varying widely upon genetic diversity. The leaves of Lemongrass (*Cymbopogon Citratus*) present lemony characteristic flavour due to its main content, citral which present great importance to the industry. Citral, a combination of neral and geranial isomers, is used as a raw material for the production of ionone, vitamin A and beta-carotene. There were a number of studies carried out to prove the anti-oxidant, anti-microbial and anti-fungal activities of Lemongrass (*Cymbopogon Citratus*). The common methods to extract essential oil from medicinal plant, including for Lemongrass (*Cymbopogon Citratus*), are hydro distillation (HD), steam distillation, solvent extraction. It is proved through a number of studies, that the quality of essential oil mainly depends on its

constituents which is primarily influenced by their extraction procedures. In contrast, these common methods can induce thermal degradation, hydrolysis and water solubilization of some fragrance constituents. In addition, the oil obtained through solvent aided extraction contains residues that pollute the foods fragrances to which they are added. As a means to overcome this sort of drawbacks, an advance and improved method such as microwave-assisted extraction, subcritical water extraction and ultrasound-assisted extraction have been applied to shorten extraction time, improve the extraction yield and reduce the operational costs. Recently, microwave-assisted hydro distillation procedures for isolating essential oils have become attractive for use in laboratories and industry due to its effective heating, fast energy transfers and also an environmental friendly extraction technique. Its acceptance as potential and powerful alternative for conventional extraction techniques has been proved through several research. Therefore, the aim of the present study was to investigate the applicability of the method to extract oils from Lemongrass (*Cymbopogon Citratus*) extracts based on the extraction yield and constituents of oils obtained under optimized condition. The effect of operational parameter such as extraction time and water to raw material ratio were evaluated to identify its optimum condition for extraction.

This technical paper focuses on the production of perfumes from natural/plant sources as against synthetic chemicals thereby will reduce any side effect resulting from synthetic chemicals. The success

of this work will stimulate the development of the perfume industry locally because of available, cheap raw materials. More jobs will be created by those that will be engaged in planting/cultivating of the plant as well as establishing small scale extraction plants. There will be reduction on the resources spent on importation of lemon grass fragrance by end users.

## II. MATERIALS AND METHOD

### A. Plant Samples

Lemongrass (*Cymbopogon Citratus*) leaves were collected from garden. The plant sample was freshly cut, 10cm from the root, in the morning of the day they were collected. Lemongrass (*Cymbopogon Citratus*), the percentage essential oil yield for the partially dried leaves was found to be higher than that of the fresh leaves. Thus, once collected, the plant material was dried at room temperature for maximum 4 days, then kept in a sealed plastic bag at ambient temperature and protected from the light. Extraction yield increase by decreasing the particle size due to the higher amount of oil released as the leave cells are destroyed by milling. In order to improve the collection efficiency, the plant material was soaked in its distilled water for 30min before the extraction performed.

### B. Reagents

N-hexane was used as analytical grade reagent purchased from Research Lab.

### C. Solvent Extraction Method

150g of the dry sample of lemongrass were weighed from the sliced lemongrass sample and placed in a 1 lit clean flat bottom flask. 500ml of N- hexane solvent were poured into the flask. The flask and content were allowed to stand for 36 hrs; this was done to extract all the oil content in the lemongrass and for complete extraction. After which the extract was decanted into another 1 lit beaker. 200ml of Ethanol were added to extract the essential oil since essential oil is soluble in Ethanol. The mixture was then transferred to 500ml separating funnel and separated by a process called liquid/liquid separation process. The content of the separating funnel was allowed to come to equilibrium, which separated into two layers (depending on their different density). The lower Ethanol extract and the upper Hexane layer were collected into two separate 250ml beaker and were placed in a water bath at 78°C. This was done to remove the Ethanol leaving only the natural essential oil. The yield of oil was determined by weighing the extract on an electronic weighing balance. The difference between the final weight of the beaker with extract and the initial weight of the empty beaker gave the weight of essential oil.

### D. Steam Distillation Method

150g of fresh lemongrass sample were placed into a 1 lit round bottom flask containing 250ml of distilled water. The flask was fitted with a rubber stopper connected to condenser and heated. Water at 0°C flowed counter currently through the condenser to

condense the ensuring steam. When the water reached 100°C it started boiling ripping off the essential oil from the lemongrass. When the lemongrass got heated up, the essential oil that was extracted from the leaf mixed with the water vapor. Both passed through the condenser and the vapor was condensed into liquid. With the use of ice block, cooling was made possible and volatilization of the essential oil was avoided. The condensate was directly collected using a 500ml beaker and then poured into a separating funnel. This formed two layers of oil and water. The tap of the separating funnel was opened to let out the water while the oil was immediately collected into a 100ml stoppered bottle. The bottle was closed tightly to prevent vaporization of the essential oil. The oil was collected and the volume of oil obtained was weighed.

### E. Formulation of Perfume

10ml of lemongrass essential oil extract were measured and placed in a 120ml beaker containing 5ml of Methanol. 5ml of the Fixatives were added to the mixture (to improve the longevity of the perfume). The solution was shaken and poured into a 50ml bottle.

### Yield of oil that obtained was calculated by:

Yield of essential oil =  
$$\frac{\text{amount of essential oil (g) obtained}}{\text{amount of raw materials (g) used}}$$

## III. RESULTS AND DISCUSSION

Quality and quantity of oil essential mainly depends on the extraction procedures. In this research, the

following methods were studied to obtain the maximum yield to formulate the perfume from lemongrass leave. Extraction time was 180 min, 360 min, 540 min, 720 min, 900 min, 1200 min.

**Solvent Extraction Method—**

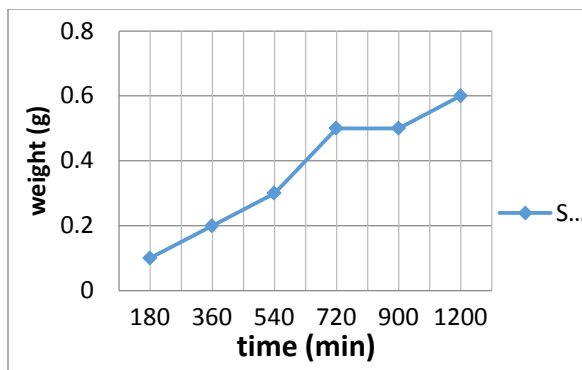


Fig. (a) Graph of the weight (g) of essential oil to the time (mins).

The amount of essential oils obtained by solvent extraction method was 1.9 g of essential oil per 150g of dry lemongrass sample. This gives about 1.30% yield of essential oil per 150g of dry lemongrass. The temperature used was 78°C i.e. the boiling point of ethanol. The volume of oil was measured at every 3hr interval to determine the oil yield at varying time. As the time increases the Ethanol solvent reduces thereby leaving the essential oil in the mixture.

**. Steam Distillation Method—**

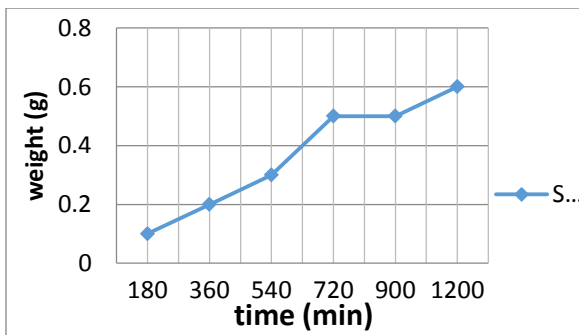


Fig. (b) Graph showing the weight (g) of essential oil against the time (mins).

The result of steam distillation process was 1.01g weight of 150g of lemongrass sample giving 0.70% yield of oil.

Method of Extraction	% Yield
Solvent extraction	1.30%
Steam distillation	0.70%

Table I: Result of Essential Oil Extraction

The oil produced was pale yellow, with an odour, pungent and cooling taste. Because of its high volatility, it was stored in a well filled air-tight container protected from light in cool place. The essential oil was insoluble in water, miscible in alcohol and in oil.

From the experiment carried out it was observed that the best method used in extraction is solvent extraction method because it gave more oil than any other method. This conforms to works done by other researchers. Steam distillation method yielded less oil compared to the solvent extraction this is because most volatile content gets lost during the heating process.

**IV. CONCLUSIONS**

In this paper, extraction of essential oil from lemongrass which has high essential oil content, which will be used for used for perfume formulation. Analyses will be carried out to determine the various oil yields using different extraction methods and the formulation of perfume with the essential oil will be produced. All these methods of extraction are special type of separation process used for heat sensitive

materials like essential oils, resins, hydrocarbons, etc. which are insoluble in water and may decompose at their boiling point. The temperature of the steam must be high enough to vaporize the essential oil present, yet not destroy or burns the essential oils.

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