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EXTRACTION OF ESSENTIAL OIL FROM *CYMBOPOGON CITRATUS* (LEMON GRASS) AND A COMPARATIVE STUDY OF SEPARATION TECHNIQUES.

Biological Science

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ABSTRACT

Cymbopogon genus is a member of the family of Graminae which are herbs known worldwide for their high essential oil content. (Opeyemi Avoseh, Opeoluwa Oyedeji et.al.) The commercial and medicinal uses of the various species of Cymbopogon are well documented. (Opeyemi Avoseh, Opeoluwa Oyedeji et.al.). Due to the presence of volatile bioactive compounds; this plant has achieved remarkable importance in various fields of useful commercial industry in-view for its applications for human welfare. Various methodologies followed for extraction of essential oil in terms of production had been elaborated in many research papers. The volatile molecules in an oil has different aromatic compounds. Perfume extraction is the extraction of aromatic compounds from raw materials, using methods such as distillation, solvent extraction etc. (M.A.Suryawanshi, V.B.Mane and G.B.Kumbhar).

Due to its higher significance for ethno-medicinal and biological properties the attempts is made for the extraction of Essential oil from Cymbopogon citratus (Lemon grass); in terms of production value; followed by a comparative analysis of different techniques of separation of oil molecules from the water solution; after extraction process. The research results into; better volume of Essential oil by Hydro-Steam distillation methodology along-with a development of efficient choice of selection for separation technique.

KEYWORDS

Cymbopogon citratus, Essential oil, separation technique

INTRODUCTION

Cymbopogon citratus, (Lemon grass) is a widely used herb in tropical countries, especially in Southeast Asia. (Shah, Gagan. *et.al)*. The genus *Cymbopogon* is the member of a family - Graminae; which are herbs known worldwide for their high essential oil content. 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. (M.A.Suryawanshi, V.B.Mane and G.B.Kumbhar). 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. (M.A.Suryawanshi, V.B.Mane and G.B.Kumbhar). The commercial and medicinal uses of the various species of *Cymbopogon* are well documented. (Opeyemi Avoseh., Opeoluwa Oyedeji *et.al*). However,

The demand of essential oil in current industry has increased due to its bioactive compound that shows various therapeutic effects. (Ranitha M., Abdurahman H. *et.al.*).The chemical composition of oil was analyzed by gas chromatography (GC)/mass spectrometry (MS) and fifteen components were identified, where neral (39.0%), geranial (33.3%), limonene (5.8%) and geranyl acetate (4.2) were the most abundant constituents. (Mahdi Vazirian, Somayeh Taheri Kashani *et.al)*.

Various techniques utilized for extraction process leads to a varied volume of essential oil of *Cymbopogon citratus*. The present research is focused on the Extraction of Essential oil of *Cymbopogon citratus* (Lemon grass) by Hydro-Steam distillation method. However, after extraction process a comparative analysis of separation technique of essential oil molecules from water was carried out and the volume of oil yield achieved had been studied.

The research study provides successful extraction of essential oil and better results are obtained in terms of % yield volume of essential oil.

MATERIALS AND METHODS

Fresh *Cymbopogon citratus* (lemon grass) leaves bought from the market was thoroughly washed and chopped onto a size of 15cm and tightly piled up in a small packets inside a self-made distillation chamber. The distillation set-up was made with the given below materials which was executed in a proper manner.

a) Processing container.
b) 6ft copper coil circularly bend in a loop form.
c) Wire mesh platform for placement of small packets of *Cymbopogon citratus* leaves (Lemon grass).
d) Coolant bucket.
e) Hollow rubber pipe for a pathway of vapourized solution from the outlet of pressure cooker.
f) Circular copper coil fixed in coolant bucket filled with Ice.
g) Outlet for collection of condensed solution in Borosil glassware container.

From the base of processing container a $1/4^{th}$ of its height was filled with sterilized water solution. On the wire mesh fitted inside; 1kg of *Cymbopogon citratus* (lemon grass) leaves were tightly filled up and the container was closed to step up for the process of heating. Vapours released during heating process were passed into a coolant bucket containing Ice-blocks. The vapours were condensed due to an application of freezing temperature maintained in a coolant bucket. Hence, a condensed solution collected in a Glassware container contained the mixture of water and essential oil molecules both.

The Distillation process utilized to extract Essential oil contained a use of both water and steam; hence, the extraction methodology is named as **"Hydro-Steam Distillation"**. The Essential oil molecules extracted were **'pale yellow to amber'** in colour

The Essential oil molecules were separated by a given below techniques.

1) Syringe separation method.
2) Solvent separation method.
3) Freezing separation method.
4) Centrifugation separation method.
5) Separation by using Separator.

1) Syringe separation method: Due to high molecular weight of water molecules the Molecules of essential oil floating on top of the surface was collected carefully without disturbing a layer beneath it. The volume of Essential oil achieved from 100gm of extracted solution was measured.

2) Solvent separation method: Per 30gm of extracted solution was mixed with 100gm of Petroleum ether. The solution mixed gently and allowed to evaporate in a water bath. The volume of Essential oil after this process was measured.

3) Freezing separation method: 100gm of extracted solution was allowed to freeze in a deep freezer. Since, Water having a nature to freeze into ice cube when below 0^0C; the Essential oil molecules were observed floating freely on an ice cube surface.

4) Centrifugation separation method: 100gm of extracted mixture was allowed to centrifuge for 20 minutes at 5000rpm. The Essential oil molecules were separated from water molecules and was collected in vials.

5) Separation by using Separator: The set-up of a glassware-separator was filled up by 100gm of extracted solution and allowed to stand still for 50 minutes. The layer of Essential oil collectively found above a water solution. Further; water was separated from an outlet and oil was collected in a vials.

RESULTS AND DISCUSSION

The methodology of yield obtained is calculated; based on the reference of yield followed by M.A.Suryawanshi, V.B.Mane, and G.B.Kumbhar. (2016).

Yield: Amount of essential oil (gm) obtained. / Amount of raw material used (gm).

Oil molecules separated from an extracted solution is presented in ***Table 1.1*** and represented graphically in ***Figure 1.1*** While Yield of Oil obtained from a raw material used is given in ***Table 1.2*** and graphically mentioned in ***Figure 1.2***. All values are expressed in terms of % yield achieved from an acquired volume.

Table: 1.1

Sr. No.	Type of Separation method	% yield volume from 100gm of extracted solution
1	Syringe method	2.5
2	Solvent separation	2.2
3	Freezing method	1.8
4	Centrifugation method	2
5	Separator	1.5

Table:1.2

Sr. No.	Type of Separation method	% yield volume from 1000gm raw material
1	Syringe method	0.25
2	Solvent separation	0.22
3	Freezing method	0.18
4	Centrifugation method	0.2
5	Separator	0.15

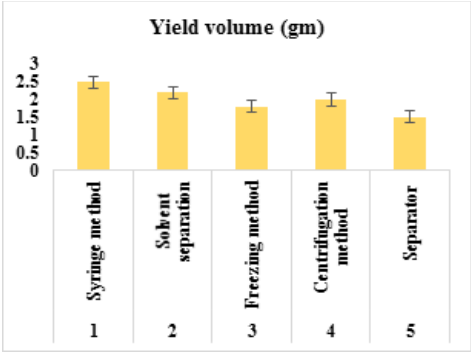

Figure1.1

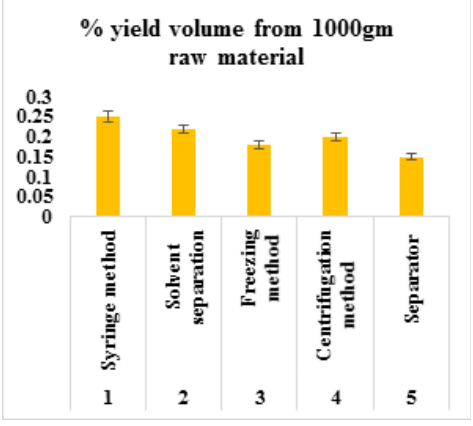

Figure1.2

From above results, it states that % yield of Essential oil acquired follow an order of series such as **'Syringe > Solvent > Centrifugation > Freezing > Separator; *(2.5% > 2.2% > 2.0% > 1.8% > 1.5%).***

CONCLUSION

The separation methods resulted a suitable % volume of Essential oil concluding Syringe as one of the best methodology of separation of Essential oil from extracted solution.

Solvent method too obtained better results. But; a use of 100gm Petroleum ether against an extracted solution of 30gm had to be compensated for achieving %volume of yield.

Centrifugation method for separation of Essential oil from extracted solution reported to be efficient than Freezing and Separator method.

The research experiment concludes a successful extraction of Essential oil from *"Cymbopogon citratus"* (Lemon grass) along with a comparative study of % yield volume obtained during separation process. The experimental research work specifies a tool of guide for achieving excellent volume of Essential oil.

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