

SCREENING OF ANTIBACTERIAL ACTIVITY OF ESSENTIAL OIL OF LEMMON GRASS (*Cymbopogon citratus*)

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ABSTRACT

Essential oil 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. This oil is used for the inhibition of pathogenic bacteria. Lemongrass oil inhibit the growth of *S. aureus* and zone of inhibition were 15 mm, 20 mm and 22 mm. and zone of inhibition for *P. fluorescens* were 15 mm, 25 mm and 30mm.

KEYWORDS: Lemongrass, solvent extraction, steam distillation.

Essential oils are extracts of various plant materials and do not originate from flowers, but from herbs, trees and various other plant materials (Ashgari *et al.*, 2010). It is estimated that 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. The use of plants extracts is part of a competitive market, which includes pharmaceuticals, food, cosmetics, and perfumery markets. Lemongrass (*Cymbopogon citratus*), a perennial plant with long, thin leaves, is one of the largely cultivated medicinal plants for its essential oils (Carlson *et al.*, 2001) 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.

Essential Oils - Essential oils, also referred to as "essences", are botanical extracts of various plant materials, and do not only originate from flowers, but from herbs, trees and various other plant material. The essential oils are extracted from the botanical material using a variety of extraction methods.

Lemongrass essential oil is extracted from *Cymbopogon citratus* (also known as *Andropogon citratus*, *A. schoenathus*) of the Poaceae family.(Figure 1)

Lemongrass oil has a lemony, sweet smell and is dark yellow to amber and reddish in color, with a watery viscosity. There were a number of studies carried out to prove the anti-oxidant, antimicrobial and antifungal activities of Lemongrass (*Cymbopogon citratus*). The common methods to extract essential oil from

medicinal plant, including for Lemongrass (*Cymbopogon citratus*), are hydro distillation, steam distillation, solvent extraction (Wang *et al.*, 2009).



Figure 1: Lemmongrass plant

The aim of the present study was to investigate the applicability of the method to extract oils from Lemmongrass (*Cymbopogon citratus*) extracts based on the extraction yield and constituents of oils obtained under optimized condition and effect of this oil on different pathogenic bacteria.

MATERIALS AND METHODS

A. Plant Samples- Lemmongrass (*Cymbopogon citratus*) leaves was collected from garden. The plant sample was freshly cut, 10cm from the root, in the morning of the day they were collected. Lemmongrass (*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 (Dhobi *et al.*, 2001) Plant material was soaked in its distilled water for 30 min before the extraction performed.

B. Reagents- N-hexane was used as analytical grade reagent

C. Solvent Extraction Method- 150g of the dry sample of lemongrass were weighed. 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 (Paviani *et al.*, 2006). 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 and allowed to come to equilibrium, which separated into two layers. The lower Ethanol extract and the upper Hexane layer were collected into two separate 250 ml beaker and were placed in a water bath at 78°C. This was done to remove the Ethanol leaving only the natural 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 (Oloyede *et al.*, 2010) . 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 vapour. Both passed through the condenser and the vapour 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 500 ml 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 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.

Yield of oil that obtained was calculated by:

Yield of essential oil = amount of essential oil (g) obtained / amount of raw materials (g)

Bacteria which are used for Screening of Antibacterial Activity

Pseudomonas fluorescens is a common Gram-negative, rod-shaped bacterium. *Staphylococcus aureus* is a gram positive bacterium that is a member of the Firmicutes, and is frequently found in the human respiratory tract and on the skin.

RESULTS AND DISCUSSION

Quality and quantity of oil essential mainly depends on the extraction procedures (Chanthal *et al.*, 2010). By Solvent Extraction Method and Steam Distillation Method were used for extraction of essential oil from Lemmongrass. This oil is used for screening of antibacterial activity. Extraction of essential oil from medicinal plants the leaves of Lemongrass, were collected from Horticulture of Biotech Park (Lucknow). For analysis of antibacterial activity the bacterial strains of *Staphylococcus aureus* and *Pseudomonas fluorescens* were used.

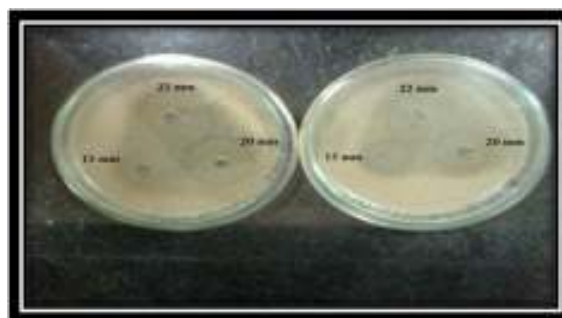


Figure 2: Activity of aqueous and methanolic extract of crude and purified Lemongrass oil against *S. aureus*

Lemongrass oil inhibit the growth of *S. aureus* and zone of inhibition was occurred for both crude and purified extract the zone of inhibition were 15 mm, 20 mm and 22 mm. and zone of inhibition for crude of Lemongrass oil against *P. fluorescens* were 15 mm, 25 mm and 30mm. and for purified extract it was 10mm,18mm and 20mm respectively.(Figure, 2)

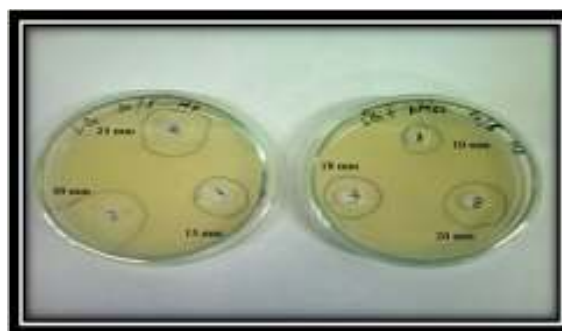


Figure 3: Activity of aqueous and methanolic extract of Lemongrass oil against *P. fluorescens*

Lemongrass oil is found to have higher antibacterial activity against the growth of *P. fluorescens* & zone of inhibition observed higher.(Figure,3)

CONCLUSIONS

In this paper, extraction of essential oil from lemongrass which has high essential oil content, which will be used for antibacterial activity. Analyses will be carried out to determine the various oil yields using different extraction methods. 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 (Tajidin *et al.*, 2012).

Lemongrass plant was performed and found within the standard range of values. It is promote the growth of medicinal plants. Major constituents of the Lemongrass oil were citral A (31.17%) & citral B (48.57%). Major constituents of the Eucalyptus oil was 1, 8- cineole (16.90%). All samples have antimicrobial activity but in the present study Lemongrasses have found highest antimicrobial activity against *P. fluorescens*.

For Future Consideration

This study will help in the whole analysis of medicinal plants (Lemongrass), their medicinal value, their composition, and its application or uses. This essential oil also use in Aroma therapy. Citral, an ingredient of Lemongrass oil, has numerous uses, & Lemongrass oil is also used for deodorants, waxes, polishes, detergents and insecticides where its low cost is attractive. The results of the present study revealed the potential of essential oil as alternative to commercial antibiotics.

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