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Analysis of Antibacterial Efficacy of Coriander Oil

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Abstract—*Coriander Oil has unique efficaciousness against diverse pathogenic microbes. The perceptible efficiency of Coriander oil is famous in perfumery, but the therapeutic potential needs to be extensively explored. In this study, the antibacterial nature of Coriander oil was evaluated against pathogenic bacterial strains Bacillus cereus, Salmonella typhimurium, A. pneumonia by the agar well diffusion assay using the minimum inhibitory concentration of the Coriander oil. The G.C analysis of Coriander oil reveals 60-70 % concentration of Linalool. The diameter of the inhibitory zones measured for Bacillus cereus was 3.4mm, Salmonella typhimurium was 2.9mm, A.pneumonia was 3.8mm. Coriander oil was found to be having highest rate of antibacterial activity against Bacillus cereus. Final results are much more encouraging to be widely inoculated in the antibacterial formulations of drugs. It could be exploited nicely to be used against the food poising pathogenic bacteria.*

Keywords: *Coriander oil, Antibacterial efficacy, Zone of inhibition, Linalool.*

1. INTRODUCTION

Coriander sativum is also known as "dhaniya" as local name, as it is an annual herb from the family *Apiaceae.* Commonly used as in culinary and food items all over the world, natively it belongs to Southern Europe. Coriander is an important herbaceous cash crop. It has large demands and is traded all over the world over from China to Australia. Coriander crop harvest is directly proportional to the light and temperature conditions during the growth. Essential oil synthesis in Coriander need high intensity of temperature and light following simultaneous optimal climatic conditions. These factors put a lot of emphasis on the growth and essential oil production of Coriander (Telci et al, 2006). It has got many traditional uses in home remedies and herbal medicine. Moreover the cosmetic companies exploit its nature of perceptible fragrance in aromatic products. It play very important role in designing the fragrances and other cosmetic items. Coriander is widely praised for its effectiveness in the medicine. Many analytical and research studies revealed the anti-oxidative potential of its seed and leaves but eventually the leaves were found to have more of the profound effect (Wangensteen et al, 2004). Coriander as whole plant in a young stage used as a source of appetizer for the ingredients of soaps and other food items. Fresh leaves are incorporated for its flavoring potential and exploited more in cosmetic industries. It has a very pleasant fragrance odor (Janardhanan et al, 2004). Toiletry formulations depends widely on herbal sources only. Separating from the traditional vast application of Indian herbs are now transforming from ancient to modern usage. Product formulations using various permissible cosmetic ingredient as a base so that particular cosmetic to known as herbal. As per the demand of herbal source oriented medicine are increasing because to their lack of side effect (Bouidin et al,1999). Coriander's fresh green leaves are rich source of essential oil, it is due to the green chlorophyll. If the leaves are dehydrated mostly the essence is lost. It enhances the physiochemical changes such as cellular structure, color, water holding capacity all are effected by the drying and loss of water from the leaves (Feng et al, 1998). The Coriander herb incorporated in a wide range of applications such as flavoring foods, beverages and several other industries. Normally essential oil containing or bearing plants have volatile, aromatic oil in certain parts. Eventually it can be extracted through a very simple procedure that is 'steam distillation'. Usually, the essential oil normally bears or carries the name of the respective plant from which it has been derived out successfully.

The chemical derived from the herbaceous parts of the plant such as the leaves has been reported in a study to be highly effective against the pathogenic strain of *Salmonella choleraeois* and the study finally concluded the effectiveness that was seen due to the chemicals which played the role of surfactants of the non ionic nature (Kubo et al, 2004).

Essential oil are playing vital role in order to treat many antimicrobial infection. Herbs play a very vital role in the pharmaceutical herbal remedies, dietary supplements, medicinal and herbal tea, essence, perfumes and detergents. Plant based products offers a wide variety to the market of medicine. If the enhancement and encouragement of the usage of herbal material is done, it would be cheaper to the chemicals that are synthesized synthetically and made in the industries (Begnami et al, 2010). Herbs play a very vital role in the pharmaceutical herbal remedies, dietary

supplements medicinal and herbal teas, essence, perfumes and detergents. Plant based products offers a wide variety to the market of medicine. If development and further enhancement of the usage of herbal material is done, it would be far cheaper to the chemicals that are synthetically made in the industries. Coriander oil is utilized all over the world in food industry as the most important flavoring agent or ingredient. Readily obtained most of the time from fresh green leaves or from the dried ripened fruits. Oil is found to be pale yellow liquid with typical sweet, warm, mild and aromatic flavor. Coriander oil has been also widely used in medicine (George et al, 2009).

Earlier essential oil of coriander has been found to be effective against the *Candida* yeast infections. Finally it has been already analyzed coriander oil extracted from the seed had the 60 to 70 % of secondary terpene named as linalool (Guenther et al, 1950). *Coriander sativum* has been an important ingredient of the Iranian folk medicine in order for the treatment of the anxiety and sleeping disorders. Moreover the new studies expose its uses as supportive and promoting drug for the treatment of active anxiety (Emamghoreishi et al, 2005). Significant number of individuals were found to be allergic the effects and acquaintances of *Coriander Sativum* (Ebo et al, 2006, Suhonen Raimo et al, 1979).

The future prospect of this research depends upon the over view on the total 80% of total world's population still depends upon the herbal source of medicine for their primary health remedies. As per the reports and recorded data of the World Health Organization there still resides a great concern about the conscience of effectiveness and dependability of herbal use with no side effects(www.umm.edu).

Although the herbal sources of medicine or medication have got the full potential, it can inculcate into the advancement of healthcare issues for remedy. Still the biggest threat to be overcome before the use of the herbal remedies into the main stream of 'as hard core medicine'. One of the initial hurdle is the matter of the exploitation of medicinal potential of ancient medicinal texts and their correct precise translation is of utmost importance. As the dogma of the effectiveness of herbal medicine is increasing further more day by day and had taken its shape in reality. Finally more researchers and doctors needed to be trained in both the herbal and modern medicine compendium that is integral part of the knowledge accumulated since the ancient times (Cheng et al, 2011).

In this study, the Coriander essential oil that has been extracted from plant portion known as leaves was analyzed. Comprehensive experimental procedures are followed for characterization of coriander essential oil on the basis of number of technological parameters which were performed in the laboratory

2. MATERIAL AND METHOD

The freshly grown Coriander leaves were used for the study, plant material was characterized taxonomically. Agar media was purchased from the hi-media pvt. Ltd. All the chemical reagents used were of analytical grade. The pathogenic strains were obtained from Biotechnology laboratory of Noida International University for the experimentation purposes.

3. CORIANDER OIL EXTRACTION

Coriander leaves were taken for oil extraction. The oil was extracted by the process known as the hydro distillation by using the Clevenger apparatus.

4. ANTIMICROBIAL METHOD

Method taken into consideration for antimicrobial activity of Coriander oil was well diffusion assay. The (MIC) minimum inhibitory concentration of Coriander oil taken is 10µl. Inoculums used was prepared using pathogenic bacteria cultures from the slants. Saline solution (0.85%) was made (50µl) of inoculums was spread with respect to the species on the Petri-plates. Nutrient agar media made and poured into the Petri-plates and were left to be cooled on a flat surface. After the solidification wells were punched in 4mm in the diameter in the agar and 10µl of the coriander oil was poured into each and every well.

Total three numbers of the pathogenic bacterial strains in the inoculums form was there in each plate and the plates were left in the incubator for the time period of 24 hours at the temperature 35°C.

Zones of inhibition were obtained clearly and diameters were measured according to the species concerned.

5. RESULTS AND DISCUSSION

Physical parameters of testing were decided according to the specified standards. The G.C profile of the oil was evaluated and the major content was reported to be linalool. The characterization and testing was done according to the specified standards.

Table 1.1: Differential specified standards of Coriander oil testing.

Characterization	Testing
Color	Pale
Odor	Typical top note
Uniformity	Initail application on the skin
Optical Rotation	+5.1
Refractive Index	1.465
G.C	60-70% Linalool

The experimental study was conducted in order to evaluate the antibacterial efficaciousness of Coriander oil. The comparative study was carried out regarding the individual pathogenic bacterial species.

Three pathogenic bacterial strains named as *Bacillus cereus, Salmonella typhimurium, A. pneumonia* were evaluated in the

terms of efficacy against coriander oil, whole assay was performed by the well diffusion test. Hence, there was significant difference in the effectiveness of the coriander oil against *Bacillus cereus.* This finally concludes that antibacterial activity was found to be maximum against *Bacillus cereus.*

Table 1.2: Exhibiting the variation of the inhibition zone among different pathogenic strains.

Organism	Plate 1	Plate 2	Plate 3	Standard Deviation
Bacillus cereus	3.4mm	2.8mm	3.0mm	1.55
Salmonella typhimurium	2.9mm	1.6mm	2.0mm	0.66
A. pneumonia	3.8mm	2.1mm	2.5mm	0.88

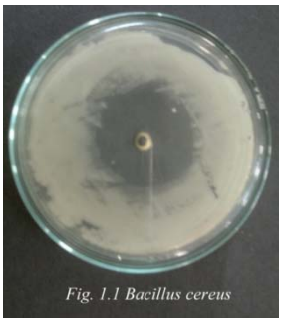


Fig. 1.1 Bacillus cereus


Fig. 1.2 Salmonella typhimurium

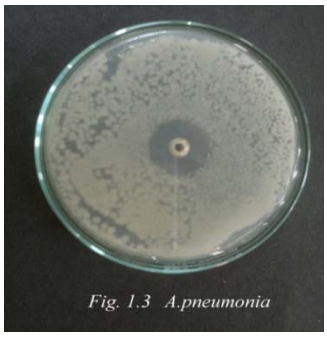
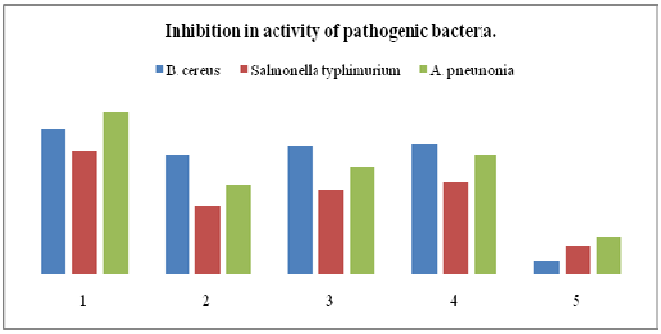


Fig. 1.3 A.pneumonia

Figures: Zone of inhibition obtained from Coriander oil against pathogenic bacteria.

Table 1.3: Zone of Inhibition shown by respective Bacterial strains by Coriander oil.



The eventual outcome of this research work suggests that coriander oil extracted from the leaves has the presence of numerous bioactive components. Further such components have got the full potential to be used as a patent drug in the near future. Such components could be very promising for other animal in-vitro studies. Data obtained during the experiments on the different pathogenic strains of bacteria were recorded and were tabulated to the statistical analysis, as per the requirement. In the experiment the zone of inhibition obtained by the MIC (minimum inhibitory concentration) of the coriander essential oil against different pathogenic strains that were analyzed. Results concluding that Coriander essential oil has powerful antibacterial activity against both the Gram positive and Gram negative bacteria. It has been found to have some membrane permeability. It eventually justify its use as a flavoring agent and preservative in order to prevent food spoilage. Coriander essential has been found to be highly effective against the broad spectrum of micro organisms. It has vast potential in future medicine and other applications (Delaquis et al.,2002a).

The antimicrobial potential of Coriander essential oil has really been effective against the clinical strains of *Bacillus cereus*. This was obtained from the study results of the research work(Filomena et al,2011).

Finally, the results obtained were further interpreted with the standard deviation. Data has analyzed on statistically analyzed. Hence the conclusions of the significant difference the antimicrobial efficacy Coriander essential oil against respective bacterial species. Moreover another study conducted and the results obtained by (Duman et al,2010), they focused that Coriander essential oil has been having higher activity of a secondary terpene called linalool. So, they explored the effectiveness of linalool singularly. They did the fractional distillation of Coriander essential oil. But results of its essential oil as a whole were more effective in comparison to the linalool alone. As the Coriander essential oil was found to be containing superior concentration of linalool. Finding suggests antimicrobial depends upon the complex interaction between individual components that leads to the overall activity not by the only effect created by the linalool(Delaquis et al,2002b).

Our results showed similarity and we agree that in general Gram positive bacteria has been found to be less susceptible than Gram negative bacteria to Coriander essential oil. Given investigation clears all the confusions regarding the efficiency against bacteria (Lo Cantore et al, 2004, Tassou et al,1995).

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