

## ORIGINAL RESEARCH



## ANTIMICROBIAL POTENTIAL OF VOLATILE OIL ISOLATED FROM CARDAMOM

Raj Kumar , Sourav Pati<sup>a</sup>, Rakesh Kumar, Md.Tanyeem Ahmed, Sujoy Khara , Md. Fahim Laskar,  
S. Deb Roy, R K. Dasgupta \*

Bharat Technology, Banitabla, Uluberia, Howrah.

Submitted on: 28.11.17; Revised on: 08.12.17; Accepted on: 12.12.17

## ABSTRACT:

The present study was aimed to re-establish the antimicrobial activity of Cardamom oil isolated from the dried ripe Cardamom fruits. Cardamom oil was subjected to antimicrobial activity against various gram positive, gram negative bacteria by disc diffusion method. Cardamom oil showed, zone of inhibition in the range of 0.3-0.6 mm against all the tested microorganisms. The volatile oil has shown good antimicrobial potential against *Bacillus subtilis* (0.6), which is even better than that of the standard drug Amoxicillin.

**KEY WORDS:** Disc diffusion, Antimicrobial, Volatile Oil, Cardamom.s

**Corresponding Author:** Ramesh Kumari Dasgupta

**E-mail:** [minudasgupta007@gmail.com](mailto:minudasgupta007@gmail.com)

**Phone:** +91- 9073221120

Indian Research Journal of Pharmacy and Science; 15(2017)1196-1200;  
Journal Home Page: <https://www.irjps.in>  
DOI: 10.21276/irjps.2017.4.4.5

**INTRODUCTION:**

Plant oils and extracts have been used for a wide variety of purposes for many thousands of years<sup>1</sup>. Rosewood and cedar wood in perfumery, to flavouring drinks with lime, fennel or juniper berry oil<sup>2</sup>, and the application of lemongrass oil for the preservation of stored food crops<sup>3</sup>. The antimicrobial activities of plant oils and extracts have application in raw and processed food preservation pharmaceuticals, alternative medicine and natural therapies<sup>4,5</sup>. Essential oils of herbs and their components, which are products from the secondary metabolism of plants have many applications in ethno-medicine food, flavouring and preservation as well as in the fragrance and pharmaceuticals industries<sup>6</sup>. The antimicrobial properties of essential oils have been described<sup>7</sup>, and because of the growing demand on antimicrobials for preventing microbial food spoilage and bacterial infections, there is an increasing interest in medicinal plants as an alternative to synthetic preservatives and antibiotics<sup>8</sup>. Many essential oils are already used in the food industry as flavouring agents and some are known to exert antimicrobial activity, but the mechanism of action is often not entirely understood.

*Cardamom* oil is one of the major essential oils in the world market and it is known to exert antimicrobial activity however, its mechanism of action is still unclear. *Cardamom (Elettaria cardamomum)* belongs to the family *Zingiberaceae*. It is a queen of all spices and has a history as old as human race. Thus this study is aimed to investigate the antimicrobial activity of essential (EO<sub>s</sub>) from clove for preventing bacterial infection.

**MATERIALS AND METHOD:****Collection of Plant Material:**

*Cardamom (Elettaria cardamomum)* Family *Zingiberaceae* was purchased from the local market (Uluberia, Howrah). The essential oils were extracted by steam distillation using a Clevenger apparatus.

**Extraction of Volatile Oil:**

About 100g of dried buds of clove accurately weighed and transferred to 1 litre distillation flask (Clevenger Apparatus) together with 250ml of water. Distillation tank was kept on the heating mantle and set the distillation assembly. Graduated receiver was filled with water avoiding any air bubbles. The out let near the upper end of the receiver was not tightened instead, loosely packed with cotton. Heating mantle was switched on and continued distillation for four hours at a rate which keeps the lower end of the condenser cool. The volatile oil thus isolated was being collected in the graduated receiver in which the aqueous portion of the distillate was automatically separated and returned to the distillation flask. Measured the volume of volatile oil (as separated out upper layer) in the graduated tube and calculated the percentage v/w of isolated oil on a dry weight basis. The volume of isolated volatile oil from the given sample of cardamom is 0.8ml. Isolated essential oil was collected and stored in brown bottle at -18°C<sup>9,10</sup>.

**Antimicrobial Activity:****Microorganisms<sup>11,12</sup>**

The strains were obtained from Microbial Type Culture Collection, Jadavpur University, Kolkata, India. The stock culture was maintained on nutrient agar media at 37°C. The 24h culture of those microorganisms was used in the study. The organisms were preserved at 4°C and recultured

once in a week. Standard strains of *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, and *Klebsiella pneumonia* were used for study.

#### Antibacterial Activity by Disk Diffusion method.

Nutrient Agar media was prepared and sterilized in a flask and cooled to 45-50 °C and was distributed by pipette (25ml) in each pre sterilized petridishes, previously inoculated with 0.01ml of the nutrient

broth cultures and swirled to distribute the medium homogenously. Disks injected with volatile oil were placed on the solid agar medium by pressing slightly. The treated petri-plates were placed at 4°C for one hour and then incubated at 37±0.1°C for 24 hrs. Same has been done for standard drug Amoxicillin and control. Lastly, the zones of Inhibitions formed on the media were measured with a transparent ruler in millimetres.

### RESULT AND DISCUSSION:

**Table .1:** Antibacterial activity of the essential oil against the bacterial strains

Drugs Used	Zone of Inhibition (mm)			
	<i>Staphylococcus Aureus</i>	<i>Klebsiella Pneumoniae</i>	<i>Bacillus subtilis</i>	<i>Escherichia coli</i>
Standard (Amoxicillin)	0.6	0.5	0.3	0.6
Volatile Oil	0.4	0.3	0.6	0.5

#Amoxicillin (1000µg/ml) was used as standard drug, ## Control has shown no activity.

The antibacterial activity of essential oil against a range of four bacterial species is summarized in Table 1. Cardamom oil was subjected to antimicrobial activity against various gram positive, gram negative bacteria by disc diffusion method. Cardamom oil showed the zone of inhibition in the range showed zone of 0.3-0.6 mm against all the tested bacteria. Volatile oil from cardamom has shown good antimicrobial potential which is comparable to that of the standard drug Amoxycillin. It showed good activity against *Klebsiella Pneumoniae* (0.3), *Staphylococcus aureus*(0.4mm) and *Escherichia coli* (0.5)which is compare able to standard(Amoxicillin). *Bacillus subtilis* showed minimum activity among all the bacteria. (Table1).

The essential oil of cardamom contains sixteen components constituting 93.62% of total were identified. It contain  $\alpha$ -terpinolene, p-Cymene,  $\alpha$ -Terpinene, Sabinene, Cineole, Terpinyl acetate, terpenoids, borneol and terpinene<sup>13</sup>. Terpenoids represent a diverse class of molecules that provide a wealth of opportunities to address many human health and societal issues. While this class of molecules has members with therapeutic properties including anticancer, antiparasitic, antimicrobial, antiallergenic, antispasmodic, ant hyperglycemic, anti-inflammatory, and immunomodulatory properties. These terpenoid are present in the essential oil. Our result also match with the literature<sup>13</sup>.The study has shown that the volatile oil from Cardamom has shown good antimicrobial activity against both gram positive and gram

negative microorganisms and were comparable to that of standard drug amoxicillin.

#### CONCLUSION:

Cardamom oil showed significant antibacterial activity against *gram positive and gram negative bacteria's such as Staphylococcus aureus, Bacillus subtilis, Klebsiella pneumonia* and *Escherichia coli*. And can be further explored to find natural alternatives to synthetic antibiotics.

#### REFERENCE

1. Hashim, H., Kamali, E.L., Mohamed, Y. 2010. Antibacterial activity and phytochemical screening of ethanolic extracts obtained from selected Sudanese medicinal plants *Current Research Journal of Biological Science*, 2(2):143-146.
2. Jones, F.A., 1996. Herbs useful plants their role in history and today. *European Journal of Gastroenterology and Hepatology*, 8:1227-1231.
3. Lis -Balchin, M and Deans, S.G., 1997. Bioactivity of selected plant essential oils against *Listeria monocytogenes*. *Journal of Applied Bacteriology*, 82:759-762.
4. Lawrence, B. M., 1993. A planning scheme to evaluate new aromatic plants for the flavour and fragrance industries. In new crops. Edited by J. Janick and J.E Simon, New York: Wiley.
5. Prashanth, D., Asha .M.K., Amt, A., 2001. Antibacterial activity of *Punica granatum*. *Fitoterapia*, 72:171-173.
6. Edris, A.E., 2007. Pharmaceutical and Therapeutic Potentials of Essential Oils and their Individual Volatile Constituents: A Review *phytother*, 21:308-323.
7. Nasar-Abbas S.M., Halkman A.K., 2004. Antimicrobial effect of water extract of sumac (*Rhus coriaria*. L.) on the growth of some food borne bacteria including pathogens *International journal of food Microbiology*, 97:63-69.
8. Burdock, G.A and Carabin, I.G., 2009. Safety assessment of coriander (*Coriandrum sativum* L.) essential oil as a food ingredient. *Food chem. Toxicol*, 47:22-34.
9. Gibiel, A.Y., Abdeldiem, M.H. and Ali, H.G.M., 2017. Antibacterial Activity of Clove (*Syzygium aromaticum* L.) Essential Oil and Gamma Irradiation against Some Food- Borne Pathogens in Minced Chicken Meat *Arab Journal of Nuclear Science and Applications*, 50: 179-193
10. Tepe, B., Sokmen, M.A., Daferea, D., Polissiou, M. 2004. In vitro antimicrobial and antioxidant activities of the essential oils and various extracts of *Thymus*. *J. Agric. Food Che.*, 52: 1132-1137
11. Deb Roy, S., Bania, R., Chakraborty, J., Goswami, R., Laila, R., Ahmed, S. A. 2012. Pharmacognostic, phytochemical, physicochemical property and antimicrobial activity studies of

lemon peel oil. *J. Nat. Prod. Plant Resour.* 2: 431-435.

12. Deb Roy, S., Apu, T., Dhrubajyoti, S., Arunav, K., Anupam, B., Bidyut, D. 2012. Antimicrobial potential of volatile oil isolated from some traditional Indian spices *International Research*

*Journal of Pharmacy.* 3:162-163.

13. Shahnaz, S. Husain, M.A., 2014. Analysis of volatile oil of the fruits of *Elettaria cardamomum* (L.) maton and its antimicrobial activity. *World journal of Pharmacy and Pharmaceutical Sciences.* 3:1798-1808.

CONFLICT OF INTEREST REPORTED: NIL ;

SOURCE OF FUNDING: NONE REPORTED