

# Evaluation of Antimicrobial Activity of Variants Java Citronella (*Cymbopogon winterianus*) Oil

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**Abstract** – The objective of this study was to elucidate the citronella oil (*Cymbopogon winterianus*) against antifungal and antibacterial activities. The experimental data was analyzed in completely randomized design with three replications. Oil was extracted from the variants and used for antimicrobial activities. The antimicrobial activities were tested using zone inhibition technique. The fungus viz. *Rhizoctonia bataticola* and *Fusarium oxysporum* f. sp. *ciceri* and bacteria viz., *Erwinia crotrivora* and *Xanthomonas auxinopodis* P. V. *citri* were used for antifungal and antibacterial properties respectively. The java citronella oil was tested against pathogenic bacteria and fungus at different concentration of citronella oil viz., 400, 800, 1000, 1200, 1400 ppm/ml. A 13.4 mm zone of inhibition was observed at 1400 ppm/ml for bacteria *Erwinia Crotrivora* and 11.74 mm zone of inhibition at 1400 ppm/ml was observed for the fungus *Fusarium oxysporum* f. sp. *ciceri* and *Rhizoctonia bataticola* and bacteria *Xanthomonas auxinopodis* P. V. *citri* did not showed any antifungal and antibacterial activity.

**Keywords** – Antimicrobial Activity, Cymbopogon Winterianus, Essential Oil, Erwinia Crotrivora, Fusarium Oxysporum f. sp. Ciceri, Rhizoctonia Bataticola, Xanthomonas Auxinopodis P. V. Citri.

## I. INTRODUCTION

Substantial amounts of stored food products are attacked by fungi, insects and animals worldwide. In particular, food products in developing countries located in tropical and subtropical regions experience serious damage, leading to economic losses and health hazard as a result of mycotoxin production. Synthetic chemicals and fumigants have been widely used for preventing quality deterioration of stored products. (Nakahara Kazuhiko *et al.*, 2003) The *Cymbopogon nardus* and *Cymbopogon winterianus* are the two important species used for the production of citronella oil. Citronella oil is classified in trade into two types, Java citronella essential oil obtained from *Cymbopogon winterianus* is considered as superior type. The main constituents of java citronella oil are citronellol (13.4 to 15.75%), geraniol (14.3 to 34.3%) and citronellal (12.0 to 46.8%). Ceylon citronella consists of citronellal (65%), citronellol (13.5%) and geraniol (17.5%).

Java citronella oil has higher alcohol content (90-95%) than that of Ceylon type (60-71%). Citronella oil also contains geranyl acetate, citronellyl acetate, limonene, elemol and other sesquiterpene alcohols,  $\beta$ -elemene,  $\gamma$ -cadinene and traces of cubebene, calamenene, bourbonene, bissabolene, eugenol, isopulegol, nerol, linalool, methyl heptenone, myricene and  $\alpha$ -pinene (Faroogi *et al.*, 1905). The essential oil of java citronella is used for making

insect repellents insecticide (Shiva *et al.*, 2002). Thus the present investigation is proposed with the objectives, to explain the possibility to use essential oils to control plant diseases. Antifungal substances, similar to fungicides, may also be present in oil of aromatic plants, acting directly on the pathogens it is observed that essential oils from citronella (*Cymbopogon nardus* (L.) Rendle) completely inhibited the germination of urediniospores of Asian soybean rust (*Phakopsora pachyrhizi* Syd. and P.Syd.) and reduced the severity of the disease in greenhouse trials (Dorman *et al.* (2000)

## II. MATERIALS AND METHODS

### Plant Material

In vitro mutagenized variants of Java citronella collected from Botany field Dr.PDKV Akola. And the fungal and bacterial cultures viz., *Rhizoctonia bataticola*, *Fusarium oxysporum* f. sp. *ciceri* and *Erwinia crotrivora*, *Xanthomonas auxinopodis* P.V. *citri* resp. collected from Department of Plant Pathology, Post Graduate Institute, Dr.PDKV Akola.

### Oil Extraction

Citronella oil is extracted by the (Clvenger apparatus) steam distillation of finely fresh, dried or part-dried grass. To determine antifungal and bacterial activity of java citronella oil.

### Preparation of Sample for Antimicrobial Screening

The citronella oil was dissolved in dimethyl sulfoxide (DMSO). To prepare final concentration of 400, 800 1000, 1200, 1400 ppm/ml of each variants was used for the paper disc method. Dimethyl sulfoxide (DMSO) was used as control for antibacterial and antifungal activity respectively. The assay was carried out in triplicates.

Twenty five milliliters of potato dextrose broth was prepared and sterilized in autoclave at 121°C (15 lbs/ sq. inches) for 20 minutes. The broth was inoculated aseptically with a loop full culture of above mentioned test organisms and incubated for 48 hrs in orbital shaker incubated at 37°C with continuous shaking at 150 rpm. PDA medium was used 20 ml in each petri plate the sterile paper discs (6mm) were soaked in the oil in different concentration viz.400, 800, 1000, 1200, 1400 ppm/ml for 30 minute. Kept the disc on plate before spreading culture of the test organism on Petri plate. The plate was transferred in BOD at 37 °C for 4-6 days. After 4-6 days zone of inhibitions were examined and recorded. The experiments were performed in triplicate and average diameter of the zones of inhibition was calculated.

### III. RESULTS AND DISCUSSION

The antimicrobial activity was tested as per zone of inhibition formed by the plant oil. The fungus viz. *Rhizoctonia bataticola* and *Fusarium oxysporum f. sp. ciceri* and bacteria viz. *Erwinia Crotrivora* and *Xanthomonous auxinopodis P. V. citri* all the java citronella oil were tested against these pathogenic bacteria at different concentration of citronella oil viz. 400,800,1000,1200,1400 ppm/ml.

#### Antifungal activity screening

Table 1. Antifungal activity at different concentrations

Concentration (ppm/ml)	<i>Fusarium oxysporum f. sp. ciceri</i> *(mm)	<i>Rizoctonia bataticola</i>
400	7.64	NA
800	9.20	NA

1000	10.04	NA
1200	10.10	NA
1400	11.74	NA

The Java citronella oil showed the antifungal activity against *Fusarium oxysporum f. sp. ciceri* at different concentration 400, 800, 1000, 1200, 1400 ppm/ml. The higher concentration at 1400 ppm/ml showed the zone of inhibition 11.74 mm. Citronella oil does not show the antifungal activity against Fungus *Rhizoctonia bataticola*. Oliveira *et al.* (2011) tested the essential oils have been for antimycotic activity and pose much potential as antifungal agents. They investigated the activity of the essential oil of *Cymbopogon winterianus* against *C. albicans*.

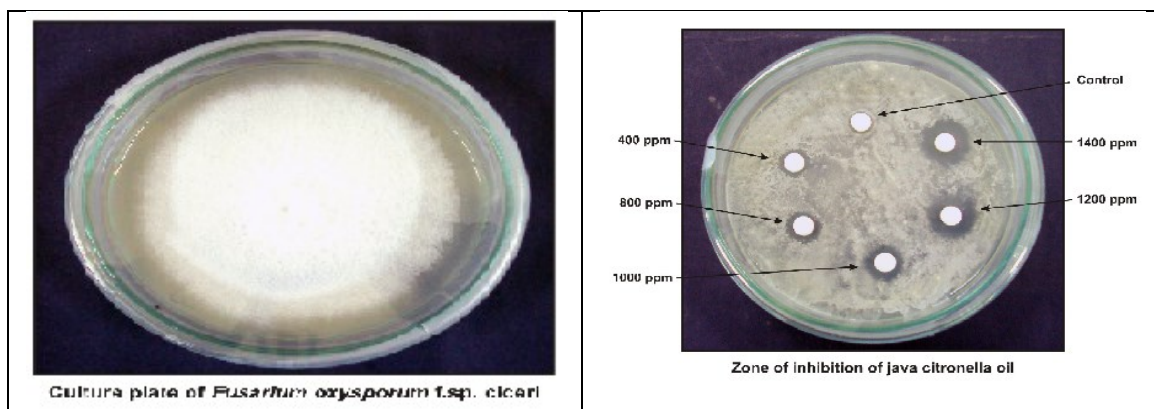


Fig. 1. Zone of inhibition of fungus *Fussarium oxysporum f. sp. Ciceri*.

#### Antibacterial activity screening

Table 2. Antibacterial activity at different concentrations

Concentration (ppm/ml)	<i>Erwinia Crotrivora</i> *	<i>Xanthomonous auxinopodis P. V. citri</i> ,*
400	5.96	NA
800	7.82	NA
1000	10.07	NA
1200	11.68	NA
1400	13.40	NA

The antibacterial activity of the Java citronella oil against bacteria *Erwinia Crotrivora* at different concentration 400, 800, 1000, 1200, 1400 ppm/ml. The higher concentration at 1400 ppm/ml showed the zone of inhibition 13.4 mm. Citronella oil does not show the

antifungal activity against Bacteria *Xanthomonous auxinopodis P. V. citri*.

Pattnaiks *et al.* (1996) reported that the essential oils of ten crops were tested for antibacterial activity against 22 bacteria by the disc diffusion method.

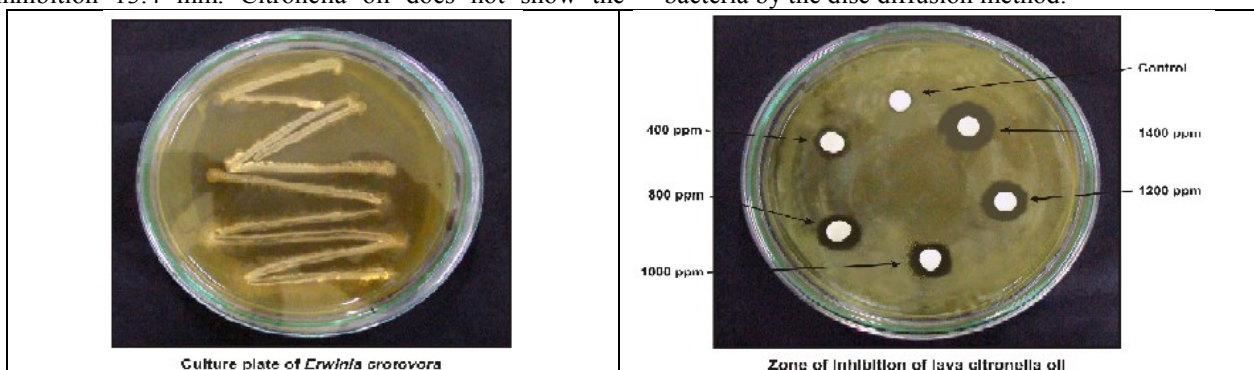


Fig. 2. Zone of inhibition of bacteria *Erwinia crotrivora*

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