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Short Communication

Evaluation of eucalyptus essential oil against some plant pathogenic fungi

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Antifungal activity of eucalyptus *(Eucalyptus camaldulensis* Dehnh.) essential oil was evaluated and suppressed the mycelial growth of postharvest pathogenic fungi, *Penicillium digitatum, Aspergillus flavus, Colletotrichum gloeosporioides* and soilborne pathogenic fungi*, Pythium ultimum, Rhizoctonia solani, Bipolaris sorokiniana* pathogenic fungi. The experiment was carried out with Whatman paper disc method in 25, 50, 75 and 100% concentration of essential oil on PDA culture at 25°C and mycelial growth measured daily for 30 days. The antifungal activity was evaluated under a randomized completely factorial design with three replications. The result showed eucalyptus essential oil in all concentration had completely inhibition of mycelial growth only in *P. ultimum and R. solani.*

Key words: Antifungal activity, essential oil, eucalyptus.

INTRODUCTION

Synthetic fungicides are currently used as primary means for the control of plant disease. However, the alternative control methods are needed because of the negative public perceptions about the use of synthetic chemicals, resistance to fungicide among fungal pathogens, and high development cost of new chemicals. The uses of plant-derived products as disease control agents have been studied, since they tend to have low mammalian toxicity, less environmental effects and wide public acceptance (Lee et al., 2007). Essential oils are concentrated, hydrophobic liquid containing volatile aromatic compounds extracted from plants (Isman, 2000). They were previously known to have biological activities such as antifungal (Soliman and Badeaa, 2002), antibacterial (Dorman et al., 2000), insecticidal and nematicidal effects (Pandey et al., 2000).

In this study, the inhibitory effect of eucalyptus *(Eucalyptus camaldulensis* Dehnh.) essential oil was determined against three postharvest pathogenic fungi, *Penicillium digitatum, Aspergillus flavus, Colletotrichum gloeosporioides* and three soilborne pathogenic fungi, *Pythium ultimum, Rhizoctonia solani* and *Bipolaris sorokiniana*.

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MATERIALS AND METHODS

Fungal cultures

The six phytopathogenic fungi such as *C. gloeosporioides* (extracted from citrus), *R. solani* and *B. sorokiniana* (extracted from rice), *P. ultimum* (extracted from Bastard saffron), *P. digitatum* and *A. flavus* (extracted from musty bread) were maintained and grown on potato dextrose agar (PDA). In this experiment, 24 h culture was used.

Extraction of essential oil

Leaves of *(E. camaldulensis* Dehnh.) was collected and washed; then extracted for 4 h by distilled water, using a Clevenger type apparatus established by Montes et al. (2001).

Antifungal activity test

Essential oil (10 µl) was directly assayed to each fungus with 25, 50 and 75% dilution with acetone and undiluted 100%. The control was used for each case by not exposing the fungus to any extract and addition of acetone. Qualitative and quantitative analysis of fungicidal activity was done using Woodward and De Groot (1999) by adding a 5 mm diameter of each fungal growth (three replicates) in the center of Petri dish containing culture PDA. Paper filter discs

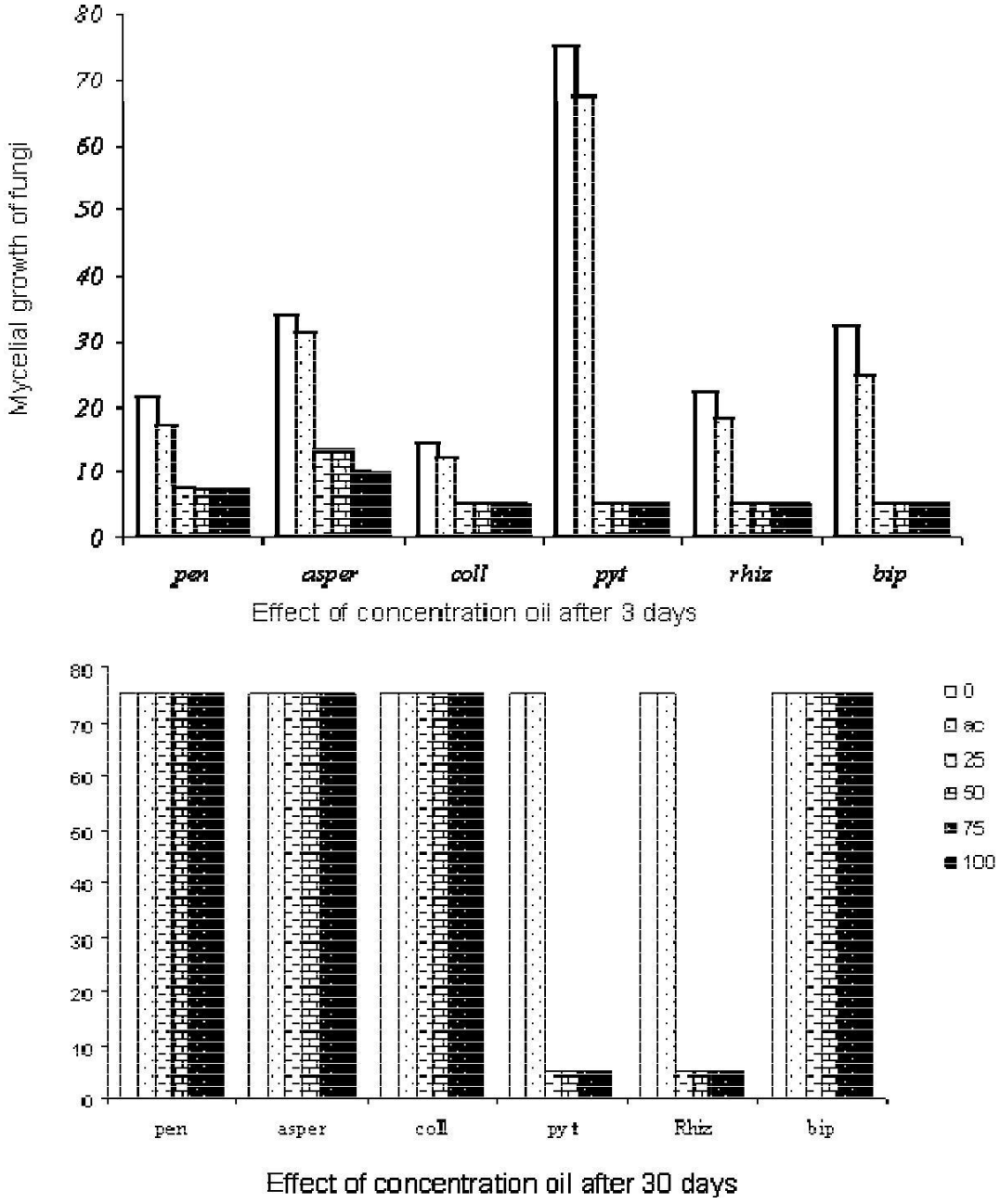

Figure 1. The comparison of mycelial growth (mm) after 3 and 30 days in essential oil present.

(Whatman No. 4 mm diameter) impregnated with increasing dilutions (0, 25, 50, 75, 100%) of essential oil were placed around the fungi and allowed only volatile compounds to be the causative agents for mycelial growth inhibition. The plate was sealed with parafilm immediately after adding each essential oil and incubated for 30 days at 25°C. The diameter of mycelial growth was measured every day.

Statistical analysis

Data were analyzed statistically using analysis of variance (ANOVA) and differences among the means were determined for significance at p≤ 0.01 using LSD test by SASS.

RESULTS

Antifungal activity of eucalyptus *(E. camaldulensis* Dehnh.) essential oil were tested against six phytopathogenic fungi such as *P. digitatum, A. flavus, C. gloeosporioides, P. ultimum, R. solani* and *B. sorokiniana*. According to the results, the effects of four concentration and times of exposure showed significant difference at p ≤ 0.01. The results showed complete inhibition of mycelial growth in *P. ultimum* and *R. solani* on all concentration of essential oil after 30 days (Figure 1). *B. sorokiniana* and *C. gloeosporioides* showed complete inhibition until 5 days,

but after that there was fungi mycelium growth and non inhibition. This essential oil in *P. digitatum* and *A. flavus* had no inhibition. The average of mycelial growth showed significant difference after 5 days.

DISCUSSION AND CONCLUSION

To develop environment-friendly alternatives to synthetic fungicides for the control of fungal plant disease, the interest on essential oils has been increased. In this study we investigated the antifungal activity of eucalyptus essential oil against six soilborne and postharvest disease pathogens. As a result, essential oil of eucalyptus inhibited the mycelial growth in all of the experiment fungi after 3 days. The most important soilborne of fungi, *P. ultimum* and *R. solani*, had 100% complete inhibition of mycelial growth, and agreement with those obtained by Huv et al. (2000), that showed *Eucalyptus unigera* oil inhibited mycelial growth *of* three phytopathogenic fungi such as *C. gloeosporioides , R. solani* and *Pythium* spp*.* This study demonstrated the *in vitro* antifungal activity of essential oil of Eucalyptus against phytopathogenic fungi. However, for the development of essential oils as alternative of synthetic fungicides, further studies are required to evaluate essential oils for application on plants and sensory quality of treated fruits and vegetables.

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