関東森林研究 63-1(2012)

Basic study on the bacteria resistance effects of *Cinnamomum camphora* and *Eucalyptus*

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Abstract: This research examined the bacteria resistance effects by volatile fragrance of *Cinnamomum camphora* and *Eucalyptus grobulus*. Experiments used *Escherichia coli* and *Staphylococcus* which were ordinary bacterium in daily life.. The experiment results of *Cinnamomum camphora* showed the volatile fragrance could resist the glowing of *Escherichia coli*, but not for *Staphylococcus*. On the other hand, the experiment results of *Eucalyptus grobulus* showed the volatile fragrance could resist the glowing of *Staphylococcus*, but not for *Escherichia coli*.

Keywords: bacteria resistance effects, *Cinnamomum camphora*, *Eucalyptus*, *Escherichia coli*, *Staphylococcus*

要旨：本研究では，クスノキとユーカリを供試材料とし，その葉から放出される芳香揮発成分の抗菌作用について，日常の身近な菌である大腸菌とブドウ球菌を用いて実験を行った。実験の結果，クスノキの芳香揮発成分は大腸菌に対して，一方，ユーカリの芳香揮発成分ではブドウ球菌に対して，菌体の増殖を抑制する作用が認められた。

キーワード：抗菌作用，クスノキ，ユーカリ，大腸菌，ブドウ球菌

Ⅰ Introduction

Recently, the bacteria resistance effects of trees have been paid attention (*1, 2*). Especially, *Cinnamomum camphora* is one of the species which have strong fragrance and insecticide effects. It has been traditionally utilized for camphor. *Eucalyptus grobulus* has many strong fragrance kinds and its distilled water has bacteria resistance effects. *Eucalyptus* is planted for horticulture and greening urban environment, too. In addition, *Eucalyptus* is utilized as one of the indoor foliage plants which have bacterium resistance. Therefore, this research examined the bacteria resistance effects by volatile fragrance of *Cinnamomum camphora* and *Eucalyptus*.

Ⅱ Method

Experiment sample was *Cinnamomum camphora* and *Eucalyptus grobulus*. Extraction and culturing bacterium methods were as below.

1. *Cinnamomum camphora*

(1) Solution: Solution for culture medium was made from LB culture medium (NaCl 5g、Tryptone 5g、Yeast ectract 2.5g, Agar 5g each stuff g/500ml). The solution was sterilized by an autoclave and provided for a culture dish (8.5cm diameter) 20ml each and made solid medium.

(2) Extraction method and an experiment tree: The volatile fragrance was trapped for 12 hours by vinyl clear bags (25cm square) covering two branches at 2m height of a *Cinnamomum camphora* tree (15m height and 28cm DBH) on the campus of Tokyo University of Agriculture.

(3) Examined bacterium and culturing mehod: *Eschewrichia coli* and *Staphylococcus aureus subsp.aureus* were selected as examined bacterium, because they were ordinary existed in daily life. Each 10μl bacterium was put on the center of the culture dish. 10ml of trapped volatile fragrance air was absorbed10ml by a syringe and put into each culture dish through 0.2μm disk filter. Culture dishes were cultivated for a month (average temperature was 30℃). Growing bacterium area of 10 repeat culture dishes and 5 control ones were periodically measured.

(4) Method of measuring growing rate of bacterium: To measure the growing rate of the bacterium, tracing the bacterium area on the paper, and scanning the area by measuring software.

2. *Eucalyptus grobulus* Solution, culture medium, bacterium, measuring method of bacterium area were same as *Cinnamomum camphora* experiment.

There are many kinds of *Eucalyptus*, but this experiment examined *Eucalyptus grobulus* which has strong fragrance. The volatile fragrance was trapped by two methods. One method was trapping volatile fragrance by a whole *Eucalyptus* plant (40cm tall) for 12hours with a vinyl clear bag (25cm square) and the other was trapping by cutting leaves (5g) for 12 hours.

Examined bacterium and the method of comparing repeat culture dishes and control ones were same as *Cinnamomum camphora* experiment.

Ⅲ Results and discussion

1. *Cinnamomum camphora* The changes of bacteria area of *E. coli* and *Staphylococcus* are shown on Fig.1 and Fig.2.

The changes of growing magnification between *E. coli* and *Staphylococcus* are different, but both of Branch No.1 and Branch No.2 showed the bacteria resistance against *E. coli*. Especially, after 15days of treatment the growing magnification was greatly accelerated. Statistical difference between volatile fragrance treatment and control by analysis of variance was confirmed ($p<0.06$) . However,

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Branch No.1 did not show the bacteria resistance against *Staphylococcus* and Branch No.2 did bacteria resistance. These results suggest the bacteria resistance effects are diverse by each part of the trees or according to bacteria.

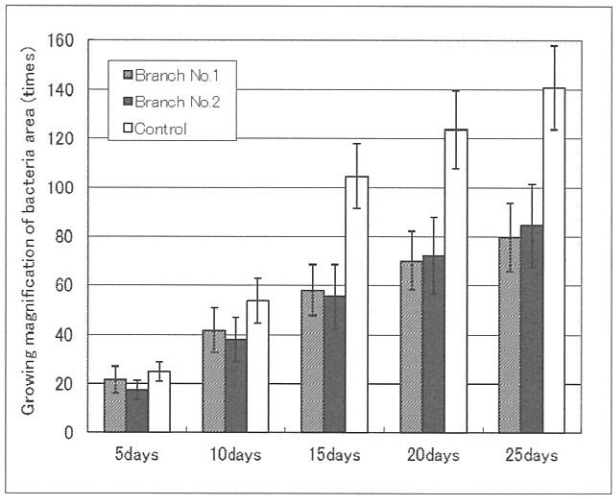

Fig.1 The effect of volatile fragrance of *Cinnamomum camphora* on the growing rate of *Eschewrichia coli.*

図－１．クスノキ芳香成分が大腸菌の成長に与える影響

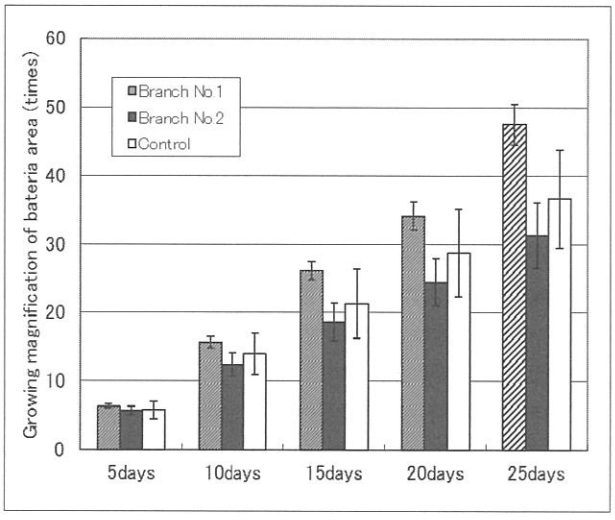

Fig.2 The effect of volatile fragrance of *Cinnamomum camphora* on *Staphylococcus aureus subsp.aureus.*

図－２．クスノキ芳香成分がブドウ球菌の成長に与える影響

2. *Eucalyptus grobulus* The changes of bacteria area of *E. coli* and *Staphylococcus* are shown on Fig.3 and Fig.4.

The changes of growing magnification between *E. coli* and *Staphylococcus* are different according to *Cinnamomum camphora* treatment. Bacteria resistance against *E. coli* was not shown. But about *Staphylococcus,* bacteria resistance was confirmed, and the effect of the whole tree trapped volatile fragrance and control showed statistical difference (t-test, $p<0.05$). These results also suggest the bacteria resistance effects are diverse at each part of the trees or according to bacteria as the result of *Cinnamomum camphora.*

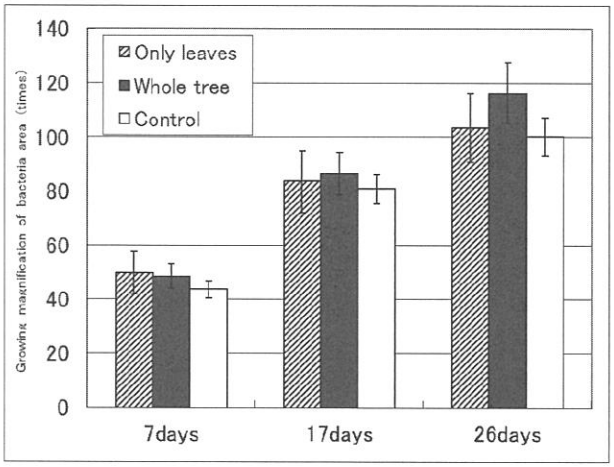

Fig.3 The effect of volatile fragrance of *Eucalyptus grobulus* on the growing rate of *Eschewrichia coli.*

図－３．ユーカリ芳香成分が大腸菌の成長に与える影響

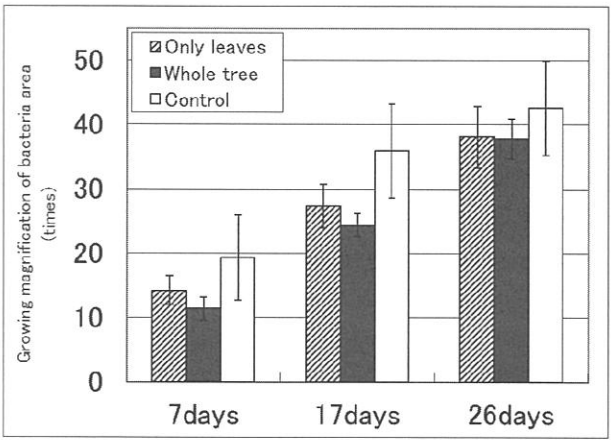

Fig.4 The effect of volatile fragrance of *Eucalyptus grobulus* on the growing rate of *Staphylococcus aureus subsp.aureus.*

図－４．ユーカリ芳香成分がブドウ球菌の成長に与える影響

Ⅳ Conclusion

This basic study showed some pratitable results of volatile fragrance of *Cinnamomum camphora* and *Eucalyptus*. However, further researches are necessary to enhance the experiment accuracy and also the effects of other parts of the trees and species should be investigated.

Ⅴ References

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