Vol. 1/2 (2001) 147 - 150

*Short Communication*

JOURNAL OF NATURAL REMEDIES

# Volatile oil constitution and microbicidal activities of essential oils of *Coriandrum sativum* L.

**J. Minija, J. E. Thoppil***

Genetics and Plant Breeding Division, Department of Botany, University of Calicut.

Received 28 May 2001 ; Accepted 12 June 2001

**Abstract**

Objective: To detect the essential oil constituents of herb and seeds of *Coriandrum sativum* L. and their microbicidal activities against six bacteria and six fungi. Materials and methods: Herb and seed oils of *C. sativum* were extracted in a Clevenger apparatus. Components were detected by gas liquid chromatography (GLC) and the microbicidal activities were analysed by disk diffusion method. Results: Monoterpenoids and phenols were detected from herb oil but only monoterpenoids could be identified in the seed oil. Herb oil showed highest activity against *Candida albicans* but seed oil have significant activity against *Xanthomonas campestris, C. albicans* and *Colletotrichum musae.* Conclusion: The microbicidal activities of these essential oils may be due to the terpenoids present in them.

**Key words:** *Coriandrum sativum,* essential oil, GLC, microbicidal activity.

## 1. Introduction

Volatile oils from aromatic and medicinal plants have been known since antiquity to possess biological activities. Major part of the flavours and fragrances provided by the plants have found its way via essential oils into everyday life. Volatile oils are known for its action as medicaments, insect repellants, microbicides, fragrances, perfumes and flavouring agents. *Coriandrum sativum* L. (Apiaceae), a herb of Mediterranean origin, which is known as house wife's secret of tasty dishes [1] was introduced from East [2]. In Sanskrit it is known as 'Dhanyaka' and is used against various ailments. Whole plant is used against tuberculosis [3] and dysentery [4]. Leaves are recommended in piles, jaundice, tooth ache, indigestion, stomach ache, nausea, diarrhoea, dysentery, flatulence, deficiencies of Vit. A, B & C, hiccough and chronic conjunctivitis [5]. Seeds are used as carminative, diuretic, aphrodisiac, anthelmintic and stomachic. It cures bronchitis, dyspepsia, ulcer, diarrhoea, dysentery, helminthiasis and rheumatism [5, 6].

Corresponding author
E-mail: mahija-j@ eth.net or minijaj@usa.net

In the present study we have tried to detect the chemical constituents of essential oils of seeds and herb and also the microbicidal activities of these oils against *Escherichia coli, Bacillus subtilis, B. megaterium, Staphylococcus aureus, Xanthomonas campestris, Proteus vulgaris, Aspergillus niger, A. parasiticus, Rhizopus oryzae, Candida albicans, Fusarium solani* and *Colletotrichum musae* (Origin: MTCC Gene Bank, Institute of Microbial Technology, Chandigarh, 160 036, India)

## 2. Materials and methods

### *2.1 Plant material*

The fresh herb was collected from Calicut in November and voucher specimen was deposited in the herbarium at Dept. of Botany (C. U. No. 51313)

### *2.2 Isolation of essential oil*

Fresh herb and dried seeds of *C. sativum* were hydrodistilled separately in a Clevenger apparatus at 100°C for 4 h and quantitatively measured. The isolated oils were dried over anhydrous sodium sulphate, transferred into small amber coloured bottles and refrigerated.

### *2.3 GLC*

Quantitative analysis of essential oils was done on a NUCON 5765 gas liquid chromatography equipped with FID and connected with chromatograph data processor. GLC conditions used were : column character: packed stainless steel; chemical in the column: liquid phase 10% SE-30 (Silicon E-30); solid phase CH W. HP (Chromosorb W High Performance), mesh size: 80/100; length: 2m; internal diameter: 2mm; carrier gas: $N_2$; inlet pressure: $3x10^{-3}$ Pa; flow rate: 40ml/min; temperature programme - oven temperature: 80-150°C (8°C/min), 150-290°C (6°C/min), injector temperature: 220°C; detector temperature: 240°C.

### *2.3 Microbicidal activity*

The microbicidal activities of these essential oils were done against six bacteria and six fungi. All bacteria except *X. campestris* were cultured in nutrient agar medium (Beef extract-1g, Yeast extract-2 g, Peptone-5 g, Sodium chloride-5 g, Agar-15 g and Distilled water-1L).

Pure culture of *X. campestris* was made in GYA (Galactose-20 g, Calcium carbonate-20 g, Yeast extract-10 g, Agar-20 g and Distilled water-1L) incubated at 35°C for 48 h under aerobic conditions. PDA (Potato-200 g, Dextrose-20 g, Agar-15 g and Distilled water-1L) medium was used for culturing *A. niger, A. parasiticus* and *R. oryzae* - aerobic and incubated at 30°C for 72 h. YEPD (Yeast extract-3 g, Peptone-10 g, Dextrose-20 g, Agar-15 g and Distilled water-1L) medium was used for *C. albicans* and PSA (Potato-200 g, Sucrose-20 g, Agar-20 g and Distilled water-1L) medium was used for *F. solani* and kept at 30°C for 48 h under aerobic conditions. Pure culture of *C. musae* was made in corn agar (Corn meal-30 g, Agar-20 g and Distilled water-1L) medium and incubated at 30°C for 96 h under aerobic conditions.

Filter paper disk diffusion method [7] was used for the evaluation of microbicidal activity.

## 3. Results and discussion

The herb oil (0.11%-light yellow) contains citronellol (30.49%), dillapiole (18.77%), α-terpineol (15.13%), anethole (2.07%) and geranyl acetate (1.37%) whereas, the seed oil (0.28%- colourless changing to light rose) consists of linalool (70.49%), terpinyl acetate (10.85%), geraniol (10.37%) and α-terpineol (3.02%).

The herb oil showed the predominance of both monoterpenoids and phenols whereas the seed oil contains mainly monoterpenoids. Presence of geraniol [8, 9] and α-terpineol [8] were

Table 1.
Microbicidal activities of the essential oils of *Coriandrum sativum L.*

| **Microorganisms** | **Zone of Inhibition (mm)*** | | | | |
|---|---|---|---|---|---|
| | **Dilution of essential oil in acetone** | | | | |
| | **1:0** | **1:1** | **1:2** | **Gentamycin Sulphate (40mg/ml)** | **Nystatin (50 IU)** |
| *Coriandrum sativum* | | | | | |
| **Herb oil** | | | | | |
| **Bacteria** | | | | | |
| *Escherichia coli* | 16 | 16 | 16 | 29 | |
| *Bacillus megaterium* | 16 | 16 | 16 | 45 | |
| *B.subtilis* | 18 | 16 | 16 | 48 | |
| *Staphylococcus aureus* | 22 | 16 | 16 | 35 | |
| *Xanthomonas campestris* | 16 | 16 | 16 | 53 | |
| *Proteus vulgaris* | 16 | 16 | 16 | 28 | |
| **Fungi** | | | | | |
| *Aspergillus niger* | 0 | 0 | 0 | | 38 |
| *A. parasiticus* | 0 | 0 | 0 | | 29 |
| *Rhizopus oryzae* | 0 | 0 | 0 | | 31 |
| *Candida albicans* | 40 | 35 | 25 | | 30 |
| *Fusarium solani* | 16 | 0 | 0 | | 41 |
| *Colletotrichum musae* | 16 | 16 | 16 | | 31 |
| **Seed oil** | | | | | |
| **Bacteria** | | | | | |
| *Escherichia coli* | 25 | 24 | 23 | | |
| *Bacillus megaterium* | 26 | 25 | 22 | | |
| *B.subtilis* | 21 | 20 | 19 | | |
| *Staphylococcus aureus* | 24 | 21 | 20 | | |
| *Xanthomonas campestris* | 30 | 26 | 22 | | |
| *Proteus vulgaris* | 21 | 20 | 19 | | |
| **Fungi** | | | | | |
| *Aspergillus niger* | 24 | 18 | 16 | | |
| *A. parasiticus* | 16 | 16 | 16 | | |
| *Rhizopus oryzae* | 24 | 16 | 0 | | |
| *Candida albicans* | 30 | 25 | 22 | | |
| *Fusarium solani* | 23 | 18 | 16 | | |
| *Colletotrichum musae* | 33 | 16 | 0 | | |

* Including the diameter of the filter paper disk (16mm).

previously confirmed by various authors. The medicinal and other value added properties reported on this taxa may be probably due to its chemical constitution, since many of the identified essential oil components have reputed medicinal, flavouring and perfumery properties [10-11].

The microbicidal activities of essential oils are shown in Table-1. Seed oil was more active than herb oil. Herb oil showed significant activity against *C.albicans* whereas seed oil has pronounced activity against *X.campestris, C.albicans* and *C.musae.* The microbicidal properties of *C.sativum* against various microbes were previously reported [12, 13]. The essential oil of *C.sativum* has potent anti-microbial property and bears potential for development of a commercial microbicide.

## References


1. Pruthi JS. (1979) *Spices and condiments,* National Book Trust: New Delhi; 98-103.

2. Grieve M. (1970) *A Modern Herbal,* Vol. l, Hafner Publishing Co.: Darien, Conn; 221-222.

3. Chopra RN, Chopra IC. (1954) *A Review of Work on Indian Medicinal Plants,* Drug Research Laboratory: Jammu; 97-98.

4. Govil JN. (1998) *Current Concepts of Multidiscipline Approach to the Medicinal Plant,* Part-1, Today & Tomorrow's Printers and Publishers: New Delhi; 24.

5. Kirtikar KR, Basu BD. (1975) *Indian Medicinal Plants,* Vol. II, Bishen Singh Mahendrapal Singh: Dehra Dun; 1225-1227.

6. Warrier PK, Nambiar VPK, Ramankutty C. (1994) *Indian Medicinal Plants,* Vol. II, Orient Longman Ltd.: Madras; 184.

7. Benson HJ. (1990) *Microbiological Applications,* Wm. C. Brown Publishers: USA; 134.

8. Pino JA, Rosado A, Fuentes V. (1976) *J. Essent. Oil Res.* 8: 97-98.

9. Bandoni A, Mizrahi I, Juarez M A. (1998) *J. Essent. Oil Res.* 10: 581-584.

10. Shirokov EP, Badgaa D, Kobozev IV. (1980) *Izv. Timirzazev S. kh. Akad.* 0: 187-191.

11. Duke JA. (2000) *Phytochemical database,* USDA-ARS-NGRL, Beltsville Agricultural Research Center, Beltville, Maryland (www.stevenfoster.com).

12. Meena MR, Sethi V. (1994) *J. Food Sci. Technol.* 31: 68-70.

13. Valsaraj R, Pushpangadan P, Smitt UW, Adsersen A, Nyman U. (1997) *J. Ethnopharmacol.* 58: 75-83.