

Growth inhibition in *Rhizoctonia bataticola* and *Xanthomonas axonopodis* pv. *malvaceum* by herbal oils

A R Thakare, S G Wankhade, R B Somani & B T Raut

Department of Plant Pathology
Dr. Panjabrao Deshmukh Krishi Vidyapeeth
Akola - 444 104, Maharashtra, India

Received 18 May 2002; Revised 24 January 2003; Accepted 20 June 2003.

Abstract

Oils extracted from six medicinal plants viz. mentha (*Mentha arvensis*), ocimum (*Ocimum sanctum*), lemongrass (*Cymbopogon flexuosus*), citronella (*Cymbopogon winterianus*), turmeric (*Curcuma longa*) and palmarosa (*Cymbopogon martinii*) were tested under *in vitro* condition for their antifungal and antibacterial properties. Mentha, ocimum, palmarosa and lemongrass oil exhibited 100% inhibition of *Rhizoctonia bataticola* at 1 and 2% concentrations, whereas citronella oil recorded 100% inhibition at 2% concentration. Turmeric oil was found to be less effective against *Rhizoctonia*. Mentha oil showed the highest (17 mm) inhibition zone against *Xanthomonas axonopodis* pv. *malvaceum* followed by ocimum oil (12 mm). The studies showed that mentha oil possessed very high inhibitory effects on fungi and bacteria.

Key words: essential oils, *Rhizoctonia bataticola*, *Xanthomonas axonopodis* pv. *malvaceum*

Many species of plants such as mentha (*Mentha arvensis*), ocimum (*Ocimum sanctum*), lemongrass (*Cymbopogon flexuosus*), citronella (*Cymbopogon winterianus*), turmeric (*Curcuma longa*), palmarosa (*Cymbopogon martinii*) etc. synthesize and accumulate considerable amount of scented organic compounds in roots, stem, leaves, flower, fruits and/or seeds. Among these some are the major sources for specific essential oils (naturally permuted mixture of scented terpenoid compounds). Essential oils are gaining commercial importance in recent years for management of diseases in human beings as well as plants. The essential oils of *Eucalyptus* sp. and *Citriodora* were most effective as antifungal agents against human pathogenic fungi (Shahi *et al.* 1998). Oil of *Ocimum sanctum* has wound healing (Shetty *et al.* 1998) and antiulcer prop-

erties (Singh & Majumdar 1999). Upadhyay *et al.* (1997) reported the effectiveness of its vapours against sugarcane pathogens. Therefore efforts were made to study the effect of some herbal oils against two common plant pathogens.

Oils were extracted from six medicinal plants i.e. mentha, ocimum, lemongrass, citronella, turmeric and palmarosa by hydrodistillation using Clavenger's apparatus. The oils thus obtained were evaluated at 1 and 2% concentrations by poisoned food technique against *Rhizoctonia bataticola* and *Xanthomonas axonopodis* pv. *malvaceum* under *in vitro* conditions.

Each oil was mixed with PDA to get the required concentration and approximately 20 ml PDA was poured in sterilized petriplates.

Discs (5 mm) of the pathogen *R. bataticola* was cut with the help of a sterilized cork borer from 5 days old culture and one disc each was placed at the centre of each plate. There were three replications and plates were incubated at $30 \pm 2^\circ\text{C}$ for 7 days. Antifungal effect was estimated by measuring the zone of inhibition in each plate. For this the colony diameter in herbal oil-amended plates was subtracted from that of control. A standard fungicide i.e. copper oxychloride at 0.2% was also tested for comparison.

The antibacterial property of the above six essential oils was tested at the concentration of 1 per cent against *X. axonopodis* pv. *malvaceum*, the causal agent of angular leaf spot of cotton by paper disc method. The bacterium was cultured on nutrient agar plated in petriplates. Three sterilized paper discs (5 mm) dipped in oil were placed at equidistant in each petriplate. Observations on inhibition zone were recorded on the 3rd day after inoculation. There were seven treatments including a control, streptomycin (100 ppm) with three replications.

The results of screening herbal oils against *Rhizoctonia bataticola* are presented in Table 1. The study has indicated that mentha, ocimum, palmarosa and lemongrass oils exhibited 100% inhibition of *R. bataticola* at both the concentrations. Citronella oil gave 100% inhibition at 2% concentration while the inhibition was 80% at 1% concentration. The copper oxychloride treatment resulted in inhibition of 77.77 and 100% at 1 and 2%, respectively. Turmeric oil exhibited 20 and 40% inhibition at 1 and 2% concentrations. The fungistatic activity of turmeric rhizome oil was reported against *Aspergillus niger* and *Sclerotium rolfsii* *in vitro* (Rao & Joseph 1971; Sawada *et al.* 1972). In the present study turmeric oil restricted partially the growth of *R. bataticola*.

The antibacterial effects of different herbal oils are presented in Table 2. The mentha oil exhibited highest (17 mm) inhibition zone against *X. axonopodis* pv. *malvaceum* followed by ocimum oil which gave an inhibition zone

Table 1. Effect of different herbal oils on the growth of *Rhizoctonia bataticola*

Treatment	Colony diameter (mm)		Per cent inhibition	
	1%	2%	1%	2%
Mentha oil	0	0	100	100
Citronella oil	18	0	80	100
Turmeric oil	72	54	20	40
Ocimum oil	0	0	100	100
Palmarosa oil	0	0	100	100
Lemongrass oil	0	0	100	100
Copper oxychloride	20	0	77.77	100
Control	90	0	0	0

Table 2. Inhibition of *Xanthomonas axonopodis* pv. *malvaceum* by different oils

Treatment	Inhibition zone (mm)
Mentha oil	17
Citronella oil	4
Turmeric oil	3
Ocimum oil	12
Palmarosa oil	7
Lemongrass oil	7
Streptomycin	9

of 12 mm. The control treatment streptomycin gave an inhibition zone of 9 mm. Turmeric and citronella oils were found least effective. It was observed that mentha and ocimum oils have higher antibacterial properties compared to the antibiotic streptomycin in reducing the growth of plant pathogenic bacteria. Khanna (1999) reported that turmeric oil has antibacterial effect.

Reference

- Khanna N M 1999 Turmeric – nature's precious gift. *Current Sci.* 79 (10) : 1351-1356.
- Rao B G N & Joseph P L 1971 Richest, aromen. *Koerpetlegem* 21 : 405- 406.
- Sawada T, Yamahara J, Shimazu S & Ohta T 1972 *Shayakugaku Zasshi* 2 : 11-16.

- Shahi S K, Shukla A C, Bajaj A K, Medgely G & Dikshit A 1998 Broad spectrum antimycotic drug for the control of fungal infection in human beings. *Current Sci.* 76 (6) : 836-839.
- Shetty S B, Udupa S L, Udupa A L, Kamath U & Bhaskar 1999 Effect of *Ocimum sanctum* on wound healing. XXXI Annual Conference of Indian Pharmacological Society, Lucknow, Dec. 18 - 20, 1998. *Indian J. Pharmacol.* 31 (1) : 77.
- Singh S & Majumdar D K 1999 Evaluation of gastric activity of fixed oil of *Ocimum sanctum*. *J. Ethnopharmacol.* 65 (1) : 13-19.
- Upadhyaya P P, Singh S P & Rao S P 1997 Fungitoxic and phytotoxic studies on vapours of essential oils from *Ocimum* spp. against sugarcane pathogens. *Int. Conf. Integrated Plant Disease Management*, New Delhi, 10-15 Nov. 1997 (Abstract).