Journal of Spices and Aromatic Crops
Vol. 17 (1) : 26–28 (2008)

Indian Society for Spices

In vitro evaluation of plant extracts and bioagents against *Alternaria burnsii* Uppal, Patel & Kamat causing blight of cumin (*Cuminum cyminum* L.)

K B Jadeja & B H Pipliya

Junagadh Agricultural University
Junagadh–362 001, Gujarat, India
Email: kbjadeja261053@yahoo.co.in

Received 14 November 2007; Revised 16 April 2008; Accepted 19 April 2008

Abstract

Laboratory evaluation of 14 plant extracts for growth inhibition of *Alternaria burnsii,* the causal organism of blight disease of cumin (*Cuminum cyminum*) indicated that 5% and 10% extract of garlic cloves and ginger rhizomes were most effective resulting in 78.52% and 72.96% mean inhibition, respectively. Evaluation of 11 isolates of *Trichoderma* spp. against the pathogen in the laboratory indicated that *T. harzianum* 360 and *T. viride* Anand were most effective resulting in 100% inhibition of *A. burnsii*.

Keywords: *Alternaria burnsii,* blight, cumin, *Cuminum cyminum,* plant extracts, *Trichoderma* spp.

Cumin (*Cuminum cyminum* L.) is seriously affected by blight caused by *Alternaria burnsii* Uppal, Patel & Kamat in Gujarat. Under warm-wet conditions the disease spreads in the whole field within a short period causing complete failure of the crop. In such conditions the crop must be protected with frequent application of fungicides and farmers start fungicide application from one month after sowing and continue up to the maturity of the crop resulting in pesticide residues in the seeds. Non-chemical methods of disease management can reduce pesticide residue problems in the product. Botanical materials (Babu *et al*. 2001; Khallil 2001) and bioagents have been tested successfully against many pathogens. In the present investigation an effort was made to test the efficacy of 14 plant extracts and 11 isolates of *Trichoderma* spp. against *A. burnsii* under laboratory conditions.

Plant extracts

Leaves of saptaparni (*Alstonia scholaris* (L.) R.Br.), marigold (*Tagetes erecta* L. (DC) Stap.), neem (*Azadirachta indica* A. Juss.), ardusi (*Adhatoda vasika* Ness.), tulsi (*Ocimum sanctum* L.), periwinkle (*Vinca rosea* L.), karanj (*Derris indica* (Lam.) Thw. Bennet.), lantana (*Lantana camara* L.), mehndi (*Lawsonia inermis* L.) and mint (*Mentha arvensis* L.), rhizomes of turmeric (*Cucurma longa* L.) and ginger (*Zingiber officinale* Rosc.), cloves of garlic (*Allium sativum* L.) and bulbs of onion (*Allium cepa* L.) were evaluated against *A. burnsii* following the procedure given by Ansari (1995) with modification. Fresh leaves, rhizomes, cloves or bulbs of respective plants

Table 1. Growth inhibition of *Alternaria burnsii* by plant extracts

Plant extract	Per cent inhibition*		Mean
	5%	10%	
Garlic	74.81	82.22	78.52
Ginger	69.63	76.30	72.96
Turmeric	40.74	41.85	41.30
Karanj	31.85	33.33	32.59
Lantana	30.00	32.96	31.48
Mahendi	26.67	32.22	29.44
Onion	20.74	37.04	28.89
Mint	22.59	24.44	23.52
Neem	10.74	34.44	22.59
Periwinkle	15.56	20.74	18.15
Saptaparni	15.93	19.26	17.59
Ardusi	8.89	10.37	9.63
Marigold	5.65	8.68	7.17
Tulsi	5.38	7.73	6.56
Control	0.00	0.00	0.00
	Between plant extracts		Within plant extracts
CD (P=0.05)	1.16		3.18

* Mean of three replications

were washed with tap water followed by sterilized water. Each sample was then homogenized in sterilized distilled water (1 ml g^{-1} of tissue) (1:1 V/W) with a mortar and pestle and filtered through fine muslin cloth. The filtrate was centrifuged at 5000 rpm for 20 min and the supernatant was filtered with sterilized sintered funnel (pore size 1–2 µ), which formed the individual plant extract solution (100%). The extracts were individually incorporated into PDA medium at 5% and 10% concentrations in 250 ml conical flasks separately and sterilized at 1.2 kg cm^2 for 15 min. These were poured into 90 mm sterilized petridishes with three replications for each concentration of extract. PDA without extracts was maintained as control. All the petridishes were inoculated with 4 mm disc of mycelium of the pathogen and incubated at 28 ± 2^0 C. Five days after inoculation, the radial growth of mycelium was recorded and per cent inhibition of fungal growth for each treatment and concentration was calculated.

Fungal antagonism

The antagonism of 11 isolates of *Trichoderma* spp. were tested against *A. burnsii* by using dual culture technique. PDA (20 ml) was poured aseptically in each of the petridish and allowed to solidify. Mycelial disc of 4 mm diameter of each antagonist and test fungus were placed on opposite ends of PDA containing petridishes. Each treatment was replicated thrice. The plates were incubated at 28 ± 2^0C for 5 days. After incubation, the growth of antagonist and test fungus was measured by linear measurement and per cent growth inhibition was calculated.

Among the 14 phyotoextracts, maximum inhibition was recorded in garlic (78.5%) followed by ginger (73.0%). The inhibition in other treatments ranged between 41.3% (turmeric) to 17.6% (saptaparni). In majority of cases there was not much difference in growth inhibition under 5% and 10% concentrations (Table 1). Chalfoun & Carvalho (1987) and Barros *et al.* (1995) also

Table 2. Growth inhibition of *Alternaria burnsii* by isolates of *Trichoderma* spp.

Isolate	Mean per cent growth inhibition*
T. harzianum 360	100.00
T. viride Anand	100.00
T. harzianum 362	85.56
T. hamatum	81.11
T. koningii	78.89
T. virens	70.74
T. harzianum 354	68.52
T. viride Improved	67.78
T. harzianum Improved	62.22
T. harzianum IARI	61.11
T. harzianum NRCG	60.00
Control	0.00
SEm±	0.99
CD (P=0.05)	2.89

* Mean of three replications

reported the effectiveness of garlic extract on growth inhibition of different *Alternaria* spp. Garlic clove extract was also reported very effective in growth inhibition of *Colletotrichum* spp. and *Sclerotium rolfsii* Sacc. causing anthracnose of betelvine (Kumar *et al*. 2007) and collar rot of chilli (Singh *et al.* 2007), respectively.

All the *Trichoderma* isolates significantly inhibited the mycelial growth of test pathogen. Cent per cent growth inhibition was recorded in *T. harzianum* 360 and *T. viride* Anand isolates. All the isolates exhibited over 60% inhibition (Table 2). The effectiveness of *Trichoderma* isolates has been reported against *A. alternata (*Fries) Keissler causing fruit rot of ber (Nallathambi & Thakore 2002) and sesame blight (Akbari & Parakhia 2007). The promising plant extracts and bioagents are to be evaluated in the field for developing integrated management schedules against blight disease of cumin.

References

Akbari L F & Parakhia A M 2007 Ecofriendly approaches to manage blight of sesame. J. Mycol. Pl. Pathol. 37: 398–400.

Ansari M M 1995 Control of sheath blight of rice by plant extracts. Indian Phytopath. 48: 268–270.

Babu S, Seetharaman, K Kumar, Nandakumar, R N & Johnson I 2001 Inhibitory effect of leaf extracts of some medicinal plants and weeds on *Alternaria solani.* Pl. Dis. Res. 16: 84–86.

Barros S T, Oliveria N T & Maia L C 1995 Effect of the garlic (*Allium sativum*) bulb extract on mycelial growth and spore germination of *Curvuaria* spp. and *Alternaria* spp. Summa-Phytopathologica 21 (2): 168–170.

Chalfoun S M & Carvalho V D 1987 Effect of fungicides and industrial garlic oil extract on fungal development. Fitopatologia Brasileira 12 (3): 234–235.

Khallil A R 2001 Phytofungitoxic properties in the aqueous extracts of some plants. Assiut J. Agri. Sci. 32: 135–143.

Kumar S & Yadav B P 2007 Efficiency of fungicides and plant extracts on *Colletotrichum* spp. J. Mycol. Pl. Pathol. 37: 363–364.

Nallathambi P & Thakore B B L 2002 Efficiency of *Trichoderma* isolates against fruit rot pathogen (*Altenaria alternata*) in Ber (Abstr.). J. Mycol. Pl. Pathol. 32 (2): 269.

Singh S R, Prajapati R K, Srivastava S S L, Pandey R K & Gupta P K 2007 Evaluation of different botanicals and non-target pesticides against *Sclerotium rolfsii* causing collar rot of chilli. J. Mycol. Pl. Pathol. 37: 499–501.