Efficacy of different extracts of certain indigenous plants against sheath blight pathogen of rice

JANKI KANDHARI AND R. P. SINGH

Division of Plant Pathology and Division of Agricultural Chemicals, Indian Agricultural Research Institute, New Delhi 110012

Extracts of eight environmental friendly plants were evaluated against *Rhizoctonia solani*, the causal organism of sheath blight of rice by poisoned food technique at different concentrations. Complete inhibition of fungal growth was observed at 100 ppm concentration by *Syzygium aromaticum* and methyl anthranilate, a chemical constituent of *Jasminium officinale* extract while nonyl alcohol, citral and phenyl ethyl propionate showed 77.7, 88.3 and 83.3 percent antifungal spectrum at the same concentration. The benzene and acetone extracts of *Tagetus tenifolia* and hexane and acetone extracts of *Tagetus erecta* also showed complete inhibition at higher concentration (1000 ppm)

Key words : Plant extracts, sheath blight, rice, *Rhizoctonia solani*

INTRODUCTION

Sheath blight disease of rice incited by *Rhizoctonia solani* Kuhn [*Thanatephorus cucumeris* (Frank) Donk] hitherto regarded as a minor disease which has assumed the status of major disease of rice growing tracts of India. Losses due to the disease are reported to be up to 50 percent (Rajan, 1987; Roy, 1993). Extensive use of pesticides has ensured higher level of production in modern agriculture but has also posed a potential threat to human health. Several plant extracts have been demonstrated to possess excellent fungicidal properties (Sarbhoy *et al.*, 1978; Tewari and Premlatha Dath, 1984; Mishra and Tewari, 1990; 1992; Tewari and Mandakini, 1991; Ansari, 1995; Sundarraj *et al.*, 1996; Kurucheve *et al.*, 1997; Srivastava and Bihari Lal, 1997). Keeping in view, the present investigation was undertaken to assess the efficacy of extracts of certain environmental friendly plants against sheath blight pathogen of rice.

MATERIALS AND METHODS

Extraction of eight plant materials (*Ocimum basilicum, Citrus reticulata, Syzygium aromaticum, Jasminum officinale, Tagetus tenifolia, T. erecta, Pyrus pashia* and *Gladiolus sp.*) was carried out. The fresh green leaves of *O. basilicum* were collected from NBPGR, Pusa campus, New Delhi. The orange peels were collected from the local market. Fresh material of both plants were shade dried and the requisite quantity was used to extract active material by using Clevengers apparatus. The material was dried over sodium sulphate (anhydrous) for overnight. Fresh *Jasminium officinale, Tagetus* flowers and *Gladiolus* seed husk were collected from IARI garden, New Delhi. *Pyrus pashia* and *Tagetus tenifolia* plant material was obtained from hilly area (Katrain). The extraction of the chemical constituents of *Jasminium officinale* were separtated first by dissolving the whole material in pure hexane then separating by column chromatography and finally indentified by gas liquid chromatography. Fresh flowers of *Tagetes* were immersed in pure ethanol and then fractioned by different solvents of increasing polarity like hexane, benzene and acetone. In cake of *Pyrus pashia* and *Gladiolus* the extraction of the plant material was carried out with redistilled hexane. The extracts thus obtained were distilled free from solvent and dried over sodium sulphate (anhydrous) for overnight.

A pure culture of a virulent isolate of *R. solani* was maintained on potato dextrose agar (PDA) slants. The experiment was conducted by poisoned food technique (Nene and Thapliyal, 1979). The concentrations used were 1000, 750, 500 and 100 ppm. Three replicates for each concentration were taken along with three control dishes. Data on percentage of radial growth inhibition (calculated on the basis of growth in corresponding control dishes) were recorded.

RESULTS AND DISCUSSION

All the test extracts exhibited fungitoxic properties. Complete inhibition of fungal growth was observed by *Syzygium aromaticum* and *Jasminium officinale* (methyl anthranilate, a chemical constituent) at 100 ppm. At 750 ppm the chemical constituent of *Jasminium officinale* and *O. basilicum* showed complete fungal inhibition. Least growth inhibition was recorded with *C. reticulata* peel extract in comparison to other even at 1000 ppm (Table 1). Several plant extracts like *Ocimum spp. (O.basilicum, O.sanctum), Tagetus erecta, Azadirechta indica, Prosopis juliflora, Thelevelia peruviana, Polyalthia longifolia, Piper betle, Lawsonia inermis, Nyctanthes arbor-tristis* and some animal faeces are reported to posses antifungal property against *R.solani*. Ansari (1995) reported *Ocimum* sp.extract effective against *R. solani* even at 1:20 (v/v) dilutions. He also reported *Leuceaena leucocephala, Tagetus erecta*, oil of *O. americanum* completely inhibited the growth of *R. solani* at 0.2 percent. Oil of *Citrus sinensis* at the same concentration reduced growth by 87 percent. Tewari and Mandakini (1991) reported complete reduction of growth of *R. solani in vitro by O. sanctum* and also checked the spread of *R. solani in vivo*. According to them *O. sanctum* could be used as source of pesticide of plant origin to control *R. solani* of rice in field. Tewari and Premlatha Dath (1984) also showed antifungal activity of *O. sanctum, Piper betle, Lawsonia inermis* and *Nyctanthes arbor-tristis* aganinst *R. solani.* Sunderraj *et al.*, (1996) reported no effect with cold water extract of *O. sanctum*. Srivastava and Bihari Lal (1997) reported leaf extract of *O. basilicum* can inhibit the growth of many fungi and bacteria due to presence of toxic substances like thymol and phenol present in *O. basilicum*. In the present investigation also *O. basilicum* extract showed compelete inhibition of *R. solani* growth at 750 ppm. Although Sundarraj *et al.* (1996) reported no effect with cold water extract of *T. erecta* on *R. solani* growth. Ansari (1995) reported complete inhibition of growth at 0.2 percent. In the present study also *T. erecta* extract (hexane and acetone) compeletly inhibited the growth of fungus at 1000 ppm. Other plant extracts which inhibited the growth of fungus are *Prosopis juliflora, Thelevelia peruviana* (Kurucheve *et al.*, 1997) crude ethanolic extract of *Polyalthia longifolia* (Mishra and Tewari, 1992) @ 2.5 percent concentration and *Azadirecta indica* (Mishra and Tewari, 1990) at 100 ppm.

Thus extract from different plant sources could be used separately or in combination which can result to control the disease at lower concentration of extracts. The fungitoxicant from plants do have promising future due to their strong fungitoxicity,

Table 1 : Efficacy of biotic products against sheath blight of rice

Biotic Products	Percent inhibition in different concentrations (in ppm)			
	1000	750	500	100
Ocimum basilicum	100.0	100.0	82.3	5.5
Citrus reticulata	15.7	0.0	0.0	0.0
Syzygium aromaticum	100.0	100.0	100.0	100.0
Jasminium officinale				
Nonyl alcohol	100.0	100.0	100.0	77.7
Methyl anthranilate	100.0	100.0	100.0	100.0
Citral	100.0	100.0	100.0	88.3
Phenyl ethyl propional	100.0	100.0	100.0	83.3
Tagetus tenifolia				
Hexane	74.4	61.1	61.1	38.8
Benzene	100.0	44.4	33.3	11.1
Acetone	100.0	66.6	38.8	6.0
Tagetus erecta				
Hexane	100.0	38.8	22.2	11.1
Benzene	77.7	22.2	0.0	0.0
Acetone	100.0	55.5	22.2	0.0
Ethyl alcohol	33.3	27.7	0.0	0.0
Pyrus pashia (Leaf)				
Hexane	33.3	27.7	22.2	16.6
Pyrus pashia (Seed)	66.6	61.1	57.4	43.3
Hexane				
Gladiolus	38.8	27.7	27.7	22.2
Bavistin	100.0	100.0	100.0	100.0
Control	Trace	Trace	Trace	Trace

readily available sources, non phytotoxicity and biodegradability.

ACKNOWLEDGEMENTS

The authors are grateful to the Head, Division of Plant Pathology, IARI, New Delhi, for providing necessary facilities and former Head Dr. A.K. Sarbhoy, for his valuable guidance in preparation of manuscript.

REFERENCES

Ansari, M. M. (1995). Control of sheath blight of rice by plant extracts. *Indian Phytopath.* **48** : 268-270.

Kurucheve, V., Gerard Ezhilan, J. and Jayraj, J.(1997). Screening of higher plants for fungitoxicity against *Rhizoctonia solani in vitro. Indian Phytopath.* **50** : 235.

Mishra Manasi and Tewari, S.N.(1990). Ethanolic extract toxicity of three botanicals against five fungal pathogens of rice. *Nat. Acad. Sci.Letters* **13** : 409-412.

Mishra Manan and Tewari S.N.(1992). Toxicity of *Polyalthia longifolia* against fungal pathogens of rice. *Indian Phytopath.* **45** : 59-61.

Nene, Y.L. and Thapliyal, P.N.(1979). Fungicides in Plant Disease Control, New Delhi, Bombay, Calcutta, Oxford and IBH Publishing Co. pp460-425.

Rajan,C.P D.(1987). Estimation of yield losses due to Sheath blight of rice. *Indian Phytopath.* **40** : 174-177.

Roy, A.K.(1993). Sheath blight of rice in India. *Indian Phytopath.* **40** : 197-205.

Sarbhoy, A.K., Varshney, J.L., Maheshwari, M.L. and saxena, D.B.(1978). Efficacy of some essential oils and their constituents on few ubiquitous moulds. *Zentrablatt. Bakt. albcit*, **133** : 723-725.

Shrivastava, Abhay Kumar and Bihari Lal (1997). Studies on biofungicidal properties of leaf extract of some plants. *Indian Phytopath.* **50** : 408-411.

Sundarraj, T., Kurucheve, V. and Jayaraj, J.(1996). Screening of higher plant and animal faeces for the fungitoxicity against *Rhizoctonia solani. Indian Phytopath.* **49** : 398-403.

Tewari, S.N. and Dath, Premlatha(1984). Effect of leaf extract media of some plants on growth of three fungal pathogens of rice. *Indian Phytopath.* **37** : 458-461.

Tewari, S.N. and Nayar Mandakini(1991). Activity of four plant leaf extracts against three fungal pathogens of rice. *Trop.Agric.* **68** : 373-376.

(Accepted for publication July 26 2000)