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Research Article

Investigations of Biofungicidal Properties of Crude Extracts of Some Medicinal Plants against Blast Disease of Ragi (*Eleusine coracana)*

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ABSTRACT

Fifteen medicinal plants, commonly available in the region and known to possess anti-microbial properties were evaluated to ascertain their relative efficacies against Pyricularia grisea and to obtain a potential bio-pesticide for the control of blast disease of Ragi. Crude aqueous extract (10% w/v) (CALE) in general caused reduction in growth and sporulation of P. grisea in vitro. Higher fungitoxic effects (85.64, 83,82 and 79.04%) were noted in the CALE of Impatiens balsamina, Tagetes erecta and Solanum nigrum respectively. Further, the fungitoxic evaluations of CALE of these plants in pot house revealed that blast disease incidence could be reduced to 62, 57 and 37% and the grain yield could be increased to 302.47, 242.39, and 199.18 % respectively. The study indicated that the five sprays of CALE of I. balsamina or T. erecta at an interval of 15 days appear to hold promise in the management of blast disease.

Keywords: *Medicinal plants, ragi, Pyricularia grisea and Blast disease*

INTRODUCTION

Ragi blast caused by *Pyricularia grisea* is an economically important disease-causing heavy yield loss all over the world. The constraints in disease control especially those involving chemical fungicides are due to their toxicity spectrum, ecological hazards and the expensive nature. Currently, botanicals in plant disease control is gaining stature and recognition as a feasible method in the control of disease. In the recent years, the fungicidal properties of plant derivatives have been exploited in the management of plant diseases (Chiejina, 2006; Malkhan et al., 2012; Poornima et al., 2011; Bhattacharjee and Dey, 2014; Islam and Faruq, 2012; Sukanya et al., 2011; Bowers and Locke, Shafuallah and Alsam Khan, 2013). Present investigation was undertaken to assess the efficacy of crude agios leaf extracts of 15 different phanerogamic plants on growth and sporulation of P. grisea and on the management of blast disease of ragi.

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MATERIAL AND METHODS

Fresh assorted leaves of *Allium sativum, Emblica officinalis, Euphorbia pulcherrima, Impatiens balsamina, Lantana camara, Mentha arvensis, Mimosa pudica, Nerium indicum, Ocimum sanctum, Ricinus communis, Solanum nigrum* and *Tagetes erecta* were collected, washed with sterile distilled water and dried under shade for two weeks. Homogenised stock solution was made separately in each case by crushing 10g dry leaf powder in 100 ml distilled water. The solution was filtered through muslin cloth several times. Ten percent strength of each extract was obtained and utilized in an in vitro test. Twenty-five ml of sterilized Richard's medium with starch as an additional carbon source contained in triplicate conical flasks was aseptically poisoned with 2.5 ml of each 10 percent extract separately. Then, they were inoculated with 5 mm diameter discs of PDA grown active culture of P. grisea and incubated at 28± 2 ℃ in an incubator for 7 days. Observations on dried mycelial weight and sporulation were recorded on 8th day.

Efficacy of CALE (10% w/v) of 3 most promising ones was tested on the P. grisea inoculated ragi plants cv. BM-1 raised in earthen pots. The plants were sprayed with the crude extracts at 15 days intervals in four different schedules viz., (i) 2 sprays (ii) 3 sprays (iii) 4 sprays and (iv) 5 sprays, starting from 15 days after the sowing of seeds. The disease incidence was recorded on 25 plants at 30 days after the last spray and the effect was also recorded as percent disease control over the untreated plants. The grain yield per plant was taken on full maturity from 25 plants and 10-12% seed moisture. The average grain weight and the increase in grain yield over the untreated check plant was worked out.

RESULT AND DISCUSSION

The crude extracts obtained from leaves of all the test plants possessed antifungal principles for the growth of *P. grisea* (Table 1). The crude extracts of *Impatiens balsamina* and *Tagetes erecta* recorded 85.64 and 83.82% reduction in the dry weight of mycelium respectively of *P. grisea* over untreated control. the extent of antifungal effect noted in the crude aqueous preparation of leaf of other plants in terms of percent reduction over control were *Solanum nigrum* (79.04%), *Allium satiivum* (76.54%), *Ricinus communis* (75.40%), *Ocimum sanctum* (73.80%), *Nerium indicum* (74.44%) and *Azadirachta indica* (69.02%). All the extracts showed the antisporulant action and mycelial growth reduction over control against the test fungus (Akinbode and Ikotun, 2008; Enviukwu and Awurum, 2011; Onyeke and Ugwoke, 2011; Yoon et al., 2011a and Hajano et al., 2012)

Effective control of the disease by plant products has beenreported by many workers. Inhibitory effects of crude extracts of *A. sativum, I. balsamina* and *T. erecta* against *Drechslera oryzea* have been reported by Srivastava et al., 2009. Thangamani and Naraynasamy,1988 have noted significant reduction in intensity of sheath rot disease of rice when the plants were sprayed with 2 percent neem oil and neem seed extracts. Mariappan et al., 1988, reported that application of 1 % neem oil at 17 days after sowing in the nursery followed by 6 spraying at weekly interval in the main field caused reduction in sheath rot disease of rice. The same result has been found by Soundharrajan et al., 2003; Thobunluepop et al., 2009; Wang et al., 2005; Cheng et al., 2008; Kilic, 2009; Kordali et al., 2008. *A. indica* inhibiting growth of several other fungi has already been reported by (Nair and Arora, 1996; Srivastava and Lal, 1997). Thymol and phenol present in Lantana camara and Ocimum and many components like Carvacrol, Thynol and P-cyamene are toxic substances reported to inhibit the growth of many fungi and bacteria (Kordali et al., 2008). Antifungal substances like decursin and decursinol angelate have also been found to control the the blast disease of rice caused by *Magnaporthe gricea*.

Evaluation of crude aqueous extracts of leaves of *I. balsamina*, *T. erecta* and *S. nigrum* for controlling blast disease of ragi in pots was carried outIt as recorded that the five sprays of *I. balsamina* extract gave the maximum disease reduction by effecting 62.34 percent and 61.40 percent reduction in disease incidence, followed by that of the five sprays of extracts of *T. erecta* (57.31% and 56.82%) 2013 and 2014, respectively and statistically they were at par. The highest grain yield of 312.17 percent and 291.87 percent over control was obtained five sprays of extracts of *I. balsamina* followed by four sprays of the same extracts (255.78% and 240.62%) and five sprays of *T. erecta* extracts (249.50% and 234.58%) in 2013 and 2014 respectively. It is concluded that the crude aqueous leaf extract (10% w/v) of *I. balsamina* and *T. erecta* hold promise in the control of the blast disease of ragi. The result supported by various workers on the impact of botanicals on the diseases. (Choi et al., 2004; Metam et al., 2011; Mi-Young Yoon et al., 2013 and Boyraz & Ozaen, 2006).

Table 1: Fungitoxic effect of crude aqueous leaf extracts of medicinal plants on the growth and sporulation of *P. grisea* in Richard's medium

Sl. No.	Leaf extracts of Plants	Dry weight of mycelium (mg)	Reduction over control (%)	Sporulation (+ or -)
1	*Allium sativum*	36.04	76.54	-
2	*Azadirachta indica*	47.59	69.02	-
3	*Solanum nigrum*	32.20	79.04	-
4	*Emblica officinalis*	142.09	7.51	+
5	*Eucalyptus citriodora*	50.40	67.20	-
6	*Euphorbia pulcherrima*	52.84	65.60	-
7	*Tagetes erecta*	24.85	83.82	-
8	*Lantana camara*	149.80	2.50	+
9	*Mentha arvensis*	46.90	69.47	-
10	*Mimosa pudica*	49.50	67.78	-
11	*Nerium indicum*	42.34	74.44	-
12	*Ocimum sanctum*	40.24	73.80	-
13	*Ricinus communis*	37.80	75.40	-
14	*Impatiens balsamina*	22.05	85.64	-
15	*Datura metel*	47.95	68.80	
	Control (without any extract)	153.46	-	+
	C.D. at 5%	12.25		

+ = Spores present
- = Spores absent

Table 2: Fungicidal efficacies of crude leaf extracts of 3 medicinal plants in controlling blast disease of ragi at different schedules

Treatments	No. of Sprays	Disease incidence (%)			Grain yield (g plant $^{-1}$)		
		2013	2014	Average	2013	2014	Average
Impatiens balsamina	(2)	61.96 (11.5)	64.97 (12.8)	63.46 (12.1)*	6.44 (30.6)	6.04 (25.8)	6.24 (28.3)**
Impatiens balsamina	(3)	57.66 (17.6)	62.98 (15.5)	60.32 (16.5)	8.61 (74.6)	8.05 (67.7)	8.33 (71.3)
Impatiens balsamina	(4)	32.26 (53.9)	34.23 (54.1)	33.24 (54.0)	17.54 (255.7)	16.35 (240.6)	16.94 (248.5)
Impatiens balsamina	(5)	26.36 (62.3)	28.61 (61.6)	27.48 (62.0)	20.32 (312.1)	18.81 (291.8)	19.56 (302.4)
Tagetes erecta	(2)	64.97 (7.2)	67.97 (8.8)	66.48 (8.0)	6.81 (38.1)	6.44 (34.1)	6.62 (36.2)
Tagetes erecta	(3)	6.94 (12.9)	64.27 (13.7)	62.60 (13.3)	9.63 (95.3)	8.85 (84.3)	9.24 (90.1)
Tagetes erecta	(4)	39.41 (43.7)	42.59 (42.8)	41.00 (43.2)	16.68 (238.3)	15.47 (222.2)	16.07 (230.6)
Tagetes erecta	(5)	29.88 (57.3)	32.18 (56.8)	31.03 (57.0)	17.23 (249.5)	16.06 (234.5)	16.64 (242.3)
Solanum nigrum	(2)	66.36 (5.2)	70.45 (5.5)	68.40 (5.3)	6.79 (37.7)	6.33 (31.8)	6.56 (34.9)
Solanum nigrum	(3)	64.43 (7.9)	68.30 (8.3)	66.56 (7.9)	7.44 (50.9)	6.74 (40.4)	7.09 (45.8)
Solanum nigrum	(4)	58.30 (16.7)	61.74 (17.15)	60.02 (16.94)	15.01 (204.4)	13.99 (191.4)	14.49 (198.1)
Solanum nigrum	(5)	44.00 (37.1)	46.28 (37.9)	45.14 (37.5)	15.10 (206.3)	13.99 (191.4)	14.54 (199.1)
Control		70.00	74.52	72.26	4.93	4.8	4.86
C.D. at 5 %		4.48	4.61		1.99	1.04	

*Figures in parenthesis are per cent reduction over control and ** per cent increase over control

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