

Effect of lemon grass (*Cymbopogon citratus*) extract on seed health of rice

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ABSTRACT

Lemon grass extract was evaluated in different dilutions on rice seed health in laboratory and net house experiments. The objectives were to investigate the effect of lemon grass extract on seed-borne pathogen of rice and seedling vigour. Four treatments as 1:1, 1:2, 1:3 dilution of lemon grass extract including a control were studied. Lemon grass extract at 1:1 dilution showed highest germination and vigour index of rice seed and seedlings. It was also found most effective in controlling seed borne fungi of rice. The fungi *Bipolaris oryzae*, *Alternaria padwickii*, *Curvularia lunata*, *Fusarium moniliforme*, *Aspergillus* and *Penicillium spp.* were controlled effectively by soaking seeds in the extract of lemon grass at 1:1 dilution for 6 hours.

Key words: Lemon grass, seed health, rice

INTRODUCTION

Seed is the vital input in Agriculture. From pathological point of view, pathogen free seed is necessary as a planting material in order to get disease free seedlings. With satisfactory yield (Fakir *et. al.*, 2002). Seeds are the common carrier of plant pathogen. It carries several destructive pathogens causing severe diseases. In case of rice most of the major diseases are seed-borne (Fakir, 2000). Among these diseases the most important seed-borne diseases are Brown spot, Blast, Sheath rot, Bakanae, Leaf scald, Seed rot, Seedling blight and Grain spot. Fungi associated with discolored rice seed resulted in poor germination, vigour and cause diseases to emerged seedling to growing plants (Danquah *et. al.*, 1976; Sharma *et. al.*, 1987) Use of quality seed reduced germination failure and seedling infection, which improved seedling stand and ultimately increased yield. Among the control practices used for preserving the crop health and achieving the desired yield, seed treatment is one of the effective methods. Use of chemicals as seed treating agent are the best way to reduce the seed-borne infection. But use of chemicals is hazardous and costly (Khan and Hossain, 1993). Therefore, it is judicious to explore inexpensive, less hazardous and eco-friendly methods of seed treatment. In this context, use of botanical pesticides or plant extract is an alternative for controlling plant disease.

Efficacy of plant extracts for controlling seed-borne pathogens has been reported by Alice and Rao (1987), Surratuzzaman *et. al.*, (1994), Fakir and Khan (1992) and other scientists at home and abroad. However, the use of plant extract for seed treatment is very limited in Bangladesh, although some plants have been identified with antifungal properties (Miah *et. al.*, 1990; Khan and Hossain, 1993). Many plant species still remain unexplored for the purpose. Extensive research with plant extract as seed treating means for controlling seed-borne diseases will facilitate to control seed borne infections of important fungal pathogens in rice. The present study has therefore, undertaken to determine the effect of lemon grass extract on seed-borne pathogen of rice.

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MATERIALS AND METHODS

The experiment was conducted in the mycology laboratory and greenhouse of Seed Pathology Center (SPC), Bangladesh Agricultural University, Mymensingh. Leaves of lemon grass were collected, washed with running tap water, dried and then chopped into small pieces. Then the small pieces were ground in a mortar and pestle. The treatments of the experiments were as follows: T₀= control, T₁= 100% , T₂= 50% and T₃= 33% lemon grass extract. To get 100%, 50% and 33% of lemon grass extract, 100, 50 and 33 g lemon grass leaves were crushed in 100 ml water. The crushed materials were filtered through cheesecloth. The extract was kept in conical flask and preserved in a refrigerator at 4±1°C.

Seed samples of BR11 (Mukta) were soaked for 6 hours in grass extracts of respective treatment. Then the plant extract was drained out and the treated seeds were dried on blotter paper. Seed samples (400 seeds for each treatment) were taken to detect the seed-borne pathogen following blotter methods. The petridish containing seeds were incubated at 25±1°C for 7 days. After incubation, seeds were examined under stereobinocular microscope for detecting pathogens that grow out of the seeds.

Vigour test was carried out using sand in plastic tray (18 x 19). The trays were filled with sterilized moist sand. One hundred seeds were taken randomly from each treatment. Seeds were sown in sterilized sand in each plastic tray in four lines at 25 seeds/ line. A total of 400 seeds were tested for each treatment following ISTA rules (ISTA, 2001)

The experiment was laid out in CRD with four replications. Germination was recorded at 7 and 14 days after sowing. Seedlings vigour was calculated as reported by Baki and Anderson (1972).

Vigour Index = (mean of root length + mean of shoot length) × percentage of seed germination.

RESULTS AND DISCUSSION

Incidence of seed-borne pathogens

Seed-borne fungi such as *Bipolaris oryzae*, *Alternaria padwickii*, *Curvularia lunata*, *Fusarium moniliforme*, *Aspergillus* and *Penicillium spp.* were identified under stereobinocular microscope on blotters. Different dilutions of lemon grass extract showed significant effect on the incidence of these fungi. Among the three dilutions of lemon grass extract, treatment T₁ was more effective for controlling of these pathogens (Table 1).

Table 1. Effect of lemon grass extract in different dilutions on the incidence of seed-borne pathogens of rice seeds

Treatments	% incidence of seed borne fungi					
	<i>Bipolaris oryzae</i>	<i>Alternaria padwickii</i>	<i>Curvularia lunata</i>	<i>Fusarium moniliforme</i>	<i>Aspergillus spp.</i>	<i>Penicillium spp.</i>
T ₀ (No lemon grass extract)	16.50	6.00	9.75	10.50	3.50	2.50
T ₁ (1:1)	3.00	1.00	0.25	4.25	0.00	1.00
T ₂	4.50	2.50	1.50	5.00	1.50	1.75
T ₃	9.00	3.50	2.50	9.75	2.25	1.75
LSD> 0.05	1.09	1.09	0.97	1.26	0.74	0.94

Mean followed by the same letter(s) in a column did not differ significantly at the 5% level by LSD.

In treatment T₂, the incidence of the pathogens was 4.5, 2.5, 1.5, 5.0, 1.5 and 1.75 respectively. Treatment T₃ was also effective in reducing the pathogens compared to control, but

relatively less effective when compared to T₂ (Table 1). The result of the study are in agreement with the findings of Alice and Rao (1986), Miah *et al.* (1990), Rahman *et al.* (1999), Rashid (2003) and Islam (2005).

Seed germination

Seed treated with different concentration lemon grass extracts demonstrated increased germination percentage. Maximum numbers of germinated seeds (88%) were recorded in T₁ and minimum (67%) in T₀ (Fig.1). T₂ and T₃ also increased the germination percentage over the control. The results corroborated with the findings of Islam (2005).

Table 2. Effect of lemon grass extracts on seedling vigour of rice

Treatments	Shoot length (cm)	Root length (cm)	Vigour index
T ₀	13.66	4.63	1349.53
T ₁	17.43	6.61	2224.61
T ₂	16.43	5.28	1841.03
T ₃	15.79	4.91	1682.49
LSD> 0.05	0.28	0.27	68.38

Mean followed by the same letter(s) in a column did not differ significantly at the 5% level by LSD.

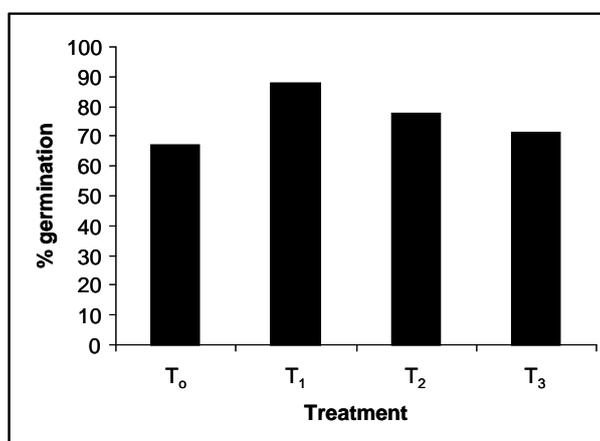


Fig.1. Effect of lemon grass extract on germination of rice seed

Seedling vigour

The treatment were found to differ significantly in respect of shoot length, root length and vigour index (Table 2). The highest shoot length (17.43 cm) was found in case of T₁ and the lowest (13.66cm) in treatment T₀. Shoot lengths 16.43 cm and 15.79 cm were found in T₂ and T₃ respectively. Root length was highest (6.61cm) in T₁ and lowest (4.63cm) in T₀. In treatment T₂ and T₃, root lengths were 5.28 cm and 4.91 cm, respectively. Vigour index was highest (2224.61) in T₁ and lowest (1349.59) in T₀. In treatment T₂ and T₃, vigour index were 1841.03 and 1682.49, respectively. Among the three dilution of lemon grass extract; dilution (1:1) was found most effective in increasing vigour index. That agreed with the results of Alice and Rao (1986) and Kurucheve and Padmavathi (1997).

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