



BIOPRIMING OF RICE SEED WITH PHOSPHOBACTERIA FOR ENHANCED GERMINATION AND VIGOUR

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ABSTRACT

Rice seeds cv. MDU 6 were bioprimed with *Phosphobacteria* (Concentration: 10, 15 and 20 %; Duration: 6, 12, 18 and 24 h). The seeds were also hydroprimed for 6, 12, 18 and 24 h. The nonprimed seeds served as control. The study revealed that biopriming with Phosphobacteria 20 % concentration for 24 h expressed high values for all the parameters studied namely speed of germination, germination (%), root length (cm), shoot length (cm), dry matter production (g/ seedlings⁻⁵) and vigour index which accounted for 36, 14, 12, 24, 30 and 28 % respectively increase over nonprimed seed.

KEY WORDS: Biopriming, phosphobacteria, germination, vigour, rice.

INTRODUCTION

Rice is the one of the most important food crop for more than 50% of the world's population and accounts for around 23 % of the global calorie intake (Li *et al.*, 2011). In recent years, a lot of studies have been done on invigoration of seeds to improve the germination rate and uniformity of growth and reduce the emergence time of many vegetables and some field crops (Basra *et al.*, 2003). In priming, seeds are exposed to restricted water availability under controlled conditions which allows some of the physiological processes of germination to occur and then, before germination is completed, the seeds are usually re-dried for short term storage before sowing (Halmer, 2003). Seed priming is now a widely used commercial process that accelerates the germination rate and improves seedling uniformity in many crops. Hence, an attempt has been carried out to standardize the optimum concentration and duration for seed biopriming using phosphobacteria.

MATERIALS & METHODS

The experiment was conducted under laboratory condition during 2014-15 in the Crop Physiology laboratory, Department of Seed Science and Technology, AC & RI, Madurai. The phosphobacteria collected from the Department of Agricultural Microbiology was used for this study. Five hundred seeds (MDU 6) were soaked twice in the volume of the respective concentration in the Phosphobacteria. For hydropriming, the seeds were soaked in water for 6, 12, 18, and 24 h. The non-primed seeds served as control. After the soaking duration, the seeds were removed from the solutions and shade dried at room temperature. The experiment was carried out with 4 replications in factorial completely randomized design (CRD). The seeds showing radical protrusion were counted daily from third day after sowing until fourteenth day. The speed of germination was calculated using the formula as suggested by Maguire, 1962. Hundred seeds

were placed in between paper using four replications and per cent germination was recorded after fourteenth days (final count) (ISTA, 1999). At the time of germination count, ten normal seedlings were selected at random from each replication and used for measuring the root length of seedlings. Vigour index values were computed using the following formula and the mean values were expressed in whole number (Abdul-Baki and Anderson, 1973). Vigour index = Germination (%) × Total seedling length (cm). The data obtained from different experiments were analysed for the 'F' test of significance following the methods described by Panse and Sukhatme (1985).

RESULTS & DISCUSSION

Data are presented in table (1-5). The speed of germination, germination, root and shoot length, dry matter production and vigour index were significantly influenced by biopriming treatment, duration of biopriming and their interactions. The results indicated the higher performance of phosphobacteria 20 % for 24 h with respect to speed of germination (8.3) than the other treatments the lowest speed of germination of 5.3 was observed in nonprimed seed. Seeds primed with phosphobacteria at 20 % concentration for 24 h also recorded higher germination (98 %) which showed an increase of 14 % over nonprimed seed (Table 1). Seeds bioprimed with phosphobacteria at 20 % for 24 h recorded longer root (22.6 cm) and shoot (19.4 cm) than the nonprimed seed (19.8 and 14.7 cm,) (Table 1 and Table 2). The bioprimed seeds with phosphobacteria 20 % for 24 h registered higher dry matter production (0.087 g 5 seedlings⁻¹), than the nonprimed seed (2898), the phosphobacteria biopriming at 20 % for 24 h registered better vigour index (4057) (Table 3).

In the present study, seed biopriming with phosphobacteria 20% for 24 h was found to be the best biopriming treatment for improving the seed germination and seedling vigour of paddy var MDU 6 (Table 4).

Biopriming of rice seed with phosphobacteria

Similar increase in the seedling growth due to phosphobacteria seed treatments was reported by Vijaya kumari (2003) in neem, kapok and amla, Gomathy *et al.* (2007) in maize and Mahfouz, Sharaf-Eldin (2007) in fennel and kokila and Baskaran (2015) in CORH 4 parental lines. The enhancement of germination and seedling vigour might be attributed to the role of phosphorus solubilising bacteria in enhancing the solubilisation of insoluble phosphorus and making it available to the germinating seed with consequent

enhancement in the metabolic activity which resulted in higher germination (Cooper, 1979). According to Kavitha (2011) seed biopriming with liquid phosphobacteria 15% biopriming for 12 h was found to be the best seed biopriming treatment for rice seed to enhance the germination rate, total germination percentage, seedling growth and vigour in ADT 43. Bhenidi seeds bioprimed with liquid phosphobacteria 20% for 12 h also resulted in higher germination percentage and seedling vigour (Mariselvam, 2012).

TABLE 1: Influence of biopriming with phosphobacteria on germination (%) of rice cv. MDU 6

Biopriming treatments (T)	Soaking duration in h (D)				Mean
	6	12	18	24	
Nonprimed seed	84 (67.78)	84 (67.78)	84 (67.78)	84 (67.78)	84 (67.78)
Hydropriming	88 (69.73)	94 (75.95)	92 (74.19)	96 (78.46)	93 (74.66)
Phosphobacteria (10%)	90 (71.35)	92 (74.19)	96 (78.46)	94 (75.95)	93 (74.66)
15%	86 (67.90)	96 (78.46)	94 (75.95)	100 (84.63)	94 (75.95)
20%	92 (74.19)	94 (75.95)	96 (78.46)	98 (81.87)	95 (77.08)
Mean	88 (69.73)	92 (74.19)	92 (74.19)	94 (75.95)	92 (74.19)
	D	T	D x T		
SEd	0.89243	0.8980	1.8488		
CD (P = 0.05)	1.696**	1.8488**	2.9085**		

Values in parenthesis are arc sine transformed values; ** - Significant at 5% level

TABLE 2: Influence of biopriming with phosphobacteria on root length (cm) of rice cv. MDU 6

Biopriming treatments (T)	Soaking duration in h (D)				Mean
	6	12	18	24	
Nonprimed seed	19.8	19.8	19.8	19.8	19.8
Hydropriming	20.4	22.3	20.7	20.9	21.1
Phosphobacteria 10%	20.6	20.4	20.7	21.9	20.9
15%	20.7	22.6	20.2	21.8	21.3
20%	21.3	22.0	21.7	22.6	21.9
Mean	20.6	21.5	20.6	21.3	21.0
	D	T	D x T		
SEd	0.22109	0.26959	0.56915		
CD (P = 0.05)	0.442**	0.56918**	1.07836**		

TABLE 3: Influence of biopriming with phosphobacteria on shoot length (cm) of rice cv. MDU 6

Biopriming treatments (T)	Soaking duration in h (D)				Mean
	6	12	18	24	
Nonprimed seed	14.7	14.7	14.7	14.7	14.7
Hydropriming	15.2	18.5	15.7	15.9	16.3
Phosphobacteria 10%	16.3	16.7	16.9	17	16.7
15%	17.2	17.4	17.6	17.9	17.5
20%	18.2	19.3	18.6	19.4	18.9
Mean	16.3	17.3	16.7	17.0	16.8
	D	T	D x T		
SEd	0.14446	0.16789	0.31569		
CD (P = 0.05)	0.288**	0.31569**	0.61676**		

TABLE 4: Influence of biopriming with phosphobacteria on vigour index of rice cv. MDU 6

Biopriming treatments (T)	Soaking duration in h (D)				Mean
	6	12	18	24	
Nonprimed seed	2898	2898	2898	2898	2898
Hydropriming	3133	3835	3349	3533	3463
Phosphobacteria 10%	3321	3413	3610	3657	3500
15%	3259	3840	3553	3970	3656
20%	3634	3939	3869	4057	3875
Mean	3249	3585	3456	3623	3478
	D	T	D x T		
SEd	29	33	66		
CD (P = 0.05)	59**	66**	132**		

TABLE 5: Influence of biopriming with phosphobacteria on Dry matter production (g/5 seedlings) of rice in MDU 6

Biopriming treatments (T)	Soaking duration in h (D)				Mean
	6	12	18	24	
Nonprimed seed	0.061	0.061	0.061	0.061	0.061
Hydropriming	0.063	0.075	0.062	0.05	0.063
Phosphobacteria 10%	0.68	0.075	0.087	0.09	0.233
15%	0.07	0.073	0.077	0.081	0.075
20%	0.072	0.076	0.082	0.087	0.079
Mean	0.189	0.072	0.074	0.074	0.102
	D	T		D x T	
SEd	0.01444	0.016785		0.031569**	
CD (P = 0.05)	0.028**	0.03159**		0.06168**	

CONCLUSION

It could be concluded from the present study that seed biopriming with phosphobacteria 20% for 24 h was found to be the best biopriming treatment for improving the seed germination and seedling vigour of rice var MDU 6.

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