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Effect of organic seed treatment on growth and quality of direct seeded rice in Tungabhadra command area of Koppal district

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Abstract

A lab experiment was conducted at Agricultural Research Station, Gangavathi, under University of Agricultural Sciences, Raichur to know the impact of organic seed treatment on growth and quality of DSR paddy in TBP area of Koppal district Karnataka state during *kharif* 2021-22 and 2022-23. The experiment was layout in a CRD design having three replications and twenty treatment combinations. There are two genotypes as a first factors and organic seed treatment as second factors. The pooled results concluded that, among the genotypes, Gangavathi sona was recorded significantly higher germination percentage, root length, seedling length and seedling vigour index- I as compared to RNR-15048 variety, where as RNR-15048 have recorded significantly higher shoot length than Gangavathi sona in laboratory conditions. Among the organic seed treatments, seeds soaked in water for 10 Hrs + soaked in cow-dung slurry for 5 hrs and shade dried seeds was recorded significantly higher germination percentage and shoot length as compared to control. Further, significantly higher seedling dry weight (122.0 mg), vigour index-I (2379.0) and vigour index-II (1150.0) was recorded with soaking in khada cloth in sweet flag extract for 30 minutes as compared to control.

Keywords: Germination percent, seed treatment, DSR, quality, genotypes

Introduction

Rice (*Oryza sativa* L.) is one of the most important staple food crop for more than two-thirds of the population of India and plays a significant role in national food security and a means of livelihood for millions of people. Direct seeded rice (DSR), is gaining popularity because of its low-input demand. It offers certain advantages *viz.*, it saves labour, requires less water, less drudgery, early crop maturity, low production cost, better soil physical conditions for following crops and less methane emission (Kaur and Singh, 2017) ^[1].

In DSR method poor establishment at early stage is the main problem. Seed treatment with organics can help to get rid of the problem of poor establishment of crop at early stage, which are eco-friendly, cheap and easy to use. Further, organic seed hardening provides hardness to high temperature, low moisture especially in semi-arid tropics. It promotes faster germination, higher seedling vigour leading to higher crop productivity in paddy. The main benefits of organic seed treatments include increased phosphate levels, nitrogen fixation and root development. (Prabhu *et al.*, 2023) ^[2]. Seed treatment helps to improve emergence as well as stand establishment under variable field conditions. Therefore, there was planned to conduct lab experiment on two genotypes under different seed treatment with organics on growth and quality parameters of rice.

Materials and Methods

A lab experiment was conducted at Agricultural Research Station, Gangavathi, under University of Agricultural Sciences, Raichur. The lab experiment was layout in a CRD design having three replications and twenty treatment combinations. There are two genotypes as a first factors and organic seed treatment as second factors.

Treatment details *such as.*, Factor I; Genotypes; G₁: Gangavathi Sona and G₂: RNR-15048 and Factor II: Organic seed treatment *such as.*, T₁: Untreated control, T₂: Drying of seed in bright sun light (12.00 noon to 1 pm) prior to sowing, T₃: Soaking seeds in water for 12 hrs and shade drying, T₄: Soaking seeds in water for 6 hrs + Soaking seeds in cowdung slurry for 6 hrs and shade drying, T₅: Soaking seeds in panchagavya (35ml/ litre of water) for 12 hrs and shade drying, T₆: Soaking seeds in khada cloth in sweet flag extract (100 g Sweet flag rhizome powder/ litre of water) for 30 min and shade drying, T₇: Soaking seeds in water for 10 hrs + Soaking in cow dung extract for 5 hrs and shade drying, T₈: Seed treatment with *Azospirillum* and PSB @ 200 g/25 kg and shade drying, T₉: Soaking seeds in biogas slurry for 12 hrs and shade drying and T₁₀: Soaking seeds in 10% cow urine for 30 min and shade drying. Observation recorded *such as.*, Germination percentage, Root length (cm), Shoot length (cm), Seedling length (cm), Seedling dry weight (mg), Vigour Index I and II and plant height (cm).

Results and Discussion

The quality parameters of paddy were differed significantly due to different organic seed treatments are presented in Table 1, 2, and 3. Among the genotypes, the pooled results indicated that, significantly higher germination percent (93.58%), root length (14.08 cm), shoot length (10.33 cm), seedling length (24.41 cm), seedling dry weight (112.53 mg), seedling vigour Index-I (2287.4), seedling vigour index-II (1054.8), field emergence (81.63%) and plant height (13.46 cm) was observed in Gangavathi sona as compared to RNR-15048. The similar results were noticed during 2021-22 and 2022-23. The higher quality parameters were noticed in genotype of Gangavathi sona,

which might be due genetic character.

With respect to organic seed treatment, quality parameters of DSR paddy differed significantly. Significantly higher germination percent (94.50) and shoot length (11.55 cm) were observed with soaking of seeds in water for 10 hrs + cow dung extract for 5 hrs. Further higher root length (14.47 cm) and seedling length (25.58 cm) was recorded with soaking in biogas slurry for 12 hrs. Whereas, significantly higher seedling dry weight (122.0 mg), vigour index-I (2379.0) and vigour index-II (1150.0) was recorded with soaking in khada cloth in sweet flag extract for 30 min. However, significantly, lower germination percent (88.25), root length (10.72 cm), shoot length (9.75 cm), seedling length (20.47 cm), seedling dry weight (92.83 mg), vigour Index-I (1806.5), vigour index-II (819.50) were observed in control.

The higher quality parameters with soaking of seeds in water for 10 hrs + cow dung extract for 5 hrs which might be due to the presence of growth promoting substance (Auxins) and rich in major and micronutrients in cow dung extracts. Further sweet flag extract improve the resistance of the seedlings against seed borne bacterial and fungal diseases. The similar results were reported by (Shinde and Malse, 2020) [3] and Prabhu *et al.*, (2023) [2]. In nursery, seeds soaked in panchagavya for 12 hrs and shade dried was recorded significantly higher field emergence plant height at 20 DAS as compared to control (Table 3) The higher field emergence and plant height which might be due to panchagavya containing plant growth substances results in the change in phenotypes of plants rapidly for better growth and productivity of crops. The similar results were close confirmative with the findings of Tharmaraj *et al.*, (2011) [4].

Table 1: Effect of organic seed treatment on germination percent, root length and shoot length of DSR paddy (Pooled data of two years)

Treatments	Germination Percentage (%)			Root length (cm)			Shoot length (cm)		
	G ₁	G ₂	Mean	G ₁	G ₂	Mean	G ₁	G ₂	Mean
T ₁	88.83	87.67	88.25	11.18	10.26	10.72	9.56	9.93	9.75
T ₂	91.17	90.00	90.59	12.62	11.31	11.97	9.65	10.14	9.90
T ₃	93.67	91.00	92.34	16.22	11.77	14.00	9.58	10.35	9.97
T ₄	93.00	95.33	94.17	11.97	11.05	11.51	10.89	11.18	11.04
T ₅	95.67	90.00	92.84	16.75	11.78	14.27	10.18	10.74	10.46
T ₆	96.17	92.17	94.17	15.28	12.53	13.91	10.82	11.86	11.34
T ₇	97.00	92.00	94.50	13.27	11.14	12.21	11.01	12.09	11.55
T ₈	92.00	91.83	91.92	14.90	13.45	14.18	10.72	11.45	11.09
T ₉	93.00	91.00	92.00	15.45	13.49	14.47	10.43	11.79	11.11
T ₁₀	95.33	92.00	93.67	13.18	13.42	13.30	10.41	11.22	10.82
Mean	93.58	91.30	92.44	14.08	12.02	13.05	10.33	11.08	10.71
Factors	S.Em _±	C.D @ 1%		S.Em _±	CD @ 1%		S.Em _±	CD @ 1%	
G	0.313	1.20		0.18	0.70		0.11	0.42	
T	0.700	2.68		0.41	1.56		0.24	0.93	
GXT	0.990	NS		0.58	NS		0.34	NS	

T₁: C, T₂: Drying under sun ligh, T₃: Soaking in water for 12 hrs T₄: Soaking in water 6 hrs + cow dung slurry for 6 hrs T₅: Soaking in PG for 12 hrs, T₆: Soaking in khada cloth in sweet flag extract for 30 min, T₇: Soaking seeds in water for 10 hrs + CDE for 5 hrs, T₈: ST with *Azospirillum* and PSB @ 200 g /25 kg T₉: Soaking in biogas slurry for 12 hrs T₁₀: Soaking in 10% Cow urine for 30 min

Table 2: Effect of organic seed treatment on seedling length, seedling dry weight, vigour index I of DSR paddy (Pooled data of two years)

Treatments	Seedling length (cm)			Seedling dry weight (mg)			Vigour index I		
	G ₁	G ₂	Mean	G ₁	G ₂	Mean	G ₁	G ₂	Mean
T ₁	20.74	20.20	20.47	94.33	91.33	92.83	1842	1771	1806.50
T ₂	22.27	21.46	21.87	95.67	92.33	94.00	2031	1931	1981.00
T ₃	25.81	22.12	23.97	98.33	101.33	99.83	2419	2012	2215.50
T ₄	22.87	22.23	22.55	108.00	121.33	114.67	2125	2118	2121.50
T ₅	26.93	22.52	24.73	128.00	115.67	121.84	2576	2027	2301.50
T ₆	26.10	24.39	25.25	126.00	118.00	122.00	2509	2249	2379.00
T ₇	24.29	23.23	23.76	120.33	114.67	117.50	2356	2138	2247.00
T ₈	25.62	24.90	25.26	116.67	122.00	119.34	2357	2287	2322.00
T ₉	25.88	25.28	25.58	123.00	120.33	121.67	2408	2303	2355.50
T ₁₀	23.59	24.63	24.11	115.00	113.00	114.00	2251	2266	2258.50
Mean	24.41	23.10	23.75	112.53	111.00	111.77	2287.4	2110.2	2198.80
Factors	S.Em±	C.D @ 1%		S.Em±	CD @ 1%		S.Em±	CD @ 1%	
G	0.246	0.94		1.13	NS		25.041	95.77	
T	0.551	2.11		2.52	9.65		55.994	214.16	
GXT	0.779	NS		3.57	NS		79.187	NS	

T₁: C, T₂: Drying under sun light, T₃: Soaking in water for 12 hrs T₄: Soaking in water 6 hrs +cowdung slurry for 6 hrs T₅: Soaking in PG for 12 hrs, T₆: Soaking in khada cloth in sweet flag extract for 30 min, T₇: Soaking seeds in water for 10 hrs + CDE for 5 hrs, T₈: ST with *Azospirillum* and PSB @ 200 g /25 kg T₉: Soaking in biogas slurry for 12 hrs T₁₀: Soaking in 10% Cow urine for 30 min

Table 3: Effect of organic seed treatment on vigour index II and plant height of DSR paddy (Pooled data of two years)

Treatments	Vigour index II			Field emergence (%)			Plant height (cm) at 20 DAS		
	G ₁	G ₂	Mean	G ₁	G ₂	Mean	G ₁	G ₂	Mean
T ₁	838	801	819.50	76.00	74.33	75.17	12.62	11.97	12.30
T ₂	871	831	851.00	77.33	76.33	76.83	13.08	12.21	12.65
T ₃	921	922	921.50	81.00	80.67	80.84	13.45	12.32	12.89
T ₄	1004	1156	1080.00	82.67	82.00	82.34	13.65	12.51	13.08
T ₅	1223	1041	1132.00	84.67	83.33	84.00	14.40	13.90	14.15
T ₆	1212	1088	1150.00	83.33	82.67	83.00	13.05	12.30	12.68
T ₇	1167	1055	1111.00	83.33	82.33	82.83	13.75	13.20	13.48
T ₈	1073	1120	1096.50	82.67	82.00	82.34	13.58	12.84	13.21
T ₉	1144	1096	1120.00	83.00	81.33	82.17	13.38	13.22	13.30
T ₁₀	1095	1040	1067.50	82.33	81.67	82.00	13.62	13.26	13.44
Mean	1054.8	1015	1034.90	81.63	80.66	81.15	13.46	12.77	13.12
Factors	S.Em±	C.D @ 1%		S.Em±	CD @ 1%		S.Em±	CD @ 1%	
G	10.602	NS		0.361	NS		0.158	0.452	
T	23.707	90.67		0.808	2.31		0.353	1.01	
GXT	33.527	NS		1.142	NS		0.500	NS	

T₁: C, T₂: Drying under sun light, T₃: Soaking in water for 12 hrs T₄: Soaking in water 6 hrs +cowdung slurry for 6 hrs T₅: Soaking in PG for 12 hrs, T₆: Soaking in khada cloth in sweet flag extract for 30 min, T₇: Soaking seeds in water for 10 hrs + CDE for 5 hrs, T₈: ST with *Azospirillum* and PSB @ 200 g /25 kg T₉: Soaking in biogas slurry for 12 hrs T₁₀: Soaking in 10% Cow urine for 30 min

Conclusion

The present investigation concluded that, among the genotypes, Gangavathi sona was recorded significantly higher germination percentage, root length, seedling length and seedling vigour index- I as compared to RNR-15048 variety. Among the organic seed treatments, seeds soaked in water for 10 Hrs + soaked in cow-dung slurry for 5 hrs and shade dried seeds was recorded significantly higher germination percentage and shoot length as compared to control. Further, significantly higher seedling dry weight (122.0 mg), vigour Index-I (2379.0) and vigour index-II (1150.0) was recorded with soaking in khada cloth in sweet flag extract for 30 minutes as compared to control.

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