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Standardization of Seed Coating Polymer on Seed Quality of Rice (*Oryza sativa* L.)

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Abstract An experiment was under taken to standardization of seed polymer coating on seed quality of rice cv BPT-5204. Result from the study indicated that seed treated with polymer @ 4 ml per kg of seed recorded higher seed quality parameters viz significantly highest (95%) germination percentage, shoot length (9.18 cm) , root length (16.98 cm), speed of germination (20.54), seedling dry weight (83.38 mg) and seedling vigor index (2485) which was on par with 5 ml kg^{-1} (P_6) and the lowest was registered in control (P_1). Hence, it is concluded that rice seeds can be treated with polymer @ 4 ml per kg of seeds to improve the seed quality parameters.

Keywords Rice, Seed treatment, Polymer, Seed quality.

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Introduction

Rice (*Oryza sativa* L.) is a major dietary staple food for higher percentage of the world's population particularly in Asia, where more than 90% of rice is grown. For more than half of the humanity rice is life. Seed coating technology has developed rapidly during past two decades and provides an economical approach to seed enhancement. An advantage of seed coating is that the seed enhancement material (fungicide and insecticide) is placed directly on the seed without obscuring its shape. Seed coating with natural or synthetic polymer have gained rapid acceptance by the seed industry as much safer coating material. Seed coating with natural or synthetic polymer have gained rapid acceptance by the seed industry as much safer coating material. By encasing the seed within a thin film of biodegradable polymer, the adherence of seed treatment to the seed is improved and ensures dust free handling, make treated seed both useful and environment friendly [1]. The polymer coating with the negligible thickness of 84μ over the seed coat provides protection from the imposed accelerated ageing, which include fungal invasion. It is simple to apply, diffuses rapidly and non toxic to the seed during germination. The film formed around seed act as a physical barrier, which has been reported to reduce leaching of inhibitors from the seed coverings and may restrict oxygen diffusion to the embryo. Increase in germination can be seen in poly-coated seeds, which may be due to increase in the rate of imbibition where the fine particles in the coating act as a'wick' or moisture attracting material or perhaps improve

seed soil contact. Coating with hydrophilic polymer regulates the rate of water uptake, reduce imbibition damage. The use of hydrophilic polymer seed coating on corn seed produced better emergence [2]. The objective of this study is to standardize the ideal dosage polymer for seed coating in rice.

Materials and Methods

The laboratory experiments were conducted at the Department of Seed Science and Technology, College of Agriculture, UAS, Raichur during 2015-16 for standardization of seed coating polymer, dosage and also to know their effect on seed quality of rice cv BPT-5204. The seeds were obtained from Rice breeder, Agriculture Research Station, Gangavathi and the seed coating polymer was procured from Incotec Pvt Ltd, Ahmadabad (Gujarat). The standardization of polymer experiment consisted of six different concentrations of polymer treatments viz. control (P_1), 1 ml kg^{-1} of seed (P_2), 2 ml kg^{-1} of seed (P_3), 3 ml kg^{-1} of seed (P_4), 4 ml kg^{-1} of seed (P_5), 5 ml kg^{-1} of seed (P_6). The observations on various seed quality parameters viz. seed germination (%), seedling length (cm) were recorded as per the ISTA [3], seedling vigor index [4] and speed of germination was recorded as per the methods and procedures described by Maguire [5].

Results and Discussion

The seeds treated with polymer showed significant superiority on seed quality parameters during standardization. The data on germination percentage as influenced by seed coating with polymer treatments are presented in Table 1. Polymer seed coating with 4 ml kg^{-1} (P_5) seed recorded significantly highest (95%) germination percentage, which was statistically at par (93.75%) with 5 ml kg^{-1} (P_6) and significantly lowest (91.00%) germination percentage was recorded in (P_1) control.

The results on shoot length as influenced by seed coating with polymer treatments are presented in Table 1.Polymer seed coating with (P_5) 4 ml kg^{-1} seed recorded significantly highest (9.18 cm) shoot length, which was statistically at par (8.50 cm) with 5 ml kg^{-1} (P_6) and significantly lowest (7.95 cm) shoot length was recorded in (P_1) control.

The data on root length as influenced by seed coating with polymer treatments are presented in Table 1. Polymer seed coating with 4 ml kg^{-1} (P_5) seed recorded significantly highest (16.98 cm) root length, which was statistically at par (15.48 cm) with 5 ml kg^{-1} (P_6) and significantly lowest (11.50 cm) root length was recorded in (P_1) control.

Seedling dry weight as influenced by seed coating with polymer treatments are presented in Table 1. Polymer seed coating with 4 ml kg^{-1} (P_5) seed recorded significantly highest (83.38 mg) seedling dry weight, which was statistically at par (81.56 mg) with 5 ml kg^{-1} (P_6) and significantly lowest (77.30 mg) seedling dry weight was recorded in control (P_1).

Table 1. Standardization of seed coating polymer for seed treatment in rice.

Treatments	Germination (%)	Shoot length (cm)	Root length (cm)	Speed of germination	Seedling dry weight (mg)	Seedling vigor index
P_1 : Control	91.00	7.95	11.50	19.36	77.30	1770
P_2 : 1 ml per kg of seeds	91.50	8.11	12.73	19.40	78.00	1907
P_3 : 2 ml per kg of seeds	92.00	8.11	13.10	19.50	78.46	1951
P_4 : 3 ml per kg of seeds	92.25	8.30	13.53	19.62	79.00	2014
P_5 : 4 ml per kg of seeds	95.00	9.18	16.98	20.54	83.38	2485
P_6 : 5 ml per kg of seeds	93.75	8.50	15.48	19.75	81.56	2248
Mean	92.50	8.36	13.88	19.70	79.62	2063
SEm ±	0.48	0.20	0.41	0.19	0.46	76
CD at 1%	1.95	0.79	1.69	0.81	1.86	242

The data on speed of germination as influenced by seed coating with polymer treatments are presented in Table 1. Polymer seed coating with (P_5) 4 ml kg^{-1} seed recorded significantly highest (20.54) speed of germination, which was statistically at par (19.75) with 5 ml kg^{-1} (P_6) and significantly lowest (19.36) speed of germination was recorded in (P_1) control.

The data on seedling vigor index as influenced by seed coating with polymer treatments are presented in Table 1 Polymer seed coating with 4 ml kg^{-1} (P_5) seed recorded significantly highest (2485) seedling vigor index, which was statistically at par (2248) with 5 ml kg^{-1} (P_6) and significantly lowest (1770) seedling vigor index was recorded in control (P_1).

Seed polymer coating is a sophisticated process of applying precise amount of active ingredients along with a liquid material directly on to the seed surface without obscuring its shape while, total seed weight may increase upto 1 to 2%

The increase in seed germination might be due to the increase in the rate of imbibition where the fine particles in the coating acts as a wick or moisture attracting material or perhaps to improve germination similar results were obtained by Manjunatha et al. [6] in chilli. The beneficial effects of polymer were attributed to enhancement of mitochondrial activity leading to the formation of more high energy compounds and vital biomolecules, which were made available during the early phase of germination reported by Kavitha [7]. These results are also in agreement with findings of Ransing et al. [8] in sorghum and Vasudevan et al. [9] in cotton, pigeonpea, chickpea and groundnut. The increase in speed of germination, shoot length and root length might be due to beneficial effect of polymer and also due to enhanced metabolic activity resulted in early germination as reported by Sherin Susan et al. [10] in maize. The increase in seedling vigor index and seedling dry weight was due to increased germination percentage, root length and shoot length of seedlings.

Germination percentage decreased as the dosage of polymer increased, where reduction was related to restricted oxygen supply to the enclosed embryo and to the retention of water soluble germination inhibitors and similar results were also reported by Xianming and Joseph [11].

Increase in seed quality parameters might be due to the activation of metabolic activity of seed, could also be due to hydrophilic polymer coating material, which might improve the rate of water uptake in sweet corn seeds as reported by Baxter and waters [2]. These results are also in agreement with findings of Suma and Srimathi [12] in sesamum and Verma and Verma [13] in soybean.

Hence, it is concluded that optimum dosage of seed coating polymer @ 4 ml kg^{-1} of seed was found superior in enhancing the seed quality which helps in reducing wastage of chemicals and most ideal and economical for coating rice seeds.

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