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Quality Analysis of Stored Seeds of Rice (cv Shatabdi) as Response of Growth Regulators and Number of Seedlings

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Abstract

The present experiment was conducted to evaluate the effect of spraying of growth regulators viz., GA_3 and Phytonal (higher and lower concentrations) on single, double and triple seedlings and seed quality of rice (cv Shatabdi). Six months a stored seed of *kharif* season was used for evaluating germination potential and seedling characters. The study revealed that the higher concentrations of both growth regulators produced positive response than control.
Key words : Rice, GA_3, Phytonal, Seed quality, Storage.

Rice (*Oryza sativa* L.) is an important cereal crop in developing countries, grown all over the world and it is the staple food of over half of the world's population, ranking second to wheat in terms of area cultivated and production. Rice just needs enough water and solar energy to cultivate in more places (1). Seed quality is the degree of excellence with regard to the characteristics referred for the purpose. High quality seeds are referred if the seed lot possesses high genetical and physical purity, high germination potential, high vigour, minimum inert matter, weeds and other crop seeds, and are free from diseases. Plant hormones and growth regulators are the chemicals that affect flowering, ageing, root growth, distortion and killing of leaves, stems and other parts, prevent or promote stem elongation, prevent leafing and /or leaf fall and other conditions. Very small concentrations of these chemicals are capable enough to create major growth changes, as referred. GA_3 and phytonol (tricontanol) are such chemicals differing in its site and mode of action. GA_3 is a plant growth regulating compound that regulates the growth of plants, including triggering seed germination. Over 100 different gibberalic acids have been identified so far and it varies with the crop plants. Rice has 14 different gibberallic acids, while corn has 20 different types. It is naturally found in plants and its utilization may help to harvest better results from the plants. It has been reported to stimulate stem elongation (2) and increase dry weight (Hore et al., 1982). GA_3 has been reported to increase number of pods in chick pea (3) and spikelet in rice. It is clear that GAs are implicated in several aspects of floral initiation in certain thermo periodic and photoperiodic plants (4). Phytonol (tricontanol) is a plant growth regulator found in the plant cuticle waxes and in bee's wax as the palmitate ester. Tricontanol has been reported to have growth enhancing properties when applied to levels of growing plants. Its laboratory synthesis was first reported in 1934. Its only commercial use is as a plant growth regulator, and it has been widely patented for this use. It is a totally non-toxic, plant growth bio-regulator without any residual effect, produces stronger seedlings with better root system and finally develops into vigorous plants leading to better yield. In spite of the fact that plant growth regulators modify the physiological process, it influences growth and may increase the yield of crops.

Methods

The present experiment was conducted during *kharif* season of 2008-09 to study the storage potential of rice cv Shatabdi (IET-4786) with spraying of two concentrations each of GA_3 and Phytonol at panicle emergence stage at District Seed Farm D Block, BCKV, Kalyani. The lab experiment was done at departmental laboratory of Seed Science and Technology. Seeds produced in *kharif* of 2008 were stored for

Table 1. Seedling length (cm) and Vigor index of stored seeds produced due to different treatments. T_0 = Spraying of water (Control), T_1 = Spraying of GA_3 10ppm, T_2 = Spraying of GA_3 20 ppm. T_3 = Spraying of Phytonol lml/3lit water, T_4 = Spraying of Phytonol 2ml/3lit water, S_1= Single seedling transplanting, S_2 = Double seedling transplanting, S_3 = Triple seedling transplanting.

Treatments	Seedling length (cm) S_1	S_2	S_3	Mean
T_0	11.345	11.255	10.785	11.128
T_1	13.755	13.460	12.665	13.293
T_2	14.713	14.300	13.288	14.100
T_3	13.365	13.275	12.668	13.103
T_4	15.583	14.605	13.928	14.705
Mean	13.752	13.379	12.667	
	SE (±)	CD (P=0.05)		CD (P =0.05)
T	1.3537	3.8634		5.1651
S				
	Vigor Index			
	S_1	S_2	S_3	Mean
T_0	1029.14	1018.50	967.91	1005.18
T_1	1261.84	1231.59	1155.87	1216.43
T_2	1364.56	1322.50	1225.44	1304.167
T_3	1222.85	1211.33	1152.88	1195.69
T_4	1437.48	1343.97	1277.82	1353.09
Mean	1263.17	1225.58	1155.98	
	SE (±)	CD (P=0.05)		CD (P=0.05)
T	133.155	380.024		508.0716

six months in ambient condition and then subjected to determination of quality testing through the parameters as was done for harvest fresh seeds (germination percent and seedling characters) to assess the residual influence of both spraying hormones during storage, if any. Vigor index was calculated from following formula.

V.I. = Germination % × Seedling Length

Results and Discussion

Germination (%)

Germination percentage was as high as 92.75 for S_1T_2 i. e. application of 20 ppm GA_3 over single seedling transplanted population followed by S_2T_2, S_3T_2 and S_1T_4. S_1T_1 was found to be statistically at par with all other combinations except water sprayed triple seedling transplanted population. It may due to the mode of acton of GA_3 persisted during storage and survival period. It is to be noted that germination (%)

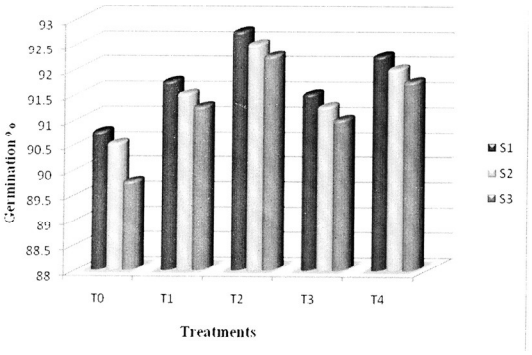

Figure 1. Effect of GA_3 and phytonol on germination percent. T_0 = Spraying of water (Control), T_1= Spraying of GA_3 10ppm, T_2= Spraying 20 ppm, T_3= Spraying of Phytonol lml/3lit water. T_4= Spraying of Phytonol 2ml/3lit water, S_1= Single seedling transplaning S_2 = Double seedling transplanting. S_3 = Triple seedling transplanting.

of stored seeds produced after spraying of either of the hormones was more than that of water sprayed control. The reduction (%) in germination was more in water sprayed control than the others and it was less after GA_3 spraying irrespective of its concentration, which indicated that GA_3 may have the potentiality of residual influence in resisting loss in germination potential due to storage.

Seedling Length (cm)

Phytonol 2ml/3liter water influenced production of seedling from stored seeds with highest length (15.58 cm) when sprayed over single seedling transplanted population. It was followed by S_1T_2, S_2T_4, S_2T_2 though they were statistically at par with the seedling produced from stored seeds germinated after water spraying. The similar scenario could be noticed irrespective of the number of seedlings transplanted and the trend followed the similar manner of reduction in magnititute with the enhanced number of seedlings. It could be revealed that reduction in this parameter was noted in very erratic manner, but maximum reduction was noted in water sprayed control.

Vigor Index

Higher magnitude of vigor index was calculated

for S_1T_4, may be due to greater influence of seedling length rather than its germination potential, though significantly similar magnitude of vigour was noted for all stored seeds produced after GA_3 and phytonol spraying. Vigour index was also in reduction trend with the increased number of seedling for each and every individual treatment. Similar to germination (%) and seedling length, higher reduction in vigour index was observed for stored seeds produced after water spray but no specific trend could be identified for GA_3 and Phytonol. Therefore, application of both GA_3 and phytonol in higher concentration may be recommended for quality seed production in rice, which may lead to the longer storage with minimum loss in vigor and viability. Though, information on production of quality seed and its storage potential through spraying/ application of growth a regulator is lacking, the same on emergence and vigour of seedling are used during clarification. Beneficial effect of GA_3in increasing seedling emergence, height, dry matter and vigor was noted by Chen et al. (5) which may support the trained production of high quality seed in the present finding. Higher seed germination and seedling emergence were also noted by Vieria (6), Santosh et al. (7) and Vieria et al. (8) through seed treatment with GA.

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