SHORT COMMUNICATION **Oryza Vol. 51 No.3, 2014 (258-259)**

Effect of seed fortification with sprouted pulses extract on germination and seedling vigour of rice

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ABSTRACT

Seed fortification is a method of seed invigoration which helps to improve the initial quality of the seeds. The effect of seed fortification with sprouted horse gram and cowpea seed extracts was studied on seed germination and seedling vigour of rice cv.ADT 47. The fortification treatments included soaking in water, sprouted horse gram and cowpea extracts with 1, 2, 3, 4 and 5 % concentrations for a duration of 8 h while untreated dry seeds maintained as control. The results of the study revealed that rice seeds fortified with 3 % sprouted cowpea extract performed better in terms of all the seed quality parameters viz.*, germination, shoot length, root length, dry matter production and was par with 3 % sprouted horse gram extract.*

Key words: *rice seed fortification, horse gram, cowpea, extract germination, seedling vigour*

Seed fortification is a method of seed invigouration which helps to improve the initial stamina of seeds with enhanced germinability, seedling vigour and field stand. Sprouting is triggered by the enzymatic activities in seeds which lead to conversion of complex carbohydrates, proteins and fats into simple sugars and amino acids (Vidal – Valverde *et al*., 2002). Sprouted pulses are good source of ascorbic acid (Plaza *et al*., 2003), riboflavin and thiamine (Sattra *et al*., 1995), choline, tocopherols, pantothenic acid (Dhaliwal and Aggarwal, 1999) and minerals (Sangronis and Machado, 2005). Hence it was hypothesized that application of sprouted pulses extract as a nutrient and growth regulator in the form of seed fortification will be beneficial to increase the seed vigour and performance. The present study was undertaken to investigate the effect of sprouted pulses extract on germination and seedling vigour of rice.

The breeder seed samples of rice variety ADT 47 were obtained from Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore and used in the experiment. Horse gram and cowpea seeds were separately soaked overnight and incubated in a wet cloth for 12 h to enable sprouting. Then 100 g of sprouts of both seeds were ground separately in a mixer-grinder by using ice cubes of 100 ml of water. The ground paste was squeezed through cloth bag to obtain the sprout extract with 100 per cent concentration. Concentrated extract was diluted with water to five different concentrations *viz.*, 1, 2, 3, 4 and 5%.

The pulse sprout extracts obtained from both horse gram and cowpea were estimated for total antioxidants activity by ferric reducing ability of plasma assay (Benzie and Strain, 1996), soluble protein content by Lowry's method (Lowray *et al*., 1951), total soluble sugars by Phenol sulphuric acid method (Dubois *et al*., 1956), ascorbic acid by oxalic acid method (Volumetric method). Analyses of minerals *viz.*, nitrogen, phosphorus, potassium, calcium, iron and zinc, were conducted using atomic absorbing spectrophotometer (Manual methods of analysis of food, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, New Delhi).

Rice seeds were fortified with 1, 2, 3, 4 and 5 % of sprouted horse gram extract and cowpea extract for 8h and dried back to the original moisture content

under shade. Water soaked seeds and untreated dry seeds were used as control. The fortified and control seeds were subjected to germination test as outlined by International Seed Testing Association (1999) with four replicates of 100 seeds each in rolled towel medium and evaluated for seed quality parameters such as germination, shoot length, root length and dry matter production. The experiment was conducted by adopting factorial completely randomized block design. The data recorded were analyzed using AGRES software.

Results revealed that all fortification treatments enhanced the seed germination and seedling vigour of rice seedlings. Among the different fortification treatments, seeds fortified with 3 % sprouted cowpea extract recorded higher germination (92 %), shoot length (10.05 cm), root length (21. 68 cm) and dry matter production which was at par with 3% sprouted horse gram extract. The untreated control recorded significantly lower germination (80%), shoot length (7.16 cm), root length (15.70 cm) and dry matter of seedlings (Fig.1). The beneficial effect of sprouted cowpea and horse gram extract could be attributed to the presence of minerals *viz*., nitrogen, phosphorous, potassium, calcium, iron, zinc, soluble sugars, soluble proteins and vitamins (Table 1). These findings are in conformity with the findings of Maria *et al*. (2007). The improvement in seed germination percentage and seedling vigour of rice seedlings is attributable to the higher nutrient potential of pulse sprout extracts used for seed fortification. The seed fortification of rice cv ADT 47 either in 3 % sprouted cowpea extract or in 3 % sprouted horse gram extract can be adopted to enhance seed germination and vigour of rice seedlings.

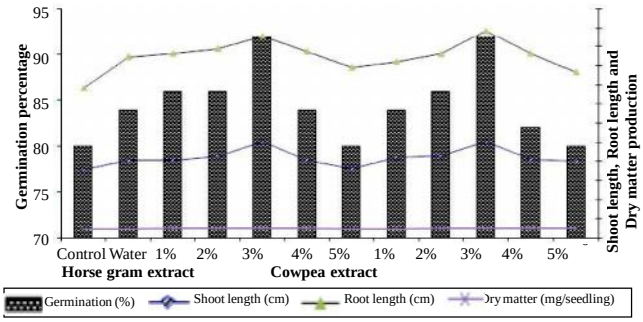

Fig. 1. Effect of seed fortification with pulse sprout extract on seed germination and seedling vigour

Table 1. Nutrients in sprouted horse gram and cowpea extracts

Name of the sample	Horse gram sprout extract	Cowpea sprout extract
Nitrogen(mg 100 ml^{-1})	89.36	93.61
Phosphorus (mg 100 ml^{-1})	410	520
Potassium (mg 100 ml^{-1})	291	339
Calcium (mg 100 ml^{-1})	20.00	14.00
Iron (mg 100 ml^{-1})	8.25	10.00
Zinc (mg 100 ml^{-1})	91.00	89.00
Total soluble sugars (%)	0.90	1.05
Soluble Protein (%)	1.59	3.00

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