International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(3): 640-642

Received: 08-03-2017
Accepted: 10-04-2017

Pragya Keshri
Department of Soil Science and Agricultural Chemistry, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Vinay Samadhiya
Department of Soil Science and Agricultural Chemistry, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

K Tedia
Department of Soil Science and Agricultural Chemistry, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Satyendra Patley
Department of Soil Science and Agricultural Chemistry, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Correspondence
Pragya Keshri
Department of Soil Science and Agricultural Chemistry, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Evaluation of the effect of seed priming on nutrient uptake in rice at harvest

Pragya Keshri, Vinay Samadhiya, K Tedia and Satyendra Patley

Abstract
The present investigation entitled "Evaluation of the effect of seed priming on nutrient uptake in rice at harvest" was carried out at Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur during *Kharif* season 201516. The soil of experimental field was clayey in texture (*Vertisols*), neutral in pH and has 0.64 % organic carbon, low nitrogen, high phosphorus and potassium content. Experiment was laid out in Randomized Block Design (RBD) with three replications. The rice variety Rajeshawari tested under two different recommended doses of fertilizers *i.e.* 100% (100:60:40 $N:P_2O_5:K_2O$ kg ha^{-1}) and 80% (80:48:32 $N:P_2O_5:K_2O$ kg ha^{-1}) and seed priming along with distilled water and nutrients *i.e.* potassium dihydrogen phosphate (KH_2PO_4) and EDTA Zn of concentration 0.5% P and 0.1% Zn, respectively. Seeds were primed in distilled water and nutrient solution for 12 hrs and then air-dried for 2 hrs. Dry seeds was also used as control. They were sown in mini plots in field. Plants were harvested after maturity. The results of experiments indicated that the highest nutrients *i.e.* nitrogen, phosphorus, potassium and zinc uptake was found in 100% GRD with seed priming (N_0: P (0.5%): K_0: Zn (0.1%)) followed by 100% GRD with water soaked seed as compared to dry seed 100% GRD (control).

Keywords: Rice, nutrient priming sources: potassium dihydrogen phosphate; zinc oxide; water soaking; different doses of fertilizer: 100% GRD and 80% GRD; nutrient uptake

Introduction
Rice (*Oryza sativa* L.) is one of the leading food crops in the world. It is reported to feed approximately one half of the world's population. Rice is the most important and extensively cultivated food crop that has been referred as "Global Grain" because of its use as prime staple food in about 100 countries of the world. India is the second largest producer of rice after china has an area of over 43 million hectares and production was 105.24 million tonnes with an average productivity of 2462 kg per hectares (Anonymous, 2014) [1]. Chhattisgarh state is popularly known as "Rice bowl of India" because maximum area is covered under rice during kharif and contribute major share in national rice production. The total estimated area of rice in chhattisgarh is 3.68 million hectares, production is 7.44 million hectares and productivity is 2020 kg per hectares, in 2013-2014 (Krishi darshika, 2015) [3].

Phosphorus is an important plant macronutrient, making up about 0.2% of a plant's dry weight. Phosphorus is the second most important nutrient that limit crop yield particularly in developing countries where high cost, lack of infrastructure and poorly operating markets limit their use. The previous researches clearly indicated that Zn-deficient plants showed reduced rate of protein synthesis and protein content. Zinc is essential for the synthesis of plant growth regulators like auxins, also act as a metal activator of several enzymes, involved in the synthesis of protein and nucleic acids in plants. Several worker reported that Zn indicate an antagonistic effect with K, Mn, Fe and Ca. Other hand, Zn undergo to submerged condition in rice soil change the behavior double valency charge to single valency charge and free for attached with other ions so that it can not be available to plant. Several research has shown that in saturated soils, rice can not take up Zn as effectively under flooded conditions. N and P also affect zinc uptake by the plants (Khalil and Jan, 2002) [2].

Seed priming comprises the soaking of seed in water and nutrients and drying back to the storage moisture until use. The protoplasm of hardened plants is found to have a lower viscosity and exhibits higher permeability to water and nutrients and is able to hold water and nutrients. The soaking induces a range of biochemical changes in the seed that are required to start the germination process *i.e.* breaking of dormancy, hydrolysis or metabolism of inhibitors, imbibitions and enzyme activation such as amylase,

protease and lipase that have a great role in initial growth and development of embryo. Every increase in activity of these enzymes results in faster initial growth of seedling therefore and thereby establishment improvement resulted in higher yield.

Materials and methods

The experiment was conducted at Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur during *Kharif* season 2015-16. The soil of the experimental field was clayey in texture (*Vertisols)* having normal pH, medium in organic carbon, low in available nitrogen and medium in available phosphorus and potassium status. The available iron, zinc, manganese and copper content of the experimental field was sufficient.

Experimental details

The experiment was laid out in randomized block design with three replications and eight treatments *i.e.* water soaked seed, seed priming with nutrients (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$), dry seed 100% GRD, water soaked seed 100% GRD, seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$) 100% GRD, dry seed 80% GRD, water soaked seed 80% GRD and 80% GRD with seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$). The Rajeshawari rice cultivar was the test crop.

Method of seed priming

Seed priming by water soaking (for 1 ha): 80 kg seeds were soaked in 52 litre of aerated distilled water for 12 hours and then air-dried for 2 hours.

Seed priming with (N_0: $P_{(0.5\%)}$: K_0: $Zn_{(0.1\%)}$): Rice seeds were soaked in 0.5% P (KH_2PO_4) and 0.1% Zn (EDTA Zn) solution for 12 hours and then air-dried for 2 hours.

Solution preparation (For 1 ha): To prepare solutions containing 0.5% P (1.14 kg KH_2PO_4) and 0.1 % Zn (400 gm EDTA Zn) were dissolved in 52 litre of distilled water and then 80 kg seeds were soaked for 12 hours and then air-dried for 2 hours.

Results and discussion

Total N uptake

Table 1 revealed that total N uptake by rice was significantly affected with application of different treatments. The highest nitrogen uptake (132.49 kg ha^{-1}) was recorded by 100% GRD with seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$) followed by (124.53 kg ha^{-1}) in 100% GRD with water soaked seed. The least nitrogen uptake was found in only water soaked seed (45.50 kg ha^{-1}) followed by only seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$) (53.14 kg ha^{-1}) treatments.

Total P uptake

It is clear from the Table 1 that the total P uptake by rice was significantly affected with application of different treatments. The highest phosphorus uptake (19.81kg ha^{-1}) was recorded by 100% GRD with seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$) followed by (17.78 kg ha^{-1}) in 100% GRD with water soaked seed. Water soaked seed without fertilizer (5.66 kg ha^{-1}) significantly reduced total phosphorus uptake compared with all other treatments except only seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$) (6.82 kg ha^{-1}) treatments.

Ros, *et al.* (2000) [5] reported similar results of higher P uptake due to P seed priming and similar results were also found by Miraj, *et al.* (2013) [4].

Total K uptake

The data presented in Table 1 clearly indicated that the highest total K uptake by rice was found (193.46 kg ha^{-1}) in 100% GRD with seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$) followed by (184.49 kg ha^{-1}) in water soaked seed 100% GRD. Water soaked seed without fertilizer significantly reduced total K uptake compared with all other treatments except only seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$).

Total Zn uptake

The data presented in Table 1 clearly indicated that the total Zn uptake by rice was significantly affected with application of different treatments. The highest total Zn uptake by rice was found (371.61g ha^{-1}) in 100% GRD with seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$). The least Zn uptake was found in only water soaked seed (145.17g ha^{-1}) followed by only seed priming (N_0: P $_{(0.5\%)}$: K_0: Zn $_{(0.1\%)}$).

The significant increased in Zn uptake by seedling due to nutrient priming was who reported by Miraj, *et al.* (2013) [4] and slaton *et al.* (2001) [6].

Table 1: Effect of seed priming on total nutrient uptake (N, P, K and Zn) in rice.

Treatment	Total N uptake (kg ha^{-1})	Total P uptake (kg ha^{-1})	Total K uptake (kg ha^{-1})	Total Zn uptake (g ha^{-1})
T_1 : Water soaked (N_0:P_0:K_0)	45.50^{e}	5.66^{d}	76.05^{d}	145.17^{f}
T_2: Seed priming with (N_0: P $_{(0.5\%)}$:K0: Zn (0.1%))	53.14^{e}	6.83^{d}	86.81^{d}	168.26^{f}
T_3 : 100% GRD + Dry seed	116.33^{bc}	15.86bc	165.87^{b}	329.74^{bc}
T_4 : 100% GRD + Water soaked seed	124.53^{ab}	17.78ab	184.49^{a}	348.49^{ab}
T_5: 100% GRD + Seed priming with (N0: P (0.5%): K0: Zn (0.1%)	132.49^{a}	19.81^{a}	193.46^{a}	371.61^{a}
T_6: 80% GRD + Dry seed	99.51^{d}	13.22^{c}	145.48^{c}	285.49^{e}
T_7: 80% GRD + Water soaked seed	102.55^{d}	14.45^{c}	154.81^{bc}	304.41^{de}
T_8: 80% GRD + Seed priming with (N0: P (0.5%): K0: Zn (0.1%)	108.07^{cd}	16.28bc	163.19^{b}	315.55^{cd}

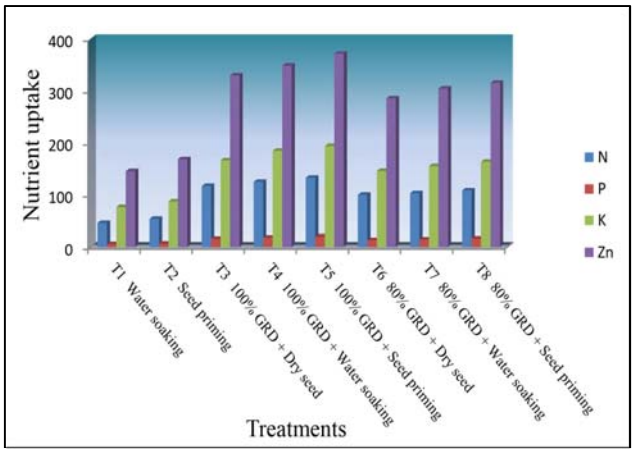

Fig 1: Effect of seed priming on total nutrient uptake (N, P, K and Zn) in rice.

References

1. Anonymous. Area, productionand productivity of rice in india. Annual report 2013-14 department of agriculture and cooperation. Ministry of agriculture government of India, 2014.
2. Khalil IA, Jan A. Cereal Crops. In Cropping Technology. National Book Foundation, Islamabad, 2002.
3. Krishi darshika. Indira Gandhi krishi vishwavidyalaya, Raipur, Chhattisgarh. 2015.
4. Miraj G, Shah HU, Arif M. priming maize (*Zea mays*) seed with phosphate solutions improves seedling growth and yield. The Journal of Animal & Plant Sciences. 2013; 23(3):893-899.
5. Ros C, Belland RW, White PF. Phosphorus seed coating and soaking for improving seedling growth of *Oryza sativa* (rice) CV IR66. Seed Sci. Tech. 2000; 28:391-401.
6. Slaton NA, Wilson CE, Ntamatungiro S, Norman RJ, Boothe DL. Evaluation of zinc seed treatments for rice. Agron. J. 2001; 96:152-157.