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Short Communication

Comparison of Direct Seeded and Transplanted Rice in Response to Zinc under Salt-Affected Soil

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Abstract. An experiment was carried out to investigate the effect of different levels of Zn (0, 5, 10, 15 kg/ha) on growth and yield of direct seeded and transplanted rice (*Oryza sativa*) under naturally salt-affected soil having pH=8.32; ECe=6.41dS/m; SAR=26.71$(mmol_c/L)^{½}$ at the farm of Soil Salinity Research Institute, Pindi Bhattian during 2013. Plant height, number of tillers/plant, panicle length and number of grains/panicle were higher in transplanted rice than direct seeded rice at all Zn levels. Maximum paddy yield (2.61 t/ha) of direct seeded rice was attained with the application of 10 kg Zn/ha closely followed by 15 kg Zn/ha application (2.41 t/ha) which was statistical at par with paddy yield (2.45 t/ha) of transplanted rice in salt-affected field. However, overall paddy yield of direct seeded rice was 5 % higher than the transplanted rice.

Keywords: direct seeded, transplanted rice, saline soil, Zn

Rice is a grain crop for feeding more than half of the world population (Fageria *et al*., 2008). Surface and underground water resources are decreasing and water has become a serious factor in rice cultivation (Farooq *et al*., 2009). Presently a shift from transplanted rice (TRR) to direct seeded rice (DSR) is in practice and TPR to DSR cultivation has been seen in many countries of Southeast Asia (Pandey and Velasco, 2002). In Asia, dry seeding is mostly adopted in rainfed lowlands, uplands, and flood-prone areas, while wet seeding is a common practice in irrigated areas (Azmi *et al*., 2005; de Dios *et al*., 2005). The transplanted rice leads to higher loss of water through puddling, surface evaporation and percolation (Farooq *et al*., 2011). After nitrogen, zinc is the most yield-affecting nutrient especially in rice. Therefore, this experiment was conducted at Soil Salinity Research Institute farm, Pindi Bhattian to investigate the effect of different levels of Zn (0, 5, 10, 15 kg/ha) as $ZnSO_4$ on growth and yield of direct seeded and transplanted rice (*Oryza sativa* Cv. Super Basmati) under naturally salt-affected soil having pH=8.32; ECe=6.41 d/S m; SAR=26.71 $(mmol_c/ L)^{½}$ at the farm of Soil Salinity Research Institute, Pindi Bhattian during 2013. Randomised complete block design was applied with three replications. Direct seeded rice sowing was done in 2nd week of June and transplanting was done in 2nd week of July. Treatment application was done at the time of crop sowing. Agronomic data were collected at maturity. Collected data were statistically analysed using LSD at 5% probability level (Steel and Torrie, 1997).

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Plant height, number of tillers/plant, spike length and number of grains/spike showed significant results in direct seeded rice with the application of zinc at different levels under salt affected soil but the values of growth parameters in transplanted rice with application of Zn were lower than direct seeded rice (Table 1). Highest plant height was attained with the application of 15 kg Zn/ha (101.3cm) followed by 10 kg Zn/ha (97.7cm). 15 kg Zn/ha got the highest position in number of 0 kg Zn/ha tillers/plant (11.7) followed by10 kg Zn/ha and 5 kg Zn/ha attaining 11.3 and 11.0, respectively. Spike length of direct seeded rice had gained highest rank in 15 kg Zn/ha (28.3cm). 10 kg Zn/ha and 5 kg Zn/ha gave the statistical similar spike length. Highest number of grains/spike was attained by the addition of 15 kg Zn/ha (98.3) followed by10 kg Zn/ha (94.7). Transplanted rice showed significant results in plant height and number of grains/spike while number of tillers/plant

Table 1. Effect of zinc on growth parameters of direct seeded and transplanted rice (*Oryza sativa)* grown under salt-affected soil

Treatments	Direct seeded rice				Transplanted rice			
	Plant height (cm)	Number of tillers/ plant	Spike length (cm)	Number of grains/ spike	Plant height (cm)	Number of tillers/ plant	Spike length (cm)	Number of grains spike
0 kg Zn/ha	93.0c	10.0b	23.3c	85.7d	85.0b	7.3	19.3	76.7c
5 kg Zn/ha	95.3bc	11.0ab	25.7b	90.0c	87.0a	7.7	20.0	80.0b
10 kg Zn/ha	97.7b	11.3ab	26.0b	94.7b	87.7a	7.7	20.0	82.3a
15 kg Zn/ha	101.3a	11.7a	28.3a	98.3a	87.7a	8.3	22.0	82.7a
LSD	2.7	1.4	1.4	2.1	1.8	NS	NS	2.2

Means bearing same letter(s) in each column are statistically similar at p = 0.05.

and spike length attained non significant findings with the treatment of different zinc levels under salt affected soil (Table 1). 15 kg Zn/ha, 10 kg Zn/ha and 5kg Zn/ha attained statistically similar results in plant height under salt stress conditions. Number of tillers/plant was the highest in 15 kg Zn/ha (8.3) while other zinc doses are approximately equal with 0 Kg Zn/ha. Number of grains/spike was the highest in15 kg Zn/ha (82.7) which was statistically at par with 10 kg Zn/ha (82.3) followed by 5 kg Zn/ha. Plant height, number of tillers/plant, spike length and number of grains/spike was gained better values than 0 kg Zn/ha. Excess soluble salts (Cl^- and SO_4^{2-} of Na^+, Ca^{2+} and Mg^{2+}) in saline soils cause high osmotic pressure and complex interactions of Na, Ca, K and other micronutrients such as Zn which disturb equilibrium in rhizosphere and plant growth. Imbalanced nutrient affects Zinc availability (Girija *et al*., 2013).

Paddy yield was significantly affected with different doses of zinc in direct seeded rice (Table 2). Maximum paddy yield of direct seeded rice was attained with the application of 10 kg Zn/ha (2.61 t/ha) followed by 15 kg Zn/ha application and transplanted rice under salt affected soil also shows significant results with the application of zinc at different levels (Table 2). Paddy yield at 10 Kg Zn/ha in direct seeded rice was closely followed by 15 kg Zn/ha application (2.41 t/ha) in transplanted rice (2.45 t/ha) which was statistically at par with paddy yield. However, overall paddy yield of direct seeded rice was 5 % higher than the transplanted rice. Paddy yield of direct seeded rice was higher (5%) than traditionally transplanted rice. Nasir *et al.* (2006) concluded that yield and yield components were significantly affected with the application of zinc.

Table 2. Effect of zinc on paddy yield (t/ha) of direct seeded and transplanted rice (*Oryza sativa)* grown under salt-affected soil

Treatments	Direct seeded rice	Transplanted rice
0 kg Zn/ha	1.88 d	1.89 d
5 Zn kg/ha	2.25 c	2.15 c
10 Zn kg/ha	2.61 a	2.25 c
15 Zn kg/ha	2.41 b	2.45 b

Means bearing same letter(s) in each column are statistically similar at p = 0.05.

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