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Effect of Salinity on Some Yield Attributes of Rice

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Abstract: An experiment was conducted at the green house laboratory of Khulna University, Khulna with a variety of rice BR11, to study the effect of different levels of salinity on some yield attributes of rice. The experiment was conducted with different salinity level e.g., 0, 7.81, 15.62, 23.43 and 31.25 dS m^{-1}. Plant height, number of tillers and the biomass of the plant were recorded. The height of the plant was decreased gradually with increased levels of salinity, but the effect was insignificant from 7.81 dS m^{-1} salinity level i.e. below this level plant height was not decreased. The tiller number of plants was decreased significantly at 15.62 dS m^{-1} of salinity level. It was also observed that the biomass of plant decreased significantly from 7.81 dS m^{-1} level of salinity. The rice variety BR11 could be selected for the cultivation in coastal saline area as it can tolerate salinity at a higher level without significantly decreasing productivity.

Key words: Salinity, yield, rice, biomass

INTRODUCTION

Salinity largely reduce the yield of rice in the coastal areas of Bangladesh, mainly in Khulna. Patuakhali, Chittagong districts and in the islands of Bay of Bengal like Bhola Hatiya and Sandi[1]. The salinity of these soils is either derived from tidal flooding with saline water at high spring tides or from periodic inundations with salt water during cyclonic storm surges. Farakka Barrage is intensifying this problem and extending the saline zone in the country. Out of total 2.83 million ha of cultivable land in the coastal area of Bangladesh approximately 0.83 million ha are saline[2].

The effective reclamation of these saline soils is difficult and complex due to frequent inundation and tidal flooding. It would therefore, be wise to grow the salt tolerant varieties of rice. Rice is usually considered to be the medium salt tolerant crop as studied elsewhere[3]. All varieties of rice, however, do not have the same sensitivity to salts. It may not be difficult to find out a salt tolerant variety or even to develop one through breeding, if proper attention is given towards this direction. A salt tolerant variety of rice may be a solution to the adverse situations like the coastal areas or for localities where salinity is increasing due to the effect of Farakka or due to the addition of low quality irrigation water.

Crop vary in their relative tolerance to soil salinity. Selection of crops for their tolerance is thus an important aspect for the management of saline soils. Research findings indicate that the soil salinity of coastal area generally varied from EC 2 dS m^{-1} to 18 dS m^{-1} during dry season[4-6]. During high soil salinity, the entire area remains fallow. Salt tolerant crops may be an alternative for increasing cropping intensity in these problem soils. In view of the above facts the present piece of research work was undertaken in the green house laboratory of Khulna University to find out the effect of salinity on some yield attributes of rice.

MATERIALS AND METHODS

A green house experiment with a rice variety BR11 was undertaken at Khulna University, Khulna to study the impact of salinity at different concentration on some yield attributes of rice. The experiment conducted in Randomized Complete Block Design with three replications. There were five salinity treatments viz., T_0=No saline water (control), T_1=7.815 dS m^{-1} EC, T_2=15.625 dS m^{-1} EC, T_3 = 23.43 dS m^{-1} EC and T_4=31.25 dS m^{-1} EC. The solution were made by dissolving common salts (NaCl) in total dissolve salts. Usual fertilizer dose and necessary water was applied. The saline water was applied at seven days interval. The observations made on plant height, number of tillers per hill and weight of biomass of the plant.

RESULTS AND DISCUSSION

Plant height: Plant height was significantly varied with different levels of salinity. It had been observed that the

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Table 1: Effect of salinity levels on some yield attributes of rice variety BR11

Salinity levels (dS m^{-1})	Plant height (cm)	Number of tillers	Biomass (g)
0	97.19a	12.94a	119.94a
7.81	94.25a	13.42a	127.37a
15.62	87.05b	12.27a	114.97ab
23.43	78.50c	9.77ab	86.91b
31.25	67.55d	6.91b	30.27c

Table 2: Correlation among the parameters

Variable	Number of tillers	Plant height (cm)	Biomass (g)
Number of tillers	1.00		
Plant height (cm)	0.77**	1.00	
Biomass (g)	0.74**	0.90*	1.00

**Significant at 1% levels of probability

height of plant decreased as the salinity levels increased (Table 1). At control the height of the plant was highest (97.19 cm) followed by T_1 i.e 7.81 dS m^{-1} salinity (94.25 cm). On the other hand the highest salinity levels (31.25 dS m^{-1}) gave the lowest plant height (67.55 cm). The results of the present experiment was in agreement the findings of Javed and Khan[7], Saxena and Pandey[8], who reported that plant height progressively decreased with increase in salinity levels. Akber *et al.*[9] also reported that during vegetative growth, plant height, straw weight, number of tiller $plant^{-1}$, dry weight of roots, and root length are all adversely affected by salinity, but all the growth parameters are not affected equally. It was found that there was a negative correlation among the salt treatment with tiller number, plant height and biomass (Table 2). It was also found that their was a positive correlation between tiller number with both plant height and plant biomass. On of the reasons for decreasing the plant height may be due to the fact that high concentration of soluble salts in soil and osmotic pressure, which created disturbance in uptake of water and other nutrients.

Number of tillers per hill: There was a significant effect of salinity on the number of tillers per hill (Table 1). The number of increased from control to 7.81 dS m^{-1} salinity levels and it was then decreased from 23.43 to 31.25 dS m^{-1} salinity levels. The results of the experiment was in agreement with many authors[9-11] who reported that salinity has less adverse effects on the tillers than on the grain and panicle production. It was also reported that the number of tillers decreased progressively with increase in salinity levels[7,8,12]. The result revealed that the rice variety BR11 was tolerant in terms of tiller number unto 16.62 dS m^{-1} salinity level without reducing tiller number significantly.

Biomass production: There was a significant effect of salinity levels on the biomass production of rice (Table 1). The biomass of plant increased from control (119.94 g) to 7.815 dS m^{-1} salinity levels (127.37 g). The biomass of the plant then decreased gradually as the salinity levels increased. The lowest biomass of plant (30.27 g) was found in the highest level of salinity (31.25 dS m^{-1}). The results of the present experiment was supported by the findings of Murthy and Rao[13] who reported that growth and grain and biological yield decreased with the increase in soil salinity.

The biomass (total dry matter) production of rice variety BR11 was not affected by salinity levels unto 15.62 dS m^{-1}. But when salinity level further increased from 15.62 dS m^{-1} then the production of biomass decreased significantly at 5% level of probability. It is evident from the result that the rice variety BR11 was suitable for cultivation upto 15.62 dS m^{-1} salinity level without significant effect on biomass production.

It can be concluded from the results that as the biomass of plant affected from a high salinity level significantly, so the yield would also affected at high salinity levels. But the rice variety BR11 was found tolerant to certain level of salinity in respect of plant height, number of tillers and biomass production. Therefore, and the variety BR11 is suitable for the cultivation in the saline soils in the coastal regions of Bangladesh.

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