B-69 Varietal screening of rice for tolerance to salinity at early growth stages

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The severe problem which limits the cultivable rice lands is soil salinity. Saline soils occur mostly in arid and semi-arid channel irrigation areas and the coastal belts.

Since reclamation methods are not economical, the use of salinity tolerant high yielding cultivars would be one method to increase rice production under saline conditions.

In rice breeding programmes for tolerance to salinity, selection for tolerance in late generations would be more efficient than that of early generations, because tolerance to salinity shows high degree of heterosis. Thus, when breeding for tolerance to salinity, large number of advanced generation homozygous lines have to be screened. Field screening of large number of lines creates problems due to non-uniformity of salinity in the field and it also involves comparatively more labour, time and is costly. If reliable and rapid laboratory screening procedures at seed germination and at later stages are identified time, labour, and cost could be minimized.

The present study was undertaken to distinguish between salinity tolerant and susceptible rice varieties by determining the influence of salinity on seed germination and subsequent seedling growth of rice.

A 2 factor factorial experiment, (factors being salinity & variety) was laid out in a complete randomized design with 2 replicates under laboratory conditions. The salinity levels used for seed germination were 0,8,16, and 24 ds/m, while the salinity level used for subsequent growth were 0,4,8, 12 ds/m. Pokkali, Nono Bokra, At354, At401, At90-332, Bw272-8 & Bg 94-1 were the varieties used for the study.

Salinity was measured by the electrical conductivity (EC) of the saline water which was used as the growing medium. Water salinity was simulated by dissolving a salt mixture of 1 NaCl : $3K_2SO_4$: 1 $CaSO_4$: $3MgSO_4$: 2 $CaCl_2$ by weight in distilled water - the chemicals and the ratio of salts that

could be found in the natural saline water. Non-sprouted seeds, were placed in petri dishes lined with blotting paper, containing varying salt concentration.

The amount of saline water added to each petri dish 5 ml. Initial saline water levels were maintained by adding distilled water daily until the 5th day. From the 6th day the initial concentration of salt solutions were reduced by half by raising the water level of each petri dish upto 10 ml by adding distilled water.

There was no significant difference in variety x salinity interaction and salinity. Since difference in seed germination is caused by inherent variability between varieties, seed germination cannot be used to study the differential varietal reaction to salinity.

Variety was found to be significant in shoot length while the effect of salinity and salinity x variety interaction was not significant. However, interaction component of tolerant vs susceptible x 0 vs 12 salinity was found to be significant. This indicates that when the salinity levels increased from 0 to 12 ds/m the shoot length did not decrease in tolerant varieties while that of susceptible varieties decreased significantly.

Thus, the difference in rate of decrease in shoot length can be used to separate tolerant and susceptible varieties to salinity in the laboratory if the salinity levels as high as 12 ds/m are used.

Variety has a significant effect on root length while salinity and variety x salinity interaction did not significantly effect root length. The interaction component of tolerant vs susceptible x 0 vs 12 salinity was found to be significant at 5% probability level. This indicates that when the salinity levels increased from 0 to 12 ds/m the root length did not increase in tolerant varieties whereas that of susceptible varieties decreased significantly. Thus the difference in rate of decrease in root length can be used to separate tolerant and susceptible varieties to salinity at seedling stage in laboratory conditions at salinity levels as high as 12 ds/m.

Both variety and salinity had a significant effect on seedling dry weight. But tolerant and susceptible varieties responded the same to increasing levels of salinity in seedling dry weight. A significant difference in seedling dry weight was visible when the salinity level increased from 0-12ds/m. But both variety x salinity interaction and the interaction component of tolerant vs susceptible x 0 vs 12 salinity were not significant.

No significant difference in number of roots was visible when the salinity level increased from 0 - to 12 ds/m. Significant varietal difference in number of roots was due to the inherent variability between varieties. Salinity x variety interactions was also not significant.

Change in growth of shoot and root length of 10 day old seedlings when the salinity level increased from 0 to 12 ds/m can be effectively used to distinguish between tolerant and susceptible varieties to salinity under laboratory conditions.

Seed germination, change in number of roots and dry weight of seedlings cannot be efficiently used to screen varieties of rice to salinity under laboratory conditions.