

RESEARCH NOTE

Salinity Tolerance of Rice in Relation To Embryo, Endosperm And Seedling Weight

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Salinity (Inland and Coastal) is one of the major constraints to rice production in Sri Lanka. Rice being a glycophyte, lacks salt glands or other excretory structures and is moderately sensitive to salinity stress. The mechanism of salinity tolerance is complex and rice cultivars respond differently to salinity. It is observed that very high intra-varietal variability of tolerance level among rice cultivars exists, which could be attributed to non-genetic reasons for salinity tolerance.

To understand the parameters that contribute individually to salinity tolerance of rice, an experiment was conducted at the Soil and Water Science Division of the International Rice Research Institute (IRRI), Philippines. Salinity tolerance was investigated in relation to the embryo, endosperm and seedling weights of nine rice cultivars, Basmathi (370), Mahsuri, Pokkali (India), IR 28, IR 29, IR 36, IR 72, IR 37255—21—3—3—2 and IR 37260—6—1—1—1—6—1.

Two hundred seeds from each variety were sown at 2cm×2cm spacing on nylon net floats and the seedlings were raised in culture solution in plastic trays. When the seedlings were 14 days old, they were transplanted at the rate of one plant per hill with 8cm×8cm spacing in plastic trays containing soils of 8 dS/m electrical conductivity. The experiment was laid out in a complete randomized block design with 17 replicates. Salinity tolerance was scored according to the standard evaluation system (SES) followed by the International Rice Research Institute, Philippines after 28 days from the date of transplanting (Table 1). Embryo and endosperm weights were recorded on dry weight basis by oven drying 100 separated endosperms and embryos per variety

at 105°C. Dry weight of 100 seedlings (28 days old) raised on nylon net floats in culture solutions was also recorded. The seedling samples were oven-dried at 60°C until constant weight.

Table 2 gives the salinity tolerance mean score, and embryo, endosperm and seedling weights of the nine varieties tested. A significant negative relationship ($r=-0.76$) was obtained between salinity tolerance mean score and endosperm weight of the varieties tested. On the other hand, no significant correlations were observed between the tolerance mean score and embryo weight or seedling weight. Thus salinity tolerance level is positively related to endosperm weight. This could be attributed to the accumulation of more carbohydrate in the seedlings which originated from the seeds having high endosperm weight and thus resulting in a high tolerance level to salinity. The study shows that seedlings originating from seeds which have high endosperm weight tolerate salinity stress better, when compared to those of low endosperm weight. From this it appears that the endosperm weight could be used as a supplementary selection criterion in rice breeding and screening for salinity stress.

Table 1. Standard scale for evaluation of salinity tolerance mean score

<i>Scale</i>	<i>Symptoms</i>
1	Growth and tillering nearly normal
3	Growth nearly normal but there is some reduction in tillering and some leaves discoloured and rolled
5	Growth and tillering reduced ; most leaves rolled ; only a few elongating
7	Growth completely ceases
9	Almost all plants dead or dying

Adapted from standard evaluation system for rice (The International Rice Research Institute, Philippines.)

Table 2. Salinity tolerance mean score, and embryo, endosperm and seedling weights of the nine rice varieties

<i>Cultivar</i>	<i>Mean score*</i>	<i>Embryo weight (mg)**</i>	<i>Endosperm weight (g)**</i>	<i>Seedling weight (g)***</i>
Basmati (370)	5.65 d	0.22	0.0149	0.096
Mahsuri	5.26 cd	0.19	0.0104	0.126
Pokkali (India)	4.14 ab	0.27	0.0218	0.213
IR 28	4.04 ab	0.30	0.0173	0.156
IR 29	4.83 bc	0.23	0.0157	0.153
IR 36	4.36 ab	0.35	0.0169	0.150
IR 72	4.44 ab	0.33	0.0168	0.094
IR 37255—21—3—3—2	3.77 a	0.32	0.0178	0.118
IR 37260—6—1—1—1—6—1	4.52 abc	0.48	0.0169	0.206

* Means of each variety followed by the same letter are not significantly different at the 0.05 level according to the Duncan's multiple range test.

** Average from 100 seeds

*** Average from 100 seedlings