

Grouping of rice (*Oryza sativa* L.) varieties for salinity based tolerance upon Na: K ratio and it's component parts of fresh and dry weight

S.R. PATEL¹, H.S. THAKARE², D.P. NAWALKAR³ and J.D. AWADARIA⁴

National Agriculture Research Project and Soil - Water Management Research Unit
Navsari Agricultural University, Navsari - 396 450 (Gujarat).

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ABSTRACT

The laboratory study was undertaken with a view to know the effect of different levels of water salinity (*i.e.*, rain water, tube well water, EC 2, 4, 6 and 8 dSm⁻¹) on Na:K ratio of different cultivars such as Masuri, Jaya, GR -4, GR -7, NAUR -1, Gurjari, GR -11, GR -104, IR -28, IR -22, Dandi, SLR 51214 in FCRD with three replications at SWMRU, NAU, Navsari during 2009. Fresh weight and dry weight, total fresh weight and Na:K ratio of shoot and root recorded after 12 days of superimpose of the treatments of different levels of water salinity. Significantly the highest value of fresh weight and dry weight of shoot and root recorded with three cultivars *viz.*, NAUR-1, Jaya and Dandi and the lowest with IR-22, IR-28 and GR-7. Total Fresh weight and Na:K ratio recorded significantly the highest with NAUR-1 and Jaya. It was also recorded that the tube well water (EC 0.08 dSm⁻¹) produces significantly the highest values of fresh weight and dry weight, total fresh weight and Na:K ratio of shoot and root of different cultivars followed by EC 2 & 4 dSm⁻¹. Significantly the highest and lowest fresh weight and dry weight, total fresh weight and Na:K ratio of shoot and root was recorded in the treatments of rain water and EC levels of 6 and 8 dSm⁻¹. From this, it can be inferred that, cv. NAUR-1, Jaya, Dandi, Gurjari, Masuri and SLR 51214 were more tolerant to water salinity and having the highest Na: K ratio and fresh and dry weight as compared to remaining cultivars.

Key words : Fresh and dry weight, Na: K ratio, rice and salinity tolerance.

Rice is one of the principle staple food crop of the world. It is grown as a one of the major cereal crop in India as well as in Gujarat state. Rice, a moderately salt-sensitive crop species is generally grown during the reclamation of salt-affected soils because it can grow well under flooded conditions. High Na/K ratios in saline growth medium may impair the selectivity of root membrane and result in passive accumulation of Na in the root and shoot. In addition, a low Na/K ratio is equally important for stomatal movement, photosynthesis and control of undue transpiration. Hence, the laboratory study was undertaken with a view to know the effect of different levels of water salinity.

MATERIALS AND METHODS

To know the effect of different levels of water salinity on fresh weight and dry weight of shoot and root, total

fresh weight and Na:K ratio of shoot and root of twelve different cultivars of Paddy *viz.*, Masuri, Jaya, GR -4, GR -7, NAUR -1, Gurjari, GR -11, GR -104, IR -28, IR -22, Dandi, were evaluated at rain water, tube well water and four artificially created salinity levels *i.e.* EC 2, 4, 6 and 8 dsm⁻¹ during 2009 *kharif* season under laboratory condition in petridishes adopting FCRD in three replication at the Soil - Water Management Research Unit, Navsari Agricultural University, Navsari. The different salinity water level prepared by using sea water in distilled water. Fifty seeds of uniform size were placed on the filter paper in petridishes having 10 cm diameter contained 10 ml of water of either of six concentration of salinity. After 12 days, five seedlings were randomly taken for recording their fresh weight of root and shoot. The samples were dried in an electric oven to a constant weight at 70°C and dry weight was recorded. Na:K ratio recorded in laboratory. The tolerance of different cultivars was assessed by their overall per cent reduction in weight of seedling and Na:K ratio.

¹ Research Scientist, Main Paddy Research Station, ^{2,3 & 4} P.G. Student.

RESULTS AND DISCUSSION

Fresh and dry weight of shoot and root and total fresh weight

2 dsm⁻¹ and 4 dsm⁻¹ salinity level showed no adverse effect on fresh and dry weight of shoot and root, but EC 6 dsm⁻¹ and 8 dsm⁻¹ reduced fresh and dry weight of shoot and root significantly and in rain and tube well water it was increased. The cultivars NAUR-1,

Jaya, Dandi, Gurjari, Masuri and SLR 51214 showed higher fresh and dry weight of shoot and root at rain water, tube well water, 2 and 4 dsm⁻¹ than other cultivars screened.

The same result is observed in case of total fresh weight. As the salinity level increases, there is reduction in total fresh weight. The cultivars NAUR-1, Jaya, Dandi, Gurjari, Masuri and SLR 51214 showed the better total fresh weight than other cultivars. Such

Table 1 Fresh weight of root and shoot and total fresh weight (g), dry weight of root and shoot (g) and Na and K ratio of root and shoot of different rice varieties as influenced by different levels of water quality at 12 days

Treatments	Fresh weight (root)	Fresh weight (shoot)	Total fresh weight	Dry weight (root)	Dry weight (shoot)	Na and K ratio (root)	Na and K ratio (shoot)
Verities							
V ₁ - Masuri	0.80	2.17	3.96	0.012	0.137	9.22	1.79
V ₂ - Jaya	0.80	2.36	4.05	0.018	0.150	9.94	1.92
V ₃ - GR-4	0.66	1.91	3.78	0.062	0.123	8.44	1.52
V ₄ -GR-7	0.59	1.46	3.51	0.056	0.119	6.57	1.38
V ₅ - NAUR -1	1.29	2.84	4.42	0.088	0.170	11.17	2.00
V ₆ - Gurjari	0.72	2.10	3.92	0.071	0.131	8.89	1.78
V ₇ -GR-11	0.65	1.80	3.60	0.06	0.123	8.34	1.44
V ₈ -GR-104	0.62	1.75	3.52	0.051	0.119	7.98	1.40
V ₉ -IR- 28	0.56	1.43	3.23	0.054	0.112	6.63	1.35
V ₁₀ - IR- 28	0.42	1.14	3.01	0.05	0.098	5.99	1.25
V ₁₁ -Dandi	0.90	2.45	4.07	0.081	0.158	10.43	1.95
V ₁₂ - SLR 51214	0.71	2.08	3.86	0.07	0.124	8.88	1.66
S.Em. ±	0.039	0.081	0.041	0.0052	0.0051	0.52	0.06
C.D.at 5 %	0.10	0.23	0.11	0.0160	0.0156	1.47	0.17
Water qualities							
E ₀	0.85	2.26	3.93	0.079	0.145	9.58	2.01
E ₁	0.85	2.01	3.84	0.076	0.141	8.99	1.86
E ₂	0.75	1.94	3.76	0.069	0.133	8.97	1.62
E ₃	0.70	1.92	3.74	0.064	0.132	8.48	1.56
E ₄	0.62	1.82	3.70	0.059	0.128	8.61	1.55
E ₅	0.61	1.80	3.50	0.058	0.101	6.6	1.13
S.Em.±	0.028	0.058	0.029	0.0036	0.0036	0.37	0.04
C.D.at 5 %	0.088	0.16	0.091	0.010	0.011	1.04	0.12
Interaction (V × E)							
S.Em.±	0.10	0.20	0.10	0.013	0.013	1.29	0.15
C.D.at 5 %	0.27	0.56	0.28	0.036	0.038	3.59	0.42
CV %	8.12	7.67	7.96	6.38	5.64	8.46	7.96

GROUPING OF RICE (ORYZA SATIVAL.) VARIETIES FOR SALINITY

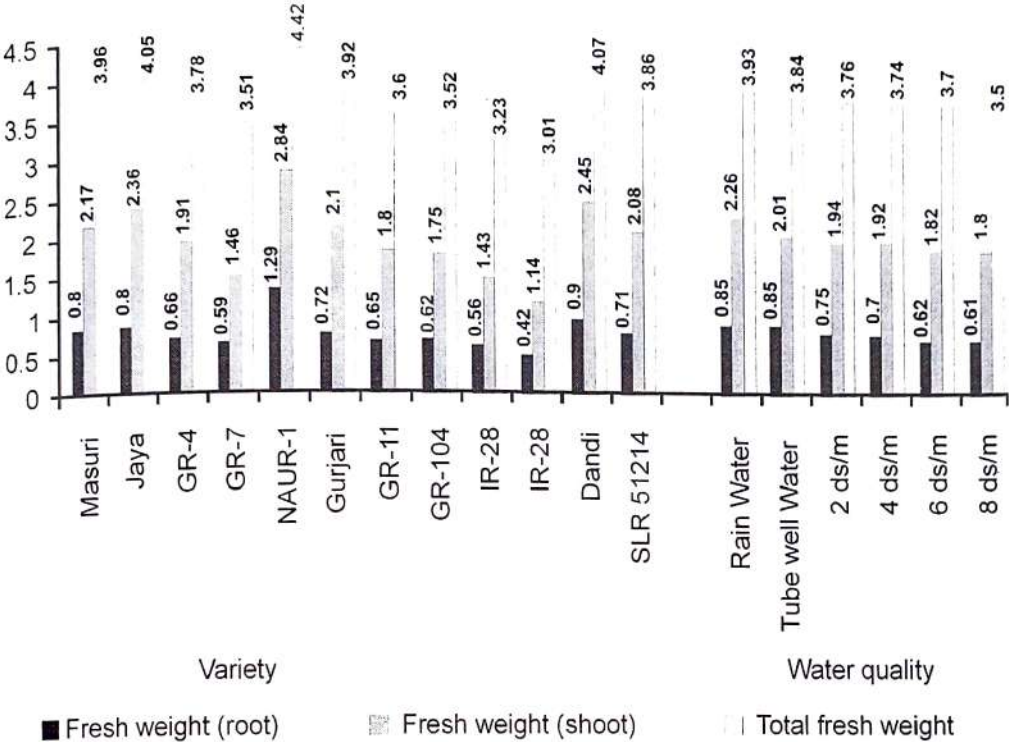


Fig. 1 Fresh weight of root and shoot total fresh weight (g) of different rice vareties as influenced different lelvels of water quality at 12 days.

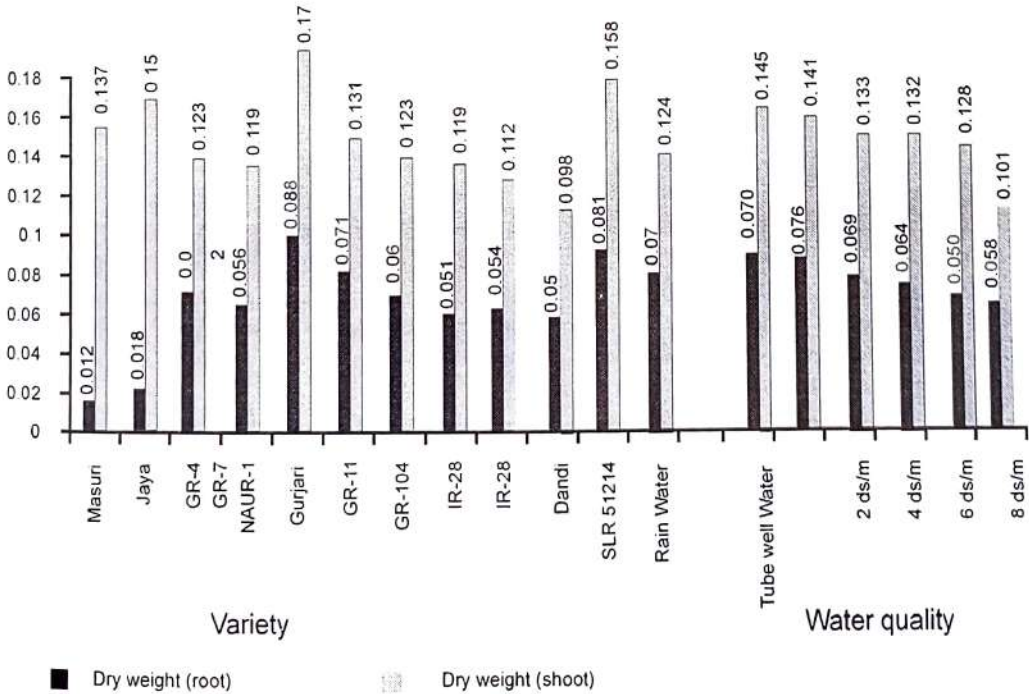


Fig. 2 Dry weight of root and shoot (g) of different rice vareties as influenced by different lelvels of water quality at 12 days.

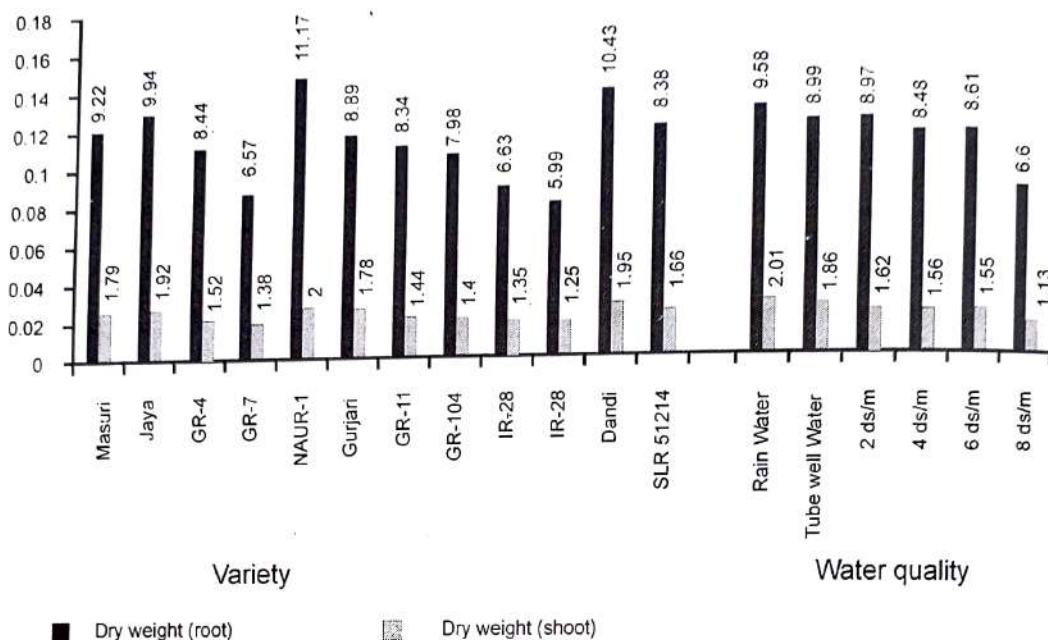


Fig. 3 Na and K ratio of root and shoot of different rice varieties as influenced by different levels of water quality at 12 days.

result are in agreements with those reported by Lallu and Dixit (2001a & 2001b) who observed that salinity decreased the total fresh weight of different mustard cultivars.

The reduction in all (i.e., fresh and dry weight of shoot and root and total fresh weight) occurred at higher salinity level in all cultivars.

Na:K ratio

At higher salinity level there is reduction in Na:K ratio, as the increase in the salinity levels there is decrease in the Na:K ratio. The cultivars NAUR-1, Jaya, Dandi, Gurjari, Masuri and SLR 51214 give the maximum Na:K ratio than the other cultivars i.e. GR-4, GR-104, GR-11, IR-22, IR-28 and GR-7. Such results are in agreements with those reported by Natarajan *et al.*, (2005)

From present investigation it can be inferred that, cv. NAUR-1, Jaya, Dandi, Gurjari, Masuri and SLR 51214 were more tolerant to water salinity and having the highest Na: K ratio and fresh and dry weight as compared to remaining cultivars.

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