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# Effect of Salinity on Variation in Na and K Contents in Wheat Seedlings

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Germination, establishment of the seedlings and derangement in the nutrients' uptake are some of the major problems under salinity. Raj 1114, Sonalika, Raj 1482, KRL-3-4 and Kharchia 65 are reported to be salinity tolerant and HD 2009, Raj 1972 and C 306 are susceptible (Prakash & Sastry 1992). It would be worth while to study th effect of Na on K uptake and also to work out the variability in these varieties of wheat bred in India for the Na and K contents at various salinity levels.

Procedure described earlier (Prakash & Sastry 1992) was followed for the study. For the estimation of Na and K ontents 50 mg of dried seedling material (excluding the roots) was auto dgiested. The Na and K contents wer estimated from the digest using the atomic absorption spectrophotometer (Shimadzu AA 646). The mineral content was recorded as mmoles $g^{-1}$ dry weight of seedlings.

The analysis of variance indicated significant differences among the genotypes and salinity levels for Na and K contents. The mean Na content over the genotypes increased linearly with the salinity (Table 1). The variability (CV) decreased as the salinity increased, similarly the range also decreased indicating a uniform effect of salinity on the genotypes. The Na content increased steeply (Fig 1) in the genotypes classified as less tolerant by Prakash and Sastry (1992) namely Sonalika, HD 2009, Raj 1972 and C 306. In the tolerant genotypes, the increase was less marked particularly with Kharchia 65. Interestingly Raj 1482 which was grouped as tolerant (Prakash & Sastry 1992) had higher Na content in comparison to other genotypes. The correlation between the dry matter

**Table 1** *Statistical parameters of Na and K contents over the genotypes at different salinity levels*

| Parameter | Salinity level (dSm$^{-1}$) | | | |
|---|---|---|---|---|
| | 1.98 | 8.00 | 15.00 | 21.50 |
| **Na** | | | | |
| Mean | 0.20 | 0.46 | 0.62 | 0.72 |
| Range | 0.09−0.25 | 0.27−0.58 | 0.42−0.79 | 0.60−0.82 |
| CV (%) | 24.21 | 21.57 | 20.07 | 10.15 |
| 't' at 5% | – | 6.77 | 8.92 | 16.87 |
| Probability | | <0.001 | <0.001 | <0.001 |
| Correlation* | 0.15 | 0.11 | −0.27 | −0.27 |
| **K** | | | | |
| Mean | 0.72 | 0.87 | 0.80 | 0.81 |
| Range | 0.44−1.31 | 0.54−1.30 | 0.40−1.56 | 0.43−1.38 |
| CV (%) | 24.21 | 21.57 | 20.07 | 10.15 |
| 't' at 5% | – | 6.77 | 8.92 | 16.87 |
| Probability | | 0.2−0.4 | 0.6−0.8 | 0.6−0.8 |
| Correlation | 0.34 | −0.24 | −0.16 | 0.24 |

* The correlation was worked out between the dry weight $100^{-1}$ seedlings and Na/K over the genotypes.

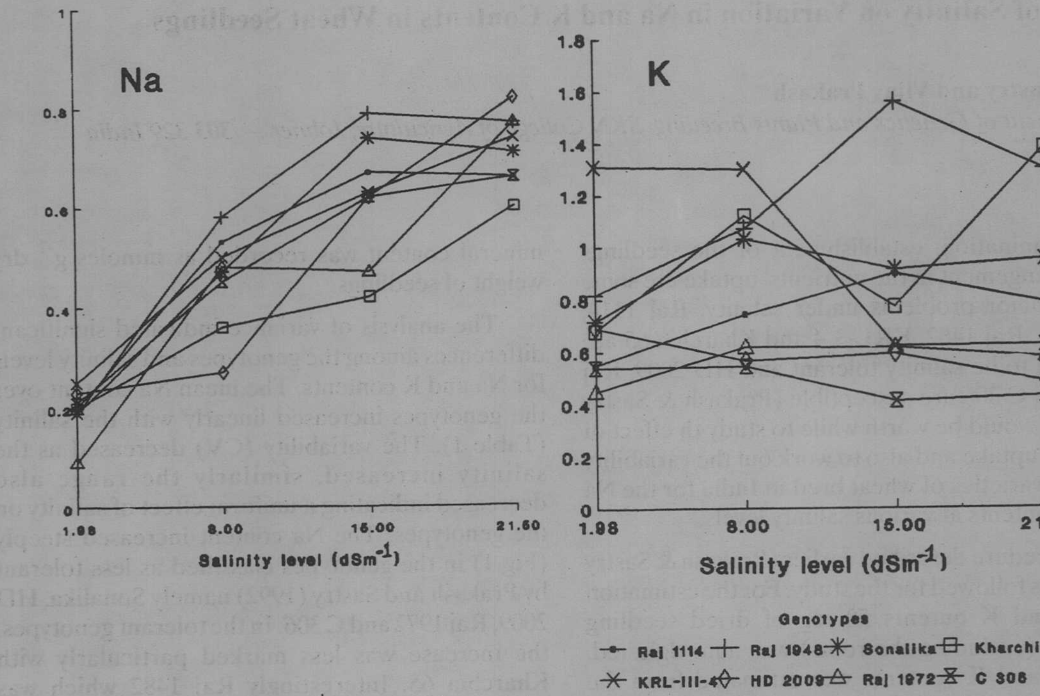


Fig 1 Na and K content (mmoles g$^{-1}$ dry matter) in selected genotypes

and Na content was non significant at different levels of salinity (Table 1), but at higher levels, the correlation was negative which indicates that rapid uptake of Na does effect the growth in terms of dry matter accumulation, probably because of toxic effects.

The mean K values did not exhibit rapid increase with increasing salinity (Table 1). This is evident from the non significant t values. The mean K content was higher at 8.0 dSm$^{-1}$ supporting the stimulatory effect of salinity (Nimbalkar & Joshi 1975). The CV values on the other hand were generally higher and almost similar at all levels of salinity. The correlation between K content and dry weights were non significant indicating independency of both traits while almost all the genotypes exhibited increasing Na over K. Among all the genotypes Raj 1482 had higher levels of K contents followed by Kharchia 65, KRL -3-4 and Sonalika. Raj. 1972 had least accumulation of the K content (Fig 1).

**Table 2** *The Na/K ratio of selected genotypes grown at different levels of salinity*

| Genotype | Salinity level (dSm$^{-1}$) | | | |
|---|---|---|---|---|
| | 1.98 | 8.00 | 15.00 | 21.50 |
| Raj. 1114 | 0.36 | 0.73 | 0.75 | 0.85 |
| Raj 1948 | 0.23 | 0.54 | 0.51 | 0.59 |
| Sonalika | 0.27 | 0.46 | 0.81 | 0.75 |
| Kharchia 65 | 0.29 | 0.32 | 0.55 | 0.43 |
| KRL – III – 4 | 0.19 | 0.38 | 1.02 | 1.19 |
| HD 2009 | 0.37 | 0.48 | 1.05 | 1.17 |
| Raj 1972 | 0.20 | 0.79 | 0.76 | 1.35 |
| C 306 | 0.39 | 0.83 | 1.51 | 1.53 |

The Na/K ratio (Table 2) show a relative decrease in the K content compared to Na content in the genotypes along the salinity gradient as reported earlier by Mass & Poss (1989). This cannot be solely ascribed to the reduced uptake of K. Among the genotypes Kharchia 65 is least susceptible as the ratio was not very high in favour of Na even at 21.5 dSm$^{-1}$ in comparison to control. Least tolerant ones HD 2009, Raj 1972 and C 306 have lower K contents in comparison to the tolerant group of genotypes. But interestingly, KRL-3-4 reported tolerant was found to be susceptible to Na toxicity in terms of K accumulation. This indicates a clear variability in the tolerance in terms of K accumulation at different levels of salinity.

It may be inferred that screening of varieties for their seedling dry and fresh weight at different levels of salinity (Prakash & Sastry 1992) along with Na and K contents may provide ideal means to test salinity tolerance at the seedling stage.

## References

Mass EV & Poss JA 1989 Salt sensitivity of what at various growth stages. *Irrigation Science* **10** 29-40

Nimbalkar JD & Joshi GV 1975 Effect of incresing salinity on germination. Growth and mineral metabolism of sugar cane Var. Co.740. *Journal of Biological Science* **18** 55-63

Prakash V & Sastry EVD 1992 Effect of salinity on germination and seedling growth in wheat. *Annals of Arid Zone* **31** 71-72

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