https://doi.org/10.29321/MAJ.10.A03774

Effect of Salinity on the South Indian field Crops: Germination and Early Vigour of *Ragi (Eleusine coracana Gaertn.)*

by

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Introduction: The effect of salinity on the crop growth varies with the stage of the crops. Even crops tolerant to salinity at the later stages are highly susceptible at the stage of germination. The sensitivity of crops at the early stage results in the uneven stand of crop and poor growth of seedlings. The study of the performance of crop in the early stages under saline conditions will throw light on the future work. Generally, *ragi (Eleusine coracana)* is considered to be resistant crop to salinity. The study of early vigour and germination will provide useful information on the relative performance of the crop in the field. The present investigation is devoted to the study on the response of three varieties of *ragi* to varying levels of salinity.

Review of Literature: Delay in the emergence of seedlings and also reduction in the percentage of germination at higher salinity levels were observed by Ayers and Hayward (1946). Iyengar *et al* (1965) reported inhibition of germination at higher concentration of sea water due to specific ionic effect which superimpose the osmotic effect of sea water dilutions when treated to crop seeds. The salinity effect was found to be varying due to varieties in rice (Ota and Yasue 1958), wheat, maize, cotton (Wahhab 1961) pearl millet and *sorghum* (Abichandani and Bhatt 1965). Balasubramaniam (1965) studied the salt effect on rice varieties and concluded that the total germination of each variety was conditioned by salinity levels and under increased salinization germination decreased progressively. The same observations were recorded with regard to the growth of the seedlings also. Kurian and Iyengar (1966) found that the higher amounts of salts in sea water delayed or inhibited the process of germination in *seasamum* which was attributed to the toxic effect of ions present in the sea water and not to the rate of absorption of the media by the seeds.

Materials and Methods: Seeds of three varieties of *ragi (Eleusine coracana) viz.* Co. 7, Co. 8 and ECW. 840 were selected. Seeds were sown in petridish containing 250 gm. of soil sieved through 2 mm. sieve. The soil

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Received on 18—8—1967.

selected was a red loam with a pH of 7.6 and EC 0.60 m. mhos. per cm. There were four salinity levels besides a control as follows: (1) control (Rain water), (2) 2000 ppm, (3) 4000 ppm, (4) 6000 ppm and (5) 8000 ppm. The saline solutions were prepared artificially with equal amount of sodium chloride and calcium chloride and dissolved in rain water which contains 300 ppm. soluble salt. The cultures were irrigated with the saline solutions according to the treatment. Irrigation was given depending upon the conditions, so as to add the optimum quantity of water. The experiment was conducted under the glass house conditions upto ten days. Seedlings with well developed radicle were selected as germinated seeds. The shoot and root length were measured.

Results and Discussion: The data in Table 1 show the germination percentage of three varieties under saline treatments. It is seen that there is a progressive decrease in the germination due to the increased salt concentration.

TABLE 1.

No.	Treatments / Varieties	Rain water (300 ppm)	2000 ppm.	4000 ppm.	6000 ppm.	8000 ppm.
		T1	T2	T3	T4	T5
1.	*Ragi* Co. 7 (V1)	98·5	95·0	86·0	45·0	26·0
2.	*Ragi* Co. 3 (V2)	91·0	89·0	70·0	27·5	6·5
3.	*Ragi* ECW. 840 (V3)	97·0	84·0	66·0	42·5	14·5

Significant at P = 0.05 for varieties, treatments and interaction.

S. E. = 1·96 C. D. = 5·91

Treatments						*Varieties*			
Co. 7	T1	T2	T3	T4	T5	Rainwater	V1	V3	V2
Co. 8	T1	T2	T3	T4	T5	2000 ppm.	V1	V2	V3
ECW. 840	T1	T2	T3	T4	T5	4000 ppm.	V1	V2	V3
						6000 ppm.	V1	V3	V2
						8000 ppm.	V1	V3	V2

The shoot height and the root length of ten days old seedlings were presented in Tables 2 and 3 respectively.

TABLE 2. *Height of shoot of 10 days old seedlings (cm.)*

No.	Treatment / Varieties	Rain water (control)	2000 ppm.	4000 ppm.	6000 ppm.	8000 ppm.
1.	*Ragi* Co. 7	3·95	3·05	2·78	2·23	1·59
2.	*Ragi* Co. 8	4·02	2·95	2·25	1·99	1·22
3.	*Ragi* ECW. 840	4·55	2·28	1·90	1·94	1·57

Significant (for treatments only)

S. E. = 0·22 C. D = 0·44

Conclusion : T1 T2 $\overline{\text{T3 T4}}$ T5

TABLE 3. *Length of root of 10 days old seedlings (cm.)*

No.	Treatment / Varieties	Rain water (control)	2000 ppm.	4000 ppm.	6000 ppm.	8000 ppm.
1.	*Ragi* Co. 7	14·65	15·20	12·86	9·75	7·45
2.	*Ragi* Co. 8	16·10	17·60	13·85	10·30	6·65
3.	*Ragi* ECW. 840	14·10	13·25	13·20	11·95	7·77

Significant for treatments and interactions.

S. E. = 0·69 C. D = 2·09

Conclusions : Co. 7 $\overline{\text{T2 T1}}$ T3 T4 T5

Co. 8 $\overline{\text{T2 T1}}$ T3 T4 T5

ECW. 840 $\overline{\text{T1 T2 T3}}$ T4 T5

It is seen that the root length and shoot height were significantly affected by salt effect. The height of shoot of young seedlings were decreasing due to increased salinity.

The E. C. of the substrate increased with increased salt levels which in turn affected the germination and vigour of the seedlings. There is not much difference in the pH due to salinity treatments.

The germination of three varieties of *ragi* thus indicates that all of them were sensitive to salinity. Every treatment was found to have influenced the germination except in the variety Co. 8 where the treatment receiving rain water and 2000 ppm. were on a par. It is also seen that up

to 4000 ppm. the germination was not much affected due to salinity as the germination percentage is 87.3, 76.9, 68.0 per cent for varieties Co. 7, Co. 8 and ECW. 840 respectively. With regard to varietal response to salinity, variety Co. 7 recorded higher percentage of germination followed by variety ECW. 840 and Co. 8. Though the variety Co. 8 has registered increased germination percentage in treatments 2000 ppm. and 4000 ppm. it is on a par with variety ECW. 840. The shoot height and root length of all varieties were affected due to increased salt concentration. The difference due to variety was not significant for shoot and root length. The root length was slightly higher in the treatments 2000 ppm. than control in two varieties *viz.* Co. 7 and Co. 8. However, the difference was not significant. The root length in the variety ECW. 840 was not affected up to 4000 ppm. The detrimental effects of salinity on germination, root development and shoot growth were attributed to the osmotic concentration of the soil solution and ionic effect of the salts in the substrate.

The present findings fall in line with Bernstein (1962) (quoted by Kurian and Iyengar, 1966) who has reported that varieties of many crops were found to be affected in germination and plant growth. Ayers and Hayward (1948) also observed reduction in the percentage of germination at the higher salinity levels. Balasubramaniam (1965) found that even the resistant strains of paddy were affected by salinity. Abichandani and Bhatt (1965) also reported similar results for pearl millet and *sorghum*.

Summary : A study on the effect of salinity on germination and early vigour was undertaken with three varieties of *ragi viz.* Co. 7, Co. 8, and ECW 840. The data on germination, shoot height and root length indicated that all the three varieties were susceptible to salinity in the early stage. The germination was sharply decreasing in the treatments receiving 6000 ppm. and above. Among the three varieties Co. 7 was found to be better in tolerance for salinity in the early stage. It is concluded that the germination and early vigour were much affected by salinity in three varieties of *ragi*. The germination was satisfactory upto a salt concentration of 4000 ppm. The variety Co. 7 is comparatively better in germination and early vigour than the other two varieties.

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A Note on the Methodological Considerations in Fitting the Cobb-Douglas Function to Data from Samples of Sugarcane Farms of Queensland-Australia

by

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Introduction: The production function approach to farm management problems is undoubtedly a significant step in the direction of greater application of economic theory and statistical methods, to the problems of individual farms and groups of farms, and therefore can be considered a refinement over the traditional methods. A survey of literature, however, reveals the inadequacy of work on production functions, both in India and elsewhere. This may be due to the fact that the origin and development of this approach is more recent, or because of some of the important limitations involved in such studies, particularly those concerning farm surveys. Within the approach again, there seems to be the belief that while biological

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Received on 3—8—1967.