Evaluation of Sorghum (Sorghum bicolor L.) varieties for their tolerance to sodicity level for sustained productivity in salt affected soils

P.Balasubramaniam,[1] A. Alagesan,[1] P. Masilamani [1] and MJ Kaledhonkar [2]

[1][Anbil Dharmalingam Agricultural College and Research Institute, Tamil Nadu Agricultural University, Tiruchirappalli – 620 027, India]

[2][ICAR-Central Soil Salinity Research Institute, Karnal -132001 , Haryana, India]

*Corresponding and presenting author Email: balutnau@gmail.com

INTRODUCTION

- More than 1100 M ha of soils are affected by salinity and sodicity of which about 60 are saline, 26 % sodic and 14 % are saline sodic (FAO 2008)[1].
- Utilizing the uncultivable barren land due to sodicity, by identifying the crops and varieties suitable for sodic soil condition to enhance the livelihood security of rural poor people living in the salt affected land is need of the day.
- Accordingly, a field experiment was initiated at Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirappalli under ICAR-AICRP on Management of Salt Affected Soils and use of saline water in Agriculture.
- The experiment is permanent and several crops and varieties were evaluated for the benefit of farming community.
- Presently, Sorghum (Sorghum bicolor L.) cultivars were evaluated for the tolerance levels of sodicity based on the Exchangeable Sodium Percentage (ESP) of 8,16,24,32,40 and 48 per cent.

METHODOLOGY

- In existing experimental field, based on the ESP existed in the different main plots, the sodium bicarbonate was applied to main plots and mixed thoroughly with the soil to create different gradient ESP levels *viz.,* 8, 16, 24, 32, 40 and 48 were artificially.
- Further, the ESP 8 and 16 were created through application of gypsum and leaching with good quality water.
- The experimental plot was thoroughly ploughed individually to bring optimum soil tilt and the ridges and furrows were formed and seeds of sorghum varieties *viz.,* K 12, Co 30, Local –Red and Local – Irungu (Black) were sown in the strip plot with a spacing of 45x15 cm.
- Uniformly 90:45:45 kg N,P_2O_5 and K_2O per hectare were applied basally to all the plots (50% of N at basal and remaining 50% at 30 DAS).
- The Atrazine herbicide has also been applied in order to control the weeds.

REFERENCES

1. F.A.O., (2008) Harmonized world soil data base (Version 1) FAO, Rome , Italy and IIASA, Luxemburg, Austria.

RESULTS

- The results during 2019 revealed that the interaction of ESP and Cultivars, the highest grain yield of 1433.7 kg per ha was recorded by Co 30 at 8 ESP level (Table 1).
- The lowest grain yield of 26.3 kg per ha recorded by Irungu local at 48 ESP level. However, 50 per cent grain yield was recorded in the cultivars *viz.,* Co 30, Red local and Irungu local at the ESP of 32 per cent whereas in the cultivar K12 recorded 50 per cent yield at 24 ESP level.
- Similarly, during 2020 the results revealed that the interaction of ESP and Cultivars, the highest grain yield of 1340 kg per ha was recorded by Co 30 at 8 ESP level (Fig.1)
- The lowest grain yield of 22 kg per ha recorded by Irungu local at 48 ESP level.
- However, 50 per cent grain yield was recorded in the cultivars viz., Co 30, Red local and Irungu local at the ESP of 32 per cent whereas in the cultivar K12 recorded 50 per cent yield at 24 ESP level.
- The results of haulm yield revealed that the 50 per cent haulm yield was recorded in the cultivars *viz.,* Red local and K12 at the ESP of 32 per cent whereas, Co 30 and Irungu local recorded 50 per cent yield at 48 and 40 ESP level respectively.

Table 1. Effect of graded levels of Exchangeable Sodium Percent (ESP) on Grain yield (Kg/ha) of sorghum cultivars (2019)

ESP level/varieties	S1 – K12	S2 – Co 30	S3 – Red local	S4 – Irungu local	Mean
M1 – 8	1024.7	1433.7	625.3	459.3	885.8
M2 – 16	827.0	1162.0	593.0	331.7	728.4
M3 – 24	660.3	944.7	419.3	242.7	566.8
M4 – 32	392.3	855.3	360.0	235.3	460.7
M5 – 40	102.7	201.0	140.7	87.7	133.0
M6 – 48	55.7	166.3	54.0	26.3	75.6
Mean	510.4	793.8	365.4	230.5	
	SED		CD(0.05)		
M	11.72		26.11		
S	11.72		23.77		
M at S	27.49		56.75		
S at M	28.71		58.23		

CONCLUSIONS

It is concluded that the sorghum cultivars Co 30, Red local and Irungu local could be recommended to the farmers for growing in the sodic soil having the ESP up to 32 per cent whereas the cultivar K12 can be recommended to the sodic soil having the ESP level up to 24 per cent for grain production.

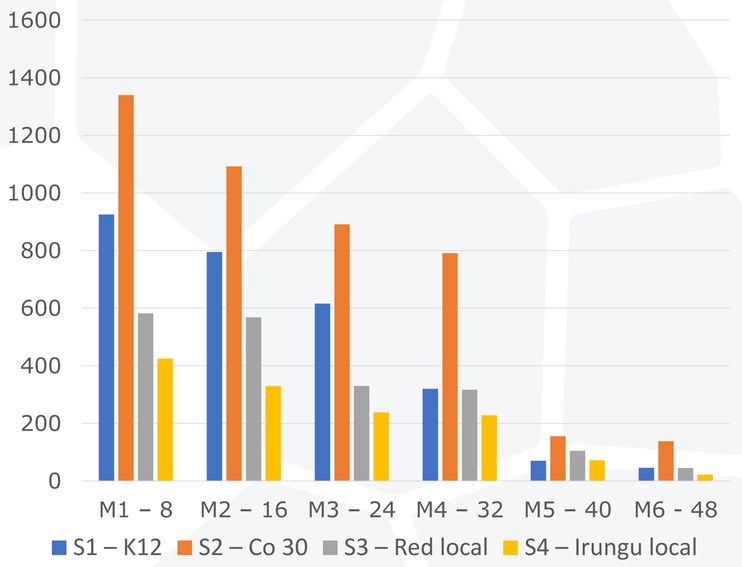

Fig 1. Effect of graded levels of Exchangeable Sodium Percent (ESP) on Grain yield (Kg/ha) of sorghum cultivars (2020)

Fig 2. Field view of sorghum varieties under different ESP levels

Fig 3. Ear head of sorghum varieties under different ESP levels

ACKNOWLEDGEMENTS

The authors acknowledge the Tamil Nadu Agricultural University and Indian Council of Agricultural Research – Central Soil Salinity Research Institute, Karnal, Haryana, India for the Technical and Financial and Administrative support.