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PERFORMANCE OF SAFFLOWER GENOTYPES UNDER VARYING SALINITY LEVELS

Safflower (*Carthamus tinctorius* L.)is one of the most important oil seeds in India. It is grown largely as a rabi crop in dry zones. Safflower cultivation under irrigated conditions should be encouraged to increase the productivity of the crop and to meet the increasing demand for oil. Due to scarcity of surface and good quality water for irrigation in arid and semi-arid zones, the underground water which is most often saline has become the major source of irrigation. There is a tremendous pressure on the utilization of land/water resources to the best advantage of mankind including saline soil and water. The salinity in arid and semi-arid regions has been an important factor in reducing the crop yields (Srivastava and Singh, 1984). To utilize these resources, there is an urgent need to identify certain crop species that are adaptable to such adverse saline situations.

There are many suggested alternatives to solve this increasing salinity problem. One of them is to search for a better germplasm with a high relative salt tolerance (Shannon,1984). Identification of genetically potential salt tolerant germplasm requires a suitable, quick and accurate method of screening and correct evaluation of its salt tolerance under field conditions. Thus, the performance of safflower genotypes under salinity needs to be evaluated. The present investigation is planned in this direction.

A field experiment was conducted during rabi season of 1984, 1985 and 1986 on a medium black clay soil (52 per cent clay) having pH of 8.4; ECe 2.3 dS/m, organic carbon 0.68 per cent and $CaCO_3$ content of 3.0 per cent. The treatments consisted of four salinity levels (1,2,4 and 6 dS/m) in irrigation water and were allotted to main plots and genotypes (G-1254, A-1, S-144, 9-51, K6 (195), B3-16-57, 19-185 and C-83) to sub-plots in a split-plot design. The treatments were replicated thrice. Single row (3 m length) of each genotype was sown with a spacing of 60 *x* 30 cm. Each plot in the field was separated by polythene sheet inserted to 1 m deep. Saline water was prepared artificially using commmercial salts viz., NaCl, $MgSO_4$, $CaCl_2$ and $NaHCO_3$ keeping a ratio of 4:1.7:1 forNa, Mg and Ca and 2:1:1 for Cl, SO_4 and HCO_3 which is the composition of local water. The saline water of respective salinity was applied seven times during the period of crop growth. Soil salinity of 0-30 cm depth was monitored in each salinity block and genotype at sowing, flowering and harvest. Using these values, the time weighted mean salinity was calculated for each block and related to respective yield using the piece-wise linear response function as described by Van Genuchten (1983) to compute the parameters such as yield maxima (Ym), threshold salinity (ECt), slope (S) and expected yield at different salinities with a view to evolve safflower genotypes for salt tolerance.

The behaviour of the genotypes under saline water irrigation was marked and the genotypes tested fell into three distinctive groups. The first group of genotypes included 9-51, C-83, A-l and

Table 1. Mean yield(Ym), threshold salinity (ECt), rate of yield reduction with a unit increase in salinity (S) and the expected yield of safflower genotypes at different salinity levels (yield expressed in g per 3 m row length)

Genotype	Ym	ECt	Slope&	Expected yield at different ECe, dS/m		
				2	4	6
G-1254	209.3	1.47	0.094	198.87	159.52	120.17
A-1	209.5	1.76	0.107	204.12	159.28	114.45
S-144	190.4	1.78	0.140	184.53	131.22	77.91
9-51	214.9	1.53	0.116	203.18	153.32	103.47
K6(195)	195.1	1.58	0.109	186.16	143.63	101.10
B3-16-57	153.0	1.59	0.105	146.54	114.41	70.71.
19-185	192.5	2.11	0.084	-	161.93	129.59
C-83	213.6	1.68	0.107	206.28	160.57	114.86

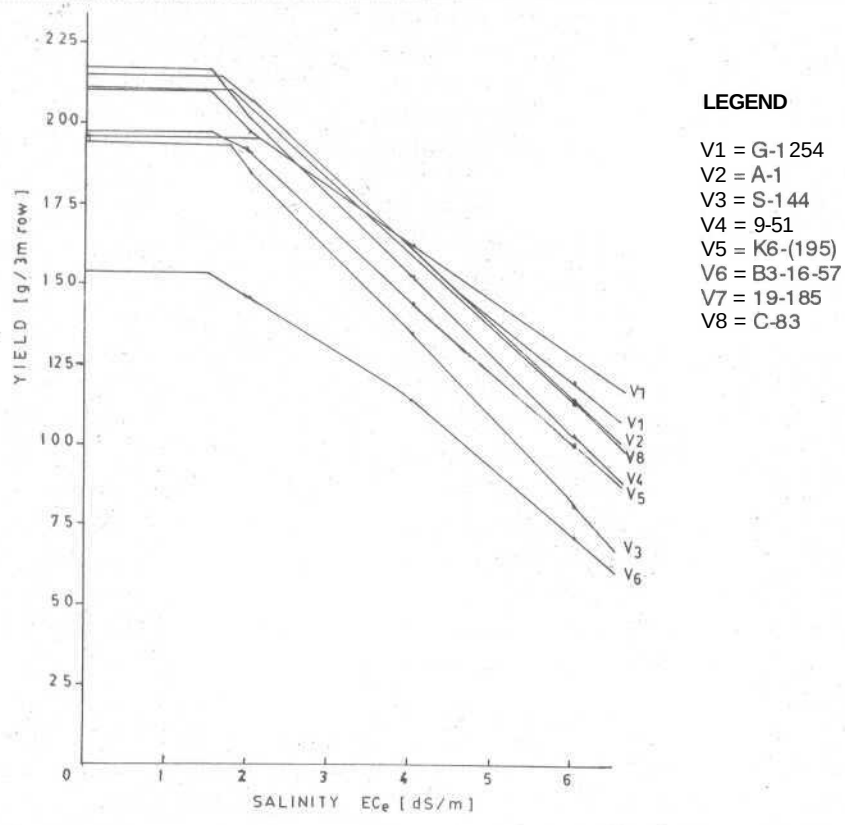

Fig. 1. Performance of safflower genotypes under saline water irrigation

G-1254 and recorded highest yield maxima without significant variations in their threshold salinity values. The second group of genotypes consisted of K6 (195), 19-185 and S-144 with moderate yield maxima and threshold salinities remaining on par with other genotypes except 19-185 which recorded a perceptibly higher threshold value. The genotype B3-16-57 was the only member of the third group recording the lowest yield maxima. These groupings were made when the salinity of irrigation water was marginal i.e., less than 2 dS/m.

When the salinity of irrigation was increased beyond 2 dS/m, the yield of all the genotypes was drastically affected as indicated by the higher values of slope and the lower values of expected yields at different salinities (Table 1 and Fig.1). The increased salinity of irrigation water brought in the differential behaviour of genotypes and the earlier order of performance of the genotypes was affected. The changes in the order of performance of these genotypes was more discernible when the irrigation water salinity rose beyond 6 dS/m (Fig. 1) and at this level of salinity 19-185 (129.6 g/3m row length) became the number one promising genotype followed by G-1254 (120.2 g/3m row length). Whereas, in the milder saline environment, the genotypes C-83, A-1 and 9-51 were found to be promising with higher yield potential.

From the foregoing results it is clearly evident that the genotypes 19-185 and G-1254 were quite adoptable to irrigation water of 4 to 6 dS/m salinity level. In spite of the reduction in yield, these two genotypes were found to be promising. The genotypes S-144 and B3-16-57 were found unsuitable when the salinity of irrigation water was higher and unfit for cultivation under saline water irrigation.

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