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FREE PROLINE ACCUMULATION AND REDUCTION IN RWC UNDER MOISTURE STRESS IN GENOTYPES OF SAFFLOWER

Screening of varieties for relative drought tolerance is of practical significance in that it helps in recommending the variety directly for cultivation under rainfed conditions. Several laboratory tests have been developed and used. A few studies show a correlation between performance in laboratory tests and actual field trial. Accumulation of free proline in leaves appears to be an adaptive mechanism for drought tolerance. A relationship between proline accumulation under stress and yield stability index has been shown in barley genotypes (Singh *et al.*[1], 1972). Such a relationship has been established (Mehkri *et al.*[2], 1976) in groundnut genotypes also. Decrease in relative water content (RWC) in the leaf under a given stress is another parameter (Barrs[3], 1968). Using these two parameters, differences in safflower genotypes were studied as a measure of drought tolerance.

Six genotypes of safflower SF–11, 143–20, S–2, C–438, A–1 and 16–4–P_2–2 were grown in a single pot (18 × 12 × 12″ size). One month old seedlings were subjected to stress by withholding water for 5 days. Determinations of proline and RWC were done on 4th and 5th day after withholding water and continued up to three days after rewatering. Rewatering was done after 5th day. Since the genotypes were raised in the same pot and subjected to stress, the attributes on proline accumulation and RWC are directly comparable between genotypes.

Free proline in the leaves was determined using the method of Bates *et al.*[4] (1973), and RWC by the method of Barrs and Weatherly[5] (1976).

The data in Table 1 indicated that free proline increased in the leaves of all genotypes under stress. But the magnitude of the increase differed among genotypes. The variety 143–20 showed a 35·9 fold increase in proline over the control followed by the variety S–2. The varieties A–1 and 16–4–P_2–2 showed relatively lesser increase in proline under stress. However, the absolute amounts of proline when compared among varieties indicated that SF–11 had the highest under peak stress followed by 143–20. Varieties A-1 and 16–4–P_2–2 were still low in the absolute amount also. On rewatering the decrease in proline was faster in SF–11 and 143–20 compared to other varietie- (Fig. 1). This aspect could be a measure of the resumps tion of the metabolic activity following rewatering Under conditions of intermittent moisture stress this point is of importance. Differences amongst genotypes in free proline accumulation have been noticed by other workers also in sorghum (Sinha and Rajagopal[6], 1975).

The data on the reduction of RWC under stress bears a significant relationship with the ability to accumulate proline. The varieties 143–20 and S–2 which showed

Table I

Variety	Proline: Control	Proline: Stress 120 hr after	Proline: No. of times increase over Control	RWC: Control	RWC: Stress 120 hr after	RWC: % reduction on stress
SF–11	102	2620	25·7	86·5	42·7	50·6
143–20	68	2445	35·9	84·3	45·8	45·6
S–2	70	2260	32·0	85·0	43·1	49·3
C–438	82	2015	24·5	90·2	41·4	54·1
A–1	81	1645	20·3	87·4	42·0	51·9
16–4–P_2–2	58	1307	22·5	88·0	42·7	51·5

Free proline (g/gm fresh wt.) and RWC in genotypes of safflower 120 hours after withholding water. All the genotypes were raised in the same pot. Control values represent data collected before withholding water.

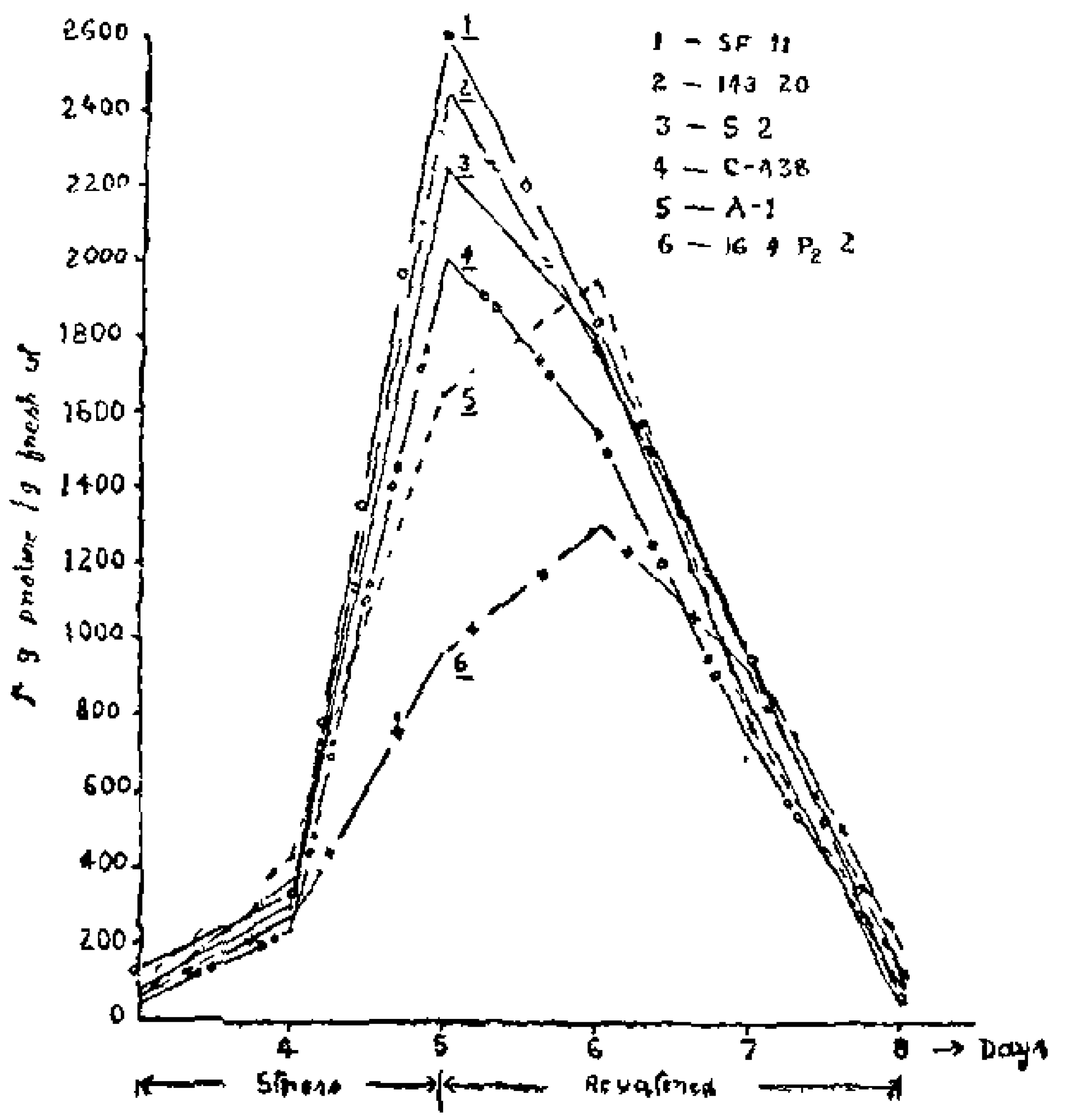

FIG. 1

a high magnitude of proline accumulation under stress also showed less reduction in RWC. This relationship in other varieties was not consistent. The main attribute for better drought tolerance of sorghum compared to maize is its higher RWC (Sanchez Diaz and Kramer[7], 1971). In this group of varieties tested, genotypes 143-20 and S-2 are relatively more tolerant to moisture stress than the other genotypes.

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INFLUENCE OF RADISH MOSAIC VIRUS INFECTION ON ASCORBIC ACID CONTENT OF RADISH (*RAPHANUS SATIVUS* L.)

DURING the survey of virus diseases of crop plants in Gorakhpur, radish plants were found severely infected with radish mosaic virus, identified in this laboratory. The present investigation was under taken to study the effect of radish mosaic virus infection on ascorbic acid content of leaves and roots of radish.

Radish was grown in pots filled with sterilized soil and kept in insect-proof glass-house. One lot of 25 plants was inoculated with the virus and the other lot of 25 plants served as control. Observations were made at 0, 10, 20, 30 and 40 days after inoculation. The ascorbic acid content was determined by the method of Ghosh *et al.*[1]. Results are given in Table I. Data are based on the average of three replications. *All the results are significant at 5% level.*

TABLE I

Ascorbic acid content (mg/g fresh wt.) of radish leaves and roots infected with radish mosaic virus

Days after inoculation	Leaf		Root	
	Healthy	Diseased	Healthy	Diseased
0	0·25	0·25	0·05	0·05
10	0·30	0·27	0·07	0·065
20	0·42	0·36	0·10	0·09
30	0·60	0·46	0·12	0·10
40	0·82	0·65	0·17	0·15

It is evident from the data given in Table I, that both in healthy and diseased leaves and root samples the ascorbic acid content gradually increases with the age of plant but in the diseased samples it is always less than the healthy counterparts. The maximum decrease in leaves is 23% and in roots it is 16·6% at 30 days after inoculation.

The decrease in ascorbic acid contents due to virus infection has also been reported by Moycho and Niemyski[2]. Diener[3] observed increased respiratory rate in virus infected plants. It is possible that due to high rate of respiration in diseased leaves and roots, the ascorbic acid is oxidised at a higher rate which caused decrease in the ascorbic acid at 10, 20, 30 and 40 days after inoculation. After 30 days of inoculation the symptoms on the plant were most severe and pronounced with maximum concentration of virus, thus there was a maximum decrease. Similar results have also been observed by Joyshi *et al.*[4] in cape gooseberry fruits (ripe and unripe) infected with cucumber mosaic virus.