VI Summary And Conclusions

SUMMARY AND CONCLUSION

A. Method of approach :

There is no need to emphasize here, that sugarcane as it is known today is considered to be a most susceptible crop for salinity. With the advent of irrigation facilities, the problem of salinity has croped up in the upland region of arable fields, which is wide under sugarcane cultivation. In Maharashtra the problem is mainly confined to the areas under sugarcane cultivation, where the soil is black and poor drained. Since, the sugarcane is the nucleus of industrial development of the region, over which, the life of almost entire farmering communities rest, it must be seriously dealt with. It has become a burning problem of the region. It is a pressing demand, therefore, to screen and breed variety which, if not wholey but partly, tolerent to the salt. The effect in this direction has been going on only by the breeders. However, it becomes a duty of plant physiologist to examine the varieties for its salt tolerance and provide a guideline to the breeder, so that he is able to incarporate the genes for salt tolerance in the newly breed varieties and thereby his effort will be more fruitful. In the present investigation therefore an humble effort has been made to unrevel the ability of some newly produced mutunts of Co 419, TS 1, TS 8 alongwith original stock Co 419 to withstand salinity in the physiological sense.

The entire work is presented in four chapters, 1) Growth, 2) Inorganic nutrition, 3) Organic nutrition; Carbohydrate and nitrogen metabolism and 4) Enzymes; Nitrate reductase, sucrose synthetase, sucrose-P-synthetase and invertase.

Chapter-I : GROWTH -

In this chapter effect of increasing concentration of salinity 2.5, 5, 7.5 and 10 ECe,on the growth of these varieties studied is discussed. To study the effect, the seeds of these varieties in the form of setts were obtained from Regional Sugarcane and Jaggary Research Station, Kolhapur and grown in pots prepared by mixture of river-bed soil and farm yard mannure. 5 buds in each of the pots were planted. Salinity treatment as per the method of USDA (Mixture of equimolar NaCl and $CaCl_2$) was given 6 weeks after seedling emergence. The concentration of salinity was increased gradualy. For such treatment 5 replication were maintained. The treatment were given for a period of one month. To see the response of these varieties with respect to growth height of the cane were measured periodicaly for a period of three months starting from 1st month. The results are graphicaly presented and discussed under the light of available literature.

Chapter-II : INORGANIC NUTRITION -

In this chapter the mineral budget of the NaCl treated sugarcane cultivares, based on the analytical data have been discussed.

Minerals such as Na^{+}, K^{+}, Ca^{++}, Mg^{++}, Mn^{++}, Cu^{++} , Fe^{++}, Zn^{++} and B^{+++} and phosphorus was estimated from the leaves. After the treatment setin, third leaf from the top for analysis, and was chosen randomly from each of the treatment pot. The leaf samples were washed thoroughly, blotted dry, cut into pieces, and part of it was set aside for organic constituents and 10 gm sample was dried in an oven at 90°C. After the constant weight was attained, the known amount of dried sample was acid digerted. The aliquot was filtered and taken for analysis. Na^{+}, K^{+}, Ca^{2+}, were estimated flame photometrically where as Mg^{++} and P were estimated colorometrically. Micro elements Fe^{+++}, Cu^{++} , Mn^{++}, Zn^{++}, B^{+++}, were estimated by stomic absorption spectro photometer. The results are graphically presented and the values for the varieties were compaired and discussed under the light of available literature.

Chapter-III : ORGANIC NUTRITION - (Carbohydrates and Nitrogen)

To determine the carbohydrate content the leaf sample was crushed in 80% ethanol and filtered, the filtrate was

condensed. Condensed sample was decolorised with lead acetate and potassium oxalate. The volume was made. The known quantity of filtrate was sampled out and was hydrolysed with 1 N HCl in an autoclave in order to reduce all the non-reducing sugars to reducing one. Alongwith it the residue of filtrate was also hydrolysed to convert insoluble carbohydrates to soluble and reducing one. It was then nutralized with Na_2CO_3 and filtered. All the sugars were estimated calorometrically by the method of Nelson (1944).

In order to estimate Nitrogen 100 mg leaf sample was digested with a microsalt H_2SO_4 in a Kjeldahl flask in a routine way and nitrogen was estimated calorometrically by the method of Howk et al., (1948). The results are presented graphically and discussed under the light of available literature.

Chapter-IV : ENZYME -

Since, Nitrate reductase and enzymes of sucrose metabolism such as sucrose synthetase, sucrose-P-synthetase and invertase are very important. They have been estimated from the leaf after the treatment was effective. Nitrate reductase was assayed and the activities determined by the method of Hunter et al., (1982). Sucrose synthetase, Sucrose-P-synthetase were assayed and their activities measured by the methods of

Fussel (1969). While invertase was assayed and its activity estimated by that of Somogyi Nelson (1944) method.

B. Conclusion :

1. Among the three varieties in Co 419 rate of growth is linear with the time which is followed by Ts 8, while Ts 1 has steady increased in growth rate.

2. The growth rate is severely reduced in Ts 8 and Co 419 when subjected to salinity in the order of magnitude, whereas Ts 1 exhibit no greater perturbation in the growth rate even at high salinity of 10 ECe, exhibiting inherent ability to with stand salinity.

3. The initial level of Na^+ in Ts 1 itself is very high. In Co 419 and Ts 8 when the bathing salinity concentration crosses 7.5 ECe the Na^+ level of the leaf steeply increases where as in Ts 1 relatively lowest maximum of 0.25% is reached at 10 ECe. It is concluded therefore, that the latter variety has an ability to regulate the entry of Na^+.

4. In Ts 1 the level of K^+ increased at the initial concentration of salinity of 2.5 ECe and decreased when the beathing concentration of salinity increased to 5 ECe, while converse is the trend exhibited by Ts 8.

5. K^+/Na^+ ratio studied in all three varieties exhibited increased tendency in Ts 1, upto 2.5 ECe as the salinity increased the ratio of these two cations steadly decreased. However, the ratio of these two cations still fall to greater depth in the other two.

6. The salinity does not appeared to affect Ca^{2+} absorption in Ts 1, on the contrary there is an appreciation in all the varieties at 2.5 ECe.

7. No greater difference between the level of Na^+ and Ca^{2+} could be seen upto 7.5 ECe and hence Na^+/Ca^{2+} ratio remained unchainged in all the three varieties.

8. At 10 ECe marked difference in Na^+/Ca^{2+} ratio of the three varieties that could be seen is mainly due to increased level of Na^+, rather than change in the levels of Ca^{2+}. Since the Na^+ level at this concentration is lowest in Ts 1 among the three varieties Na^+/Ca^{2+} ratio is minimum here which marks the ability of this variety to withstand salinity.

9. Ts 8 and Co 419 exhibit parallel tendency of Mg^{2+} uptake upto 7.5 ECe, where as in Ts 1, salinity appeared to stimulate uptake of Mg^{2+}.

10. In Ts 1 there is fluctuation in the level of Mg^{2+} at different salinity concentrations. However, there is

no decrease in the level even at 10 ECe exhibiting that salinity did not affect the Mg^{2+} absorption in any of the three varieties.

11. These three varieties differed in their response to phosphorus uptake under salinity conditions. Phosphorus uptake increased with salinity in Ts 1 and Ts 8 parallely. This increase is very high in Co 419.

12. Phosphorus uptake in Ts 1 appeared to be affected severely by salinity, while Co 419 exhibited parallel increase in phosphorus salinity. This nature of Ts 1 is considered to be undesirable.

13. Fe^{3+} absorption has decreased with increasing salinity in all the three varieties. Nonetheless it has not caused deficiency due to salinity.

14. Mn^{+} uptake is reduced in Ts 1 and Ts 8 while it is appreciated in Co 419. However, no deficiency symptoms could be seen in any of the variety.

15. The level of Zn^{2+} in Ts 1 and Co 419 has increased with salinity which is not consistant within Ts 8.

16. Similar to Zn^{2+} and Mn^{2+} even Cu^{2+} uptake has increased in Ts 8 and Co 419.

17. Salinity does not appear to restrict the B^{3+} absorption in any of the varieties taken for investigation.

18. There is a steady increase in the level of reducing sugar with a concomitant decrease in starch, when subjected to increased concentration of salinity in the varieties taken for investigation.

19. Lack of reduced carbohydrate metabolism even under increasing concentration upto 10 ECe in all the three varieties reflect on their ability to withstand salinity.

20. Three varieties exhibited progressive increase in the nitrogen level of the leaves with increasing salinity. This is attributed to stimulatory effect of salinity.

21. The increased nitrogen level is mainly attributable to the increased nitrate reductase activity which is double in Ts-1, $9\frac{1}{2}$ times in Ts-8 and four times in Co 419. However, the three varieties can be arranged in order of magnitude of initial NR activity at Ts 8 > Ts 1 > Co 419.

22. Response of the three varieties to increasing concentration of salinity with respect of Sucrose-P-synthetase is more or less parallel with decreasing trend up to 7.5 ECe and sudden increase at 7.5 ECe and onwards.

23. The tendency of Sucrose-synthetase activity in response to salinity appears to be same in all the three varieties as that of sucrose-P-synthetase.

24. Ts-1 and Co 419 exhibited a parallel tendency of increase in the activity of invertase upto 2.5 ECe whereas Ts-8 showed gradual fall in the activity when exposed to salinity. In breef salinity seems to affect enzymes of Sucrose-metabolism.