SUMMARY AND CONCLUSION

The concept of water conservation in lakes employing water evaporation retardant chemicals has gained prominence in the past few years. Similarly recent reviews have detailed the potential for use of antitranspirants to enhance the yield of agronomic crops exposed to water stress during growth (Fenton et al. 1982, Nickell 1982). Curtis (1926) concluded that transpiration is usually an unavoidable evil, unavoidable because of structure of leaves and evil because it often results in water deficit and injury by desiccation. Thus, very low efficiency in water utilization by green plants offers tremendous challange for research on methods of decreasing water loss from vegetation. The reduction in transpiration rate with slight or without reduction in photosynthesis of the plants is sought by many research workers with the spray of different antitranspirants (Shimshi 1963a, 1963b, Gale et al. 1966, Davenport 1967, Abou-Khaled et al. 1970, Patil and De 1976a, Mungse and Bhapkar 1979). Solarova et al.(1982) and Kramer (1983) also have concluded that antitranspirants have only limited practical usefulness.

In Maharashtra, since summer is dry and hotter, the crop needs water more frequently. However, adequate water for frequent irrigation during summer is not available and irrigations are therefore, usually given at comparatively longer intervals. In canal irrigated

areas, the frequency of irrigation entirely depends upon the availability of water in the storage during summer rather than crop needs. The well water which is also limited during summer. Water stress caused due to unpredictable rains has become an endemic problem in India more so particularly in Maharashtra. Under such situation it is very difficult for farmers to save the crop. This necessitates a thorough investigation as to how to save the crop from moisture stress and to tide over the summer situation.

In the recent years several water evaporation retardant chemicals which can be used as antitranspirants are introduced in the market. One of such effective chemicals was introduced by HICO Ltd. Bombay. It is a combination of ethylene oxide and long chain fatty alcohol (C_{12} - C_{28}) carbon atoms derived by the process 'hydroxyethylation'. The preliminary experiment using this product (HICO-110R) as a foliar application showed some promising results. This has prompted us to carry out the experiments by using HICO-110R on sorghum and groundnut which are the crops considered as a rain fed crops.

Following experiments were conducted during 1988-89 with a view to investigate physiological mechanism of its action on plant growing in drought prone area :

1. Relative water content 2) Osmotic potential of cell sap 3) organic constituents such as chlcrophylls, polyphenols, proline, nitrogen 4) nitrite and nitrate reductase 5) stomatal regulation and 6) growth and yield.

Method of approach :

The plants were raised in an earthen pots and were allowed to stabilize for one month. After stabilizing the plants, the foliar application of HICO-110R (1m/lit distilled water) was given to run-off point with the help of air pneumatic spray pump. The control plants were sprayed with equal amount of distilled water. After that 4 groups were made. First group : control, second group : sprayed control, third group : stressed and fourth group : sprayed and stressed. The stress was imposed by with-helding water for 8 days. In some experiments the plants were received three consecutive sprays of HICO-110R (1 ml/lit) at an interval of 15 days and after every spray the plants from a group 'stressed' and 'sprayed and stressed' were received water stress of eight days. Control and sprayed control, were received water as per their requirement. The effects of HICO-110R were investigated in the following ways :

Effect of foliar application of HICO-110R on :

1) Osmotic potential of cell sap
2) Relative water content
3) Chlorophylls, polyphenols, proline, nitrogen
4) Nitrite and nitrate reductase
5) Stomatal regulation
6) Yield.

The results are discussed under the light of available up-to-date literature.

Conclusions :

1. HICO-110R facilitates the turgor maintenance of leaf tissue by ajustting the osmotic potential of cell sap both in sorghum and groundnut.

2. HICO-110R helps in maintaining the water balance in plant tissue even under stress condition.

3. HICO-110R stimulates the chlorophyll synthesis in sorghum and groundnut under control condition.

4. Increase in chlorophyll contents under sprayed and stressed condition than that of control indicate that HICO-110R helps in protecting the photosynthetic apparatus from stress damage.

5. HICO-110R has potentiality to maintain the chlorophyll stability index both in sorghum and groundnut plants under control as well as under water stress conditions.

6. The stimulation in proline content due to HICO-110R foliar application was more pronounced in groundnut rather than in sorghum.

7. Increase in polyphenol content due to HICO-110R may help the plant in developing disease resistance. The reason why HICO-110R sprayed plants were disease free as compared to control.

8. Nitrogen content showed differential response to HICO-110R foliar application under control condition.

9. More nitrogen content in sprayed and stressed plants than that of stressed plants suggests that it maintains nitrogen balance too.

10. The foliar application of HICO-110R not able to retain the nitrite reductase activity under sprayed and stressed condition of groundnut. However, in sorghum it is effective in stimulating the activity almost double than that of stressed plants in plants stressed after spray.

11. Enhanced nitrate reductase activity in sprayed and stressed groundnut leaves is in response to increased nitrogen content due to HICO-110R foliar application.

12. HICO-110R reduces transpiration loss of water and facilitates maintenance of cell turgor. This effect is more pronounced under stress condition by checking transpiration and increasing diffusive resistance.

13. In HICO-110R sprayed and stressed plants the process of gases diffusion is superior to those of stressed plants.

14. HICO-110R helps in conservation of water in plants under stress condition by maintaining the osmotic pool and keeps the temperature of the leaf at desired level.

15. HICO-110R stimulates leaf area expansion, increases height, internodal length and biomass production.

16. Yield in terms of test grain weight, earhead weight and pod weight is also stimulated by HICO-110R foliar application.

17. Increase in number of chloroplasts per palisade tissue, size of palisade and chloroplast diameter under stress condition due to HICO-110R foliar application is interesting and beneficial event. However, it needs further investigation.

Thus, the overall message of the dissertation is : HICO-110R not only acts as a growth regulator but it also acts as an antitranspirant. It helps in maintaining the cell turgor and relative water content of plant tissue under water stress condition thereby plant remain in unwilted condition for some more days. Even if growth is inhibited by stomatal closure during crucial period, the possibility of saving the crop plants by maintaining favourable internal water balance is far more important and HICO-110R foliar application did it well in the present investigation.

Thus, above all conclusions led us to surmise that the foliar application of HICO-110R is suitable for protecting the crops during shorter period of drought and works well as a growth promoter even under control and water stress condition.