SUMMARY AND CONCLUSIONS

A recent survey of soils of Gujarat by the State Department of Agriculture has revealed that approximately 3,04,582 hectares of land in Gujarat lie under uncultivable conditions due to salinity. An increase in population demands an increase in agricultural production. One of the methods by which this demand could be met is to bring more and more areas of land under cultivation of crop plants. Paddy is one of the most widely cultivated cereal crops of India and it accounts for 40% of the total food grain production. In agriculture, ready germination of seeds and establishment of healthy seedlings are two important desirable features as the final crop producing value of plants much depends on the said processes. It is found that seeds fail to germinate under saline conditions and if at all they germinate, their percentage of germination is very low. Hence the present studies were undertaken with a view to finding out the various factors responsible for the failure of seeds to germinate under saline conditions and also to evolve some chemical treatments which would render the seeds readily germinable under the said conditions.

Experiments were carried out to study the effect of different concentrations of salt (Sodium Chloride) viz., 0.05, 0.1, 0.2, 0.5, 1.0, 1.5 and 2.0% on germination and growth of seedlings of paddy (Oryza sativa L. var. Bhura Rata).

It has been observed that salt at 1.0 and 1.5% level reduces the percentage of germination and growth of seedlings significantly. Germination of seeds was totally inhibited by salt at a concentration of 2.0%. This inhibitory level of salt is comparable to that observed in soils of saline areas of Gujarat.

Attempts were made to induce germination in seeds under the toxic level of salt by treating them with a number of chemicals such as succinic acid, CCC, thiourea, proline, 2-chloroethanol, IAA and gibberellic acid (GA_3). The seeds were given pre-sowing soaking treatments with said chemicals (different concentrations for a period of 4 hours - optimum duration of soaking). Among different chemicals tried only the treatment with gibberellic acid (10 mg/l) was found promoting germination of seeds and growth of seedlings significantly under the toxic level of salt at which control seeds totally failed to germinate.

To understand the mechanism by which gibberellic acid brings about the germination of seeds under the toxic level of salt the following studies were carried out :

(1) Changes in the dry weight of endosperm of seeds during different stages of germination under different treatments.

(2) Changes in the levels of various cellular constituents viz. total starch, total soluble sugars, reducing sugars, total nitrogen, total protein and phytin of endosperm of seeds during different stages of germination under different treatments.

(3) Activity of α and β -amylases, invertase, maltase, protease and phytase in the endosperm of seeds during different stages of germination under different treatments.

A marked reduction in the dry weight of endosperms of seeds was observed during the germination of control seeds. Under the influence of the toxic level of salt, no such significant reduction in the dry weight of endosperm of seeds was observed. However, the treatment of seeds with GA_3 resulted in a greater loss in dry weight of endosperm of seeds even under the inhibitory level of salt as compared to its control (salt alone).

The depletion of stored food materials (starch, protein, phytin) from endosperms of seed was also adversely affected by salt. Treatment of seeds with GA_3 brought about a slightly enhanced rate of depletion of reserve food materials from the endosperm under the influence of salt. This enhanced rate of

depletion of stored material from the endosperm under the influence of GA_3 has been found taking place as a result of high activity of amylases, invertase, maltase, protease and phytase. Thus it has been found that GA_3 brings about germination of seeds under the toxic level of salt by stimulating the activity of the said enzymes and this in turn results in rapid degradation of stored food materials of endosperm and the mobilization of degraded food materials from endosperm to the growing axis leading to germination and growth of seedlings.

From the present studies it is concluded that salt (NaCl) at a concentration of 2% completely inhibits the germination of seeds. This inhibition of germination was found due to an inhibition of hydrolysis of reserve food materials in the endosperm as evidenced from their levels, changes in the dry weight of endosperm and also reduced activity of hydrolases viz. α-amylase, β-amylase, invertase, maltase, protease and phytase. Among different chemicals tried, GA_3 at a concentration of 10 mg/l brought about as high as 52% germination of seeds under the influence of 2% level of salt at which control seeds totally failed to germinate. GA_3 brings about germination of seeds under the toxic level of salt by

(1) quickening the mobilization of stored food

materials from the endosperm as evidenced by their levels in the endosperm and also the changes in dry weight of endosperm during germination of seeds,

(2) Mobilization of food materials from the endosperm was facilitated by GA_3 by inducing their hydrolysis as evidenced by increased activities of α-amylase, β-amylase, invertase, maltase, protease and phytase.

Failure of seeds to germinate under the toxic level of salt may be due to

(1) the inhibition of synthesis of gibberellin and other promoters of germination by salt as exogenously supplied GA_3 could partially nullify the inhibitory effect of salt and bring about 52% germination of seeds.

(2) The high concentration of salt may be inducing the synthesis of inhibitor of germination viz. abscisic acid and lowering the level of promoters (Mizrahi et al., 1972).

Under these conditions exogenously supplied GA_3 may be counteracting the inhibitory effect of abscisic acid and/or increasing the endogenous level of promoters. This can result in germination of seeds.

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