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**SUMMARY AND CONCLUSIONS**

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Seed germination marks one of the most important phases in life cycle of a plant. In majority of plants it is the only means of propagation and multiplication. Hence successful seed germination is a key factor in determining survival of the species. The success of the seeds to germinate is decided by variety of endogenous and environmental factors. Seed germination is a genetically programmed and environmentally modulated event. There are several incidences of germination failure due to number of environmental constraints. This becomes a very serious issue in case of crop production. Since crop stand establishment is many determined by the seed germination and emergence of the hypocotyl. Hence there are continuous attempts by agriculturists to improve the germination performance and to enhance the seedling vigour. One promising strategy in this respect is presowing soaking treatment of seeds. Several solutions including distilled water, salts, micronutrients, plant growth promoters, plant growth retardants and polymers have been employed for this purpose and many studies have revealed a positive influence of these treatments on seed germination at further crop growth and survival under stress conditions. It is because of these reasons the technique is also famous under different names such as seed hardening,

seed priming and seed advancing. However, the biochemical basis of favourable influence of seed treatment on seed germination process is understood only in case of few crop species like wheat. Hence it was thought worthwhile to study influence of presowing soaking treatments of some plant growth regulators (ascorbic acid, salicylic acid CCC and ethephon) on seed germination physiology of soybean which is one of the popular oil and protein crops through out the world. Although physiology of soybean has been extensively studied and some books and monographs on this crop are also available, seed germination is not properly covered in these publications. Hence it was thought worthwhile to compile the literature available on soybean seed germination. This has formed the substances of chapter I in the dissertation. The methodology followed for the investigation has been described in detail in second chapter. Some of the significant findings of the present investigation can be summarized as follows :

Generally the medium used for presowing soaking treatment in most of the earlier studies is distilled water. But in the present investigation this was found unsuitable for soybean because during air drying following soaking treatment cracking of the seed coat was noticed. Interestingly the use of acetone as a medium proved quite satisfactory for soybean since such seed coat cracking was

not observed. Further Khan et al. (1978) have advocated superiority of organic solvent infusion technique for seed treatment. Hence seed pretreatment with plant growth regulator solutions prepared in organic solvents like acetone appears more desirable for crops like soybean.

Presowing soaking treatment with 25 ppm ascorbic acid, CCC, ethephon proved effective for increasing water uptake during first 12 and 24 h. of germination. Since water uptake is a prerequisite for various biochemical processes increase in hydration would help in activating the metabolism. Lipase plays a key role in germination of oilseeds like soybean. The activity of this enzyme was found to be stimulated due to all the four seed pretreatments (i.e. ascorbic acid, salicylic acid, chlorocholine chloride and ethephon) and ascorbic acid and salicylic acid were most effective in this respect. The activity of another important enzyme  $\alpha$ -amylase was also greatly increased during germination of seeds hardened with salicylic acid and CCC in comparison to untreated seeds (control). This can cause favourable effect on carbohydrate interconversions. The seed pretreatment with salicylic acid, ascorbic acid and chlorocholine chloride also elevated the activity of hydrolytic enzyme acid phosphatase. Phytin is a main reserve of phosphorus in soybean seeds. This is degraded by enzyme phytase during seed germination. The presowing soaking

treatment of seeds with ascorbic acid and salicylic acid caused increase in activity of this enzyme. Enzyme nitrate reductase plays a vital role in assimilation of nitrogen in plants. The activity of this enzyme is influenced by several endogenous and environmental factors and various chemicals including plant growth regulators. It was noticed that presowing soaking treatment with CCC greatly stimulated the NR activity. Other growth regulators except salicylic acid were also effective to some extent in this respect. Dehydrogenases catalyze some key reactions of glycolysis Pentose Phosphate Pathway and TCA cycle and TTC reduction gives broad idea about nature of activity of various dehydrogenases. The seed pretreatments with ethephon and ascorbic acid caused a marked increase in dehydrogenase activity which indicates stimulation of respiratory turnover. The catalase activity in germinating seeds was found to be reduced due to salicylic acid and ethephon pretreatment whereas ascorbic acid pretreatment caused slight increase in activity of this enzyme. Enzyme peroxidase occupies a key position in secondary metabolism as well as auxin metabolism. The activity of this enzyme was considerably increased in seeds pretreated with CCC and ascorbic acid. The other two treatments (ethephon and salicylic acid) also caused increase in the enzyme activity. However, preliminary peroxidase isozyme analysis did not

reveal any significant differences.

The positive influence of presowing soaking treatments on metabolism of germinating soybean seeds was also reflected in the level of some important metabolites. Thus the amount of soluble sugars ascorbic acid and free proline was found to be elevated in the pretreated seeds particularly seeds hardened with ascorbic acid. The presowing soaking treatments also caused increase in the level of SH content in the seeds. Some of these changes are of definite significance during germination and seedling growth in view of importance of these metabolites in stress resistance process.

It is clear that the short term (8 hour) seed preatment with plant growth regulator solutions prepared in organic solvent like acetone is more desirable for crop like soybean. It is evident from the foregoing account that the overall metabolism of germination soybean seeds is favourably influenced by presowing soaking treatments of ascorbic acid, ethephon, chlorocholine chloride and salicylic acid. This can help in improving the seedling vigour and also provide impetus for further, plant growth.