# INTRODUCTION

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Seed germination represents one of the most critical events in the life cycle of plants. The survival of majority of plant species on this planet depends on the success of this particular process. In case of crop plants seed germination determines the extend of crop stand establishment. Extensive studies on various aspects of seed germination in last several decades has very clearly indicated that seed germination is very complex process, which is regulated by variety of endogenous and environmental factors (Mayer and Poljakoff-Mayber, 1978; Bewley and Black, 1978). There have been several instances of germination failure in crop plants due to different environmental constraints and such failure has posed a major limitation on crop productivity. On the otherhand improvement in seed germination performance and enhancement in seedling vigour have often lead to appreciable increase in crop yields. It is because of these reasons there have been continuous attempt to improve germination performance and seedling vigour in crop plants. One approach to solve this problem lies in understanding seed ecology of a particular crop species and then providing optimal factors for germination. The second approach involves selection of crop varieties with more 'efficient' seeds and plant

breeders have made significant contribution in this respect. The third strategy involves use of various seed treatments to improve the germination performance.

Will and DeSaussure in (1983) for the first time used soaking and drying in a seed treatment before planting to increase drought tolerance. Latter on this techniques was applied for improving salt tolerance by pretreating seeds in salt solutions (Genkel and Kolotova, 1934). since these early studies positive effects of presowing soaking treatments with water, salt solutions, micronutrients, plant growth regulators and polymers like polyethylene glycol (PEG) have been noticed by many workers in different parts of the world (Genkel, 1961; Dawson, 1965; Chinoy et al 1969; Shannon and Fromcois, 1977; Khan et al 1978; Arora et al 1990). In literature the technique of presowing soaking has been designated by different terms such as seed hardening. Seed priming, seed advancing, 'seed preconditioning'. It can very well realized by all these terms that presowing soaking treatment causes a definite advantageous effect on seed germination process. According to Genkel (1961), the physiological basis of seed hardening involves (i) greater hydration of colloids, ii) higher viscocity and elasticity of the protoplasm, iii) increase in bound water, iv) increase in the intensity of respiration and photosynthesis, v) increase in hydrophilic colloids and decrease in

lipophilic colloids, vi) increase in the temperature required for protein coagulation, vii) more intense transpiration, viii) lower water deficit, ix) more efficient root system (Genkel, 1961). Longden (1973) mentioned that incase of some lots of carrot seeds, pretreatment caused increase in number of cells in the embryo. The extensive work of Chinoy and co-workers, Chinoy et al (1969) has revealed several positive changes in the energy relations of plants due to ascorbic acid pretreatment. According to Khan et al (1978) the osmotic preconditioning with PEG causes changes in the pattern of protein synthesis and activation of several enzyme systems. However, such studies have been restricted only to few crop species and the physiological changes induced by seed pretreatments are not fairly understood. Hence it was thought worthwhile to study biochemical changes induced due to presowing soaking treatments incase of soybean. For the purpose of seed pretreatment four different plant growth regulators (ascorbic acid, ethephon, CCC, and salicylic acid) were chosen. The important role of ascorbic acid as a effective pretreatment agent is highlighted in several studies particularly of Indian workers. The ethephon is also attracting attention of several plant physiologists since it is an ethylene generating compound and ethylene is involved in breaking of dormancy in some seeds like peanut. Although

chlorocholine chloride (CCC) is well known growth retardant, there are some reports which indicate that this compound is capable of inducing stress resistance in plants. Salicylic acid has been recently recorded as a possible phytohormone by some plant physiologist (Raskin, 1992). An attempt has been made in the present investigation to see whether presowing soaking treatment with this plant growth regulators influence the metabolism of germinating soybean seeds in a similar manner.

Soybean (*Glycine max* L.) has been selected as a test crop for the present investigation. This is one of the most promising oil seed crop which is rapidly replacing other oil seeds in many parts of India. Beside oils the seeds are also rich in proteins. There have been numerous attempts to understand the physiology of this crop and to bring about increase in crop productivity. But as compared to other physiological aspects the seed germination is paid less attention. This is quite evident from various review articles and monographs published on this crop. Hence to understand to the basic problems involved in soybean seed physiology, an exhaustive review of literature on various aspects of soybean seed germination has been taken and this forms the substance of first chapter. The methodology followed for present investigation has been covered adquately, in the second chapter **'Materials and Methods'**.

Various findings of the investigation have been discussed in the light of recent and relevant literature in the third chapter 'Results and Discussion'. The significant findings have been briefly summarised in the last chapter under the heading Summary and Conclusions. This chapter is followed by Bibliography.