INTRODUCTION

I N T R O D U C T I O N

In the life cycle of most of the higher plants seeds occupy a very important position since they are the means of multiplication of plant species. In the words of Heydecker (1973) 'seed is an end and beginning, it is the bearer of essentials of inheritance; it symbolises multiplication and dispersal, continuation and innovation, survival, renewal and birth'. The life of human beings on this planet is also very much dependent on the seeds since about 70% of the food supply is derived from the seeds of a limited number of crop species. The ever increasing human population is exerting a constant pressure on the seed reserves produced by these crop species. Further, increased urbanization, industrialization and faulty agronomic practices are continuously curtailing the extent of land under cultivation of these crops. It is quite obvious that in such a situation a greater attention is deserved by seed development, seed storage and seed germination.

Understanding of seed germination process is of paramount significance from the point of crop production programme. Several studies have been made on this problem in this century from different angles. The process of activation of the resting embryo has been considered as seed germination by Heydecker (1973). According to him, physiologically and strictly speaking germination

ends with the first manifestational growth even before the seedcoat is ruptured. But he promptly admits that it is very difficult end point to determine. According to Bewley and Black (1994) germination begins with water uptake by the seed (imbibition) and ends with the start of elongation by the embryonic axis usually the radicle. Seed technology laboratories in many part of the world consider seedling capable of independent growth as the end point of germination. In the eyes of a farmer, emergence of the aerial parts of a seedling above the ground marks the successful seed germination and this is perhaps the most convenient and suitable way to analyse germination under field conditions.

In a physiological sense seed germination represents a very complex metabolic process which involves a complex integrated network of several biochemical pathways. Further this process is found to be genetically controlled. This is reflected in marked differences observed in germination behaviour of different species with respect to process like seed viability, seed dormancy, timing of various metabolic events and hydrolysis of food reserves. The endogenous level of various hormones also adds a new dimension to this problem since hormonal regulation of seed germination is now well known. Hence seed of every plant speices has a potential to offer a new system for germination studies.

The environment prevailing during seed germination has a profound influence on the germination behaviour of seeds. The various ecological situations that the seeds may experience during germination process have definite effects on seed viability, dormancy and metabolism of germinating seeds. The negative influence in some cases is so prominent that germination failure occurs or abnormal seedlings develop. Among various environmental factors the influence of light and temperature is very significant and involvement of phytochrome system in light mediated processes is very well recognized. Several other factors such as pH of the soil solution, soil salinity, soil water potential, presence of heavy metals and toxic pollutants pesticide and fungicide residues and gaseous composition of atmosphere are also found to be effective in altering the normal germination process. Besides these factors, a phenomenon of allelopathy is also noteworthy in this respect. It is now very well realized that the presence of neighbouring plant species can have a significant influence on seed germination, growth and yield of crop plants (Rice, 1974). The influence may be either positive or negative depending upon the nature of allelochemicals released by the allelopathic plants. Such allelopathic effects will become more prominent to future agricultural systems because of decrease in farm size, intensive farming, increasing need of intercropping and crop rotation and introduction of agroforestry. Hence it was thought worthwhile to

investigate influence of some common prominent plant species which have entered in the agriculture of this region, on the seed germination and seedling metabolism. These plants include Eucalyptus globosus Labill one of the recently introduced and problematic roadside and farmside tree species, Melia azedarach L. a popular tree species with great biopesticide potential, Moringa oleifera Lamk. or drumstick tree having good economic value for small farmers, Parthenium hysterophorus L. an obnoxious and disturbing widely spread weed species and soybean (Glycine max (L.) Merrill) a new oil seed legume introduced on large scale in cropping system of this region.

For germination study, a popular cereal crop Sorghum bicolor (L.) Moench and popular legume crop moong (Vigna mungo Linn.) have been selected with a view to find out whether the influence of allelopathic agents on the germination behaviour shows similar trend for both the crops or otherwise.

The review of literature on allelopathy indicates that effects on plant growth have been mainly investigated and not much attention has been paid to the influence of allelopathic agents on biochemical processes. In the present investigation besides seedling growth, studies are further extended to metabolic studies. The water uptake and respiration process are of prime

importance during seed germination and according to Bewley and Black (1994) the extent to which germination has progressed can be determined roughly say by measuring water uptake or respiration. Hence these two aspects have been studied. Further influence of allelopathic agents on the activities of dehydrogenase and nitrate reductase has been also investigated. The status of photosynthetic pigments under the influence of leaf leachates of the five plant species (mentioned earlier) has been analysed. Since the mineral elements play a vital role in plant metabolism, an attempt is also made to study influence of allelopathic agents on mineral nutrition of seedlings of Sorghum and moong.

The thesis is divided into four chapters. The extensive literature on allelopathy has been briefly summarized in Chapter I 'Review of Literature'. The methodology followed for the investigation has been properly described in Chapter II - 'Materials and Methods'. In the third chapter 'Results and Discussion', the findings of the present investigation have been presented and discussed in light of relevant literature. In the last Chapter 'Summary and Conclusion' the significant findings of present investigation have been briefly summarized.

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