INTRODUCTION

" Care with the seed, joy with the harvest "

- Psalm 126.

Over 70 % of the world's food supply is derived directly from the seeds of a small number of seed crops. In most crop species seed formation initiates the next reproductive cycle. Heydecker (1973) aptly described seed as an end and a beginning, it is the bearer of the essentials of inheritance; it symbolises multiplication and dispersal, continuation and innovation, survival, renewal and birth. The dual requirement, food and reproduction plays unusual demand on the biological process of seed development and germination. An understanding of the vast array of physiological, molecular and developmental events associated with seed development and germination is needed to increase supplies of these grains and to preserve the genetic resources of these species.

A great deal of information has accumulated in this century regarding the nature of seed germination. About twenty thousand publications appeared in which the seed germination is mentioned in some way upto 1974 (Mayer & Schain; 1974). These papers have clearly indicated that germination is a quite complicated process which involves integration of several biochemical pathways. Similarly the process has been found to be regulated by well defined control systems. There is ample evidence that shows a very complex interaction between different parts of the seed.

The environment has profound effect on germination behaviour which is brought about in two ways. The environment prevailing during seed development as well as the location of seeds on the plant affect subsequent germination behaviour. The same consideration also applies to the direct effect of environment during germination on germination behaviour. However, not much work has been done to explain the mechanism of the control of germination by environmental factors. Discovery of phytochrome represents one of the important milestones in understanding the influence of one of the important environmental factor - light - on seed germination (Borthwick,1952). But the same is not true with other environmental factors.

The vast array of literature accumulated in this century on seed germination clearly points out the fact that there is a great difference among plant species so far as the germination behaviour is concerned. This difference can be easily recognised from the presence of a long lasting dormancy in some seeds and immediate loss of viability in other seeds. Though the pattern of major biochemical process like breakdown of seed reserves or increase in respiration rate, is more or less similar in all seeds; we can find that there are large differneces in the interaction of these processes with the environment. Hence, seeds of every plant species can potentially provide a new system for study.

The literature regarding the physiological studies of seed germination clearly indicates that most of the work has been done only on seeds of dominant crops like rice, barly, maize and pea and very little attention has been paid to the seeds of other crops plants. Millets are among these neglected crop species. The millets are small seeded annual cereal grasses used for food, feed, forage, industrial or other products in tropical as well as in temperate regions. Finger-millet or ragi (Eleusine coracana Gaertn.) is one of the major millets in India producing highest mean yield among the millets. The ragi grain is highly nutritious and has malting property. Hence, the present investigation is devoted to the physiological studies in germination of ragi seed in relation to environmental factors. The environmental factors include salinity, water stress and boron toxicity. As ragi is a starchy cereal, the study is mainly centered around the activity of enzyme α amylase under stress conditions. Besides α amylase the behaviour of acid phosphatase is also studied. Oxidative enzymes like peroxidase, catalase and dehydrogenase are known to play an important role in the respiratory metabolism of germinating seeds. Hence the effect of various stress conditions on the activities of these enzyme systems is also investigated. It is well known that varietal differences exist in many crop species regarding ecological adaptations which can be well exploited in breeding programme. With this view in mind the germination performance of several improved varieties of ragi is also studied in the present investigation.

In order to understand the basic problems involved in the study of seed germination in general and ragi seed germination in particular a brief resume of a current status of literature on germination is covered in Chapter I. This chapter mainly deals with physiology of seed germination and control mechanisms. Besides this aspect research work done on ragi seed germination is briefly reviewed. The next chapter deals with the methodology followed in the present investigation. The major findings of the present work are recorded and discussed in detail in the 3rd chapter. The significant findings of the present work are summarised in the last chapter of the thesis.

The present study was perused to have a preliminary idea of physiological process during germination in this crop under various stress conditions. It must be admitted here that many more such attempts on selection and hybrid varieties of ragi are essential to arrive at a definite synthesis, with respect to the germination physiology of this crop. Such studies are in progress in our laboratory and they will also cover other dimensions.