Introduction

The present critical situation in world food supplies demands that all of the agricultural resources be utilized to the full. The green revolution demonstrated that much more effective use could be made of cereal crops on the tropics than had previously been thought feasible. A similar demonstration is long over due for the legume crops. This source, however, has not been exploited very effectively by man. If there is to be any significant expansion of pulse crop production in the tropics, where it is most needed, new and informed approaches must be developed to solve the outstanding problems.

The study of physiology of individual legume crop has an important role to play in guiding the efforts of agronomists, plant breeders, plant pathologists and others who are actively engaged in the business of improving efficiency of production. It is important to know, for example, the extent to which the physiology of a crop can be moulded to fit a particular set of environmental conditions or production practices and conversely the extent to which the techniques need to be modified to accomodate unalterable physiological processes. This has been very well achieved in soybean and peanut and to some extent in other grain legumes, such as dry bean, chickpea, pigeonpea and cowpea. Soybean is the world's premier crop growing well in temperate climates only. Although extensive research programmes have been conducted to adopt the soybean to tropical conditions, results have so far not achieved viable economic returns. It is no wonder then one has to be after such other sources.

In fact there are numerous minor grain legumes which are cultivated on smaller scales and have received however, a scant attention from the scientific community. Among these are moth bean (*Phaseolus aconitifolius* Jacq.), horse gram (*Dolichos* sp.) lentil (*Lens esculanta*) winged bean (*Psophocarpus tetragonolobus*) Dhaincha (*Sesbania* sp) and Sunn hemp (*Crotalaria juncea* L.).

Moth bean (*P. aconitifolius*) is the most drought resistant of the kharif pulses and largely grown as a dry crop either alone or subsidiary to millets or cotton. It is highly useful against wind erosion in sandy areas. Occassionally it is used as a green manure and ripe pods are consumed as vegetable. The whole grain (23% protein) is used as pulse in the main producing regions. In India, area under cultivation of grain legume is about 2 million hectares and total annual production of about 0.3 million tons.

Sunn hemp (*C. juncea*) is distributed in tropical and substropical regions of the world. It is mainly cultivated either for the fibre or a green manure crop in rotation with grain or cash crops. India grows about 3,25,000 hectares of sunn hemp per year with an anual production of 80,000 to 1 lakh tons of which 20 to 30% is exported to the United Kingdom, Belgium and United States. Sunn hemp is hard and drought resistant crop growing on poor soils.

Salinity has posed a constant problem to the modern agriculture on salt affected soils or under saline water irrigation. Millions of hectares of land throughout the world is saline and unproductive. In India, there are about 15 million acres of saline lands distributed in the States of Punjab, Rajasthan, U.P. and the Deccan and Coastal areas. This ever alarming problem is increasing day by day affecting food production in the country. Unfortunately no cheaper methods of desalination of soil or water have been achieved to overcome the salinity hazards. According to Epstein *et al.*, (1980), besides an engineering approach, the development of crops tolerant to salinity is a better strategy for meeting the challenge of salinity problem. To achieve this, it is of prime importance to understand the performance and the physiology of plant species and the cultivars under saline conditions.

With this view in mind and to achieve dual purpose, in the present investigation, an attempt has been made to investigate the physiology of salt tolerance in rather underexploited legume crops - *P. aconitifolius* and *C. juncea*. The preliminary studies with these legumes indicated that the species respond differently to the salinity conditions particularly during germination. *P. aconitifolius* showed a good germination under saline conditions as compared to that of *C. juncea*. It was thought worthwhile, therefore, to examine the process in details with the emphasis on the biochemical and physiological events to understand the probable mechanism of salt tolerance during germination.

For the present studies the seeds were subjected to various concentrations of NaCl and $CaCl_2$, with distilled water as control. The seedlings were grown in Petridishes under sterilized conditions. The treatments were continued for 120 hours. The effect of salts on germination percentage, linear seedling growth, water uptake and biomass production has been determined. Changes in some organic constituents such as carbohydrates and proline during germination have also been attempted. Influence of salinity on the level of some important enzyme systems such as peroxidase, catalase, amylase, acid phosphatase and nitrate reductase has also been investigated.

To know the basic problem of salinity and for better understanding of the process of germination a brief review has been given along with the economic importance and agronomy of selected grain legumes, P.aconitifolius and C.juncea, in chapter I of the thesis. Chapter-II describes the material procured, the methodology adopted for germination of seeds and that followed for the analysis. The important findings of the investigation have been critically discussed and correlated in the light of recent literature in Chapter-III of the thesis. The problem, perspectives and significant findings of the investigation have been summarised briefly in the last chapter of the thesis (Chapter-IV). The recent research papers, books, reviews and monographs extensively used for the discussion, have been properly listed in Bibliography the last part of the thesis.