CHAPTER I

INTRODUCTION
1) INTRODUCTION

In a world where the population is increasing at an alarming rate, the pressure on agriculture to produce large amounts of products is unrelenting. There is also an increasing concern that the means employed in the recent past to achieve high yield of crops are becoming unsustainable because of their disastrous long term ecological consequences (Boulter, 1995).

Today, man has to face many complex problems as demand for food has increased in world, because of rise in population. Therefore, it has become necessary to increase crop production substantially throughout the world which is possible by agriculture. The agricultural research programs are playing an important role in production of new and better varieties and strains of crop plants. Thus, it is necessary for plant physiologists to undertake research programs to increase crop yield.

Humans are directly or indirectly dependent upon plants for food and food is directly or indirectly produced by photosynthetic activity. About 70% of earth is covered by oceans and 30 % is covered by land. One third of the land area is semi arid or arid and half of this area has saline soil.

There are many reasons for soil salinization. One of the reasons is increasing use of poor quality water, continuous addition of waste salts to our environment and increasing contamination of underground water sources (Somers, 1979). Another reason is excessive presence of sodium salts like chlorides, sulphates, carbonates and magnesium.
High concentrations of salts result in water deficit in apoplasts and injures subcellular organelles disrupting functions like photosynthesis, respiration and affect synthesis of nucleic acids, proteins and hormones which results in poor germination, poor crop growth and yield. As salinity decreases, permeability of roots to water absorption is increased.

However, there are certain salt tolerant crops eg- barley, sugarbeet, cotton; paddy and wheat are medium tolerant and beans, celery, pea are salt sensitive crops. Salt tolerant varieties possess the ability to reduce intracellular accumulation of sodium and chloride ions. In halophytes, however, intracellular salt concentration is reduced because of secretion of salt through salt glands through the shoots or by developing succulence. It has been suggested that ability of the plant to tolerate salinity may enhance agricultural productivity.

Salinity problems occur in both arid and irrigated areas of the world. Irrigated area in 103 countries totalled 203 million hectares and if 25 % of the land is saline (Thorne and Peterson, 1955) it works out to be 50 million hectares (Carter, 1975). About 7 million hectares of productive land is saline (Champagnol, 1979). Saline, alkali and saline alkali soils are found in all the states of India. In Maharashtra, salinity is caused due to tidal action of sea water in coastal regions and due to improper irrigation practices in the plains (Bowa, 1981). Due to these reasons, lands were damaged due to development of salinity in soil because of which land has been rendered uncultivable (Kakade, 1968). Soil in the districts of Ahmednagar, Pune, Satara, Sangli and Sholapur is saline. As more importance is given to increasing irrigation facilities, more area becomes saline which requires immediate attention (Wadkar, 1976).
Saline soil is predominant in sodium and chloride ions which contributes to the salinity of the soil. Salt stress results in poor growth and productivity, if soil contains excess (about 0.1 %) of soluble salts. Soil salinity also affects plant morphology, anatomy and physiology. However, reclamation measures were suggested by Puri (1934) and Basu (1950). NaCl has been demonstrated to be damaging to germination and plant development (Bliss et al. 1986; Jeschke and Wolf, 1988) and toxic effects associated with excess salinity are described (Greenway and Munns, 1980).

To overcome the problems of salinity, use of suitable agronomic practices, selection, breeding of well adapted crops or varieties can be done. Conventional plant breeding methods have been successful in increasing salinity tolerance of some crop plants (Shannon, 1984). In addition, plant tissue culture and genetic engineering offer alternative strategies to improving the salinity tolerance of a given crop plant (Stavarek and Rains, 1984; Hanson, 1984). Commercial crop yield for establishing salt tolerance is one of the remedies according to Mass and Hoffman (1977). It is very important to investigate the physiological basis of salt tolerance, in order to study the aspect of salt tolerance which can help to solve salinity problem. One of the useful strategies to combat soil salinity is to select salt tolerant crop. The variability in salt tolerance among varieties of crops offers excellent ground for growers to grow salt tolerant cultures to increase agricultural productivity under unfavourable environment like salinity.

According to Wadleigh and Gauch (1944), Magistad (1945), Brown and Hayward (1956) and Bernstein (1961), accumulation of soluble salts in soil increases osmotic pressure of soil solution reducing uptake of water and nutrients by plants. On the other hand, plants absorb constituents of saline solutions at different degrees which brings a
toxic or nutritional effect on the plants which is known as 'specific ion effect' (Eaton, 1942, Uvhits, 1946). This view was supported by (Berg, 1950, Russel, 1950, Bernstein and Ayers; 1953).

Excess accumulation of salts under saline conditions disturbs dynamics of normal plant life due to effect of 'salt injury'. However, Russel (1950) and Kakade (1968) observed reduction in growth and yield in salt tolerant plants without any salt injury. Besides, the plants differ in their sensitiveness towards a particular saline condition within the genera, species and varieties (Bhardwaj, 1958, Torres and Bingham, 1973). Maas and Nieman (1978) and Lauchli and Epstein (1984) stated that such studies will help in the selection and breeding of crops for salt tolerance, for example, rice, sorghum, barley, wheat, corn, cotton, tomato and mung bean. Safflower and bajra are being tested. Such work is going on in Australia, Egypt, Israel, Italy, Korea, Kuwait, Pakistan, Philippines, Rumania, Russia, Spain, Taiwan, Tunisia and USA (Somers, 1979).

In India, about 7.5 million hectares of land has become salty due to faulty water management and excessive use of fertilizers (Abroal, 1984). Keeping this view in mind, it was envisaged to study salt tolerance of safflower Cv. Bhima. This cultivar is recent promising and is recommended for growing in the state of Maharashtra.