INTRODUCTION

All land plants in a sense, are living either partly or entirely out of their natural original medium water. In fact, all living things are children of an environment that is aqueous. Without water no life exists and life in plants takes place in an aqueous medium. Several functions of water in plants have been well established (Russell et al., 1959). Water is a major constituent of tissue, a reagent in photosynthetic and hydrolytic processes, the solvent for and mode of translocation for metabolites and mineral within plants, and is essential for cell enlargement and growth.

Water is as important quantitatively as qualitatively constituting 60 to 90% of the fresh weight of plant cells and tissues. Water is just as important a part of the protoplasm as the protein molecules which constitute the protoplasmic framework, and with reduction of water content, many of the physiological processes associated with growth are affected and under severe deficit, death of plants may result.

The worldwide interest in water relation of plants is accentuated by increasing sensitivity to the seriousness of dwindling water supplies in many regions of the world. A need to increase crop production exists in the face of mounting food shortages and water conservation is an important factor in overcoming food deficiencies.
Large part of the globe are lying in the arid and semiarid conditions, although 3/4 of this planet is covered with oceans whose salt concentration is too high thus making them too dry to supply the need of water for higher plants. This is also true in India, especially in this State i.e. Gujarat, where the rainfall is irregular, erratic and scanty.

Plants respond to the severity of their environment, which have occupied the attention of man long before the beginning of the science of biology (Levitt, 1941). Hydration and rehydration of cells is based on any environmental factor potentially unfavourable to living organisms and has been adopted by biologist in term of "Stress".

Growth is reduced by a decrease in relative turgidity below 90 %, and is approximately half of the normal growth rate when the relative turgidity reaches 85 to 83 % (Mitchell, 1970). Wardlaw (1967) reported that photosynthetic rate is reduced with progressive wilting of plants as a result of increased water stress, which was also reported by many other workers. Plants undergo both qualitative and quantitative changes in their constituents when subjected to water stress. Since, the effect of water stress is on the function of biological molecules and their component systems, and therefore, it affects the
general metabolism of plants. The most critical of them are the reversible hydration and dehydration of proteins which also affects some specific functions of the enzymes.

Seed is a ripened ovule containing a dormant embryo, its seed coat and food storage tissue - the endosperm or cotyledon. When seed absorbs water, the dormant embryo awakes and this is called germination. Germination of seed is conditioned by an optimum supply of water in the medium, optimum temperature and presence of oxygen in balance proportion in atmosphere. The establishment of seedlings and successful germination in any case, depends upon the adsorbed water and this accounts to a several fold increase in water content (Kracir and Kozlowski, 1960).

When a seed absorbs water the protoplasm gets hydrated and a number of metabolic processes are activated. The food reserves from cotyledon or endosperm is hydrolysed and mobilized to the growing embryo axis. Water, thus, has a paramount role in continuing and maintaining the germination process.

Deficit of water may hamper any physiological processes. Water deficit may be of two nature in the case of plants. Water in the soil and water from atmosphere. The soil water deficit has a greater importance in the case of crop plants. Due to the atmospheric dryness caused by high
temperature, high wind velocity and high light intensity as well as low humidity, plants suffer from any temporary wilting.

Total drought resistance consists of several complex mechanisms and interaction. It has been suggested that there are only two basic resistance mechanisms—these being drought avoidance and drought tolerance (Levitt, 1969, 1972). Drought avoidance is by deep root system, thick cuticle, small cell size etc., which help to maintain the optimal water content for growth. Drought tolerance is dependent upon the property of protoplasm such as osmotic pressure, bound water content, viscosity, survival at high temperature and/or low humidity.

The pioneer worker Maximov (1929, 1941) concluded that without injury, the drought resistant phenomenon can be best determined by noting the plants' ability to withstand soil dryness. The responsibility of this ability is based on protoplasm permeability and hydrophily.

Drought resistance is a dynamic process which changes with different phases of growth. Some of the phases are more critical than the others, and maximum drought resistance of a plant is in dry seeds (Chino, 1942, 1960). The plants although, showing an apparent reduction in germination and arrested growth during water stress, the metabolic changes
may differ depending upon the nature of water stress employed (Vora et al., 1974). Thus, use of osmotica, salts, desiccation and low temperature may not cause the same metabolic alteration.

The presence of salts in the ambient medium also causes a physiological drought to the plants. Salinity is known to affect many aspects of the metabolism of plants and to induce changes in their anatomy and morphology. In addition to water stress, it also causes ionic toxicity to the plants. When NaCl is used as osmotic agent at high concentration, the response of higher plants either be due to osmotic and/or ionic effect on the cells. Iyengar and Kurian (1971) worked on the tolerance of crop plants to sea water from time to time. Ramana and Ramadas (1978) and Varna and Poonia (1979) observed reduced germination, dry matter and rootlets formation due to the effect of salts.

Water stress also can be simulated by desiccating the seedlings in desiccator containing desiccants like CaCl₂ or conc. H₂SO₄ (Kaufmann, 1968; Chinoy et al., 1969). Desiccation causes water stress much as would be in soil when there is no or restricted availability of water due to erratic or scanty rains. Further, there would be a gradual withdrawal of water from the desiccating seedlings.

Temperature stresses can occur at temperatures being either too low or too high to be lethal to tissues.
Most actively growing plants are killed by frost when temperature drops below the freezing point, water becomes first supercooled, and then, it is converted into ice. Low temperature influences the physiological and biochemical processes (Alden and Hermann, 1971). Levitt (1972) and Lysons (1971) have focused attention on intracellular changes, injury and death in higher plants sensitive to low temperature.

The plant exposed to chilling temperature may be expected reactions and the plant may suffer stress or injury (Levitt, 1972). Perennial plants must develop frost resistance in order to survive a period with temperature may cause severe frost injury.

Many studies on plant responses to water stress were carried out by investigators. But studies on physiological and metabolic aspects of seedlings are very few. Boyer (1975), Kramer (1969) and Todd (1972) have studied the effect of water stress on metabolism and physiology of plants in details.

Thus, after a persual of literature an attempt was made to investigate the germination behaviour of the seedlings under the different stresses using salts, desiccation and low temperature treatments and also to study the associate biochemical and metabolic changes of two

With this view, the following experiments are carried out:

(1) Effect of different salts on biochemical changes during germination of Tur and Gram seedlings.

(2) Effect of desiccation treatment on biochemical changes in germination seedlings of Tur and Gram.

(3) Effect of low temperature treatment on biochemical changes in germination seedlings of Tur and Gram.