INTRODUCTION

Drought is an effective environmental factor which adversely affects crop productivity in arid and semi-arid regions of the world (Turner and Kramer, 1980). Considerable emphasis has been laid in recent years on the study of the effect of drought in many crop plants (Hsiao, 1973; Begg and Turner, 1976; Levitt, 1980b; Clarke and Durley, 1981; Kramer, 1983; Bielorai et al., 1983; Turner and Burch, 1983; Morgan, 1984). It was also found that drought affected practically every aspect of plant morphogenesis modifying their anatomy, morphology, physiology and biochemistry.

Drought is a meteorological term, and is commonly defined as a period without significant rainfall (Turner, 1979). Since
the lack of rain leads to a water stress condition, the term drought stress is defined as a water stress due to lack of rain or more simply a natural water stress. However, the two terms (water stress and drought stress) are often used interchangeably (Levitt, 1980a). The term, water stress, is used in the present study, referring to a plant-water-deficit induced artificially in the soil under glasshouse conditions.

The meaning of the term drought resistance is so debatable that Evanari (1960) refused to use it. Drought resistance is a complex subject and there is a lack of standard terminology in the literature dealing with it (Turk et al., 1980). Drought resistance is separated into two components as discussed by Levitt (1956). The drought avoidance is the ability to prevent reduction in water content and the drought tolerance is the ability to survive reduction in water content (Turk et al., 1980).

Drought resistant varieties of plants are of paramount importance in the agricultural economy of 'dry farming' areas. Although numerous reports are available on the responses of drought resistant varieties to water stress, the studies on the physiology of recovery of these plants have received less attention. Whether drought-tolerance or drought avoidance mechanisms are the most suitable for a particular crop will depend on the degree and duration of the expected deficit (Begg and Turner, 1976).
Cotton is one of the important tropical commercial fibre crops. World cotton production is based on the seed fibres of four species of *Gossypium*, the most important of them being *G. hirsutum* L. Cotton is an annual crop of temperate regions as well as of the tropics (Phillips, 1976). In India, cotton is cultivated in about 8 million hectares and the lint production is about 7.8 million bales weighing 170 kg each. In Tamil Nadu, an area of 3.5 lakh hectares is used for cotton cultivation and a production of 5 lakh bales to the national coverage and production (Balasubramanian, 1985). The growth and development of the cotton plant is sharply curtailed during periods of limited water supply. During these periods, the plants wilt but after losing a few leaves, they again resume growth when water becomes available (Eaton and Ergle, 1948). Such a quick recovery is considered to be drought tolerant adaptation (Cutler et al., 1977). The tolerance is attributed to the osmotic adjustment in cotton plant (Cutler and Rains, 1978). Moreover, the ability to recover from the effects of drought is linked to water use efficiency. However, the information available on the biochemistry of recovery in cotton plant is relatively scarce, and so importance has been given in the present investigation to understand the physiological and biochemical characteristics of plants during the period of recovery.

Agronomists and plant breeders characterize plants for their drought resistance only on the basis of yield and yield components (Stocker, 1960; Blum, 1974). Though yield may function
as a basic parameter to understand stress effects, a biochemical analysis of the same will give us a complete picture of the mechanism of drought resistance. Two varieties of cotton (LRA 5166 and MCU 9) have been released from the Tamil Nadu Agricultural University, to cultivate in the dry farming areas. Their potential tolerance to drought has not been so far worked out on a biochemical basis.

Since water deficit has a clear negative effect on productivity and biomass, the main constituents of this biomass being nitrogen and carbon, their metabolisms have been studied in detail and the results compared between the two cotton varieties.

It has been suggested by some workers that the accumulation of osmotically active solutes may play a role in maintaining a favourable water balance in plants (Hsiao et al., 1976). In the present study, therefore an attempt has been made to identify the important solutes of cotton leaves, their concentrations and their contribution to the osmotic adjustment under water stress conditions.

As the biochemical aspects of the cotton varieties (MCU 9 and LRA 5166) in relation to drought resistance have not been studied so far, the present work aims at finding--
*how the two varieties of cotton respond to water stress; and
*how the varieties revive upon alleviations of water stress.
Thirty-day old pot cultured LRA 5166 and MCU 9 cotton varieties were subjected to water stress by withholding watering. Leaf samples were collected on 3rd, 6th and 9th day after the induction of stress for various physiological and biochemical analysis. Revival studies were made by alleviating the stress condition of the plants by rewatering on 9th day and sampling studies were carried out on first and 3rd day after rewatering.