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Development of drought tolerant index in cotton genotypes based on relative water content and yield

K. ANANTHI AND H. VIJAYARAGHAVAN

Department of Crop Physiology, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA
Email : ananthiphd@yahoo.com

Water stress adversely affects both yield and fibre quality of cotton (*Gossypium spp* L.). A study was conducted to determine the relative water content (RWC) and drought tolerant index (DTI) of cotton plants under water stress in cotton. The experiment was conducted by adopting Factorial Randomized Block Design with three replications. The treatments comprised of water stress imposed at vegetative, squaring and boll development stages of crop growth. In case of drought tolerant genotype, the leaves maintained higher RWC and photosynthetic activities under water stress than that of drought sensitive genotype. Prolonged water shortages virtually affect all the metabolic processes and often result in severe reductions in plant productivity.

Key words : Relative water content, Yield, Drought tolerant index

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INTRODUCTION

Cotton (*Gossypium* spp.; Family : Malvaceae) a leading natural fibre source, is grown in arid and semiarid regions of the world. It is a very important cash crop for Indian farmers and contributes around 30 per cent to the gross domestic product of Indian agriculture. It is considered as the 'white gold' and 'king of fibre crops'. Water use efficiency is a key factor determining plant productivity under limited water supply. Through intensive breeding programmes, cultivars have been developed that are grown commercially as annuals. The relative water content (RWC) was studied in drought tolerant and drought sensitive genotypes of cotton (*G. hirsutum* L.) during induction of water stress and posterior recovery (Asish Kumar *et al*., 2008). In case of drought tolerant genotype, the leaves maintained higher RWC and photosynthetic activities under water stress than that of drought sensitive genotype. Flower and Ludlow (1986) proposed that RWC is an alternative measure of plant water status which tells upon the metabolic process in the tissue and lethal leaf water status. Upreti *et al*. (1998) noted changes in RWC under stress and normal conditions, the reduction being significant under stress condition. Crop management for both optimum yield and fibre quality is a realistic and important approach to take for a profitable cotton production system. Water availability is arguably the most limiting factor to profitable cotton production in the South East. Pace *et al*. (1999) suggested cotton cultivars that can endure and recover from drought are needed to minimize fruit loss and reduce the amount of water required for crop production. Minimum numbers of flowers were found when moisture stress was imposed at flowering stage (Kaur and Singh, 1992). Jordan (1983) reported higher rate of square and boll shed in cotton due to water stress. Varma (1975) reported more than 32 per cent of flower shedding and 58 per cent of boll shedding in cotton. Kaur and Singh (1992) found that flower number and percentage of boll abscission were decreased by water stress at flowering stage of cotton. Seed cotton yield decreased as the allowable water deficit increased (Cudrak and Reddel, 1988). Lint yield is generally reduced because of reduced boll production, primarily because of fewer flowers and also due to increased boll abortions when the stress is extreme and when it occurs during reproductive growth (Pettigrew, 2004). Seed yield and yield components are severely affected by water deficit.

RESEARCH METHODOLOGY

The aim of this experiment was to investigate the responses caused by progressive water stress and the