PHYSIOLOGICAL RESPONSES TO SOIL MOISTURE DEFICIT STRESS ON SELECTED TOMATO (*Lycopersicon esculentum Mill*) CULTIVARS AT THE FLOWERING STAGE

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ABSTRACT

Agricultural production of crop plants has always been a risky business which is strongly influenced by environmental stress. This can be biotic or abiotic factor. Water is essential for plant life. It is the major constituent of the living cells, a universal solvent that allows critical chemical reaction to occur, carries essential nutrients through the plant and is essential for cell turgidity and cell elongation. Water; provide electron through photolysis for carbon dioxide fixation, a key step in photosynthesis.

The effects of water deficit on crop yield are determined primarily by the degree and timing of such deficit. Water deficit is the major constraint in Agricultural productivity and inhibits crop yield in semi-arid and arid regions. Water deficit affects every aspect of plant growth including Anatomy, Morphology, Physiology and Biochemistry. The most obvious effects of water stress are reduction in plant size, leaf area and crop yield.

The quantity and quality of plant growth depend on cell division, enlargement and differentiation and all are affected by water deficit stress but not necessarily to the same extent. Drought has been reported to decrease the apparent quantum yield of CO_2 exchange in tomato. Respiratory carbon loss is also affected by water stress, although the effect is generally not as pronounced as it is on photosynthesis. The maintenance component of plant respiration has also been reported to increase or decrease.

There is a need to utilize the water efficiently and effectively because water availability is scarce in the dry zone of Sri Lanka. This experiment was conducted in the Agronomy farm of the Eastern University of Sri Lanka which is located in the Batticaloa district. The experiment was started in April 2013 and brought to end in July2013. The soil of the experimental site is sandy regosal which is the prominent soil type in the Batticoloa district.

In the Agronomy farm of EUSL, suitable land was selected for the nursery. Three beds were prepared from the land surface. The soil of the beds were sterilized before sowing the seeds. The tomato seeds were sterilized and sown to bed in rows. Vigorous seedlings were transplanted at the age of 25 days to the main plot. Utmost care was taken for the healthy growth of the transplanted seedlings.

This experiment was conducted to determine the physiological responses of moisture stress in selected tomato cultivars such as 'Roma', 'Thilina' and 'KC- 1' during the flowering stage and to find out the most suitable tomato cultivar which could resist drought in order to sustain the yield. This experiment was arranged in the Randomized Complete Block Design (RCBD) with six treatments and four replications. Moisture stress was imposed to the plants for a period of six days for each treatment during the flowering stage. The control plants were watered daily to field capacity.

The results showed that the Stomatal Resistance (RS) was significantly higher and Transpiration Rate (TR), Relative Water Content (RWC) and Leaf Area Index (LAI) were significantly lower in the stressed plants than the control treatments. Slight increase in the Root Length Density (RLD) was observed irrespective of the type of cultivars. The 'KC- 1' cultivar stressed during the flowering stage showed the highest percentage of RS, RWC,LAI and RLD and lowest percentage of TR than those of 'Roma' and 'Thilina' tomato cultivars. Hence, considering the physiological responses and yield of selected tomato cultivars to moisture stress, 'KC-1' was identified as more tolerant cultivar to drought than the other two tested cultivars.

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