EFFICACY OF THIOUREA APPLICATION ON BIOCHEMICAL CHANGES IN CHICKPEA (Cicer arietinum L.) UNDER WATER DEFICIT STRESS

ABSTRACT

Key words: Chickpea, Drought stress, RWC, MSI, Total chlorophyll, Proline, True protein, Glycine betaine, MDA, Ascorbic acid, Hydrogen peroxide, Antioxidant activity and protein profile.

The present experiment on “EFFICACY OF THIOUREA APPLICATION ON BIOCHEMICAL CHANGES IN CHICKPEA (Cicer arietinum L.) UNDER WATER DEFICIT STRESS” was conducted at Department of Biochemistry, Junagadh Agricultural University, Junagadh with the objectives to study the effect of polyethylene glycol-6000 induced water deficit stress (drought) and thiourea soaked seed followed by drought treatments on various physiological, biochemical parameters, antioxidant enzymes system and SDS and Native electrophoresis was used to examine the protein profiling in leaf of 20 days old chickpea seedlings of GG 4 genotype.

The experiment was carried out in laboratory with chickpea genotype GG-4 and different PEG induced water deficit stress with thiourea soaked and without thiourea soaked seed treatments. Application of thiourea positively influenced the above parameters. However, the magnitude was varied with the different concentrations.

In chickpea leaf tissue, the highest RWC and MSI were found in treatment- Th3P0 (75 ppm thiourea and no water stress). The lowest RWC and MSI were observed in treatment- Th0P2 (-6 Bar PEG water stress). In different treatment combinations of thiourea and water stress, the highest RWC and MSI were found in treatment- Th3P1 (75 ppm thiourea + -2 Bar PEG water stress).

The highest total chlorophyll content was found in treatment – Th3P0 (75 ppm thiourea) while the lowest total chlorophyll content was found in treatment- Th0P0 (Control). In different treatment combinations of thiourea and water stress, the highest total chlorophyll content was found in treatment- Th3P2 (75 ppm thiourea + -6 Bar PEG water stress).
In chickpea leaf tissue, the highest proline, malondialdehyde, glycine betaine, hydrogen peroxide and ascorbic acid content were found in treatment- Th0P2 (-6 Bar PEG water stress). The lowest proline, malondialdehyde, glycine betaine, hydrogen peroxide and ascorbic acid content were found in treatment- Th3P0 (75 ppm thiourea). In different treatment combinations of thiourea and water stress, the lowest malondialdehyde, glycine betaine, hydrogen peroxide and ascorbic acid content were found in treatment- Th3P1 (75 ppm thiourea + -2 Bar PEG water stress) while highest proline content was found in treatment- Th3P2 (75 ppm thiourea + -6 Bar PEG water stress) and the lowest proline content was found in treatment- Th1P1 (25 ppm thiourea + -2 Bar PEG water stress).

True protein is decreased due to water stress, the highest true protein was found in treatment- Th3P0 (75 ppm thiourea) while the lowest true protein was observed in treatment- Th0P2 (-6 Bar PEG water stress). In different treatment combinations of thiourea and water stress, the highest true protein was found in treatment- Th3P1 (75 ppm thiourea + -2 Bar PEG water stress).

Antioxidant enzymes activity like POX, CAT and SOD showed positive effect under drought stress, the highest activity was found in treatment- Th0P2 (-6 Bar PEG water stress). The lowest activity was observed in treatment- Th3P0 (75 ppm thiourea). In different treatment combinations of thiourea and water stress, the highest activity was found in treatment- Th1P2 (25 ppm thiourea + -6 Bar PEG water stress). Thus thiourea @ 25 ppm was effective to increase activities of these enzymes.

Thiourea @ 75 ppm was effective as it allowed to increase total chlorophyll content and proline under -6 Bar and RWC, MSI, true protein under -2 Bar water stress treatments. Also thiourea @ 75 ppm resulted decrease in malondialdehyde, ascorbic acid and hydrogen peroxide under -2 Bar water stressed plants. This was true for glycine betaine in -6 Bar water stressed plants @ 25 ppm thiourea. Thus, both the concentrations of thiourea (25 ppm and 75 ppm) seemed to be effective to alleviate water stress in chickpea genotype GG – 4.

In this study, responsive proteins in chickpea leaves under control, thiourea treatments, stress condition and in different treatment combinations of thiourea and water stress were investigated by protein profile. SDS and Native gel analysis of the resulting protein revealed drought stress responsive protein and different treatment combinations of thiourea and drought stress protein expression in chickpea genotype GG – 4. Chickpea is one of the important pulse crops growing in Gujarat State. The problem of water stress in Gujarat is prevailing from seed germination to harvest in chickpea crop. The present study on the effect of thiourea at seedling stage of Chickpea (Cicer arietinum L.) to overcome the water deficit stress. The present work is also throw light on the effect of thiourea on physiology and biochemistry in response to water stress in susceptible genotype to increase the production as well as productivity of chickpea under water deficit stress. Susceptibility has been minimized against the water stress through thiourea treatment.