Indian Journal of Ecology (2016) 43 (2): 554-558

Manuscript Number: 2447
NAAS Rating: 4.47

Diversity of Cowpea (*Vigna unguiculata* L. Walp) in Terms of Some Germination Components under Drought Stress

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Abstract: Comparative study was carried out the effect of different PEG-4000 concentration on germination components of five cowpea verities (BL-1, BL-2, EC-4216, Kohinoor and Local). Seeds of all verities were tested for drought tolerance using different concentration of PEG-4000 (control, -0.075, -0.1 and -0.2 MPa). PEG-induced drought stress decreased germination speed, coefficient velocity of germination, germination rate index, seedling length, relative growth rate and led to reduction in water content in all varieties and mean germination time increased with increasing drought stress concentrations. Germination speed was highly inhibited in all five varieties at -0.2 MPa PEG concentrations. BL-2 variety showed greater drought tolerance during germination parameters. BL-2 might be used for further study of drought stress on growth processes and its physiological consequences at an advanced stage of growth.

Key Words: Cowpea, Diversity, Drought, Germination, PEG, Stress

Recent year water resources for successful crop production have been decreasing. Furthermore, in view of various "climate changes" has a negative impact on agriculture production. A modest evolution suggested that nearly 90% of global rural area is affected by Abiotic stress (Cramer *et al.*, 2011). Abiotic factors such as drought, cold, chill, flood, frost, elevated CO_2 level, heat and light that severely affected the plant growth (Basha *et al.*, 2015). Drought stress highly affected numerous plant responses, varying from; maintaining higher plant productivity, altered gene expression for metabolic process under environmental stresses is the main challenge facing modern agriculture (Gill and Tuteja, 2010). Noteworthy developments were made in understanding the physiological, biochemical, and molecular agronomic scale especially the potential target and response mechanism for improving crop response to drought (Chen *et al.*, 2013).

Cowpea (*Vigna unguiculata* L. Walp.) is grown in the tropical and sub-tropical areas that includes parts of Asia, Africa, Southern Europe, Southern United States and Central and South America which is adapt to various climatic and ecological conditions. Leguminous plants, they can improve fertility of agriculture soils and thus reduced amount of mineral fertilizer used. Cowpea contributes in human food, particularly their seeds very rich in good quality protein and essential amino acids. For this region seeds are used in complementing diet on cereals which are protein nitrogen compound (Tsoata *et al.*, 2015).

Poly ethylene glycol (PEG) is one of the dependable approaches for the selection of desirable verity. Several reports have shown that invitro screening techniques using PEG (Sakthivelu *et al.*, 2008). Identification of cowpea verity under water stress condition is vital to increase production. This can be accomplished by explaining the drought tolerance verity of cowpea. Current study was planned for simple and quick screening of higher tolerant cowpea verity to drought and understands the effect of different PEG-4000 concentration on germination and early growth parameters.

MATERIAL AND METHODS

Seeds of five different cowpea varieties used in the study were collected from Indian Grassland and Forage Research Institute (IGFRI), Jhansi, India. The names of the varieties are BL-1, Bl-2, EC-4216, Kohinoor and Local (available in local area), uniform seeds of all varieties were surface sterilized 0.1% $HgCl_2$ for 3-5 minutes and then washed thoroughly with autoclaved double distilled water and surface dried. Ten seeds of each verity in each treatment were allowed to germinate on a filter paper in 9 cm diameter petri dishes. Each filter paper was moistened with solutions of 0 MPa (distilled water) as a control, or final osmotic potentials of -0.075, -0.1 and -0.2 MPa of PEG (MW 4000).

20 ml of appropriate solution was applied to each petri dish pletely randomized design (CRD) with three replicates for each treatment. Germination room temperature was maintained at 25 ± 1°C in the dark with 8 h photoperiod. Petri plates were periodically checked and respective solutions were applied to compensate evaporation. Seedling lengths were measured (1 to 10 days after treatment application) by using a scale. GS, MGT, GRI, CVG, RGR and WC were calculated by the following formulae

$GS = \sum Si / D$ (Rajabi and Poustini, 2005)