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Effect of Salt Stress on Biochemical and Physiological Parameters of Four *Cicerarietinum* L. Varieties

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Abstract: *Chickpea, Cicerarietinum L. belongs to the family Fabaceae. It is a self-pollinated, diploid, annual legume crop. The global production of chickpea is nearly 11 million tonnes and India is the major producer accounting for 64% of the total chickpea production. It is a major source of high quality protein in human diet and also provides high quality crop residues for animal feed. In the present investigation the effects of salinity stress affect species productivity and change physiological and biochemical changes of four varieties of Cicerarietinum L. Biochemical and physiological parameters, growth, and yield of field crops especially salt sensitive crops like chickpea are affected adversely by salinity in arid to semi-arid regions.*

Keywords: Chickpea, *Cicerarietinum* L., Salt

I. INTRODUCTION

Chickpea (*Cicerarietinum*L.) - Fabaceae - third most important pulse crop in the world in terms of total production. Cool season crop, - dry and semi-dry area in the world - South Asia, West Asia, North Africa, East Africa, southern Europe, North and South America, and Australia (Roy *et al*., 2010). In India, chickpea is cultivated in rabbi season during October to January (In winter season). Chickpea is the most important food for human and animals - protein, carbohydrate, and fiber and many essential vitamins and minerals (Roy *et al*., 2010). *C.arietinum* L. is the most important nutrient food for human and animals as it is a valuable source of protein, carbohydrate, fiber andmany essential vitamins and minerals (Roy *et al*., 2010). It is used for making different useful product like, besan, dal, sweets, and other food products.

Salt is the major causing salinization and affects morpho-physiological,biochemical and molecular processes, including seed germination, plant growth and water and nutrient uptake in crop plants (Kaya *et al.,* 2011, Silva *et al*., 2008).The negative effects of salinity stress on growth and physiological include the reduction in germination rate and seedling growth (Tambhale et al., 2011), and decrease in photosynthetic rate and biomass production (Mansourand Salama, 2004).

III. MATERIALS AND METHODS

Plant material

Four certified varieties of Chickpea viz. Vijay, Digvijay, Jaki-9218, ILC-5. Wereprocured from Seed testing laboratory, Krushibhavan, Shivajinagar, Pune, 05.

Salt treatment

Different concentrations of NaCl (0 mM - control. 50 mM, 100 mM, 150 mM and 200mM) were used.

Methods

NaCl stress treatmentfifteen seeds of each variety were treated with different concentrations of NaCl suchas, 0 mM (control), 50 mM, 100 mM, 150 mM and 200 mM. Initially, seeds were allowed togerminate in dark in petriplates lined with germination paper. After two days the plates weretransferred in light and incubated at room temperature. The experiment was performed in tworeplications and each replicate contained 15 seeds.

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Growth / Physiological Parameters

Germination percentage was calculated on third day while the observations on rootlength, shoot length and total length (cm) were conducted from 10 seedlings on 11th day aftersowing. Germination percentage was calculated using: Germination % = (No. of germinatedseeds / total no. of seeds)*100

Seed vigor: The seed vigor was calculated as: Seed vigor index = (Germination % * meansof total seedlings length in cm) / 100

Weight reduction %: Fresh weight was calculated from each concentration of NaCl in bothreplications from ten seedlings on 11th day and expressed in grams. These 10 seedlings ofeach concentration were kept for drying at 60^0C for 21 days and dry weight was calculated.Weight reduction percentage was calculated by using following formula:

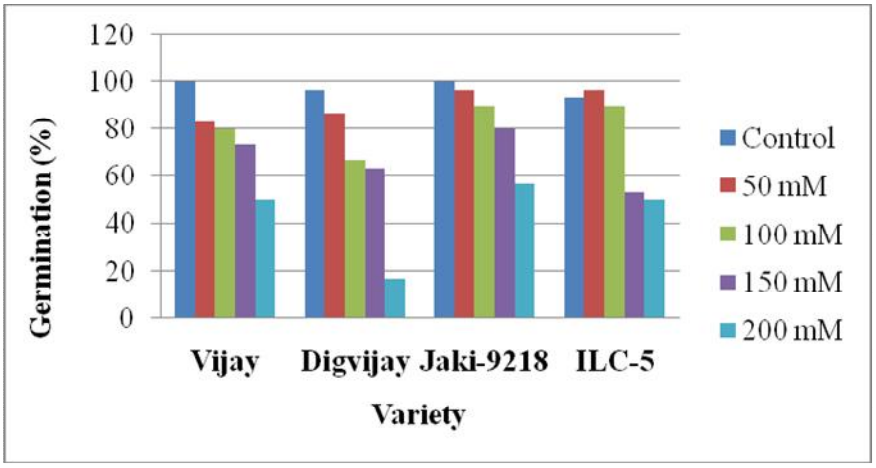
Fresh weight percentage reduction: FWPR % = 100 * [1 – (fresh weight salt stress / fresh Weight control)].

Dry weight percentage reduction: DWPR % = 100 * [1 – (dry weight salt stress / dry weight Control)].

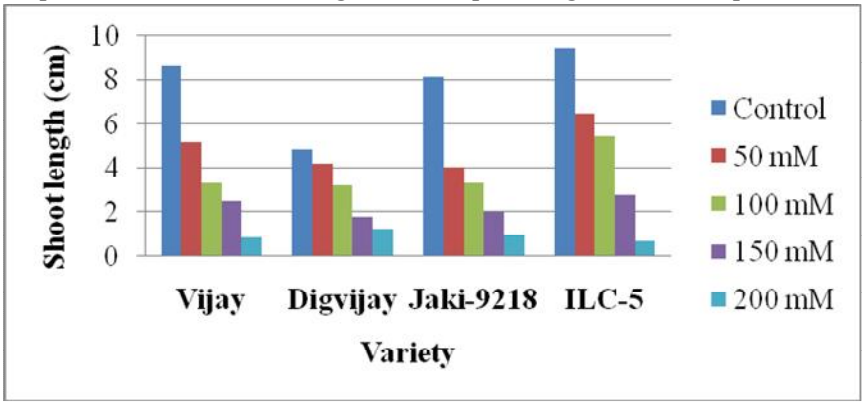
Chlorophyll estimation

Chlorophyll estimated on 12th day from each concentration. The estimation wascarried out from 250 mg and soaked in 80% chilled acetone (5ml) and incubated in dark forthree days. After three days the absorbance was measured at 663 and 645 nm.

Results:



Graph.1. Effect of NaCl salt on germination percentage in four chickpea varieties



Graph 2. Effect of NaCl on shoot length in four chickpea varieties

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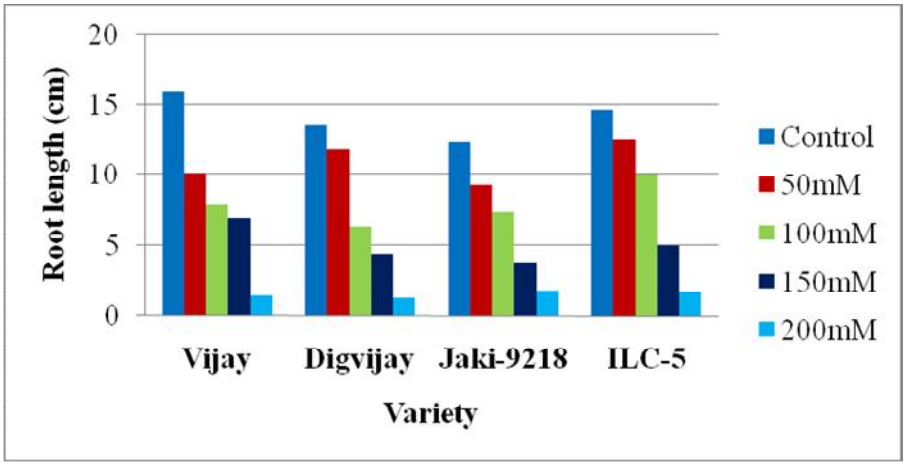
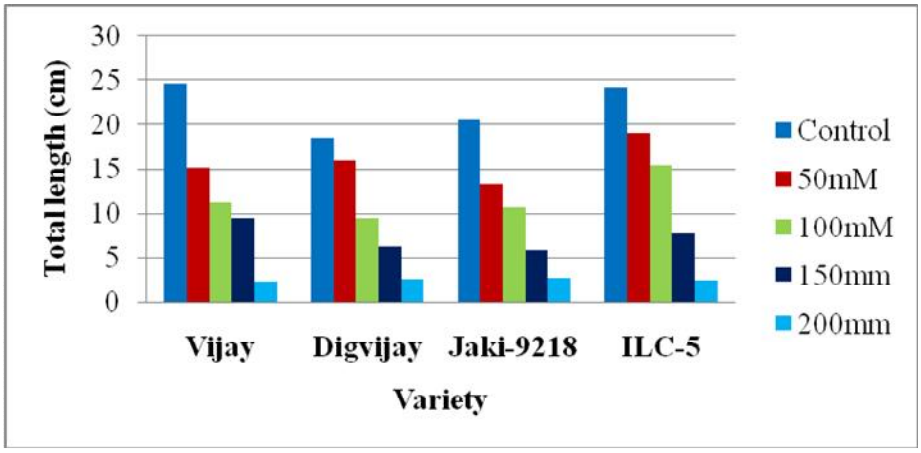
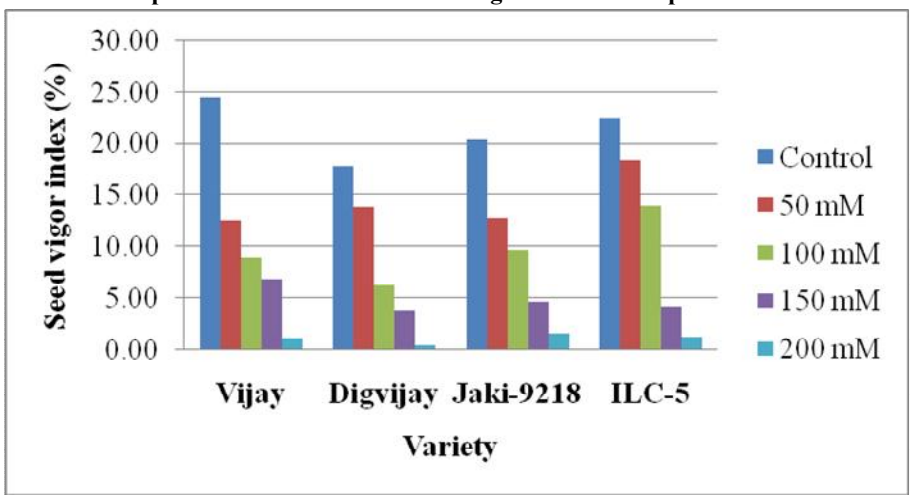


Graph 3. Effect of NaCl on root length in four chickpea varieties



Graph 4. Effect of NaCl on total length in four chickpea varieties



Graph 5. Effect of NaCl on seed vigor index in four chickpea varieties

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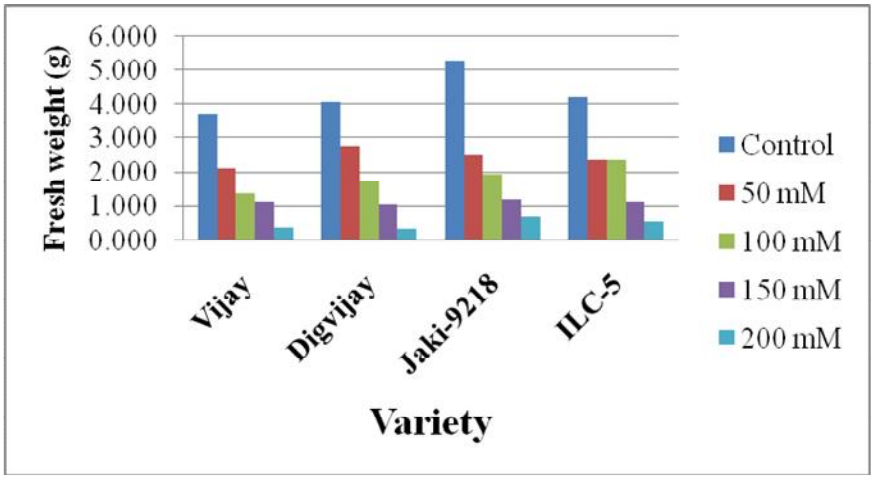
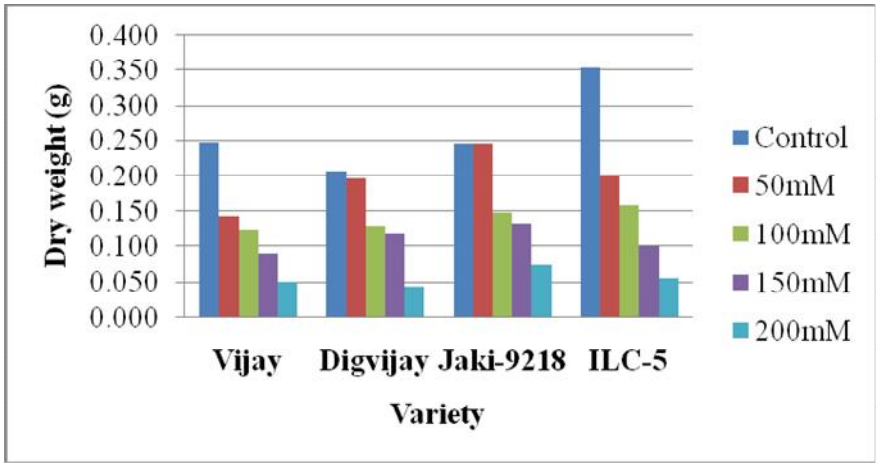
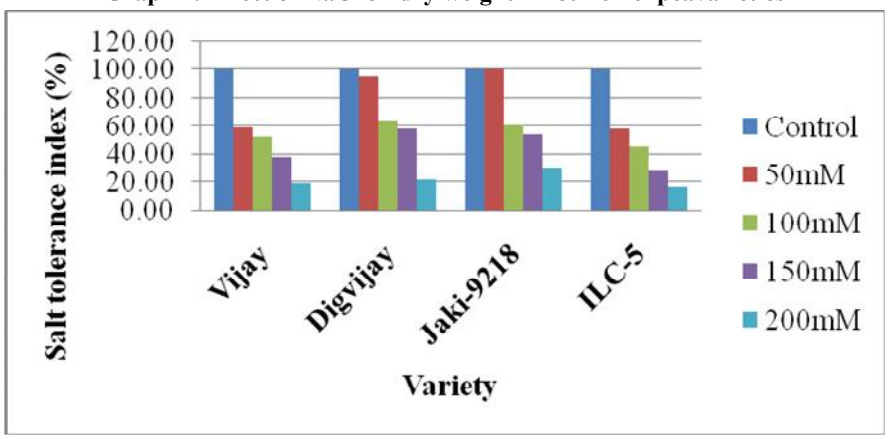


Graph 6. Effect of NaCl on fresh weight in four chickpea varieties



Graph 7. Effect of NaCl on dry weight in four chickpeavarieties



Graph 8. Effect of NaCl on salt tolerance index in four chickpea varieties

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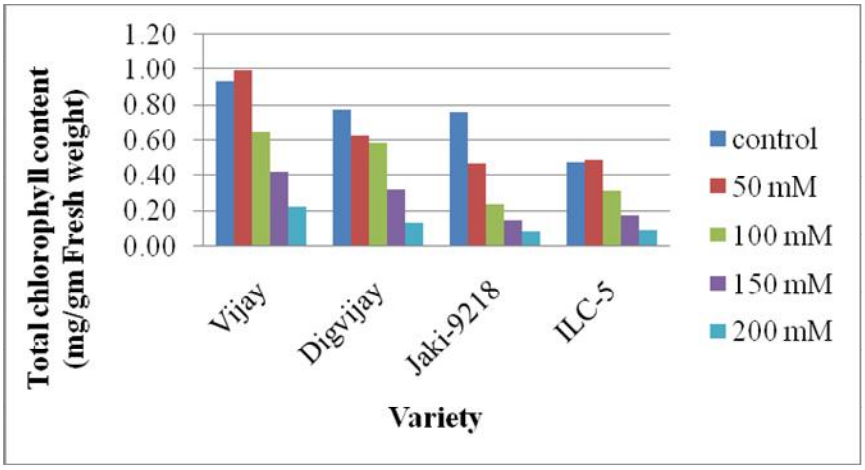

Graph 9. Effect of NaCl on total chlorophyll content in four chickpea varieties

IV. CONCLUSION

The preliminary studies conducted on effect of different concentrations of NaCl on four chickpea varieties at seedling level indicated that NaCl exhibited inhibitory effect on seed germination and seedling physiology.

However, varieties Vijay, Jaki-9218, ILC-5 found to be more tolerant to salinity as compared to Digvijay variety.The salinity effect under the field condition may not be the same due to the large variations in the environmental conditions.

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