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RESEARCH ARTICLE

TO STUDY EFFECT OF SALINITY ON MUNGBEAN (*VIGNA RADIATA*)

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ABSTRACT

Salinity is major abiotic stress limiting growth and productivity of plant in many area of the world due to increasing use of poor quality water for irrigation and soil Salinization. In present study growth parameter of all the plant (control, 50mM, 100mM) were compared and analyzed to interpret the effect of salt stress on plant. It was observed that the treated plant have decreased shoot and root length as compared to control plantlet. Biochemical parameter also affected by the salinity as the salt concentration increase there is increase in the chlorophyll content and the protein content of treated plantlet. The total carbohydrate content was found to be equal in treated and control plantlet. Due to the salt stress the IAA concentration was found to be higher in both shoot and root of the treated plant as compare to control.

Key words: Vigna radita , Salinity , Biochemical parameters, Endogenous auxin

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INTRODUCTION

Plants need essential mineral nutrients to grow and develop. However, excessive soluble salts in the soil are harmful to most plants. In fact, no toxic substance restricts plant growth more than does salt on a world scale. Mung bean is a very important pulse crop which provides an inexpensive source of vegetable dietary protein. Today, of various abiotic stresses, soil salinity is known to cause considerable crop losses According to an estimate, 33% of irrigated land world-wide has been affected by salinity (Ashraf *et al.,* 2008). Inside the plant, soluble salts at higher concentrations cause hyper osmolality, ion toxicity and disequilibrium of nutrients that adversely affect plant growth and development (Munns, 2002). High levels of both Na+ and Cl- in cytosol are inhibitory to a number of metabolic and cellular processes (Ashraf *et al.,* 2008). Soil salinity causes prominent losses of yield in all crops, therefore causing to reduction in crop production (3,4). Reduction in yield due to salinity is due to a number of physiological and biochemical abnormalities in plants grown which have been mentioned in a number of comprehensive reviews on salinity effects and tolerance in plants (Ashraf *et al.,* 2008; Munns, 2002). The most common salinity effect is a general stunning of plant growth. Earlier reports showed gradual reduction in seed germination, plant height, shoot and root length, dry matter, biomass, root, stem and leaf weights with progressive increase in salinity stress in mungbean plants (Munns and Tester, 2008). Reduced yield in mungbean under salt stress may be due to reduced efficiency per day of plant to fill the developing seeds, which may lead to reduced number of seeds/pod or plant and dry matter yield of individual seed (Saha *et al.,* 2010). NaCl stress caused a drastic effect on the roots as compared to shoots, accompanying reductions in length, number of root hairs and branches, while the roots became stout, brittle and brown in color (Pattanagul and Thitisaksakul, 2008)

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MATERIALS AND METHODS

Collection of sample

Seeds of Mung bean (*vigna radita Nirmal 80322)* were collected from Selu in Parbhani (Maharashtra state). Uniform, healthy seeds of *Vigna radiata* were selected and thoroughly washed under tap water 2-3 times and finally by distilled water. The seeds were dip in 70% Ethanol for 60sec. Then the seeds were transferred in 01% $HgCl_2$ for 15-20mins. During that period the beaker was swirled for shaking so that all surfaces of seed comes in contact with sterilant. The sterilant was removed and seeds were washed thoroughly by sterile distilled water. Repeated washes (2-3 times) were done to remove all traces of sterilant. The seeds of Mung bean were inoculated in the Murashige and Skoog medium containing potassium chloride salt having 50mM, 100mM concentration and one of them kept as a control. The plantlets were incubated in light at 25° C for 7 days. The experiment was performed in triplicate. After 7 days plantlets were removed from the tube and shoot length, root length and fresh weight were taken. The plantlets were dried in hot air oven at 80^0C and dry weight was taken. (Ghosh *et al.,* 2014).

Preparation of extract

Methanolic extract of vigna radiata leaves and root was prepared by vigorous grinding in 80% methanol by using mortar and pestle. The mixture was centrifuged at 8000rpm for 20min supernatant was collected and used for analysis (Nigam Arti).

Determination of Biochemical Parameters

Estimation of chlorophyll content:
Chlorophyll was extracted with 80% (v/v) chilled acetone. The absorbance for chlorophyll b at 645nm and for chlorophyll a at 663nm and of total chlorophyll was recorded and total chlorophyll content was calculated by using the formula.

Total chlorophyll content = [{(20.2×A645) + (8.02×A663)}/1000×*W*] ×*V*

Where "*W*" is the fresh weight of the material and "*V*" is the extraction volume and is expressed in terms of mg g^{-1} fresh tissue (Chao *et al.,* 1999).

Estimation of protein concentration by Lowry's method

Protein concentration present in shoot and root of plantlet was calculated by using Folin-Ciocalteu reagent and absorbance was taken at 660nm. The concentration of protein was calculated by using standard graph (Kapoor and Srivastava)

Estimation of total carbohydrate content by Anthrone's method

Total carbohydrate was estimated by using Anthrone's method and absorbance was taken at 630nm on spectrophotometer. The unknown total carbohydrate concentration was calculated by using standard graph (Nafees *et al.,* 2010).

Estimation of reducing sugar by Summner`s method

Reducing sugar concentration was estimated by using 3, 5-DNSA reagent. Absorbance was taken at 540nm on the spectrophotometer. Unknown reducing sugar concentration was calculated by using standard graph (Nafees *et al.,* 2010).

IAA concentration Determination

1.0 ml extracted sample of shoot and root of control, 50mM, and 100mM plantlet were taken in different test tubes and 2ml of 25% TCA and 2ml of Ehrlich's reagent added in it. The test tubes were incubated for 30min. at room temperature. The absorbance was taken at 530nm on UV-visible dual beam spectrophotometer. IAA concentrations were calculated from the standard graph (Anthony, 1970).

RESULTS AND DISCUSSION

Plant growth pattern analysis

Morphological Features: Growth parameter of all the plantlets (Control, 50mM, 100mM) were compared and analyzed to interpret the effect of salt stress at different concentration. In comparison to control, plants grown on 50mM KCl are having more shoot length whereas 100mM are having extensively decreased shoot length. In comparison to control plants grown on 50mM KCl are having significantly more number of roots with increased root length whereas 100mM are having decreased shoot &root growth.(Fig.1) These results are resemble with the results of (Muhammad Ashrad Ullah *et al.,* 2016)

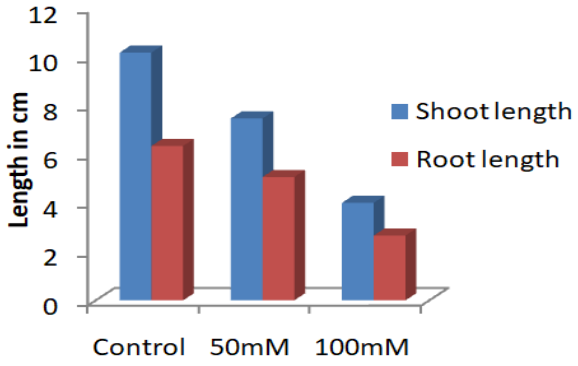

Fig 1. Comparison of shoot androot length

Comparison of total chlorophyll content in leaves

Chlorophyll content was found to be increased in all treated plant as compare to control. (Fig.2) These results are agreed with the findings of (Ashraf *et al.,* 2008, Munns,2008) The results regarding the ''increase'' in chlorophyll content with the increase of salt concentrations agree with results reported by (Misra *et al.,* 1997).

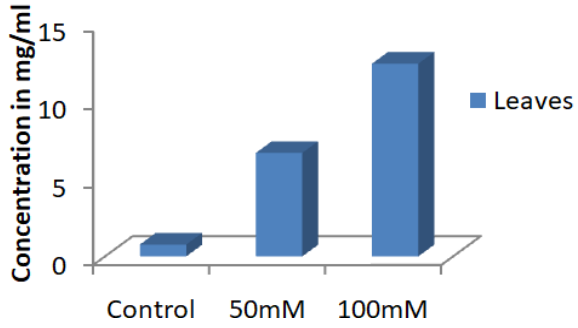

Fig 2.Comparison of total chlorophyll

Comparison of protein concentration in Leaves androots

Protein concentration is increased in leaves of the treated 100mM plant and decreased in 50mM plant as compare to control. Whereas in root the protein concentration found to be increased as compare to control in treated plant (Fig.3). Kapoor and Srivastava (2010) in recent study on Vigna mungo (L.) observed an increase in protein content when increasing salt concentration. The results obtained, in general agree with what Chao et al. (1999) had presented. They noticed an increase of protein content of the tomato plant *Lycopersicon esculentum* (L.) in response to salt treatment.

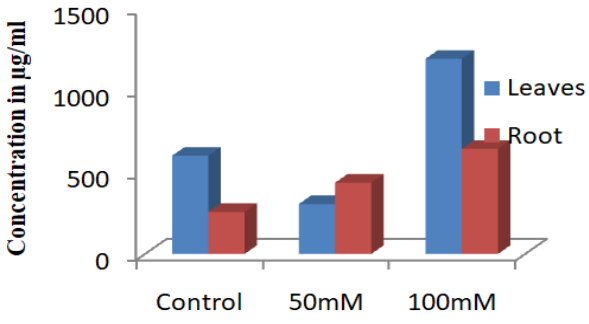

Fig 3. Comparison of protein concentration

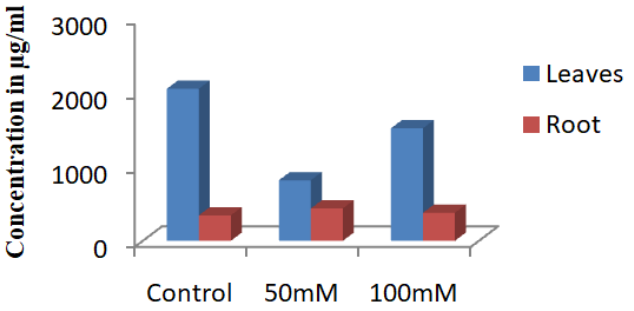

Fig 4. Comparison of reducing sugar concentration

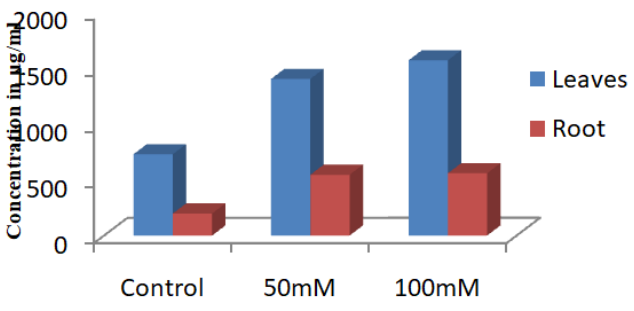

Fig 5. Comparison of IAA concentration

Comparison of Reducing Sugar concentration in Leaves and roots

The concentration of reducing sugar present in the leaves of control plantlet is significantly increased in contrast to treated plantlet whereas, in root the reducing sugar concentration was increased as compare to untreated plantlet.(Fig. 4) Increased accumulation of sugar has been reported in many plant species exposed to salinity (Wattana Pattanagul and Thitisaksakul, 2008). According to Stoop and Pharr (1994) the increase in glucose pull induced by salinity in cereals petioles appear to be due to decreased demand of carbon. Sugar content in shoots had a increase under salinity stress.

Comparison of IAA concentrations in Leaves androots

The IAA concentration higher in the leaves of treated plant as compare to control while the IAA concentration increased in the roots of treated plant as compare to control plantlet.(Fig.5) It is well documented auxin, a class of essential plant hormone; demonstrate almost every aspect of plant growth and development.

Conclusion

Salt stress is responsible to change morphological features of plant. Along with it is responsible to alteration of various biochemical parameters positively and negatively. The plant may get adopted in salt stress condition as a result protein concentration is increased in roots of treated plant. Sugar accumulation takes place to survive in stressful condition.

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