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Effect of sulphate type of salinity on some metabolic drifits in germinating groundnut (*Arachis hypogae*) varieties

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SUMMARY

Groundnut varieties, JL-24, GG-2, GAUG-10 (tolerant group) and GG-7, GG-13, GG-20 (susceptible group) were germinated under sulphate dominant salinity ranging from 0, 20, 40, 80 m eq/L. Sulphate salinity decreased the seedling vigour index of all groundnut varieties, and the decrease was found more in susceptible varieties at 1st and 4th days after germination (DAG). With increasing salinity regimes, various metabolites like free amino acid, protein, total phenol and free proline contents were deposited at higher rate in seedlings of tolerant varieties compared to susceptible ones for better osmotic adjustment. However, sulphate salinity decreased the accumulation of total sugars, starch and free fatty acid contents in the seedlings of all groundnut varieties during 1st and 4th DAG. The decrease in sugar content was found more in susceptible varieties than tolerant once. Activities of alpha-amylase decreased but that of protease and peroxidase increased under salt stress at 1st and 4th DAG in all varieties of groundnut.

Key words : Groundnut, Sulphate salinity, Vigour index, Metabolites, Alpha-amylase, Protease, Peroxidase, Salt tolerance

Groundnut (*Arachis hypogaea* L.) is an important oilseed and is emerging as a food crop in India, grown in an area of 6.45 million ha with a total production of 6.57 million tons based on an average of the last five years (FAO, 2005). This contributes to 26.6% of world's groundnut area and 18.5% of world's groundnut production. Groundnut occupies nearly 28.3% of the cultivated area and contributes 31.7% of the production of the total oilseeds in the country. Groundnut is mainly grown in the states of Andhra Pradesh, Gujarat, Tamil Nadu, Karnakata, Maharastra and Rajasthan in summer (January–June) and rainy season (June–October). It is widely used as cooking oil, digestible protein, minerals and vitamins in many countries and contributes significantly to food security and alleviating poverty. About 80% of India's groundnut production is crushed for oil, 12% for using as seed, 5% for food and 2% for export.

Among many reasons ascribed for the lower productivity of groundnut, salinity is an important abiotic stress which significantly affects seedling, vegetative and reproductive growth, seed quality and yield. Root zone salinity increases as a result of continuous use of saline water for irrigation because of limited or non-availability of good quality water in majority of groundnut growing areas. It can rapidly inhibit root growth and in turn their capacity to uptake water and essential mineral nutrients from the soil (Neumann, 1995). Groundnut yields were severely affected with an increase in soil and water salinity (Patel *et al.*, 1992).

Survival of plants in adverse environment depends on its ability to withstand extreme stresses, affecting the developmental, physiological and biochemical processes. To achieve this, understanding of the physiology and mechanism of salt tolerance in plants is highly essential. Present work was, therefore, designed to find out the effect of sulphate type of salinity on carbohydrate and protein metabolisms of germinating groundnut varieties differing in relative salt sensitivity.

MATERIALS AND METHODS

The sulphate dominant salt solution was prepared by taking 1N of NaCl : Na_2SO_4 : $MgCl_2.6H_2O$: $MgSO_4.7H_2O$: $CaCl_2.2H_2O$ in the ratio of 3.66 : 9.34 : 0.5 : 4.0 : 2.5 for 20 m eq/l which comprises 13.3 m eq SO_4/l and 6.7 m eq Cl /l. Accordingly, 40 and 80 m eq/L sulphate dominant salt solutions were also prepared. Thus, the concentration of saline solutions- 20, 40 and 80 m eq /l were used for salt stress. Total four treatments were arranged for sulphate type of salt stress as -T_1 - 00 m eq /L (*i.e.* Distilled water, Control), T_2 - 20 m eq /l, T_3 -40 m eq /l, T_4 -80 m eq /l.

Seeds of uniform size of six varieties (V_1 - JL-24, V_2-GG-2, V_3-GG-7, V_4-GAUG-10, V_5-GG-13 and V_6-GG-20) of Groundnut (*Arachis hypogaea* L.) were

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