Analysing the Impact of Salinity on Biochemical Parameter of Indian Mustard.

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***Abstract*- The beginning of 21st century is marked by global scarcity of water resources, environmental pollution and increased salinization of soil and water. Increasing human population and reduction in cultivable land are two threats for agricultural sustainability. Salinity being most brutal environmental factors limiting the crop productivity as most of the crop plants are sensitive to salinity at high salt concentrations. It has been estimated that worldwide 20% of total cultivated and 33% of irrigated agricultural lands are afflicted by high salinity. It has been predicted that 50% of the arable land would be saline by the year 2050. Salinity affects almost all aspects of plant development including: germination, vegetative growth and reproductive development. Soil salinity imposes ion toxicity, osmotic stress, nutrient deficiency and oxidative stress on plants, and limits water uptake from soil. It significantly reduces plant phosphorus (P) uptake because phosphate ions precipitate with Ca ions. In order to assess the tolerance of plants to salinity stress, growth or survival of the plant is measured because it integrates the up- or down-regulation of many physiological mechanisms occurring within the plant. Using the salt-tolerant crops is one of the most important strategies to solve the problem of salinity. Development of salt-tolerant crops has been a major objective of plant breeding programs for decades in order to maintain crop productivity in semiarid and saline lands. The present study was therefore carried out to examine the salt-induced modulation in growth and carbohydrate concentration in different varieties of *Brassica* which in turn will be helpful in effective breeding for salt tolerance.**

Keywords-Salt-tolerant, Salinity, Ion toxicity, Crop productivity

INTRODUCTION-

Salinity is the process of accumulation of soluble salts, by which saline soils are produced. Soil salinity is a major concern to the agriculture in arid and semi - arid regions. According to an estimation one third of the world's land surface is arid or semi - arid (4.8 × 109ha.) , out of which one - half is estimated to be affected by salinity (Bradbury and Ahmad , 1990) .High salt content in the soil affects the soil porosity and also decreases the soil water potential that results in a physiological drought. The problems of salinization are increasing, either due to bad irrigation drainage or agriculture practices. Despite its relatively small area, irrigated land is estimated to produce one - third of the world food. High salinity lowers water potential and induces ionic stress, and results in secondary oxidative stress. It severely limits growth and development of plants by affecting different metabolic processes such as CO_2 assimilation, oil and protein synthesis. The composition of salts in large amounts mostly is calcium, sodium and magnesium chloride and sulphate ions and in relatively small amounts are potassium, carbonates, bicarbonates, borate and lithium salts. When plants are exposed to salt stress, they adapt their metabolism in order to cope with the changed environment. Survival under these stressful conditions depends on the plant's ability to perceive the stimulus, generate and transmit signals and instigate biochemical changes that adjust the metabolism accordingly. Some of the harmful effects of salt stress include the reduction in germination rate and seedling growth and the expansion in the leaf area which eventually declines photosynthetic area and biomass production. Similarly, percent germination, height, grain and straw yield of pearl millet decreased with increasing concentration of salinity. Under saline conditions, mineral ion interactions in the external media may affect the internal requirements of essential minerals required for plant growth and development. High salinity lowers water potential and induces ionic stress, and results in secondary oxidative stress. It severely limits growth and development of plants by affecting different metabolic processes such as CO_2 assimilation, oil and protein synthesis .

Na^+ and Cl^- ions can enter into the cells because of their prevalence and have their direct toxic effects on cell membranes, as well as on metabolic activities in the cytosol. These primary effects of salinity stress causes secondary effects like reduced cell expansion, assimilate production and membrane function, as well as decreased cytosolic metabolism and production of reactive oxygen intermediates (ROS). Therefore, Salinity is of vital importance to present day agriculture, as rapid population growth especially in the developing world and consequently increased demand for agricultural products have made salinity oriented problems urgent

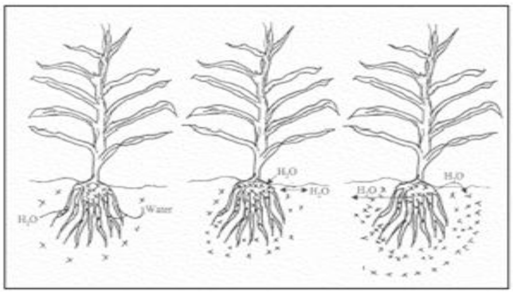

Figure (1) : Increased salts in root zone can result in decreased water uptake by plant.

Effect of salinity on biochemical parameters of Indian Mustard-

Brassica is considered to be a salt resistant crop; as a result, these crops are more appropriate to evaluate the basis of salt stress tolerance in plants. The dominance of the *Brassica* amphidiploids species over the diploid species in terms of salt resistant is obvious from various documents. Tolerance of oilseed *Brassica* to salt stress is a complex characteristic, which is greatly modified by cultural, climatic and biological. The amphitetraploids *Brassica* species including *Brassica napus, B. carinata and B. juncea* are more tolerant to salinity and alkalinity than their relevant diploid progenitorssuch as *B.campestris*, *B. nigra and B. oleracea*. Canola (*B. napus L*.) is one of the most important oilseed crops in the world. It has been observed that *Brassica carinata* and *Brassica napus* were salt resistant in comparison with *Brassica campestris* and *Brassica juncea*. A variety of carbohydrates clearly play important roles in salt and osmotic stress tolerance in plants. However, is the question of how carbohydrates in seed (both pre-existing and those accumulating during germination) affect germination and root elongation under salt stress? We assessed germination and carbohydrate status of seeds fromsalt tolerant species, under increasing levels of salt stress. Proteins are compounds of fundamental importance for all functions in the cell. It is well known that alteration of gene expression is always involved in preparing plants for an existence under stress. Protein variation is an essential part of plant response to environmental stress as well as for adaptation to environmental conditions. Under conditions of water deficit (dehydration) numerous processes are modified or impaired. Water stress affects the protein levels of plants but the results of different authors are contradictory. Some authors show decreased protein levels under water stress. Others found an absence of deleterious effects of drought on protein levels. The reduction of leaf chlorophyll content under NaCl stress has been attributed to the destruction of chlorophyll pigments and the instability of the pigment protein complex .It is also attributed to the interference of salt ions with the de novo synthesis of proteins, the structural component of chlorophyll, rather than the breakdown of chlorophyll. It is therefore proven that soil salinity had negative effects on the growth and photosynthetic metabolism of *C.roseus*. Photosynthesis is a major factor in the determination of plant growth. The reduction in crop production observed in various plant species exposed to salt stress is linked to the decline in photosynthesis. Reduction in the photosynthetic capability of various plant species by salt stress has been documented in a number of reports. The inhibition in photosynthesis under saline condition can also be explained by the decline in chlorophyll content. Salt stress has also been found responsible for decreased biosynthesis of chlorophyll and inefficiency of photosynthesis, all of which ultimately leading to lowered economic productivity.

CONCLUSION-

There is also a need to enhance crop production under saline conditions. Germination and seedling characteristics are the most viable criteria for selecting salt tolerance. Further, germination percentage, germination speed and seedling growth are important criteria for cultivar selection. Therefore, it becomes imperative to screen genotypes at the seedling stage under saline environments to identify tolerant genotypes for better germination and early seedling establishment, to obtain higher yields and manage salinity. Therefore, the present study was undertaken to evaluate the effect of salinity on seed germination and seedling growth and biochemical parameters on Indian mustard.

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