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A Review:

Effects of soil salinity on growth characteristics of maize (*Zea mays* L.)

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ABSTRACT

The increase in salinity delayed and decreased the rate and percentage of seed germination, respectively. Though there was a decrease in root length of seedlings, there was an increase in the diameter of roots. Like wise, height of the shoot apex was reduced while the width of the base of shoot apex was increased with increased salinity. Furthermore, higher chloride, sucrose and carbohydrate contents were found in the leaves of plants on saline soils. On the other hand, dry matter content, pigments and transpiration rates were reduced with increased salinity. As a result of the aforementioned effects of increased salinity, yield of maize was found to be diminished.

Key words : Salinity, NaCl, Irrigation, Water stress, *Zea mays* L.

Soil salinization is one of the major factors of soil degradation. It has reached 19.5% of the irrigation land and 2.1% of the dry land agriculture existing on the globe. The effects of salinity are more conspicuous in arid and semi arid areas where 25% of the irrigated land is affected by salts (FAO, 2000). The adoption of poor soil and water management practices in the irrigated area leads to develop the salinity in the soil and the problem becomes a great importance for agricultural production. Among the food crops, maize plays a major role in many developed as well as developing countries and in some countries the maize is the staple food. Salinity development in maize cultivating soils has become a crucial problem. It may be due to the poor land and water management. Therefore, this attempt has been made to review some effects of salinity to the maize in different stages such as germination, vegetative growth, pollen germination and mature stage and some physiological processes with a view to create awareness on the management to tackle the salinity problem.

Germination:

Different concentrations of salinity levels have been tried with the maize to observe the germination characteristics by several investigators. Increasing salinity level from 3 – 6, 12 and 18 dSm^{-1} EC delayed and decreasing germination and adversely affected seedling growth in various cultivars (Maliwal and Paliwal, 1984; Wahhab *et al.*, 1957; Soliman *et al.*, 1988; Ashrafuzzaman *et al.*, 2002). Like wise, Maiti *et al.* (2002) also found the same results further he compared the wild variety and hybrid variety and stated this effect was greater in hybrid varieties (loss of 26.40%) compared to that of wild cultivars (loss of 19.92%). But Chang (1961) reported that under alkaline situation or in soils irrigated by high SAR water, germination of maize is not as adversely affected as with the salinity. Wahhab *et al.* (1957) also indicated that generally maize tolerated about 0.3% of salt content. Soldatini and Giannini (1985) reported that the maize seedlings treated with 0.1M NaCl showed a low water deficit but greater interference with CO_2 fixation and amino acid metabolism than those treated with 14% polyethylene glycol (PEG). Neumann (1993) used a creep extensiometer technique, to provide direct evidence that short (20 minutes) and long term (3 days) exposures of roots to growth inhibitory levels of salinity (100 $molm^{-3}$ NaCl) induced reductions in the irreversible extension capacity of cell walls in the leaf elongation zone and of intact maize cv. and the long term inhibition of cell wall extension capacity was reversed within 20 minutes of salt withdrawal from root medium. Also, he reported that. Inhibited elongation of leaf epidermal tissues was also reversed after salt removal.

Felipe *et al.* (1981) found that, in maize plants, salinity increased the chloroplast fret system in mesophyll cells decreased as number of osmiophillic globules, increased the number of light lipid droplets in the stoma, changed the shape of bundle sheath chloroplasts and increased in the size of chloroplast starch granules. Under NaCl stress, the net photosynthetic rate, transpiration rate and stomata conductance all decreased (Jiang *et al.*, 2001). Further, they observed that the