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Effect of Salt Stress on Nutritional Value of Vegetables

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Abstract

Vegetables serve as a source of pharmacologically active molecules. However, due to increased environmental stresses the concentration of bioactive compounds and the valuable constituents of vegetables are getting deteriorated day by day. Salt stress is one of the major environmental stresses affecting the plants nutritional value. Salt stress influences the plant growth by inducing adverse effects on different physiological and biochemical processes and thus leads to nutrient disorder. Therefore, there is a need to develop some tools/techniques which would be helpful for the farmers whose soil or irrigation water are saline as well as those people who frequently consume vegetables for nutritional purposes.

Keywords: Nutrients; Salt stress; Vegetables; Vitamins

Introduction

Vegetables are the immense source of pharmacologically active molecules which have been used for treatment of diseases without any adverse effect and therefore constitute a major portion of human diet. They contain nutritional values like micronutrients, macronutrients, antioxidants, vitamins etc. However, the increased environmental stresses have strong influence on the concentration of bioactive compounds and the valuable constituents of vegetables are getting deteriorated day by day. Salt stress is one of the major environmental stresses affecting the plants nutritional value. The adverse effect of excess minerals on plant is called salt stress and it is a huge problem negatively affecting physiological and metabolic processes in plant life, ultimately diminishing growth and yield. This editorial shed light on adverse impact of salt stress on nutritional value of vegetables

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Salt taken up by the plants influence the plant growth by inducing adverse effects on different physiological and biochemical processes, including turgor, photosynthesis and enzymatic activities and all these processes are regulated by the nutrients in plants. Due to salt uptake there is reduced uptake of the nutrients that leads to nutrient disorder. Nutrient imbalance results from the effect of salinity on nutrient availability, competitive uptake, transport or partitioning within the plant or may be caused by physiological inactivation of a given nutrient resulting in an increase in the plant's internal requirement for that essential element [1]. For example, salinity reduces phosphate uptake and accumulation in crops grown in soils primarily by reducing phosphate availability. Salinity dominated by Na^+ salts not only reduces Ca^{2+}availability but also reduces its transport and mobility to growing regions of the plant, affecting the quality of both vegetative and reproductive organs. These disorders are aggravated in the environment with high transpirational demands. Salinity directly affects nutrient uptake such as Na^+ reducing K^+ uptake or by Cl^- reducing NO_3^- uptake. The occurrence of these disorders ultimately affects crop yield and quality. Nitrogen (N), in one form or another, accounts for about 80% of the total mineral nutrients absorbed by plants [2]. Moreover, inadequate nitrogen is often acts as a growth-limiting nutritional stress in field soils. N uptake, translocation, and assimilation as well as nitrogen natural isotopic signature appear to be especially sensitive to salinity [3].

Potassium being the most prominent inorganic plant solute makes a major contribution to the low osmotic potential in the stele of the roots that is a prerequisite for turgor-pressure-driven solute transport in the xylem and the water balance of plants [2]. But under saline condition i.e. high level of external Na^+ not only interferes with K^+ acquisition by the roots, but also may disrupt the integrity of root membranes and alters their selectivity. Calcium plays an essential role in processes that preserve the structural and functional integrity of plant membranes, stabilise cell wall structures, regulate ion transport and selectivity, and control ion-exchange behaviour as well as cell wall enzyme activities [4]. As the salt concentration in the root zone increases, plant requirement for Ca^{2+}also increases. At the same time, the uptake of Ca^{2+} from the substrate may be depressed because of ion interactions, precipitation, and increases in ionic strength. These factors reduce the activity of Ca^{2+}in solution thereby decreasing Ca^{2+} availability to the plant which leads to calcium disorders in plants.

Magnesium being an important component of chlorophyll is adversely affected by increased salinity. Calcium is strongly competitive with Mg^{2+} and the binding sites on the root plasma membrane appear to have less affinity for the highly hydrated Mg^{2+}than for Ca^{2+} [2]. Thus, high concentrations of substrate Ca^{2+}often result in increased leaf-Ca along with a marked reduction in leaf-Mg and this might lead to reduced photosynthetic activity of plants.

The availability of most micronutrients depends on the pH of the soil solution as well as the nature of binding sites on organic and inorganic particle surfaces. In saline soil, the solubility of micronutrients (e.g. Cu, Fe, Mn, Mo and Zn) is particularly low, and plants grown in these soils often experience deficiencies in these elements [5], but not in all cases. Differences can be attributed to plant type, plant tissue, salinity level and composition, micronutrient concentration, growing

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conditions and the duration of study. Consequently, the relationship between salinity and trace element nutrition is complex and salinity may increase, decrease, or have no effect on the micronutrient concentration in plant shoots.

Salinity not only influences the nutrients of vegetable crops but also degrades the antioxidant property. Bano et al. [6] have found a significant salt-induced suppression in plant growth, total phenolics, total soluble proteins, and activities of catalase (CAT), superoxide dismutase (SOD), and peroxidase (POD). On the other hand, they observed a considerable increase in leaf turgor potential, Na^+ and Cl^- contents, proline, glycinebetaine (GB), ascorbic acid (AsA), and H_2O_2 contents in the leaf or root tissues of carrot plants under similar condition. These results suggest that the nutritional value in terms of antioxidants declines under salt stress.

Conclusion

Vegetables are essentially required to safeguard health particularly by precluding diseases as they are good source of vitamins, mineral nutrients and antioxidants but the increased salinity problem possesses threat to the nutritional values of the vegetables. Therefore, there is a need to develop some tools/techniques which would be helpful for the farmers whose soil or irrigation water are saline as well as those people who frequently consume vegetables for nutritional purposes. Developing such techniques would also curtail the crop losses due to salinity problem which is a major area of concern these days.

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References

1. Grattan SR, Grieve CM (1994) Mineral nutrient acquisition and response by plants grown in saline environments: Handbook of plant and crop stress. (2ndedn), Marcel Dekker Inc, New York, 203-226.
2. Marschner H (1995) Mineral Nutrition of Higher Plants. (2ndedn) Academic Press, London, pp: 889.
3. Debouba M, Gouia H, Suzuki A, Ghorbel MH (2006) NaCl stress effects on enzymes involved in nitrogen assimilation pathway in tomato "Lycopersicon esculentum" seedlings. Journal of Plant Physiology 163: 1247-1258.
4. Rengel Z (1992) The role of calcium in salt toxicity. Plant, Cell & Environment 15: 625-632.
5. Chang AC, Adriano DC (1990) ASCE Manuals and Reports on Eng. Practice No. 71, ASCE, pp: 138-160.
6. Bano S, Ashraf M, Akram NA, Al-Qurainy F (2012) Regulation in some vital physiological attributes and antioxidative defense system in carrot (Daucus carota L.) under saline stress. Journal of Applied Botany and Food Quality 85: 105-115.