

Role of zinc in plant nutrition Shubham Kumar

Introduction:

Zinc is a micronutrient that plants require in lower amounts, and its insufficient supply would reduce crop production. Zn influences hydrogenase and carbonic anhydrase activity, ribosomal fraction stabilization, and cytochrome production in plants. One of the most common micronutrient deficiencies in agricultural crops is zinc insufficiency. Whereas zinc is a necessary element, too much of it can be harmful. Zinc is a key component of carbonic anhydrase and a stimulant of aldolase, which are both involved in carbon metabolism. Zinc deficit soils are reported in various countries of the world affecting large areas of cultivated soils in, Brazil, China, Turkey, India and Australia, making zinc the most common crop micronutrient deficiency. Zinc deficiency is the most common crop mineral deficit, affecting vast regions of agricultural soil in India, Turkey, Brazil, China and Australia.

Role of zinc in plants:

- Zn is a component of many biomolecules, including proteins, lipids, and auxin cofactors, and hence

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plays a vital role in plant nucleic acid metabolism.

- Zn is also located in a range of biomolecules, including lipids, proteins, and auxin co-factors, and hence has an essential part in the metabolism of nucleic acids in plants.
- Zn is a component of numerous enzymes and is required for the development of a number of important plant enzymes. (Akay, 2011).
- Low zinc levels cause amino acid build up and a drop in sugar content in plant tissues since it is required for protein and starch formation. (Taheri *et al.*, 2011)
- The addition of Zn (priming) boosts IAA production (Indole-3-acetic acid) and GA₃(Gibberellic acid) Drought stress increases the synthesis of these hormones, which increases plumule weight and length.
- Zinc is an essential element for plant growth. Zinc aids in the generation of growth hormones, the formation of starch, and the maturation of seeds. (Brady and Weil, 2002).

- Increased cereal, vegetable, and fodder production is enhanced by plenty of Zn fertilisation. (Prasad *et al.*, 2012).

Deficiency symptoms:

- Its deficiency results in the development of abnormalities in plants that become visible as todeficiency symptoms such as stunted growth, chlorosis and smaller leaves, spikelet sterility.
- A lack of the micronutrient Zn can harm the quality of harvested products.
- Plants with Zn deficiency have smaller leaves and shorter internodes, limiting their growth. (Acquaah 2002 and Alloway, 2004).



Fig. 1: Zinc deficiency symptoms in maize

Characteristics of zinc nutrient:

- In general, zinc does not form separate silicate minerals in igneous rocks, and it is not abundant in quartz and feldspars. Krauskopf (1972) reviewed the geochemistry of zinc and pointed out zinc is most commonly found in the lithosphere as the mineral in the form of ZnS (sphalerite).

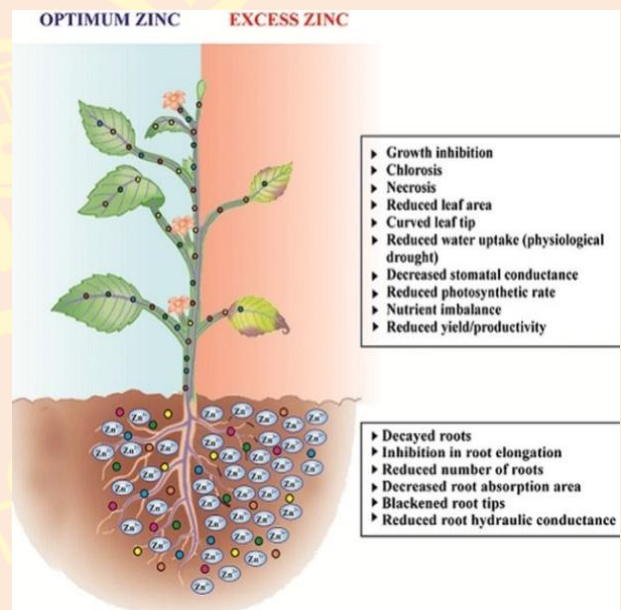


Fig. 2: Role of Zinc in plants in Optimum and Excess, Diagrammatic presentation

- The Zn^{2+} with an ionic radius of 0.83 Å substitutes to some extent for Mg^{2+} (0.78 Å) and Fe^{2+} (0.83 Å) (Goldschmidt, 1954).
- In comparison to other nutrients, zinc has a medium mobility inside plants. When Zn is added to plant rooting media, the radioactive tracer is

frequently translocated to other sections of the plant within a few hours.

- Auxin production and other enzyme systems are both dependent on zinc. (Throne 1957)
- Zinc is recognized as an essential component in several dehydrogenases, proteinases, and peptidases (Vallee and Wacker, 1970)
- Sphalerite (ZnS) and smithsonite (ZnCO₃) are the two forms in which zinc is present in earth crust (Berg & Shi, 1996). It is also a necessary component of all six types of enzymes and indeed the majority of regulatory proteins. (Berg & Shi, 1996).
- Even at low costs, the prospective supply of Zn is severely limited. (Tilton, 2003; & Kesler *et al.*, 2015).
- ZnO is a biological substance with photo-oxidizing and photocatalytic properties for chemicals and biota. (Sirelkhatim *et al.*, 2015; Vaseem *et al.*, 2010).

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Shubham Kumar, Research Scholar, MS Swaminathan School of Agriculture, Shoolini University, Solan -173229 (HP)