Department of biology

2025-2026

((Plant Physiology))

Stage (3)

((Lecture -5-))

Elements Found in plants

By

Asst. Lec. Zainab Nadhum Aziz

Magnesium (Mg)

✓ The form that plants absorb and become available: -

- Magnesium exists in the soil in three forms:

1- The soluble form in the soil solution.

2- The exchangeable form.

3- The form fixed in minerals.

Physiological importance of magnesium

1- Component of the chlorophyll molecule.

2- Plays a role in photosynthesis.

3- Plays a role in carbohydrate metabolism.

4- Activates many enzymes, especially carbohydrate metabolism enzymes and nucleic acid synthesis enzymes.

Symptoms of Magnesium Deficiency in Plants:-

- Because it is a mobile element in plants, deficiency symptoms appear first on older leaves and then on younger ones.

- Severe paleness between the veins of leaves; appearance of anthocyanin pigment after yellowing.

-Appearance of dead spots in severe deficiency.

Potassium element K

✓ The form absorbed by the plant and becomes available: -

1-Soluble form.

2- Exchangeable form.

3-Fixed form.

Physiological Importance of Potassium

1-It plays a role in stomata closure and opening.

2- It is found in meristematic regions.

3-It plays a role in building carbon skeletons used in protein synthesis.

4-It contributes to carbohydrate metabolism.

Symptoms of potassium deficiency: -

1-Moist yellowing appears, followed by the formation of dead areas at the tip and margin of the leaf.

2-Downward curvature of the leaf tip.

3- Causes stunted plant growth and short internodes.

4-Severe deficiency causes poor vegetative growth.

Sulfur element (S)

✓ The form that plants absorb and make available: -

1- It is found in the mineral's barite, cobaltite, and gypsum.

2- It is also found in soil solution as sulfur ions (SO2-2).

3- Organic sulfur becomes available to plants through the activity of microorganisms.

Physiological Importance of Sulfur

1- It is involved in the synthesis of sulfur-bearing amino acids such as

(Cysteine, Cysteine, Methionine).

2- It is involved in the synthesis of vitamins such as (Biotin, Thiamine, and the coenzyme COA).

3- It is involved in nitrogen metabolism.

4- It is involved in the synthesis Al kinin.

Symptoms of Sulfur Deficiency

The symptoms of sulfur deficiency are similar to those of nitrogen deficiency, and deficiency symptoms appear first on young leaves due to the difficulty of its translocation within the plant.

Iron (Fe)

- A micronutrient found in the mineral limonite, it becomes available to plants in the form of (Fe++ ,Fe+++)

- It is readily available in acidic soils and precipitates in alkaline soils.

Physiological Importance of Iron

1-It is involved in the synthesis of cytochromes.

2-It is involved in the synthesis of ferredoxin (Fd), an important compound in photosynthesis.

3-It is involved in the synthesis of chlorophyll.

4-It is involved in the synthesis of chloroplast proteins.

5-It is involved in the synthesis of FAD.

6-It forms the enzymes catalase and peroxidase.

Symptoms of iron deficiency in plants: -

1-Chlorophyll paleness appears on young leaves because iron is an immobile element.

2-Chloroplast formation is inhibited by inhibiting protein synthesis.

3-Yellowing appears between the veins.

Copper element Cu

✓ The form that plants absorb and become available:-

1- Most of it is found in the form of chalcopyrite.

2-Chalcopyrite (CuFeS2).

Physiological Importance of Copper

1- It is involved in the structure of several enzymes (ascobate oxidase).

2-It is involved in the structure of plastocyanin (PC) and this plays a role in photosynthesis.

3-It assists in or participates in the fixation of carbon dioxide in photosynthesis.

Symptoms of Copper Deficiency

1-Appearance of discoloration on fruit trees .

2-Appearance of dead spots and brown spots on leaves and fruit.

3-The deficiency causes death of the tips of new leaves, which then fall off.

Zinc (Zn)

✓ The form absorbed by the plant and available: -

1-Found in ferromagnesian minerals (manganese biotite).

2-Zinc is released as Zn++.

3-Physiological importance of this element.

4-Contributes to the biosynthesis of growth.

5-Activates many enzymes.

6-Participates in the formation of some enzymes such as alcohol dehydrogenase.

7-Symptoms of deficiency of this element.

8-Yellowing of the interveinal spaces of large leaves.

9-Appearance of white spots on the leaves, also called rosetteing.

Molybdenum (Mo)

It exists as $MoO4^{-2}$ ions, but the most readily available form for plants is $MoO3^{-3}$, which is more readily available at alkaline pH.

Physiological Importance:

1-Contributes to nitrogen fixation and nitrate metabolism.

2-Plays an important role in phosphorus metabolism.

Deficiency Symptoms:

Yellowish mottling between veins in lower leaves, leaf margin death, and leaf curling. Causes whiptail disease in cauliflower.

Other elements

- Rice, millet, barley, and sunflowers may need silicon. It is an essential element for the growth of buckwheat and tomatoes.

- Boron replaces C1 in sugar beet plants, where Cl is necessary for H2O oxidation in photosynthesis.

- Cobalt is important for cyanobacteria but is toxic to higher plants.