Essential nutrients for rice

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Rice Fact Sheet

Introduction

There are 16 essential elements needed for rice production. These may be supplied by the soil or added in the form of chemical or organic fertilizer. If any of these nutrients are in short supply the plant will not reach its yield potential.

Essential Nutrients

There are 16 essential elements for rice. The macro elements are carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur. All of these are needed by plants in large amounts, often more than 0.1 % of plant's dry weight.

The microelements are iron, manganese, copper, zinc, molybdenum, boron, and chlorine. These are needed by plants in lesser quantities and are often referred to as trace amounts. Silicon is also classified as a 'beneficial' nutrient for rice but its physiological functions are not yet clear.

Macro nutrients

Nutrient	Importance	Source	Deficiency
Nitrogen (N)	Promotes rapid plant growth and improves grain yield and grain quality, through higher tillering, leaf area development, grain formation, grain filling, and protein synthesis	Inorganic fertilizers like Urea, Diammonium phosphate (DAP)	Stunted yellowish plants with limited number of tillers
Phosphorus (P)	Major role in the formation of plant hormones and maintenance of membrane integrity, root development and promoting rapid growth of the plant especially during active tillering, early flowering, and it also hastens ripening and grain development.	Inorganic fertilizers like DAP, SSP	Stunted dark green plants with limited number of tillers
Potassium (K)	Improves root growth and plant vigor, helps prevent lodging and enhances crop resistance to pests and diseases	Inorganic fertilizers like Murate of Potash (MoP)	Yellowish brown margin or dark brown necrotic (dead) spots on older leaf tips.
Zinc (Zn)	Deficiencies affect plant color and turgor	Inorganic fertilizers like Zinc sulfate	Dusty brown spots on upper leaves of stunted plants appearing 2-4 weeks after transplanting
Sulfur (S)	Essential component of plant structures and metabolism	Inorganic fertilizers like Ammonium sulfate and gypsum	Yellowing of the whole plant with chlorosis being more pronounced in young leaves possibly with necrosis of the tips.

Micro nutrients

Nutrient	**Importance**	**Deficiency**
Iron (Fe)	Essential plant nutrient required for electron transport in photosynthesis	Intervenial yellowing and chlorotic leaves that turn whitish and ultimately dead plants
Calcium (Ca)	Helps promote normal root growth and development	Leaves become white, rolled and curled
Magnesium (Mg)	Constituent of chlorophyll involved in CO_2 assimilation and protein synthesis and also activates several essential enzymes	Pale-colored plants, with interveinal chlorosis first appearing on older leaves and later on the younger leaves as deficiency becomes more severe
Manganese (Mn)	Enables the formation and stability of chloroplast, protein synthesis, nitrate reduction, and tricarboxylic cycle and helps reduce iron toxicity	Interveinal chlorosis which begins at the tip of the younger leaves
Boron (B)	Plays a primary role in cell wall biosynthesis and structure as well as plasma membrane integrity	Reduced plant height, reduced or arrested panicle formation
Molybdenum (Mo)	Primary role is reduction of nitrate to nitrite	Resembles N deficiency and necrotic spots at leaf margin
Copper (Cu)	Plays a role in nitrogen, protein and hormone metabolism, photosynthesis, respiration, and pollen formation and fertilization	Blueish green leaves, which become chlorotic near the tip
Chlorine (Cl)	Essential in photosynthesis	-