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Iron – A Vital Nutrient for Groundnut: Deficiency Symptoms and Management

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Abstract: -

Iron plays a key role in growth and development of groundnut. Which having several functions in plant system such as chlorophyll synthesis, cofactor of several enzymes, respiration and stress tolerance. Deficiency of iron in plants leads to chlorosis of young leaves, stunted growth and effect nodule formation which ultimately leading to lower yields. Hence, proper iron supplementation to crop is essential as iron deficiency is frequently observed in groundnut crop sown during rabi season in calcareous and alkaline soils showing drastic reduction in crop yield. Remedial measures for iron deficiency in plants include soil amendments application, foliar application, organic matter application, seed treatment and selecting iron-efficient varieties.

Key words: groundnut, iron deficiency, chlorosis, management.

Introduction:

Groundnut is major legume crop which is called as wonder nut as it is having several uses as food and oil, with each part of the plant having special usage. Versatility and adaptability of the crop made to cultivate all over the world, which is native of South America. India is major producer of groundnut after China with highest area of cultivation. From total groundnut production 50% is used for oil extraction, 35% is for direct human consumption and remaining 15% for seed and animal feed. Kernels of groundnut are considered as nutritional power house due to its remarkable composition of protein (25%), oil (45-50%), antioxidants, minerals and vitamins. Along with its nutritional benefit's it also promotes sustainable agriculture as the crop improve soil fertility by nitrogen fixation hence it can be introduced in crop rotation. Groundnut is majorly grown in light soils as pegs can be penetrated easily into the soil. Calcareous and alkaline soils which are light in texture show iron deficiency in plants majorly in rabi sown conditions due to higher calcium carbonate and alkaline conditions make iron unavailable to plant.

Role of iron

Along with macronutrient,

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micronutrients are also equally essential for crop growth and development. Among several micronutrients iron is one of the important elements essential for ground nut crop. Iron has several functions in plant system. It promotes chlorophyll synthesis as it is cofactor of enzymes such as δ-Aminolevulinic acid synthase and Protochlorophyllide Reductase which play key role in chlorophyll synthesis.

Fig. 2 Leaves showing iron deficiency in groundnut

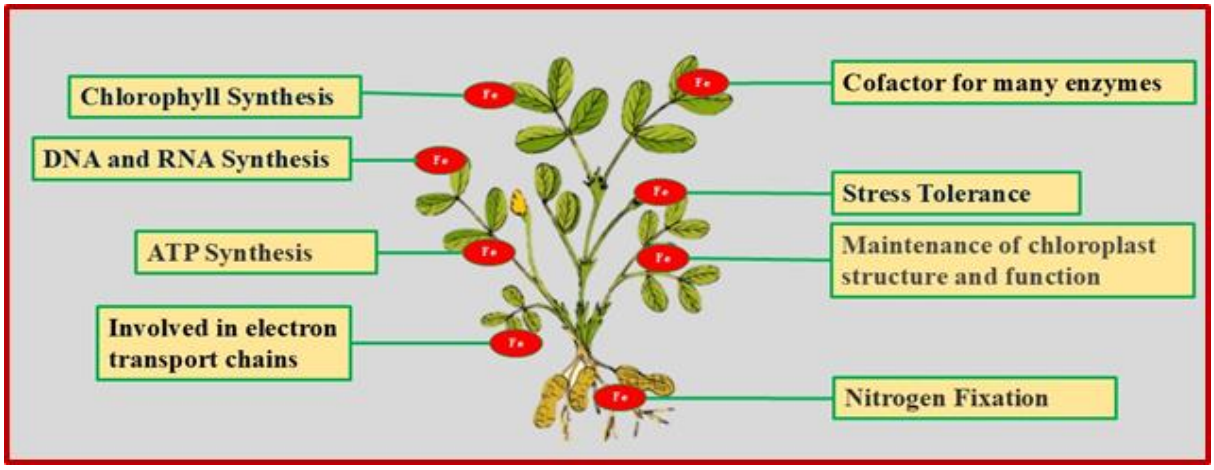

Fig. 1 Role of iron in groundnut plant

Iron help in ATP synthesis and oxygen reduction as iron containing components help in electron movement in electron transport chain of respiration. Iron also serves as cofactor for many enzymes such as catalase (stress tolerance), nitrogenase (nitrogen fixation) and cytochrome enzymes (oxidation and reduction).

Iron deficiency symptoms

Deficiency of iron symptoms primarily observed on young newly growing leaves with interveinal chlorosis while veins remaining green as shown in fig. 2. Under severe deficiency conditions total leaf turns into papery white. The plant shows stunted growth due to decline of chlorophyll content ultimately leading to yield reduction up to 20% based on severity of iron deficiency. Nitrogen fixation by root nodules is also affected by iron deficiency.

Control measures for iron deficiency

Soil application

- To control iron deficiency soil amelioration with iron sulphate, elemental sulphur, pyrite, gypsum and phosphogypsum at the rate of 20 kg iron ha^{-1} which help in good supplementation of iron to crop.

- Application of chelated iron such as FeEDDHA at a rate of 5-10 kg iron ha^{-1} is very effective in controlling Fe deficiency in calcareous soils.
- Seed treatment or soil application of biofertilizers such as *Pseudomonas* and *Bradyrhizobium* which keep iron in soluble form by synthesis of chelates.

Foliar application

- Iron deficiency in standing crop can be treated by foliar application of iron containing water soluble chemicals such as ferrous sulphate, ferrous ammonium sulphate, Fe-EDTA and ferric citrate
- Foliar spraying of 0.5 % iron sulphate + 0.01 % citric acid mixture two to three times at crop development stages will be the best solution to control Fe induced chlorosis.
- As iron is less mobile nutrient require frequent foliar sprayings to control deficiency and spraying should be done during wet and humid conditions such as evening hours for efficient absorption.

Selection of Iron-Efficient genotypes

- Among various remedial measures selection of iron-efficient genotypes is the best and efficient method, which can tolerate iron-chlorosis and give good yields.

Drip application

- Application of iron source through drip irrigation system is an efficient method to control iron deficiency in semi-arid and arid regions compared to soil and foliar application.
- Iron sulphate @ 3 kg Fe ha^{-1} is supplied through drip irrigation system known as fertigation.

Soil pH Management

- Iron availability can be improved by maintaining proper Ph conditions. As iron availability increases with lower of soil Ph which help to reduce iron deficiency, especially in calcareous soils.

Organic matter

- Adding organic matter such as compost and FYM can improve soil health and enhance iron availability. Decomposition of organic matter increase soil acidic nature which improve iron availability to crop.

Conclusion

Micronutrient, iron play a pivotal role in healthy growth and development of groundnut crop. As it plays a key role in chlorophyll synthesis, enzyme activation, and energy transfer. Deficiency of iron hence show a huge impact on growth and yield of groundnut especially in calcareous and alkaline soils. Proper management is required

by early diagnosing the symptoms in the field. Effective strategies including foliar spraying, soil amendments, iron chelates and proper irrigation management help to mitigate iron deficiency. By adopting integrated nutrient management and regular soil testing, farmers can ensure optimal iron availability and maintain high productivity in groundnut cultivation.