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Micronutrient Malnutrition in Groundnut

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Abstract

Groundnut is an energy rich crop but grown under energy starved conditions on marginal lands and soils with poor fertility. Micronutrient stress in groundnut pulls down the productivity of crop to a great deal. Lime Induced Iron Chlorosis is commonly noticed in calcareous soils and soils of high pH which together affects the fodder value of haulms. Interveinal chlorosis, marginal necrosis, rosetting of leaves, pop seeds and ill filled pods are the common symptoms of micronutrient stress in groundnut. Soil application of micronutrient fertilizers in deficient soils and foliar sprays in the standing crop can alleviate micronutrient malnutrition in groundnut. Enrichment of soil with organic matter can help in avoiding fixation losses of micronutrients and aid in enhancing use efficiencies.

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Introduction

Groundnut *(Arachis hypogaea)* is the premier oilseed crop of India and an important 'snack food' of Tamil Nadu. In the global front, India is the second largest producer of groundnut next only to China. In Tamil Nadu, its acreage spreads over an area of 3.355 lakh hectare with a production of 9.112 lakh tones and productivity of 2,716 kgs per hectare. Groundnut is an energy rice crop but grown under energy starved conditions on marginal lands. Though the average productivity of groundnut in Tamil Nadu is twice the national average, there is a long distance between the potential yields, which can be exploited with appropriate nutrient management options. Low or no use of micronutrients is one of the key factors for low productivity in groundnut. There is growing deficiencies of secondary and micronutrients such as Ca, S, Zn, Fe and B due to intensive cropping with high analysis fertilizers.

An average groundnut crop, with 2.0 to 2.5 t ha^{-1} of economic yield, requires, 160-180 kg N, 20-25 kg P, 80-100 kg K, 60-80 kg Ca, 15-20 kg S, 30-45 kg Mg, 3-4 kg Fe, 300-400 g Mn, 150-200 g Zn, 140-180 g B, 30-40 g Cu and 8-10 g Mo (Singh, 1999). The Ca, K, P and S among macronutrients and Fe and B among micronutrients are involved in the kernel filling and oil synthesis and hence are required in higher quantities. Micronutrient availability is determined by soil parent material, organic matter, pH, redox potential, moisture and a host of biologic and anthropogenic factors (Fageria *et al*., 2002). Delineation of micronutrient deficient areas of Tamil Nadu revealed that the deficiency was in the order of Zn (52%) > Cu (30%) > Fe (22%) > Mn (8%). The limiting micronutrients need to be applied with NPK fertilizers for achieving maximum yield. The fact is accentuated by insidious micronutrient malnutrition of thousands of people resulting in anaemia, cognitive impairment and nutritionally related health problems across the globe. Hence micronutrient fertilization for crops is the step forward to scrap micronutrient malnutrition of human beings. Micronutrients required for groundnut are iron, manganese, zinc, copper, molybdenum and boron.

Iron (Fe) Deficiency

Groundnut is highly susceptible to iron and boron deficiencies. Iron chlorosis is witnessed in calcareous and alkaline soils with soil pH above 7.5 and in soils with poor organic matter due to fixation of iron as iron carbonate. The deficiency is characterized by chlorosis of younger leaves called 'Interveinal Chlorosis' and in advanced stages, the leaves turn papery white and necrotic. Soil application of 50 kgs of ferrous sulphate per hectare is recommended in soils of low available iron. Foliar application of 0.5-1.0% ferrous sulphate solution was proved very successful for groundnut if iron deficiency is noticed in a standing crop.

Zinc (Zn) Deficiency

Zinc deficiency is ubiquitous across different soil types and groundnut yield is reduced by about half when the zinc level in the soil is lower than 1.2 ppm. The deficiency is noted as irregular mottling with interveinal chlorosis. Internodal length is greatly reduced resulting in rosette appearance. It is also characterized by bronzing symptoms. Zinc deficiency is likely to occur in soils low in organic matter, with high levels of soil P, and when the soils are cool and wet during the vegetative phase. 25 kgs of zinc sulphate is recommended per ha to alleviate zinc stress. Unless the soils are highly deficient in zinc, its application can be practiced once in two years. If zinc deficiency is observed in a standing crop of groundnut, foliar application of 0.5% zinc sulphate solution corrects the problem.

Copper (Cu) Deficiency

In the event of copper deficiency, entire leaves become cupped and the leaflets turn upwards. Plants turn stunted with interveinal chlorosis and marginal necrosis. Unfavourable shoot:root ratio is the prominent implication (Singh *et al*., 2004) of copper deficiency but it is rarely encountered.

Manganese (Mn) Deficiency

In groundnut, Mn deficiency appears as interveinal chlorosis of younger leaves with necrotic spotting. Since manganese deficiency is rarely found in the soils of Tamil Nadu, its deficiency is seldom noted in groundnut.

Boron (B) Deficiency

Boron deficiency is usually observed in deep black soils. Shrivelled pods, pop seeds and poorly developed kernels are the end results of boron deficiency which severely affects the marketability of the produce. Even little higher amount of application may result in boron toxicity which reduces groundnut yield. However, the amount of boron recommended on a soil test report improves good kernel development in groundnut. Application of 10 kgs of borax per ha as soil application is recommended for boron deficient soils. Even, foliar application of boron as low as 0.1 ppm in the form of boric acid also increases the yield.

Molybdenum (Mo) Deficiency

The deficiency of molybdenum (Mo) is confined largely to acid soils with pH less than 5. Its deficiency is quite likely in high pH (more than 8) soils also. Soil application of 0.5-1.0 kgs of ammonium molybdate per ha and/or foliar spray of 100-200 ppm ammonium molybdate before flowering was found to increase groundnut yield.

Conclusion

For groundnut, macronutrient fertilizers are traded globally as commodities while the micronutrient fertilizers are considered speciality and even luxury items. There is also a perception amongst farmers in both developed and underdeveloped nations that micronutrients should not be routinely applied but rather should be applied only in response to demonstrated deficiencies. In many developing nations there is further a general ignorance of the role of micronutrients in crop productivity. Each of these misconceptions will ensure the progression towards increasing global micronutrient imbalance. As the use efficiency of the micronutrient fertilizers is very less to the tune of < 5%, they can be incubated with farm yard manure to enhance their use efficiencies. Hence groundnut growers can resort to balanced nutrition with micronutrient fertilizers to abate micronutrient malnutrition.

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