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Effect of Foliar Micronutrients Application on Potato Cultivation

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Indian soils are not in condition to fulfil the requirement of all nutrients. Hence, the nutrients are supplied from the external sources. The application of micronutrients like Boron, iron copper and Zinc has pivotal effect on different parameters of potato. It is proved that the application of NPK along with adequate amount of micronutrients like boron, copper, zinc and manganese is considered essential to produce high tuber yield in case of potato.

Keywords: Balance nutrient, Foliar, Micronutrient, Potato

Introduction

Potato is a very popular vegetable grown all over the world and is an important food crop grown in more than 150 countries in the world. India is now producing 43.77 million tonnes of potato tubers in an area about 2.13 million hectare.Indian agricultural heavily depends on fertilizer application which results in greater rate of nutrient collapse and soil health problems.

The micronutrients play an important role in crop production. In recent years, the importance of micronutrients to crop plant in increasing production has been greatly realized. However, so far their effects on quality of crops have been largely ignored. It is therefore, essential that fertilizer use in relation to quality of the produce should receive urgent attention. Crops grown in most soils in India suffer from deficiencies of one or more micronutrients, even though the soils often contain apparently adequate total amounts of the respective elements. The nature and extent of deficiencies varies with soil type, crop genotype, management and agro-ecological situations. With the intensive cropping of high yielding varieties of rice and wheat, deficiency of zinc (Zn) initially, and subsequently deficiencies of iron (Fe) in rice, and manganese (Mn) in wheat, emerged as threats to sustaining high levels of food crop production. Micronutrient deficiencies are now frequently observed in intensively grown cereals, oilseeds, pulses and vegetable crops. With widespread and regular application of Zn fertilizers, the occurrence of Zn deficiency has declined in

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recent years, but multi micronutrient deficiencies are now becoming an increasing problem. Analysis of soil and plant samples has indicated that 49% of soils in India are potentially deficient in Zn, 12% in Fe, 5% in Mn, 3% in copper (Cu), 33% in boron (B) and 11% in molybdenum (Mo). Basal application to soil and/or foliar sprays of Zn, B and Mo, and foliar sprays of Fe and Mn have been recommended as the most suitable methods for correcting such deficiencies in crops. Micronutrients like zinc and manganese also influences the protein and sugar content in potato tubers. Thus, micronutrients are important key elements which stimulate the uptake of other primary and secondary nutrients when applied in optimal concentration Therefore; the present article is focused on the influence of foliar micronutrients on potato.

Foliar application of Zinc

Zinc is a cofactor for approximately 300 enzymes involved in nearly all aspects of cell metabolism and also an essential micronutrient for growth and development. The alternative approach is the application of Zn nutrients to plant leaves and stems through foliar fertilization. In this context, a recent study recommends foliar application of Zinc @ 30 ppm due to its contribution towards the increased superiority in yield and quality of potato. Foliar application of Zn with high concentration is poisonous and with decreasing level of photosynthesis in plants performance will be less.

Foliar application of boron

Boron (B) is a micronutrient necessary for plant growth. It plays an important roles in cell wall synthesis, sugar transport, cell division, cell development, auxin metabolism, good pollination and fruit set, seed development, synthesis of amino acids and proteins, nodule formation in legumes and regulation of carbohydrate metabolism. Moreover, foliar boron fertilization provided a continuous supply of plant nutrient for a longer period of crop growth or when required by the plants, which possibly facilitates a steady translocation of the photosynthesis resulting in higher crop yield than soil application. Also, foliar applied micronutrient in readily available form, especially boron, faces less resistance as compared to the soil applied ones, which might have to compete with other antagonistic macronutrients phosphorus, to reach the absorption site of root in available form.

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Foliar application of Copper

Late blight management in potato is heavily depends on fungicide application and in many areas the fungicide application has increased in many folds over the last decades due to the emergence of new and more aggressive races of the pathogen. The only effective fungicides currently permitted for blight control in organic agriculture are copper-based products (e.g. Bordeaux mixture, fixed-copper hydroxide, copper oxide and copper oxychloride). Copper fungicides reliably work as contact fungicides if applied prophylactically, their environmental side effects during production (mining) of copper and also in the soil and especially towards aquatic environments are unacceptable. So the focus given to reduce the amount of copper, but the CuOH 500ppm alone was not reducing the blight severity in a significant level. But by incorporating other biomolecules or biocontrol agents such chitosan and Trichoderma along with copper it was reducing the disease as equal to mancozeb 2000ppm.

Table 1: Range of micronutrient concentrations required for normal plant growth

Trace elements	Concentration in ppm	Fertilizers-Content	Range of application (kg/ha.)	
			Soil	Spray
Z (Zinc)	0.02 to 0.2	Zinc sulphate- 21% Zn	2.3-56.0	0.56
B (Boron)	0.1 to 1.0	Borax-10.50% B	5.5-56.0	2.3-22.4
Cu (Copper)	0.01 to 0.05	Copper sulphate 24% Cu	5.6-33.6	-
Fe (Iron)	0.5 to 5.0	Ferrous sulphate- 19% Fe	16.8-56.0	5.6-7.8
Mn (Manganese)	0.1 to 0.5	Manganese sulphate- 30.5% Mn	16.8-33.6	4.5-9.0

Foliar application of Iron

Iron (fe) deficiency is a widespread agricultural problem that decreases plant growth and crop yields. Fe application increased all plant characteristics relating to yield components, yield and dry matter percentage of potato crop. A recent study on potato cultivars receiving Fe sulphate (10 to 40 kg Fe ha^{-1}) applied to the soil before planting also resulted in unsuccessful translocation of Fe to tubers.

Foliar application of Manganese

Manganese (Mn) is an activator of many different enzymatic reactions and also takes part in photosynthesis. Mn is very necessary to improve the yield and quality of potato tuber crop as depicted by positive resulted were obtained from foliar application of manganese sulphate on all plant characteristics relating to yield and quality of potato crop.

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