



Micro-nutrient management for soil fertility, nutrients uptake and productivity of greengram (*Vigna radiata*) and finger millet (*Eleusine coracana*) under semi-arid Alfisols

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ABSTRACT

Three field experiments of greengram [*Vigna radiata* (L.) Wilczek] followed by finger millet [*Eleusine coracana* (L.) Gaertn.] in sequence with 12 treatments of micro-nutrients in combination with recommended NPK fertilizers applied to finger millet were conducted during 2005–2007 in a semi-arid Alfisols at Bengaluru, Karnataka. The effects of treatments on available soil and plant uptake of nutrients and yield of crops were assessed. Using the relationships of yield with soil and plant nutrient variables, regression models of yield through soil and plant variables were calibrated and effects of variables on crop yields were assessed. The models gave high and significant yield predictability in the range of 0.92–0.98 through different variables. The model of plant uptake through soil nutrients indicated that soil sulphur, iron and zinc had a significant positive effect; while soil N, K, boron and molybdenum had a negative effect on plant nutrient status in greengram. Similarly, soil P, manganese and zinc had a significant positive effect, while soil N, K and iron had a negative effect on plant uptake of nutrients in finger millet. Based on a relative efficiency index (REI) criterion, recommended NPK + ZnSO₄ @ 12.5 kg/ha + borax @ 10 kg/ha + Mo @ 2 g/kg seed (9.68) was superior for maximum plant uptake, while recommended NPK + FYM @ 10 t/ha (9.21) was superior for maximum soil fertility of nutrients in greengram. In finger millet, recommended NPK + FYM @ 10 t/ha (8.70) showed the maximum REI for soil nutrients, while recommended NPK + ZnSO₄ @ 12.5 kg/ha + borax @ 10 kg/ha (9.71) the maximum REI for plant uptake of nutrients. The combined REI over soil and plant nutrients for both crops indicated that application of NPK + ZnSO₄ @ 12.5 kg/ha + borax @ 10 kg/ha + Mo @ 2 g/kg seed could be prescribed for attaining maximum plant uptake of nutrients and productivity of greengram and finger millet in sequence, apart from maintaining maximum soil fertility of nutrients under semi-arid Alfisols.

Key words : Finger millet, Greengram, Micro-nutrients, Productivity, Plant uptake, Relative efficiency index, Soil fertility

Finger millet, an important rainfed crop grown under semi-arid Alfisols of Karnataka in south India, is a promising source of calcium (Ca), iron (Fe), zinc (Zn) and protein. The crop is sustainable even under low rainfall situation (Maruthi Sankar *et al.*, 2011) and responds even to better rainfall, macro- and micronutrient application under rainfed conditions. Umesh Gupta and Subhas Gupta (2005) described that boron (B) and other trace elements, such as chromium (Cr), nickel (Ni) etc., are required for food-producing animals. Hence, field calibration data are needed to improve fertilizer recommendations for micro-

nutrient anions and molybdenum (Mo).

Upadhyaya *et al.* (2011) reported genetic variability for grain Fe, Zn, Ca and protein content in finger millet. They found that accessions rich in Zn gave significantly higher grain yield than those rich in Fe and protein content. In soybean experiments conducted in soils with low N and without any fertilizer N application, Rubens Jose Campo *et al.* (2009) found that inoculation of Mo-rich seeds produced plants with increased N and Mo content in the grain, higher grain yield and total N. Mo-rich soybean seed did not require external application of Mo.

Application of starter and top dressed N in combination with two split FeEDTA fertilization was beneficial to improve early growth and yield of inoculated soybean in Mediterranean-type soils. The starter N increased the biomass and leaf area index, whereas Fe did not affect growth parameters; while both N and Fe had a positive effect on

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