

ABSTRACT

Laboratory, Pot and Field experiments were undertaken to delineate the available micronutrients (Zn, Cu, Fe, Mn and B) and S status in soils, to know the vertical distribution of available Zn in soils, Zn adsorption characteristics in soils, to study the efficacy of Zn sources and methods of application on growth and yield of maize (*Zea mays*) and On-farm trial was carried out to know the effect of Zn sources on maize and its residual effect on greengram in soils of Nabarangpur district of Odisha.

For delineation of available micronutrients (Zn, Cu, Fe, Mn and B) and S status in soils, 154 nos. of soil samples were collected from three blocks viz. Umerkote, Raigarh and Jharigaon of Nabarangpur district of Odisha with the help of global positioning system (GPS) and recorded the longitude and latitude of the area. Thematic soil fertility maps were prepared by using GPS and Geographical Information System (GIS). The soils of these area are strongly acidic to slightly acidic in nature and found to be deficient in DTPA extractable Zn that needs to be supplemented with Zn fertilizer for the better crop yield specifically for maize which have high Zn requirement in different soils. Vertical distribution of the DTPA-extractable Zn reveals that available Zn decreases with increase in depth. As maize is highly responsive to Zn fertilization Farmers of these areas preferred to add more NPK to maize crop. Adsorption characteristics study revealed that Zinc adsorption increased with increasing rate of Zinc addition. So the required amount of addition of Zn provide favorable environment for crop growth and development .

Field trial on maize was conducted in adopted village of Krishi Vigyan Kendra of district Nabarangpur during kharif and rabi 2013-14 and 2014-15 followed by green gram as residual crop. The experiments was laid out in a randomized block design replicated four times with nine treatment combinations consisting of Organic matter, Lime, Zinc Sulphate and nano zinc. Treatment combinations are as follows: T₁: NPK alone ; T₂: NPK + 2.5kgZn/ha ; T₃: NPK + 2.5kgZn/ha+ lime10% of LR; T₄ : NPK+5.0 kgZn/ha; T₅ : NPK+2.5kgZn/ha+ 3 spray of ZnSO₄ @0.5% ; T₆ : NPK+Organic Matter@ 5t/ha; T₇ : NPK+Organic Matter +2.5kgZn/ha; T₈ : NPK+Organic Matter+2.5kgZn/ha+3spray of ZnSO₄ @0.5% ; T₉ : NPK+Organic Matter +Nano Zn @ 0.3% spray before and after flowering. The recommended dose of N, P₂O₅ and K₂O @ NPK (150-80-80) kg / ha were applied through urea, single superphosphate and muriate of potash, respectively. The Zinc as a source of ZnSO₄, lime, organic matter and nano zinc were applied as per treatment details and foliar spray of zinc through ZnSO₄ and nano-zinc respectively. All the soil and plant analysis were made following standard procedures besides growth parameters were recorded. Results revealed that combined application of NPK, organic matter, Nanozinc @ 0.3% spray increased more cob yield over control in pot as well as field experiment and the pooled data of cob yield increased by 29.67% over control in field experiment. The Zn uptake in cob and stover in pot as well as field experiment increased significantly in best treatment (T₉) which signifies nutrient content in cob and stover can be improved by combined application. So it is interesting to note that application of Zn along with NPK or NPK+OM+Lime as soil application or soil+ foliar application or in the form of nano Zn has profound effect on increasing yield of maize. The Zn uptake in cob and stover in pot as well as field experiment increased significantly in best treatment (T₉) which signifies nutrient content in cob and stover can be improved by combined application. The treatment (T₉) has also greatest residual effect of Zn on green gram yield and stover yield than other treatments.

Keywords: Maize, Green gram, Zinc, lime, Organic Matter, acid soil, nutrient content, growth attributes.