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RESPONSE OF ZINC IN ALLUVIAL SOIL FOR HIGHER YIELD OF WHEAT

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Abstract

In crop production, the importance of Zn was realized due to raising its deficiency from intensified agriculture, increasing prevalence of high yielding crop varieties, multiple cropping. These factors have combined to create large gaps between the soil Zn supply and crop requirements. The zinc deficiency in the soil adversely affects crop yield and nutritional quality. Zinc levels had significantly beneficial effect on the straw / dry matter yields of the rabi crops over control in both crop seasons. The best results in linseed, lentil and cabbage were obtained at 7.5 kg Zn ha-1, in wheat at 10 kg Zn per Ha and in berseem at 5 kg Zn per Ha. Zinc uptake was highest in wheat crop. The uptake of Zn by these crops increased significantly with its addition over control in both the years.

KEYWORDS: *Alluvial soil, higher yield, Rabi crop, Nutrient intake.*

DISCUSSION AND ANALYSIS:

Zinc is directly or indirectly required by several enzyme systems, auxin and protein synthesis, seed production and rate of maturity. Zinc is believed to promote RNA synthesis, which in turn is needed for protein production. Zinc is not translocated within the plant. So symptoms first appear on the younger leaves and other plant parts. Common symptoms of zinc deficiency, which generally occurs, are stunted growth poor tillering, development of light green yellowish bleached spots, chlorotic bands on either side of the midrib in the plants. The sustainable production needs balanced supply from soil along with suitable physical and biological properties to attain a better growth of roots and efficient utilization of nutrient from

the rhizosphere. The deficiency of zinc under semi-arid climate has emerged as a serious limitation to crop production. Zinc deficiency is being widely expressed in the light textured soils.

Experimental details

Field experiments for two consecutive years were carried out with following treatments.

Crops : 1 (wheat) Zn Levels : 6 (0, 2.5, 5.0, 7.5, 10.0 and 15 kg per hectare)

Preparation of the experimental field

The experimental field was prepared by a deep tractor ploughing and discing and finally laid out in to plots leaving irrigation channels and bunds in between the treatments.

Sowing/ transplanting

The wheat seeds were sown in furrows on November 15, in both the years of experimentation

Irrigation

The crops were irrigated at the proper time as judged by the appearance of soil and the crop. The source of irrigation water was tube-well.

Selection of sites for soil sampling

For the present study, in all 250 surface soil samples were collected from cultivated fields of village Sehi, and Basai at tehsil Chhata in Mathura district. The sites selected for this study are given.

Collection of soil samples

The soil samples were collected from the 50 selected sites in the tehsil. The soil samples were drawn from 0-23 cm depth with the help of a soil auger. The soils were put in polythene bags, labeled property and carried to the laboratory.

Statistical analysis

Linear correlation coefficients were worked out in order to see whether available amounts of zinc in soils were interrelated with soil characteristics such as EC, pH, organic carbon and calcium carbonate. Response of rabi crops to zinc

In order to study the response of Wheat crops to zinc application, field experiment was conducted at village Sehi and Basai , Tehsil Chhata, District Mathura (U.P.) for two consecutive years i.e. 2020- 21 and 2021-22. The wheat crops were grown in the Rabi season during both the years.

Composition of Soil

Component	Value	Method of Determination
Sand (%)	61.55	International
Silt (%)	20.66	Pipette method
Clay (%)	17.29	(Piper, 1966)
Textural class	Sandy loam	Triangle method

Zinc: Zinc in the diacid (HNO3 and HClO4) extract of the plant material was determined on an atomic absorption spectrophotometer.

Uptake studies

The uptake of nitrogen, phosphorus, potassium, sulphur and zinc by various crops was computed by multiplying contents of the elements with the yield data.

Statistical analysis

The data regarding yield, chemical composition and nutrients uptake were processed and analyzed statistically to test whether the effects of different treatments were significant or not. Fisher 'F' test was applied for this purpose. The interpretation of the results is based on statistical significance of calculated 'F' values at 5% level. Critical difference (C.D.) has been worked out for comparing the differences between the levels of significant treatments.

Percent apparent recovery (PAR)

Percent apparent recovery (PAR) of applied zinc was concluded from total zinc uptake by the crop using the following formula:

$$PAR = \frac{T-C}{F} \times 100$$

Where,

T= Total Zn uptake (g ha-1) in treated plot

C= Total Zn uptake (g ha-1) in control plot

F= Amount of Zn added in treated plot (kg/ha)

Zinc use efficiency

$$\text{Zn use efficiency (kg produce /kg Zn)} = \frac{\text{Yield of fertilized plot - Yield of unfertilized plot}}{\text{Amount of zinc fertilizer added in fertilized plot}}$$

All parameters are the above equations are in kg per hectare.

Interactive effect of Zn and Ni on wheat

A green house experiment was conducted with following details:

Levels of Zn : 4 (0, 2.5, 5.0 and 10.0 mg kg-1) 92

Replication : 3

Design : RBD

Effect of zinc levels on yields of Wheat crops -

Year: 2020-21

Zn (Kg per Hectare)	**Wheat (Quintal per Hectare)**	
	Grain	**Straw**
00	42.57	66.10
2.5	45.25	68.20
5	47.76	73.52
7.5	51.57	78.85
10	52.10	79.95

Year: 2021-22

Zn (Kg per Hectare)	**Wheat (Quintal per Hectare)**	
	Grain	**Straw**
00	42.67	65.85
2.5	45.35	68.32
5	47.56	72.82
7.5	51.87	79.12
10	51.95	79.95

The application of zinc brought about a significant improvement in yields of the crops but the magnitude of increase varied appreciably. The addition of 7.5 kg Zn ha-1, on an average, increased the grain yield of wheat,

Results and Findings:

- A ll the soils o f Agra d istrict studied were alkaline in reaction, the variation in pH being fro m 7.0 to 8.9. The Bah soils showed relatively m ore pH value than the soils o f other tehsils o f Agra district. On the other hand, the soils o f Sadar tehsil had low er pH.
- The electrical conductivity o f soil-water suspension ranged fro m 0.05 to 0.60 dSm-1. The Sadar and Kheragarh soils contained relatively lower concentration o f soluble salts as compared to soils of other tehsils. Soluble salts do not appear to pose any problem fo r successful cultivation o f the crops in Agra district.
- Zinc levels had significantly beneficial effect on the straw / dry matter yields of the rabi crops over control in both crop seasons.
- Zinc uptake was highest in wheat crop. The uptake of Zn by these crops increased significantly with its addition over control in both the years.
- Application of zinc favoured the higher production of the rabi crops. Application of zinc enhanced the uptake of nutrients by these crops. Among the crops tried, linseed crop was found to show the best results in respect of seed production. The wheat showed better apparent recovery

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