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Depth wise distribution of DTPA: Copper in post-harvest soil of wheat as influenced by crop residue and residual starter zinc

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Abstract
The present experiment is a part of a long-term experiment based on the effect of crop residue and residual starter zinc. This part of investigation "Vertical distribution of DTPA- c copper in Post-Harvest Soil of Wheat as Influenced by Crop Residue and Residual starter Zinc". Distribution of available Copper in different soil depths as influenced by the graded level of crop residues and residual starter zinc under rice-wheat cropping system in calcareous soil are presented. The data on depth wise distribution of available Copper as influenced by long term application of crop residue and residual starter Zn under rice-wheat cropping system are depicted and illustrated i. It was recorded an increase in 15-30 cm depth (3.13 to 3.68 mg kg-1) in comparison to 0-15 cm depth (3.10 to 3.65 mg kg-1) and further it was decreased in 30-60 cm (3.08 to3.61 mg kg-1) and 60-90 cm depth (3.07 to 3.54 mg kg-1) as influenced by crop residue but with increasing level of residual starter Zn, the availability of Cu was decreased in all depths as 0-15 cm depth (3.40 to 3.31 mg kg-1), 15-30 cm (3.44-3.34 mg kg-1). 30-60 cm (3.36 - 3.27 mg kg-1) and 60-90 cm (3.33-3.23 mg kg-1) but among all depths, Cu was high in 15-30 cm of depth.

Keywords: Vertical distribution of DTPA copper, crop residue. Rice-wheat, cropping system

Introduction
The wide scale adoption of this cropping system has increases in agricultural production but this intensive system over a period of time and nature of crop has set declining yield trend as well as deterioration in soil productivity even with optimum use of fertilizers. Hence, for restoration of soil fertility, there is an urgent need to look forward another option like, crop residue incorporation in soil for better production. India is likely to have a potential availability of 343 million ton. Which is estimated to increase to the tune of 496 million ton till 2025 (Tandon, 1997) [14]. During last three decades, chemical fertilizers are playing a dominant role in rice based cropping systems. But the doses of fertilizers may be substituted by the incorporation of crop residues in soil. Incorporation of crop residue alters the soil environment and influences the microbial population in soil, which participate in nutrient transformation. So present investigation is based on depth wise distribution of manganese and iron in rice wheat cropping system as influenced by residual starter Zinc and crop residues.
So present investigation is based on "Vertical distribution of DTPA- Copper in Post-Harvest Soil of Wheat as Influenced by Crop Residue and Residual starter Zinc."

Materials and Methods
A brief description of the materials and methods used in the present investigation entitled "Vertical distribution of DTPA- Manganese in Post-Harvest Soil of Wheat as Influenced by Crop Residue and Residual starter Zinc" is outlined as follows.

Materials
1. Chemical
All Chemicals used in the present investigation were of analytical grade.

2. Glass Ware and Plastic Ware
All the glassware and plastic ware used in the present investigations were of good quality, properly washed in acidified detergent solution followed by tap water, and finally rinsed thrice with distilled water.

3. Water
Deionized and double glass distilled water free from dissolved gaseous impurities were used in the laboratory analysis.

4. Collection of Sample for Laboratory Works
Soil Samples

Soil samples from each of the 48 plots after the harvest of the 36th crop were collected from different depths (0-15, 15-30, 30-60, 60-90, and cm) with the help of post hole anger. These samples were air-dried and processed to pass through 70 mesh sieve and stored in polyethylene bags for analysis.

Methods for field experiment

A field experiment was started in *Rabi*, 1993-94 in light-textured highly calcareous soil deficient in available Zn at Dr. Rajendra prasad central agricultural university Research farm, Pusa and the current investigation period is 2011-12. As per the details given below. Wheat cv. HP 1102 was grown as a general crop applying recommended dose of N, P_2O_5, and K_2O before the start of the experiment. After harvest, the straw was weighed and treated as crop residue for the first crop during *Kharif*, 1994.

Treatments

Details of Field Experiment

A long-term field experiment is being conducted since 1994 at RAU, Pusa Farm with the following details, where observations were taken.

Treatment : 16 (4 main treatment and 4 sub treatment)
Replication : 3
Design : Split Plot
Plot Size : 5 x 2 m

Crop rotation: Rice (cv. Rajshree), Wheat (cv. HD 2824)
A detailed layout plan of the experiment is given in Fig.1. N

R_1		R_2		R_3	
CR_1 Zn_1	IRRIGATION CHANNEL	CR_3 Zn_4	PATH	CR_2 Zn_1	IRRIGATION CHANNEL
CR_1 Zn_2		CR_3 Zn_3		CR_2 Zn_4	
CR_1 Zn_3		CR_3 Zn_2		CR_2 Zn_3	
CR_1 Zn_4		CR_3 Zn_1		CR_2 Zn_2	
CR_2 Zn_1		CR_4 Zn_4		CR_1 Zn_2	
CR_2 Zn_2		CR_4 Zn_3		CR_1 Zn_1	
CR_2 Zn_3		CR_4 Zn_2		CR_1 Zn_3	
CR_2 Zn_4		CR_4 Zn_1		CR_1 Zn_4	
CR_3 Zn_1		CR_2 Zn_4		CR_4 Zn_3	
CR_3 Zn_2		CR_2 Zn_3		CR_4 Zn_1	
CR_3 Zn_3		CR_2 Zn_2		CR_4 Zn_4	
CR_3 Zn_4		CR_2 Zn_1		CR_4 Zn_2	
CR_4 Zn_1		CR_1 Zn_4		CR_3 Zn_2	
CR_4 Zn_2		CR_1 Zn_3		CR_3 Zn_4	
CR_4 Zn_3		CR_1 Zn_2		CR_3 Zn_1	
CR_4 Zn_4		CR_1 Zn_1		CR_3 Zn_3	

Fig 1: Layout Plan

Main Plot ***Sub Plots***

Crop residue levels - 4 (Applied to each crop) Zn - levels – 4 (Applied only to the first crop CR_1 & No crop residue (CR_0)
CR_2 & 25% of straw produced (CR_{25})
CR_3 & 50% of straw produced (CR_{50})
CR_4 & 100% of straw produced (CR_{100})
Zn_1 & no Zn (Zn_0)
Zn_2 & 2.5 kg Zn ha^{-1} ($Zn_{2.5}$) Zn_3 & 5. Kg Zn ha^{-1} ($Zn_{5.0}$)

Zn_4 & 10 kg Zn ha^{-1} ($Zn_{10.0}$) Recommended dose of fertilizers (NP K) for both crop are 120: 60: 40 Kg ha^{-1}. Rice and wheat crops are being grown continuously under the rice-wheat system during *Kharif* and *Rabi* seasons. The chopped straw of the previous crop treated as crop residues were incorporated as per treatment.

Table 1: Details of treatment combinations, therefore, were as follow

1.	CR_1 ZN_1	5.CR_2 ZN_1	9.CR_3 ZN_1	13.CR_4 ZN_1
2.	CR_1 ZN_2	6.CR_2 ZN_2	10.CR_3 ZN_2	14.CR_4 ZN_2
3.	CR_1 ZN_3	7.CR_2 ZN_3	11.CR_3 ZN_3	15.CR_4 ZN_3
4.	CR_1 ZN_4	8.CR_2 ZN_4	12.CR_3 ZN_4	16.CR_4 ZN_4

DTPA Analysis of soil by the method Lindsay, W.L. and Norvell, W.A. 1978

Statistical Analysis and Presentation of Data

Wherever possible the experimental data were subjected to analysis of variance as per the procedure of Panse and Sukhatme (1967) [12]. The critical difference (CD) at a 5 percent level of probability was worked out for comparing the significant treatment effects.

DTPA- Cu

The depth wise distribution of available Cu in post-harvest soil after wheat (36th) as influenced by residual effect of starter Zn and continuous incorporation of crop residue of previous crop under rice-wheat cropping system are presented in Table 2 and illustrated in Fig. 2. The available Cu content of surface soil (0-15 cm) varied from 3.08 to 3.73 while in 15-30, 30-60 and 60-90 cm depths, it ranged from 3.12 to 3.77, 3.06 to 3.69 and 3.03 to 3.60 mg kg^{-1}, respectively. Available Cu content in soil was slightly higher in 15-30 cm depth (3.39 mg kg^{-1}) in comparison to 0-15 cm depth (3.36 mg kg^{-1}) and started to decrease with increasing of depth in 30-60, (3.32 mg kg^{-1}) and 60-90 cm (3.27 mg kg^{-1}) available Cu. Similarly, It was recorded an increase in 15-30 cm depth (3.13 to 3.68 mg kg^{-1}) in comparison to 0-15 cm depth (3.10 to 3.65 mg kg^{-}

^{1}) and further it was decreased in 30-60 cm (3.08 to 3.61 mg kg^{-1}) and 60-90 cm depth (3.07 to 3.54 mg kg^{-1}) as influenced by crop residue but with increasing level of residual starter Zn, the availability of Cu was decreased in all depths as 0-15 cm depth (3.40 to 3.31 mg kg^{-1}), 15-30 cm (3.44-3.34 mg kg^{-1}). 30-60 cm (3.36 - 3.27 mg kg^{-1}) and 60-90 cm (3.33-3.23 mg kg^{-1}) but among all depths, Cu was high in 15-30 cm of depth. Behera *et al*., 2009 [8] also worked on the DTPA extractable micronutrient cations and found that Cu content was maximum in the 15-30 cm layer and then decreased down.

Table 2: Vertical Distribution of DTPA-Copper (mg kg^{-1}) in Post-Harvest Soil of Wheat (36th crop) as Influenced by Crop Residue and Residual Starter Zinc

	Depth (Cm)				
Treatments	**0-15**	**15-30**	**30-60**	**60-90**	**Mean**
CR_0 Zn_0	3.11	3.14	3.09	3.13	3.10
CR_0 $Zn_{2.5}$	3.11	3.13	3.08	3.05	3.09
CR_0 $Zn_{5.0}$	3.09	3.12	3.08	3.05	3.08
CR_0 Zn_{10}	3.08	3.12	3.06	3.03	3.10
Mean	3.10	3.13	3.08	3.07	3.10
CR_{25} Zn_0	3.25	3.30	3.22	3.16	3.23
CR25 Zn2.5	3.23	3.27	3.20	3.17	3.22
CR25 Zn5.0	3.18	3.22	3.17	3.13	3.18
CR_{25} Zn_{10}	3.16	3.21	3.13	3.07	3.14
Mean	3.21	3.25	3.18	3.13	3.19
CR_{50} $Zn\ _0$	3.51	3.56	3.46	3.42	3.49
CR50 Zn2.5	3.47	3.50	3.43	3.36	3.44
CR50 Zn5.0	3.46	3.50	3.36	3.31	3.41
CR_{50} Zn_{10}	3.40	3.44	3.32	3.29	3.36
Mean	3.46	3.50	3.39	3.35	3.43
CR_{100} Zn_0	3.73	3.77	3.69	3.60	3.70
CR100Zn2.5	3.67	3.73	3.63	3.57	3.65
CR100Zn5.0	3.63	3.66	3.57	3.51	3.59
CR100Zn10	3.58	3.56	3.55	3.49	3.55
Mean	3.65	3.68	3.61	3.54	3.62
Zn_0	3.40	3.44	3.36	3.33	3.38
Zn2.5	3.37	3.41	3.34	3.29	3.35
Zn5.0	3.34	3.37	3.29	3.25	3.31
Zn_{10}	3.31	3.34	3.27	3.23	3.29
Mean	3.36	3.39	3.32	3.27	3.33
CD = (0.05%) CR	0.04	0.04	0.03	0.04	
Zn	0.02	0.03	0.03	0.03	
CR x Zn	0.04	0.06	0.06	0.07	
CV (%)	1.85	1.98	1.76	1.92	

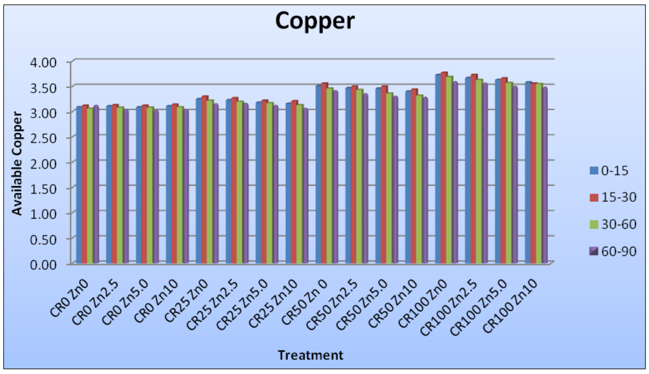

Fig 2: Vertical distribution of Copper (mg Kg^{-1}) content of PHS of wheat (18th Cycle)

References

1. Agbenin JO, Henningsen. The distribution and transformation of iron and manganese in soil fraction in a savanna alfisol under continuous cultivation. Nutr Cycl Agroecosys 2003;66:259-270.
2. Behera SK, Singh D, Dwivedi BS, Singh S, Kumar K, Rana DS. Distribution of fraction of zinc and their contribution towards availability and plant uptake of zinc under long-term maize (Zea mays L.) - wheat (Triticum aestivum L.) cropping on an Inceptisol. Aust J Soil Res 2008;46:83-89.
3. Behera SK, Singh D, Dwivedi BS. Changes in fractions of iron, manganese, copper and zinc in soil under continuous cropping for more than three decades. Commun Soil Sci Plant Anal 2009;40:1380-1407.
4. Dhaliwal SS. Different chemical pools of Mn as influenced by submergence, green manure and soil applied Mn under rice- wheat system. Asian J Soil Sci 2008;3(1):94-98.
5. Dhaliwal SS, Walia SS. Integrated nutrient management for sustaining maximum productivity of rice-wheat system under Punjab conditions. J Res PAU 2008;45:12-16.
6. Dhaliwal SS, Sadana US, Sidhu SS Gurpreet S. Role of cropping systems in amelioration of aggravated micronutrients deficiency in alluvial soils of Punjab. J Pl Sci Res 2011;27:21-29.
7. Elbordiny MM, Camilia YD. Effect of some salt affected soil properties on micronutrients availability. J Appl Sci Res 2008;4(11):1569-1573.
8. Herencia JF, Ruiz JC, Melero MS, Villaverde J, Maqueda C. Effects of organic and mineral fertilization on micronutrient availability in soil. Soil Sci 2008;173:69-80.
9. Khan MSH, Mian MJ, Akhtar A, Hossain MF, Sikder MSI. Effects of long term fertilization and cropping on micronutrient cations of soils in Bangladesh. Pak J Biol Sci 2002;5:543-544.
10. Lu S, Liu X, Li L, Zhang F, Zhang X, Tang C. Effect of manganese spatial distribution in the soil profile on wheat growth in rice-wheat rotation. Pl Soil 2004;261:39-46.
11. Page L, Miller RH, Keeney DR. Methods of soil analysis. Part 2, 2nd edition. Am Soc Agron, Madison, Wisconsin, USA 1982.
12. Panse VG, Sukhatme PV. Statistical methods for agricultural workers, 2nd Prasad, R. and Power J.F. (1991) Crop residue management Soil, Science 1967;15:205-239. ed. ICAR, New Delhi
13. Panse VG, Sukhatme PV. Statistical methods for agricultural workers 4thEdn. ICAR, New Delhi 1985, 359.
14. Tandon. Organic residues: An assessment of potential supplies their contribution to agricultural productivity and policy issues of Indian agriculture from 2000-2025. In plant nutrient needs, supply efficiency and policy issues (J.K. Kanwar and J.C. Katyal Eds.) National Academy of Agricultural Sciences, New Delhi, 1997, 15-28.
15. Sharma BD, Harsh A, Kumar R, Nayyar VK. Relationships between soil characteristics and total and DTPA-extractable micronutrients in Inceptisols of Punjab. Commun Soil Sci Pl Anal 2004;37:799-818.
16. Sharma MP, Bali SV, Gupta DK. Crop yield and properties of inceptisol as influenced by residue management under rice-wheat cropping sequence. J Indian Soc Soil Sci 2000;48:506-509.
17. Singh JP, Karwasra SPS, Singh M. Distribution and

forms of copper, iron, manganese and zinc in calcareous soils of India. J Indian Soc Soil Sci 1988;146:359-66.
18. Verma A, Nepalia V, Kanthaliya PC. Effect of decade long – term fertilizer and manure application on soil fertility and productivity of rice-wheat system in a Mollisol. J Indian Soc Soil Sci 2005a;53:365-368.
19. Verma VK, Setia RK, Sharma PK, Singh C, Kumar A. Pedospheric Variations in distribution of DTPA-extractable micronutrients in soils developed on different physiographic units in central parts of Punjab, India. Int. J Agri Biol 2005b;7(2):243-246.
20. Zhang L, He M, Zhang XE, Stoffela PJ. Long term effect of manure application on micronutrient availability under rice-wheat and maize-wheat cropping systems. Soil Sci Soc Am J 2008;70:1699-1717.