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Site specific nutrient management use in two soil type vertisol and Inceptisol of Mungeli district of Chhattisgarh on grain and straw yield

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Abstract

The treatments constituted with application of all nutrients applied at optimum level known as All (SSNM dose) while in others, one of the nutrient elements from all the nutrient treatments (All) was omitted. There were eleven treatments for each type of soil and three replications with CRD (completely randomized design). All treatments were common for both the soils except omission of Fe and Mn in case of Vertisol and omission of Ca and Mg in case of Inceptisol were kept keeping the concept of soil reaction. After addition of all treatments, rice (IGKV R-1) was transplanted in three hills/pot with 2 to 3 seedlings in each hill. The yield reductions were more pronounced with N and P omission pots (43.2%, 41.7% and 34.1%, 31.8% respectively). Reductions in grain and straw yields in S omitted pots were 11.3% and 10.6%, respectively. And Grain and straw yields of rice in Inceptisol were significantly reduced with the omission of N, P, and S in comparison to the treatment (T1) that received all the nutrients.

Keywords: Inceptisol, vertisol, nutrients, straw

Introduction

SSNM approach is a important regional and real-time management to the defined as a dynamic, field-specific management of nutrients in a particular crop or cropping system to optimize the supply and demand of nutrients according to their differences in cycling through soil-plant systems. Crop production used approaches of SSNM in large-scale farming, which mainly focus on managing the spatial variability of nutrients within large production fields using highly advanced tools. Thus, this approach has shown the potential to improve productivity and profitability in intensive (double or triple) rice cropping systems of Asia and Africa by Jinger *et al.* (2017) [1].

Material and methods

1. Site description

A pot experiment was conducted in Department of Soil Science and Agricultural Chemistry, BTC College of Agriculture and research Station, Bilaspur, during Kharif season 2017-18. On the basis of 1st season results farmer's field demonstration was also carried out at field of farmer's (from where bulk of soils were collected for pot experiment) during Rabi season 2017-18. The soils used for pot experiment were two type i. e. Inceptisol and Vertisol. Both the soils were collected from two different locations of Mungeli district. Collected soils were air dried and filled in cemented pots.

2. Experiment design

The Experimental details used in omission pot trails were as follows

Soil type	: Inceptisols & Vertisols
Replication	: Three
Treatment	: Eleven
Design	: C.R.D.
Test crop/variety	: Rice (IGKVR-1), Wheat (GW-273)
Kind of trial	: Pot culture experiment (omission pot trial)
No. of pots	: 66
Seasons	: <i>Kharif</i> , 2017 and <i>Rabi</i> , 2017-18

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3 Treatment Details

Vertisols		Inceptisols	
Treatment -1 (T ₁)	All (N, P, K, S, Fe, Mn, Cu, Zn, B, Mo)	Treatment -1 (T ₁)	All (N, P, K, S, Ca, Mg, Cu, Zn, B, Mo)
Treatment -2 (T ₂)	All – N	Treatment -2 (T ₂)	All – N
Treatment -3 (T ₃)	All – P	Treatment -3 (T ₃)	All – P
Treatment- 4 (T ₄)	All – K	Treatment- 4 (T ₄)	All – K
Treatment- 5 (T ₅)	All – S	Treatment- 5 (T ₅)	All – S
Treatment- 6 (T ₆)	All – Fe	Treatment- 6 (T ₆)	All – Ca
Treatment- 7 (T ₇)	All – Mn	Treatment- 7 (T ₇)	All – Mg
Treatment- 8 (T ₈)	All – Cu	Treatment- 8 (T ₈)	All – Cu
Treatment- 9 (T ₉)	All – Zn	Treatment- 9 (T ₉)	All – Zn
Treatment- 10 (T ₁₀)	All – B	Treatment- 10 (T ₁₀)	All – B
Treatment- 11 (T ₁₁)	All – Mo	Treatment- 11 (T ₁₁)	All – Mo

4 Statistical Analysis

Statistical analyses of the data in Completely Randomized Design were computed with standard methods of experimental design.

Results and discussions

1. Growth and Yield attributes

In pot culture experiment with two soil type (*Vertisol* and *Inceptisol*) under study, grain and straw yields in each soil types, some agronomic parameters like effective tillers/pot, number of field grains/panicle and 1000 grain weight have been recorded and results are presented in the following tables.

The growth and yield attributes of rice in both the soil type

were found significant in nutrient omission trail study except grain test weight (Table 4.1). Effective tillers per pot were varied from 7.33 to 12.67 and 8 to 13.67 in *Vertisols* and *Inceptisols*, respectively. Omission of N and P treatments significantly reduced the effective tillers per pot in both the soil types. The filled grains per panicle of rice varied from 79.33 to 101.33 and 85 to 115 in *Vertisols* and *Inceptisols*, respectively. Test weight of rice grain varied from 23.01 to 24.44 gm/1000 grains in *Vertisols* and from 23.52 to 24.62 gm/1000 grains in *Inceptisols*. A shortage of N and P were the most important limitation for test weight in both the soils. Omission of N and P decreased plant growth parameters. Other omission treatments did not have any remarkable effect on plant growth parameters.

Effect of Nutrient omission trials on Growth and Yield attributes of rice crop grown in *Vertisol* and *Inceptisol*

Treatments	Effective tiller per pot		Filled grains per panicle		Test weight	
	<i>Vertisols</i>	<i>Inceptisols</i>	<i>Vertisols</i>	<i>Inceptisols</i>	<i>Vertisols</i>	<i>Inceptisols</i>
T ₁ All	12.67	13.33	95.33	105	24.44	23.85
T ₂ All – N	7.33	8.00	79.33	85	23.01	23.52
T ₃ All – P	8.00	9.33	86.67	96	23.52	23.6
T ₄ All – K	12.67	12.33	91.00	105	24.55	24.62
T ₅ All – S	11.00	11.33	80.67	114	24.17	23.87
T ₆ All –Fe/Ca ^a	12.33	12.67	97.00	106	23.90	24.09
T ₇ All –Mn/Mg ^b	12.67	12.33	97.67	108	24.54	24.09
T ₈ All – Cu	11.67	12.00	101.00	107	23.86	24.27
T ₉ All – Zn	10.33	12.67	101.33	115	24.06	24.46
T ₁₀ All – B	10.67	13.67	101.00	112	24.32	23.88
T ₁₁ All – Mo	11.67	13.00	99.33	108	24.45	24.06
CD at 5%	1.85	1.11	10.24	7.27	NS	NS

^a means All–Fe for *Vertisol*, All–Ca for *Inceptisol*, ^b means All –Fe for *Vertisol*, All–Ca for *Inceptisol*

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