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Effect of different nutrient management practices for rice crop affected by spillage water of iron ore mines at head region of Hitkasa Dam, Dalli Rajhara, Chhattisgarh

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Abstract
During the *Kharif* season (2021), the field experiment was conducted at the farmer's field, to study about the "Effect of different nutrient management practices for rice crop affected by spillage water of iron ore mines at head region of Hitkasa dam, Dalli Rajhara (C.G.)". The uptake of N and K i.e., (93.19 kg ha^{-1} and 147.53 kg ha^{-1}) were higher in (T$_4$) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}), whereas phosphorus uptake was found to be higher (24.04 kg ha^{-1}) with the application of treatment (T$_6$) 75% GRD (75:45:30) + 5 t/ha^{-1} vermicompost. The application of treatment (T$_4$) STCR Yield Target 6 t ha^{-1} (128:42:77 kg ha^{-1}) produced highest grain and straw yield with a total production of 55.29 q ha^{-1} and 65.80 q ha^{-1}.

Keywords: Iron ore, vermicompost, super compost, integrated nutrient management

Introduction
Rice (*Oryza sativa* L.) which is also the staple food for more than half of the world population and provides 21% and 15% per capita of dietary energy and protein, respectively. The rice plant is a semi aquatic annual grass plant with a height of 1.2 m and long leaves, flattened bone over hollow stems. About 43% of the basket of the Indian food grain is contributed by rice alone. Rice (*Oryza sativa* L.) and wheat (*Triticum aestivum* L.) cropping system is the largest cropping system practiced in South Asian countries (Nawaz *et al.* 2019) [1]. In 2018, global production of rice was found to be 759.6 million tonnes (Mt) in comparison to 2014 with just production capacity of 740 Mt (FAOSTAT, 2016) [2]. India is ranked the world's second largest rice producer (177 Mt) after China (211 Mt), with total area of 44 million hectares. Soil test crop response (STCR) is based on the concept of crop production through soil test-based plant nutrient management dealing with crop yields along with the soil test estimates and fertilizer inputs. Soil test calibration that is intended to establish a relationship between the levels of soil nutrients determined in the laboratory and crop response to fertilizers in the field permits balanced fertilization through right kind and amount of fertilizers. The model of STCR is preferably the most important in order to sustain the yield and reduce the cost of fertilizers hence decreasing the cultivation cost (Saxena *et al*. 2008; Chatterjee *et al.* 2010). Chaubey *et al.* (2015) [5, 3, 4] stated substantially higher returns from the improved practice (STCR technology) as compared to the farmer's practice (GRD) for both the hybrid rice and improved rice. Integrated nutrient management system can help to bring about equilibrium between degenerative and restorative activities in the soil eco-system (Upadhyay *et al.* 2011) [6]. Sustaining rice (*Oryza sativa* L.) productivity at high level is a great challenge, particularly in areas where rice productivity declines due to faulty nutrient management practices (Gill *et al*. 2008). Shrivastava and Singh *et al*. (2017) [7-9] stated that the uptake of N, P, K, S and Zn was significantly improved under treatments having organic manure along with inorganic levels (100%, 75% and 50% NPK) of fertilizer over alone levels of inorganic fertilizer in rice field. Parkinson *et al*. (2013) [10], stated that integrated nutrient management maximizes use efficiency and improve soil health with minimum use of chemicals and also this approach is flexible. The Integrated nutrient management aspect is considered to be the best option to meet ever demand of increasing population. INM has shown considerable increase rice yields by minimizing nutrient losses to the environment and also managing the nutrient supply and hence increasing nutrient efficiency. Singh and Singh, (2011) [11] stated that to provide adequate soil health and plant nutrient, it is important to explore plant nutrient

sources and other than the chemical fertilizers and their application in integration with vermicompost is essential.

Material and Method

The field experiment was conducted in the village of Kondekasa of the Gram Panchayat Dhobedand at Dalli Rajhara in Balod district (C.G) in a latitude and longitude of 20.5891° N, 81.0403° E during the *kharif* season, 2021. The village is located (28.2 km) from District headquarters Balod, and is (96.4 km) away from the state capital Raipur.

The soil type was found to be Inceptisol (Matasi) occupying about 22% area of land in Chhattisgarh. The soil was found red in colour due to siltation of iron ore above the soil surface but actually beneath the siltation there was Inceptisol.

The seedlings were ready for transplanting after 25 days of sowing, and were transplanted in the puddled soil at 20 x 10 cm spacing. Gap filling was done after one week of transplanting to decrease plant competition and maintain desired plant population. For puddling, the field was irrigated with the help of canals by flood irrigation method and up to 5 cm height of water and after the transplanting of seedlings, 3-5 cm of standing water was maintained until 2 weeks before harvest. For the management of unwanted weeds at its initial growth stage, manually weeding was done initially at 25 days and later at 45 days after sowing of crop. Chlorantraniliprole 0.4% was used in the form of granules @ 4 kg acre^{-1} for pest management.

The harvesting was done after 135 days of transplanting and post-harvest procedures were followed. After harvesting, plant samples were collected and were oven dried at 65^{0}C. The dried samples were then powdered with the help of grinder and then used for chemical analysis such as uptake of N, P, K and micronutrient in plant.

Treatments

The field experiment was conducted in a Randomized Block Design with seven treatments and three replications. The experimental field was divided into plot of size 5 x 5 m^2. The treatments consisted of (T_1) Control (0:0:0 kg ha^{-1}), i.e., no application of fertilizers/manure in the field, (T_2) GRD (100:60:40 kg ha^{-1}), (T_3) GRD + Zn (100:60:40:5 kg ha^{-1}), (T_4) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}), (T_5) Farmer's Practice (80:40:20 kg ha^{-1}), (T_6): 75% GRD (75:45:30 kg ha^{-1})+5 t/ha Vermicompost, (T_7) 75% GRD (75:45:30 kg ha^{-1})+5 t/ha^{-1} Super compost.

Climate and Weather

The climate of the place is tropical. The average rainfall in the area is nearly 1000-1200 mm which mostly occurs between the months of June to September (about 3-4 Months) which is mainly in the rice growing season. The hottest and coolest months are May and December, respectively. The weather data during the experimental period was recorded from meteorological observatory at Krishi Vigyan Kendra, Dhamtari during the crop growth period.

Results & Discussion

Nutrient uptake

Nitrogen uptake

The highest result was found with the treatment (T_4) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}) 93.19 kg ha^{-1}. The treatments GRD (100:60:40 kg ha^{-1}) 79.81 kg ha^{-1}, GRD + Zn (100:60:40:5 kg ha^{-1}) 79.90 kg ha^{-1}, farmer's practice (80:40:20 kg ha^{-1}) 71.12 kg ha^{-1}, 75% GRD (75:45:30) + 5 t/ha^{-1} vermicompost 91.10 kg ha^{-1}, and 75% GRD (75:45:30) + 5 t/ha^{-1} super compost 84.86 kg ha^{-1} respectively, were at par with STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}). The significantly lowest recorded N uptake was found with the treatment (T_1) control (0:0:0 kg ha^{-1}) 44.64 kg ha^{-1}.

Phosphorous uptake

The highest result was found with the treatment 75% GRD (75:45:30) + 5 t/ha^{-1} vermicompost 24.04 kg ha^{-1}. The treatment GRD (100:60:40 kg ha^{-1}) 18.74 kg ha^{-1}, GRD + Zn (100:60:40:5 kg ha^{-1}) 18.77 kg ha^{-1}, (T_4) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}) 18.02 kg ha^{-1}, farmer's practice (80:40:20 kg ha^{-1}) 14.61 kg ha^{-1}, 75% GRD (75:45:30) + 5 t/ha^{-1} super compost 22.57 kg ha^{-1}, were at par with 75% GRD (75:45:30) + 5 t/ha^{-1} vermicompost respectively. The significantly lowest recorded P uptake was found with the treatment (T_1) control (0:0:0 kg ha^{-1}) 10.30 kg ha^{-1}.

Potassium uptake

The highest result was found with the treatment (T_4) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}) 147.53 kg ha^{-1} and at par with treatment GRD (100:60:40 kg ha^{-1}) 113.92 kg ha^{-1}, GRD + Zn (100:60:40:5 kg ha^{-1}) 116.63 kg ha^{-1}, farmer's practice (80:40:20 kg ha^{-1}) 91.34 kg ha^{-1}, 75% GRD (75:45:30) + 5 t/ha^{-1} vermicompost 137.37 kg ha^{-1}, 75% GRD (75:45:30) + 5 t/ha^{-1} super compost 124.54 kg ha^{-1} respectively. The significantly lowest K uptake was found with the treatment (T_1) control (0:0:0 kg ha^{-1}) 60.34 kg ha^{-1}.

Yield

Grain Yield

The highest grain yield was obtained in (T_4) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}) 55.29 q ha^{-1} and it was at par with GRD (100:60:40 kg ha^{-1}) 47.41 q ha^{-1}, GRD + Zn (100:60:40:5 kg ha^{-1}) 47.51 q ha^{-1}, 75% GRD (75:45:30) + 5 t/ha^{-1} vermicompost 53.10 q ha^{-1}, and 75% GRD (75:45:30) + 5 t/ha^{-1} super compost 50.30 q ha^{-1} respectively. Significantly lower yield was recorded in (T_1) control (0:0:0 kg ha^{-1}) 23.91 q ha^{-1} and farmer's practice (80:40:20 kg ha^{-1}) 41.91 q ha^{-1} respectively.

Straw Yield

The highest straw yield was obtained in (T_4) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}) 65.80 q ha^{-1} and it was at par with GRD (100:60:40 kg ha^{-1}) 56.89 q ha^{-1}, GRD + Zn (100:60:40:5 kg ha^{-1}) 57.01 q ha^{-1}, farmer's practice (80:40:20 kg ha^{-1}) 50.71 q ha^{-1}, 75% GRD (75:45:30) + 5 t/ha^{-1} vermicompost 63.73 q ha^{-1}, and 75% GRD (75:45:30) + 5 t/ha^{-1} super compost 60.36 q ha^{-1} and significantly lower yield was recorded in (T_1) control (0:0:0 kg ha^{-1}) 30.36 q ha^{-1} respectively.

Table 1: Effect of nutrient management on the nutrient uptake in rice

S. No.	Treatments	Plant N uptake (kg ha^{-1})	Plant P uptake (kg ha^{-1})	Plant K uptake (kg ha^{-1})
T_1	Control (0:0:0 kg/ha)	44.64^{d}	10.30^{d}	60.34^{e}
T_2	GRD (100:60:40 kg/ha)	79.81^{b}	18.74^{b}	113.92^{c}
T_3	GRD + Zn (100:60:40:5 kg/ha)	79.90^{b}	18.77^{b}	116.63^{c}
T_4	STCR Yield Target 6t/ha (128:42:77 kg/ha)	93.19^{a}	18.02^{b}	147.53^{a}
T_5	Farmer's Practice (80:40:20 kg/ha)	71.12^{c}	14.61^{c}	91.34^{d}
T_6	75% GRD (75:45:30) +5 t/ha Vermicompost	91.10^{a}	24.04^{a}	137.37^{ab}
T_7	75% GRD (75:45:30) +5 t/ha Super compost	84.86^{b}	22.57^{a}	124.54^{bc}
	SEm±	1.689	0.775	4.704
	CD(p=0.05)	5.205	2.388	14.494

Table 2: Effect of nutrient management on the yield of rice

S. No.	Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})
T_1	Control (0:0:0 kg/ha)	23.91^{c}	30.36^{c}
T_2	GRD (100:60:40 kg/ha)	47.41^{ab}	56.89^{ab}
T_3	GRD + Zn (100:60:40:5 kg/ha)	47.51^{ab}	57.01^{ab}
T_4	STCR Yield Target 6t/ha (128:42:77 kg/ha)	55.29^{a}	65.80^{a}
T_5	Farmer's Practice (80:40:20 kg/ha)	41.91^{b}	50.71^{b}
T_6	75% GRD (75:45:30) +5 t/ha Vermicompost	53.10^{a}	63.73^{a}
T_7	75% GRD (75:45:30) +5 t/ha Super compost	50.30^{ab}	60.36^{a}
	SEm±	2.601	2.670
	CD(p=0.05)	8.015	8.227

Conclusion

The result of the experiment concluded that the highest grain yield 55.29 q ha^{-1} and straw yield 65.80 q ha^{-1} was produced by the treatment (T_4) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}). The uptake of nitrogen 93.19 kg ha^{-1} and potash 147.53 kg ha^{-1} were higher in (T_4) STCR Yield Target 6t ha^{-1} (128:42:77 kg ha^{-1}) and whereas in phosphorus uptake was found to be higher 24.04 kg ha^{-1} with the application of 75% GRD (75:45:30) + 5 t/ha^{-1} vermicompost.

References

1. Nawaz A, Farooq M, Nadeem F, Siddique KH, Lal R. Rice–wheat cropping systems in South Asia: issues, options and opportunities. Crop Pasture Science. 2019;70(5):395-427.
2. FAOSTAT; c2016.
3. Chatterjee D, Srivastava A, Singh RK. Fertilizer recommendations based on targeted yield concept involving integrated nutrient management in potato in tarai belt of Uttarakhand. The Indian Journal of Agricultural Sciences. 2010;80(12):1048-1063.
4. Chaubey AK, Parganiha OP, Paraye PM. Effect of STCR technology for target yield in Rice. Pl Archives. 2015;15(1):267-269.
5. Saxena AK, Singh S, Srivastava A, Gautam P. Yield target approach for assessing the fertilizer requirement of onion in Mollisols of Uttarakhand. Indian Journal of Horticulture. 2008;65(3):302-306.
6. Upadhyay VB, Jain V, Vishwakarma SK, Kumhar AK. Production potential, soil health, water productivity and economics of rice (*Oryza sativa*)–based cropping systems under different nutrient sources. Indian Journal of Agronomy. 2011;56(4):311–316.
7. Gill MS, Pal SS, Ahlawat IPS. Approaches for sustainability of rice (*Oryza sativa*)-wheat (*Triticum aestivum*) cropping system in Indo-gangetic plains of India. Indian Journal of Agronomy. 2008, 53(2).
8. Srivastava PC, Bhatt M, Pachauri SP, Tyagi AK. Effect of zinc application methods on apparent utilization efficiency of zinc and phosphorus fertilizers under basmati rice–wheat rotation, Archives of Agronomy and Soil Science. 2014;60(1):33-48.
9. Singh M, Singh YV, Singh SK, Dey P, Jat LK, Ram RL. Validation of Soil Test and Yield Target based Fertilizer Prescription Model for Rice on Inceptisols of Eastern Zone of Uttar Pradesh, International Journal of Current Microbiology Applied Science. 2017;6(2):406-415.
10. Parkinson R, Gangwar B, Singh VK. System based integrated nutrient management. Published by new India publishing agency, New Delhi, India, Soil Use and Management. 2013;29(4):608.
11. Singh CS, Singh AK. Growth and yield response of rice varying levels of fertility, Sulphur and Zinc under transplanted condition. Environment and Ecology. 2011;29(3):978-984.