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Effect of inorganic fertilizer and crop residue on yield attributes and yieldof rice (*Oryza sativa* L.) *Vr.* Pusa Basmati- 1121

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Abstract
A field experiment was conducted during *Kharif* season of July 2013 and 2014at crop research farm SHIATS Allahabad to study the effect of inorganic fertilizer and cropresidue on yield attributes and yield of rice. Treatments were arranged using (4x3) factorial R.B.D with three replications. The crop was harvested at maturity data on plant ht. (cm.), no. of tillers, no. of effective tillers; panicle length (cm.), test wt. (g.), grain yield (q/ha.) and straw yield (q/ha.) were recorded. Plant ht., no. of tiller, no. of effective tiller, test wt., grain yield and straw yield was found significantly increased by different levels of doses. Maximum plant ht. was observed (86.10 cm and 87.89 cm.), no. of tillers (22.38 and 25.00), no. of effective tiller (12.29 and 13.33), panicle length (28.75 and 28.94 cm.), test wt. (23.33 and 23.64 g.), grain yield (39.54 and 41.78 q/ha.) and straw yield (87.45 and 91.23 q/ha.) by different levels of inorganic fertilizerand different levels of wheat residue retention in 2013-14 showed Plant ht. (83.19 and 84.17 cm.), no. of tillers (21.68 and 22.42), no. of effective tillers (10.70 and 10.75), panicle length (28.23 and 27.89 cm.), test wt. (23.33 and 23.64 g.), grain yield (34.75 and 36.41 q/ha.) and straw yield (84.08 and 79.26 q/ha.) in both the years of experiment 2013,14 respectively.

Keyword: Fertilizers, yield, rice etc

1. Introduction
Rice is the third largest cereal crop and is the staple food of nearly one half of the world population. The cropped area, production and productivity in India is 43.95 Mha, 106.54 M tonnes and 24.24 kg ha^{-1} (Agricultural statistics at a glance 2014) [1]. Amongst rice, Basmati rice is known as queen of rice and area under scented rice varieties are also increasing day by day with the opening world market as well as domestic consumption (Singh *et al*., 2008) [13]. India's long-grain Indian Basmati rice is traditionally grown in Punjab, Haryana and western Uttar Pradesh. For MY 2014/15, Basmati rice production is estimated at 8.8 MMT (2.0 M ha.), up 1.2 MMT from last year. MY 2015/16 is forecast to increase further to 9.5 MMT (USDA 2014-15) [6]. Rice contributes 43 per cent of total food grain production and 46 per cent of total cereal production in India. It continues to play vital role in the national food grain supply. It is the staple food of nearly half of the world population. It ranks third after wheat and maize in terms of worldwide production. Asia accounts for 90 per cent and 92 per cent of world's rice area and production respectively. Thus, rice production, consumption and trade are concentrated in Asia. One third of Asia's rice production is consumed in China and one fifth in India. Among the rice growing countries in the world, India has the largest area under rice crop (about 45 M ha.) and ranks second in production next to China. India and China, together accounts for 56% of the total production and about 50% of world's area under rice during 1997-98. From production point of view! China ranks first in the world and accounts for 34.6 percent of total production of world during 1997-98. India accounts for 21.5 per cent of total rice production of world during 1997-98. Uttar Pradesh accounts for 14.42milliontonnenesof total rice production of India during 2015 (Direct. Eco. Stati 2015) [5].
In India over 500 million tonne of agricultural residue are produced every year (MNRE 2009 [10]; www.nicra.iari.res.in/Data/FinalCRM.doc). With increase production of rice and wheat, residue production has also increased substantially. There is a large variability in production of CRs, and their use depends on the crops grown, cropping intensity and productivity in different regions of India (Singh and Sidhu, 2014) [11].

One tonne of wheat residue contains 4-5 kg N, 0.7- 0.9 kg P, and 9-11 kg K. Besides NPK, one tonne of rice and wheat residue contain about 9-11 kg S, 100 g Zn, 777g Fe and 745g Mn (Singh and Sidhu, 2014) [11].

Yield responses to residue retention were affected by both climate and soil conditions. Furthermore, agronomic practices, particularly N management, significantly influenced yield gains under crop residue retention. The increasing levels of NPK increased both grain and straw yields of rice, thus increased the economic return (Das *et al.*, 2003) [4]. Tayefe*et. al.,* (2014) [15] also reported that nitrogen fertilization significantly increased the grain yield, plant height, no. of tillers, no. of panicle sand dry matter production.

Materials and Methods

Experimental details

The trial with three replications and twelve treatments was laid out in Factorial (4x3) R.B.D to assess the performance of different organic and inorganic fertilizer on growth and yield of paddy crop (*Vr*. Pusa basmati -1121) during Kharif season to assess the "*Effect of inorganic fertilizer and crop residue on yield and yield attributes of rice*" at crop research farm SHIATS Naini, Allahabad (UP) INDIA. The Crop Research Farm is situated at 25^0 57' N latitude, 87^0 19' E longitude and 98 m altitude from the sea level. This area is situated on the right side of the river *Yamuna* and by the opposite side of Allahabad City.The area received about 800.45mm rainfall during the *Kharif* season of both the Years. The soil of the experimental plot was sandy loam in texture (59.16.0% sand, 25.23% silt and 15.61% clay), slightly acidic (pH 7.81) low in soil organic carbon (0.38%), available nitrogen (191.43 kg ha^{-1}) low in available phosphorus (17.16 kg ha^{-1}) and medium in potassium (143.62kg ha^{-1}).

Factor levels		
I_0	Control	0:0:0 NPK
I_1	25% NPK	30:15:15 NPK
I_2	50% NPK	60:30:30 NPK
I_3	100% NPK	120:60:60 NPK
W_0	Control	
W_1	50% Wheat residue	2.5 tonne/ha.
W_2	100%Wheat residue	5.0 tonne/ha.

The experiment comprised twelve treatments with 3 replications having 4 different Inorganic fertilizer levels and 3 different residue incorporation levels. Required quantity of fertilizer as per treatment was applied uniformly in the plots through broadcast method of application. A uniform dose of 120 kg N ha^{-1}, 60 kg P_2O_5 ha^{-1} and 60 kg K_2O ha^{-1} were applied in the form of Urea (46 % N), Single Super Phosphate (16% P_2O_5) and Mureate of Potash (60% K_2O). All plots received ½ dose of N, full dose of P and K and 1/4th N fertilizer at two equal splits - at tillering and panicle initiation as per treatments. The crop irrigated as and when required. The weeds were removed manually at 30 and 60 days after transplanting (DAT). The residue incorporation was at 5 tonnes wheat straw.

Observations recorded

The observation on plant height was recorded from randomly selected spots/ locations in each plot at different stages and their average was worked out. Tiller number from the same spots were recorded at 30 and 60 DAT. Observation on yield parameters like no. of effective tillers, panicle length, test weight, grain yield, straw yield, were recorded at maturity. The economics of crop was worked out considering the prevailing market price of the inputs and outputs.

Statistical Analysis

The data were statistically analyzed applying the techniques of analysis of variance and the significance of different sources of variations was tested under Factorial RBD design at probability level 0.05%.

Results and Discussion

Plant height (cm)

Different levels of inorganic fertilizer resembled significant effect over plant height in both the years 2013 and 2014. The plant height was found to be highest in treatment I_3 (100% RDF) which was (18.75, 19.11 cm), (39.36, 40.11 cm), (86.10 cm, 87.89 cm) at 30, 60, and 90 DAT respectively in both the years. At 30 DAT in the year 2014 treatment I_2 was found to be at par with treatment I_3. Similarly, at 60 DAT I_2 was found to be at par to treatment I_3 when the plots were supplied with different levels of inorganic fertilizer against the control. Effect of different levels of wheat residue with respect to plant height in the year 2013 and 2014 was found to be significant with maximum in treatment W_2 (5 tha^{-1} wheat residue) which was (17.72 and 18.83), (38.34 and 38.00), (83.19 and 84.17) at 30, 60, and 90 DAT respectively and the plant height being lowest in the control treatment. Consequently the interaction effect was found to be significant at 30, 60, and 90 DAT of rice growth. As similar findings have also been reported by Arshadullah *et al.,* (2012) [2] that crop residue incorporation alone and with an starter dose significantly affected plant height.

Number of tillers $hill^{-1}$

Tillering was prominent at all the successive stage of growth in rice. At different levels of inorganic fertilizer with respect to no. of tillers in the year 2013 and 2014 tillering was found to be maximum and significant in treatment I_3 (100% RDF) which was (4.87 and 5.33), (22.38 and 25.00) at 30 and 60 DAT respectively in both the years of experiment, with lowest in the control treatment. Effect of different levels of wheat residue with respect to no. of tillers in the year 2013 and 2014 was found to be maximum and significant in treatment W_2 (5.0 tha^{-1} wheat residue) which was (4.47 and 4.67), (21.68 and 22.42) in both the successive years at 30 and 60 DAT respectively. Although treatment W_1 (2.5 t $ha.^{-1}$) was found at par with treatment W_2 at 30 DAT and minimum no. of tiller was found in the control plot. Interaction effect of the two years was also found to be significant at 60 DAT but at 30 DAT was found non-significant in both the years. The maximum no of tiller attained at 30 and 60 DAT in response of inorganic fertilizer and wheat residue was (20.32 and 20.23) in both the year of experiment respectively. These results are in confirmation with Manzoor *et al.,* (2006) [9].

Number of effective tillers $hill^{-1}$

Effect of inorganic fertilizer had significant influence over the no. of effective tillers $hill^{-1}$ and the maximum no. of effective tiller (12.29 and 13.33) was obtained from the treatment I_3 in both the years of experiment 2013 and 2014. Effect of wheat residue also had significant influence over the no. of effective tillers $hill^{-1}$ and the maximum no. of effective tiller (10.70 and 10.75) was obtained from the treatment W_2 in both the years of experiment 2013 and 2014. Hence, the interaction effect of the two years was also found to be significant in both the

years. Similar findings were reported by Rathore *et al.,* (2014) [11].

Panicle length (cm)

Different levels of inorganic fertilizer resembled significant effect over panicle length in both the years 2013 and 2014. The panicle length was found to be highest in treatment I_3 (100% RDF) which was (28.75 and 28.94 cm) in both the years of experiment respectively. The effect of different levels of wheat residue with respect to panicle length in the year 2013 and 2014 was found to be significant with maximum in treatment W_2 (5 tha^{-1} wheat residue) which was (28.23 and 27.89). Although interaction effect of the two years was also found to be significant in both the years. Similar findings have been reported by Sharma *et al.,* (2012) [12].

Test weight (g)

Different levels of inorganic fertilizer with respect to test weight in the year 2013 and 2014, it was found to be maximum and significant in treatment I_3 (100% RDF) which was (23.33 and 23.64) during both the years of experiment.

Wheat residue under varied levels on test weight in the year 2013 and 2014, it was found to be maximum and significant in treatment W_2 (5 t ha^{-1}) which was (22.25 and 23.29) during both the years of experiment.Interaction effect of the two years was also found to be significant in both the years. Kumar *et al.,* (2014) [7, 8] confined the report with similar findings.

Grain yield (q ha^{-1})

The inorganic fertilizer levels exerted significant effect on grain yield of rice. The grain yield increased steadily with the increase in inorganic fertilizer level up to the 100% NPK ha^{-1} it was found to be maximum and significant in treatment I_3 which was (39.54 and 41.78) during both the years of experiment. Thewheat residue levels exerted significant effect on grain yield of rice. The grain yield increased steadily with the increase in inorganic fertilizer level up to the 100% NPK ha^{-1} it was found to be at maximum and significant in treatment W_2 which was (34.75 and 36.41) during both the years of experiment.Interaction effect of the two years was also found to be significant in both the years. The maximum grain yield attained in response of inorganic fertilizer and wheat residue was found in treatment T_{11} (43.50 and 45.39) in both the year of experiment respectively hence treatment T_{10} was found at par with T_{11} in the year 2014. As similar findings have also been reported by Arshadullah *et al.,* (2012) [2] that crop residue incorporation alone and with an starter dose significantly affected grain yield.

Straw yield (q ha^{-1})

Different levels of inorganic fertilizer had a significant effect on straw yield. The maximum straw yield of (87.45 and 91.23) qha^{-1} was obtained from treatment I_3 during both the years of experiment. Consequently, the different levels of wheat residue also had a significant effect on straw yield. The maximum straw yield of (84.08 and 79.26) qha^{-1} was obtained from treatment W_2 during both years of experiment. Hence, interaction effect of the two years was also found to be significant. The maximum straw yield attained in response of inorganic fertilizer and wheat residue was found in treatment T_{11} (95.92 and 94.94) in both the year of experiment respectively. Blaise and Rajendra Prasad (1996) [3] reported similar finding.

Table 1: Effect of inorganic fertilizer and wheat residue on growth, yield attributes and yields of rice.

Factors	Plant ht. (cm)		No. of tiler's $hill^{-1}$		No. of effective tiler's $hill^{-1}$		Panicle length (cm)		Test wt. 1000 seeds wt. (g)		Grain yield (q ha^{-1})		Straw yield (q ha^{-1})	
Inorganic Fertilizer (I)	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
I_0	71.65	71.89	16.49	17.44	5.31	5.33	25.82	25.04	19.00	18.22	22.39	23.80	61.72	63.05
I_1	78.75	77.78	20.71	20.00	8.49	9.11	28.01	26.73	21.11	20.30	30.74	31.01	79.04	69.88
I_2	82.14	83.11	21.42	21.89	10.31	10.89	28.26	27.80	22.11	22.05	33.46	34.24	83.95	81.13
I_3	86.10	87.89	22.38	25.00	12.29	13.33	28.75	28.94	23.33	23.64	39.54	41.78	87.45	91.23
F-test	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed. (±)	0.32	1.20	0.05	0.30	0.17	0.24	0.10	0.14	0.12	0.23	0.43	0.62	0.67	0.56
C. D. (P = 0.05)	0.67	2.49	0.10	0.62	0.36	0.49	0.20	0.30	0.24	0.48	0.90	1.28	1.39	1.15
Crop Residue (C)														
C_0	75.02	75.08	18.12	19.50	6.80	8.42	26.91	26.33	20.08	18.92	27.15	28.29	69.06	72.73
C_1	80.77	81.25	20.95	21.33	9.80	9.83	28.00	27.18	21.83	20.95	32.70	33.42	80.98	76.98
C_2	83.19	84.17	21.68	22.42	10.70	10.75	28.23	27.89	22.25	23.29	34.75	36.41	84.08	79.26
F-test	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed. (±)	0.28	1.39	0.04	0.35	0.15	0.28	0.08	0.17	0.10	0.27	0.38	0.71	0.58	0.64
C. D. (P = 0.05)	0.58	2.88	0.09	0.72	0.31	0.57	0.17	0.34	0.21	0.55	0.78	1.48	1.20	1.33
Interaction (I x C)														
F-test	S	NS	S	S	S	S	S	S	S	NS	S	NS	S	S
S. Ed. (±)	0.56	-	0.08	0.60	0.30	0.48	0.16	0.29	0.20	-	0.75	-	1.16	1.11
C. D. (P = 0.05)	1.16	-	0.17	1.24	0.62	0.99	0.34	0.59	0.42	-	1.56	-	2.40	2.31

Conclusion

From the above discussions reported that inorganic fertilizer (100% N P K ha^{-1}) and wheat residue (5 tha^{-1}) significantly influences the plant height, no of tillers $hill^{-1}$, effective tillers $hill^{-1}$, panicle length, test weight, grain yield and straw yield was found highest in treatment I_3W_2 both the year of experiment 2013 and 2014 respectively.

References

1. Agricultural statistics at a glance, 2014.
2. Arshadullah M, Ali A, Hyder SI, Khan AM. Effect of wheat residue incorporation along with starter dose on rice yield and soil health under saline sodic soil The Journal of Animal and Plant Sciences, 2012; 22(3):753-757.
3. Blaise D, Prasad R. Relative efficiency of modified urea fertilizers in wetland rice (*Oryza sativa*). Indian Journal of Agronomy. 1996; 41:373-378.
4. Das K, Medhi DN, Guha B. Application of crop residues in combination with chemical fertilizers for sustainable

productivity in rice (*Oryza sativa*) and wheat (*Triticum aestivum*) system. Indian J Agron. 2003; 48(1):8-11.
5. Directorate of Economics and Statistics, Ministry of Agriculture, 2015.
6. USDA (2014-15) Grain and Feed Annual report, India.
7. Kumar A, Meena RN, Yadav L, Gilotia YK. Effect of organic and inorganic sources of nutrient on yield, yield attributes and nutrient uptake of rice CV. PRH-10. www.thebioscan.in 2014; 9(2):595-597.
8. Kumar A, Meena RN, Lalji Yadav, Gilotia YK. Effect of organic and inorganic sources of nutrient on yield, yield attributes and nutrient uptake of rice *cv*. PRH-10.*The Bioscan.* 2014; 9(2):595-597.
9. Manzoor Z, Awan TH, Safdar ME, Ali RI, Ashraf MM, Ahmad M. Effect of nitrogen levels on yield and yield components of basmati. J Agric. Res. 2006; 44(2):115-120.
10. MNRE, 2009. www.nicra.iari.res.in/Data/FinalCRM.doc
11. Rathore SS, Gopichand Singh, Kapila Shekhawat, Baishya LK. Productivity enhancement of paddy (*Oryza sativa L*.) through integrated soil fertility management in rice-french bean cropping systems Indian Res. J. Genet. and Biotech. 2014; 6(1):348-358.
12. Sharma D, Sagwal PK, Singh I, Sangwan A. Influence of different nitrogen and phosphorus levels on profitability, plant nutrient content, yield and quality in basmati cultivars. International Journal of IT, Engineering and Applied Sciences Research. 2012; 1(1):1-4.
13. Singh RP, Singh N, Mehta S, Godara AK. Adoption of fertilizers and weedicides inbasmati paddy crop in Kurukshetra Distt. (Haryana). Agric. Sci. Digest. 2008; 28(1):36-38.
14. Singh Y, Singh B, Ladha JK, Khind CS, Khera TS, Bueno CS. Effects of residue decomposition on productivity and soil fertility in rice–wheat rotation. Soil Sci. Soc. Am J. 2004; 68:854-864.
15. Tayefe M, Gerayzade A, Amiri E, Zade AN. Effect of nitrogen on rice yield, yield components andquality parameters. African Journal of Biotechnology. 2014; 13(1):91-105.