Effect of Inorganic Fertilizer and Crop Residue on Carbohydrate and Fat Content in Basmati Rice (Oryza sativa L.)

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Abstract— *A field experiment was conducted during Kharif season of July 2013 & 2014at crop research farm SHIATS Allahabad to study the effect of inorganic fertilizer and wheat residue on carbohydrate and fat content in basmati rice. Treatments were arranged using (4x3) factorial R.B.D with three replications. Increasing level of NPK fertilizer significantly increases carbohydrate content in grain in 100% RDF ha^{-1}over control. Among incorporation/ retention of wheat residue also increase the carbohydrate content with increasing level from 0 to 5 tone ha^{-1}. It was lower in control and higher in highest level of wheat residue, which was at par with 2.5 t ha^{-1} wheat residues in the year of experiment 2013-2014. In the fat content maximum increased in 100% RDF (NPK) over control. Among the fat content maximum increased in incorporation of 5 t ha^{-1} wheat residue was found better than the rest of the treatment both the years of experiment 2013,14 respectively.*

Keywords— Rice, NPK fertilizer, wheat residue, Carbohydrate, fat.

I. 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 million ha, 106.54 M t & 24.24 kg ha^{-1} (Agricultural statistics at a glance 2014). 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). 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 million ha.), up 1.2 MMT from last year. MY 2015/16 is forecast to increase further to 9.5 MMT (USDA 2014-15). 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.

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 tone/ha.
W_2	100%Wheat residue	5.0 tone/ha.

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 million ha.) and ranks second in production next to China. India & 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 per cent 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 14.42million tones of total rice production of India during 2015 (Direct. Eco.Stati. 2015). Phosphorus is a structural component of cell membranes, chloroplast and mitochondria, It is necessary

for photosynthesis, development of plant cell as well as fat and carbohydrate. Potassium is the third major element and plays very important role in photosynthesis and translocation of nutrients from leaves to the seed. It affects both carbohydrate metabolism and also regulates their proportion in the plants Trivedi *et al*., (2015).

In India over 500 million ton of agricultural residue are produced every year (MNRE2009; 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 & Sidhu, 2014). One ton of wheat residue contains 4-5 kg N, 0.7- 0.9 kg P, & 9-11 kg K. Besides NPK, one ton of rice and wheat residue contain about 9-11 kg S, 100 g Zn, 777g Fe & 745g Mn (Singh & Sidhu, 2014).

II. MATERIALS&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 & 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 rainfall during the cropping season varied in both the years (1061.90 mm in 2013 and 539.00 mm in 2014). The deficiency in rainfall was 50.75% in 2014 (Figure 1).Temperature ranging from maximum 16.60 to 36.09 ^{0}C, relative humidity ranging from 66.49 to 91.74% and total bright sunshine of 111.07 hours and 113.79 hours prevailed during the crop periods of 2013 and 2014 respectively. 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}).

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 & 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 tons wheat straw. Harvesting was done on November 10, 2013 and November 6, 2014.

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%.

III. RESULTS AND DISCUSSION

Carbohydrate (%)

Different levels of inorganic fertilizer resembled significant effect over carbohydrate content in both the years 2013 and 2014. The carbohydrate was found to be highest in treatment I_3 (100% RDF) which was 75.30 and 73.56 respectively in both the years against the control.

Effect of different levels of wheat residue with respect to carbohydrate content in the year 2013 and 2014 was found to be significant with maximum in treatment W_2 (5 t ha^{-1} wheat residue) which was 74.04 and 72.48 respectively and the carbohydrate content being lowest in the control treatment. Consequently the interaction effect was found to be significant in the year 2013 but it was non significant in year 2014. As similar findings have also been reported by **Trivedi *et. al*., (2015)**

Fat content (%)

At different levels of inorganic fertilizer with respect to increase fat content in the year 2013 and 2014. It was found to be maximum and significant in treatment I_3 (100% RDF) which was 1.04 and 1.11 respectively in both the years of experiment, with lowest in the control treatment. Effect of different levels of wheat residue with slightly increase fat content in the year 2013 and 2014 was found to be maximum & significant in treatment W_2 (5.0 t ha^{-1} wheat residue) which was 1.02 and 1.08 in both the successive respectively. Interaction effect of the year 2013 was also found to be significant but in year 2014 was found non-significant. The maximum fat in treatment I3W2 (100%NPK and 5.0 t ha^{-1} wheat residue) in both the year of experiment respectively. These results are in confirmation with **Saikia *et. al*., (2012)**

IV. CONCLUSION

So, from the above discussions draws the finding reported that the inorganic fertilizer 100% N:P:K ha $^{-1}$ and wheat residue 5 t ha^{-1} significantly influences the plant Carbohydrate content and Fat content was found highest in treatment I_3W_2 in both the year of experiment 2013 and 2014 respectively.

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Table .1.1: Effect of inorganic fertilizers and wheat residue in carbohydrate content of rice.

	Ist Year (2013)				IIst Year (2014)			
Treatment	**C_0**	**C_1**	**C_2**	**Mean**	**C_0**	**C_1**	**C_2**	**Mean**
I_0	67.41	67.67	68.95	**68.01**	65.60	66.83	67.62	**66.68**
I_1	70.62	73.58	74.28	**72.83**	69.28	70.92	72.60	**70.93**
I_2	71.93	75.22	75.75	**74.30**	71.67	73.83	74.00	**73.17**
I_3	72.59	76.11	77.19	**75.30**	71.33	73.67	75.68	**73.56**
Mean	**70.64**	**73.14**	**74.04**	-	69.47	71.31	72.48	-
	F test	**S.Ed**	**C.D**	-	**F test**	**S.Ed**	**C.D**	-
Inorganic(I)	**S**	0.15	0.30	-	**S**	0.28	0.57	-
Residue(W)	**S**	0.13	0.26	-	**S**	0.32	0.66	-
Interaction(I*W)	**S**	0.25	0.52	-	**NS**	-	-	-

Table.1.2: Effect of inorganic fertilizers and wheat residue in carbohydrate content of rice.

	Ist Year (2013)				IIst Year (2014)			
Treatment	**C_0**	**C_1**	**C_2**	**Mean**	**C_0**	**C_1**	**C_2**	**Mean**
I_0	0.92	0.93	0.95	**0.93**	0.91	1.00	1.04	**0.99**
I_1	0.97	1.01	1.01	**1.00**	1.01	1.04	1.05	**1.04**
I_2	0.99	1.04	1.04	**1.02**	1.06	1.07	1.09	**1.07**
I_3	1.00	1.05	1.07	**1.04**	1.08	1.11	1.14	**1.11**
Mean	**0.97**	**1.01**	**1.02**	-	1.02	1.06	1.08	-
	F test	**S.Ed**	**C.D**	-	**F test**	**S.Ed**	**C.D**	-
Inorganic(I)	**S**	0.004	0.009	-	**S**	0.014	0.030	-
Residue(W)	**S**	0.004	0.007	-	**S**	0.016	0.034	-
Interaction(I*W)	**S**	0.007	0.015	-	**NS**	-	-	-

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