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TO STUDY THE EFFECT OF INTEGRATED NUTRIENT MANAGEMENT OF RICE (Oryza Sativa L.) IN CENTRAL PLAIN ZONE OF U.P.

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Abstract— **The pot experiment of rice was conducted at pot house of the Department of Soil Science and Agriculture Chemistry, CS Azad University of Agriculture and Technology Kanpur, during the kharif season 2013. The doses of experiment were ½ of soil test recommendation doses, 100% of recommended doses and 75% of recommended doses of N, P2O5 and K2O. The crop was further added with 5 kg/ha Zn and S is 40 kg/ha. The result showed that the grain yield ranged from 26.26 to 53.02 q/ha and straw from 30.90 to 64.30 q/ha. The N content in grain ranged from 1.23 to 1.49%, P from 0.26 to 0.42%, K from 0.29 to 0.51, S from 0.11 to 0.25% and Zn from 14.00 to 25.0 mg/kg. The N content in rice straw varied from 0.49 to 0.59%, P from 0.11 to 0.20%, K from 1.20 to 1.54%, S from 0.103 to 0.183% and Zn from 28.0 to 40.0 mg/kg. It was noted the N uptake 48.13 to 116.92 kg/ha, P uptake from 10.21 to 35.12 kg/ha, K uptake from 44.69 to 119.76 kg/ha, S uptake from 6.06 to 25.01 kg/ha and Zn from 1232.84 to 3897.5 gm/ha. The starch content varied from 63.31 to 73.90%, amylase from 28.00 to 34.00% and amylopectin from 66.20 to 74.50%. The treatment T9 (100% RDF + 25% N Vermin-compost + S + Zn + PSB) gave the best result in term of yields nutrient concentrations uptake value and crop quality.**

***Index Terms*__Energy loss, Transmission substation, Transmission loss, MATCAD, Station service**

I. INTRODUCTION

Rice (Oryza sativa L.) is one of the most important and stable crop in tropical and sub-tropical area of our country. It is grown in monsoon climate. Rice is grown over an area of 40 to 41 million ha in the country. Today, the total rice production in Kharif season (2010-11) is 95 million tonnes (Agriculture Survey 2011). Andhra Pradesh, Bihar, Uttar Pradesh, Madhya Pradesh and West Bengal are the leading states of rice production. West Bengal and Uttar Pradesh have the highest rice production. The average yield/ha is highest in Punjab (3346 kg/ha). Besides the ideal ratio of N.P.K is 4 : 2 : 1 for cereal crops. Indiscriminate use of fertilizer adversely affect the physio-chemical properties of the soil resulting in poor rice production. Rice is a high carbohydrate containing food. The protein content of milled rice is usually 6-7 percent. Milled rice losses valuable proteins, vitamins and minerals.

Nitrogen is major structural constituent of the cell. It helps in building up vegetative growth. In the absence of nitrogen the crop growth is greatly retarded foliage turns yellowish, cause shrivelling of grain and lower crop yield. Chlorophyll and carbohydrates assimilation are greatly diminished. Phosphorus is second important major plant nutrient for crop production. It has been called as the "Bottleneck of World Hunger". 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. It also enhances the plant ability to resist pest attack, strain of moisture stress and cold condition.

Sulphur is one of the nature's super nutrients. It is now recognized as the fourth major nutrient in addition to nitrogen, phosphorus and potassium. It influences plants growth in two ways firstly acting as a nutrient and secondly by improving the soil conditions. Zinc is involved in carbohydrate and protein metabolism through several enzyme systems. Zinc is also involved in the synthesis of some growth promoting hormones and in the reproductive process of many plants which are very vital for grain formation.

FYM a by product of dairy farm is a potential source of plant nutrient organic resources are largely biological in origin and they have several nutrients in their composition which on decomposition are released into soil. The materials are available in abundance in eastern UP at normal cost and may be used in integrated manner with N fertilizer with and without Zn in calcareous alkali condition. Further agriculture is poised again to make efficient and extensive use of these organic manures of crop production as it has stabilised that they cut down the expenditure on chemical fertilizer at least by 50%. It has been well stabilised that the applied organic resources not only increase soil fertility but also increase soil physical conditions which help for proper growth of plant and N P& K uptake by paddy and various form of N in soil increased significantly by application if fertilizer N along with FYM and N fixation bacteria. Increasing water holding capacity, aeration permeability, soil aggregation and nutrient holding capacity and decreasing bulk density and soil crusting are

attributing to the continuous use of organic manure proper dose, time and techniques of fertilizer application are responsible for efficient use of N,P,K,Zn,S and FYM. Looking at the important role of integrated use of both organic and inorganic sources of nutrients in the improvement of soil life, crop yield and quality the present study was initiated on rice.

II. MATERIALS AND METHOD

The pot experiment of rice was conducted at pot house of the Department of Soil Science and Agriculture Chemistry, CS Azad Uni. of Agril. and Tech. Kanpur, during the kharif season 2013. The rice verity NDR 359 was taken for study with 12 treatments and 3 replication. The initial characteristics of soil (initial stage) were also analyse to know the nutrient status of soil. The soil of experimental field is low in organic carbon, available N2 and available Zn but medium in case of available P , K and available S is low. The pH and EC in soil was in normal range. The pH, EC and organic carbon was determined by Walkley and Black's rapid titration method described by Jackson (1967). Available N was determined by Alkaline permanganate method as described by Subbiah and Asija 1956). Available phosphorus was extracted with 0.5 M (NaHCO3 Olsen et al. 1954) and the extract of P was determined caloriometrically using vandomolybdate yellow colour method (Jackson 1967). The available K was first extracted by using NH4OAC (PH 7.0) and in the extract, available K was determined by flame photometer. Available sulphur was determined by turbidimetric method (Chesnin and Yien 1950) after extraction with 0.15% Cacl2 solution. Available zinc was estimated by atomic absorption spectrophotometer using DTPA extractant (Lindasay and Norvell, 1978). The plant samples were also analysed for N P K, S and Zn. Nitrogen was determined by kjeldahl's method (Jackson 1967). Phosphorus was determined calorimetrically (Chapman and Pratt,1961) in a diacid extract according to Jackson (1967). Potassium was determined by flame photometric method (Chapman and Pratt,1961) in sodium acetate and acetic acid buffer as outlined by Jackson (1967). Sulphur was determined by turbidimetric method as described Chesnin and Yien (1956). Zinc was determined by atomic absorption spectrophotometer as described by Lindasey and Norvell (1978For quality characterstics the amylose and amylopectin was also determined by the method described by Mc Cready and Hassid (1943) in rice grain.

III. RESULTS AND DISCUSSION

Grain and Straw Yield: Maximum grain and straw yield are found under the treatment T9 (100% RDF +25% N Vermin compost + S + PSB + Zn), while these were minimum grain and straw yield found in treatment T1 (control receiving). Grain and straw yield was comparatively more under treatment T9 having (100% RDF + 25% N vermin compost + S + PSB + Zn), as compared to NPK fertilizer alone. Addition of various levels of NPK alone through inorganic fertilizer also increased the crop yield but to the extent at their combination with organic manure. Grain and straw yield under various inorganic fertilizer levels in combination with organic manure provide better performance over different N level alone. Similar results finding by Singh et al. (1997), Patel et. al. (1998), Dwivedi et. al. (2006) also reported a significantly increase in grain and straw yield with the combined use of fertilizer over control.

Crop Quality: The maximum starch content is in rice grain was observed in T9 (100% RDF + 25% N Vermin compost+ S+ PSB + Zn) treatment and lowest in control. In case of amylase content the highest value was recorded in control and lowest in T9 treatment combination and in case of amylopectin content the highest value was observed in T9 treatment combination and lowest in control. The data in present study are in agreement with several workers , Agrawal and Agrawal (1992), Pathak et.al. (1999), Dwivedi et. al. (2006).

Uptake: The uptake values of nutrients of grain and straw increased partly due to concentration of nutrients and major due to grain and straw yields. It was recorded that N uptake varied from 48.13 to 116.92 kg/ha, P from 10.21 to 35012 kg/ha, K from 44.69 to 119.76 kg/ha, S from 6.06 to 25.01 kg/ha and Zn from 1232.84 to 3897.5. The uptake values indicate the appropriate quantity of nutrients under present study required application under current study by Singh and Singh (1998), Zia et. al. (1995), Wani et. al. (2000).

Nutrient content : The N content in grain varied from 1.23% to 1.49, P from 0.26% to 0.42%, K from 0.29% to 0.51, S from 0.11% to 0.25 and Zn from 14.00 to25.00 ppm. The minimum and maximum concentration of nutrient was observed in control and doze 100% RDF + 25% N Vermin compost + S + Zn + PSB. The variation in the concentration of different nutrients was small but significant. The N content in straw varied from 0.49 to 0.59, P from 0.11 to 0.20, K from 1.20 to 1.54, S from 0.103 to 0.183 and Zn from 28.00 to 40.00 ppm/kg. The trends of variation in the results were similar to those described for grain content. The concentration of these nutrients increases with increasing level of nutrients has also been reported by Tripathi and Tripathi (2009).

CONCLUSION: The dose of (100% RDF + 25% N Vermin compost + S + PSB + Zn) gave the highest grain and straw yield nutrient content, uptake values and crop quality. So it is concluded that application of sulphur and zinc along with the combination of NPK gave best result to the farmer.

Table – 1 yield % increased over control

Treatment	Grain yield (q/ha)	% Increase over control	Straw yield (q/ha)	% Increase over control
T1	26.26		30.90	
T2	28.54	7.98	32.12	9.43
T3	28.40	7.53	33.60	8.03
T4	30.26	13.21	36.40	15.10
T5	44.75	41.31	51.40	39.88
T6	46.65	43.70	52.90	41.58
T7	50.11	47.59	62.00	50.16
T8	51.07	48.58	62.10	50.24
T9	53.02	50.47	64.30	52.41
T10	48.80	46.18	60.45	48.88
T11	46.90	44.00	57.90	46.63
T12	48.45	46.10	55.70	44.52
SE±	**2.521**		**1.877**	
CD(P=0.05)	**5.233**		**3.897**	

Table- 2 Effect of different treatments on starch, amylase and amylopectin content (%)

Treatment	Starch (%)	Amylase (%)	Amylopectin (%)
T1	65.38	34.00	66.20
T	66.82	33.40	67.80
T3	63.31	33.30	67.00
T4	67.03	33.00	68.20
T5	67.65	32.80	69.80
T6	68.98	31.70	70.40
T7	71.03	28.50	72.90
T8	71.90	29.30	73.90
T9	73.90	28.00	74.50
T10	70.61	30.00	72.40
T11	68.98	31.30	71.30
T12	69.67	30.50	72.00
SE±	**0.056**	**0.288**	**0.049**
CD	**0.166**	**0.846**	**0.143**

Table – 3 Effect of different treatments on uptake of N, P, K,S and Zn uptake values.

Treatment	N Uptake (kg/ha)			P Uptake (kg/ha)			K Uptake (kg/ha)			S Uptake (kg/ha)			Zn Uptake (g/ha)		
	Grain Uptake	Straw Uptake	Total Uptake	Grain Uptake	Straw Uptake	Total Uptake	Grain Uptake	Straw Uptake	Total Uptake	Grain Uptake	Straw Uptake	Total Uptake	Grain Uptake	Straw Uptake	Total Uptake
T1	32.29	15.84	48.13	6.82	3.39	10.21	7.61	37.08	44.69	2.88	3.18	6.06	367.67	865.2	1232.84
T2	37.10	17.74	54.84	8.56	5.11	13.67	11.41	42.30	53.71	3.71	3.75	7.46	456.64	1057.72	1514.36
T3	36.06	16.80	52.86	8.23	4.70	12.93	11.07	40.99	52.06	3.40	3.59	6.99	417.48	1008	1425.48
T4	41.15	18.56	59.7	9.38	5.82	15.2	12.70	46.59	59.29	4.53	4.00	8.53	505.34	1176.81	1682.15
T5	61.75	26.72	88.47	14.32	8.22	22.54	18.79	68.36	87.15	7.60	6.01	13.61	774.17	1678.72	2452.89
T6	65.31	28.03	93.34	15.39	8.99	24.38	20.52	71.94	92.46	8.39	6.18	14.57	886.35	1798.6	2684.95
T7	72.15	35.34	107.49	18.54	11.78	30.32	24.55	91.76	116.31	11.52	9.92	21.44	1162.55	2356.0	3518.55
T8	75.58	36.01	111.59	20.42	11.79	32.21	25.53	93.77	119.3	12.25	11.30	23.55	1256.32	2421.9	3678.22
T9	78.99	37.93	166.92	22.26	12.86	35.12	20.74	99.02	119.76	13.25	11.76	25.01	1325.5	2572.0	3897.5
T10	69.29	33.85	103.14	17.56	10.88	28.44	22.93	87.65	110.58	10.24	9.49	19.73	1058.96	2276.54	3335.5
T11	64.72	30.68	95.4	15.94	9.84	25.78	21.10	81.06	102.16	8.44	6.94	15.38	938.0	2045.60	2983.6
T12	67.83	30.07	97.9	15.50	10.02	25.52	22.28	79.09	101.37	9.20	8.52	17.72	1036.83	2005.2	3042
SE±	**0.952**	**1.214**		**0.535**	**0.668**		**0.632**	**1.162**		**0.710**	**0.965**		**43.119**	**82.123**	
CD(P=0.05)	**1.977**	**2.521**		**1.11**	**1.387**		**1.311**	**2.413**		**1.475**	**2.003**		**89.523**	**170.503**	

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