

# Effect of organic and inorganic fertilizer on macronutrients content and uptake of wheat crop under rice- wheat cropping system

DOI :

10.15740/HAS/ARJCI/5.2/200-203

Visit us: [www.researchjournal.co.in](http://www.researchjournal.co.in)

■ UMESH KUMAR PATEL<sup>1</sup>, ROSHAN LAL SAHU AND SACHIN KUMAR<sup>1</sup>

## AUTHORS' INFO

### Associated Co-author :

<sup>1</sup>Krishi Vigyan Kendra, ANJORA  
DURG (C.G.) INDIA

### Author for correspondence:

#### ROSHAN LAL SAHU

Krishi Vigyan Kendra, ANJORA

DURG (C.G.) INDIA

Email: [roshanagri@rediffmail.com](mailto:roshanagri@rediffmail.com)

**ABSTRACT :** The field experiment was conducted in 2004-2005 at the Research Farm of IGAU, Raipur (C.G.) in an on going AICRP on LTFE since 1999, laid out in RBD with ten treatments comprised of 50,100 and 150 per cent of recommended levels of N, P, K and organic sources FYM @ 10t ha<sup>-1</sup>, green manure (sunhemp *in situ*), blue green algae @ 10 kg ha<sup>-1</sup> and ZnSO<sub>4</sub> @ 10 kg ha<sup>-1</sup> were applied in *Kharif* season only. The results showed that the total uptake of nitrogen and phosphorus in treatment T<sub>8</sub> (100%NPK+FYM) and potassium and sulphur was recorded with treatment applied 150 per cent NPK (T<sub>4</sub>) of recommended NPK fertilizers.

**Key Words :** Organic and inorganic fertilizer, Macronutrient uptake

**How to cite this paper :** Patel, Umesh Kumar, Sahu, Roshan Lal and Kumar, Sachin (2014). Effect of organic and inorganic fertilizer on macronutrients content and uptake of wheat crop under rice-wheat cropping system. *Adv. Res. J. Crop Improv.*, 5 (2) : 200-203.

**Paper History :** **Received :** 31.10.2013; **Revised :** 20.11.2014; **Accepted :** 30.11.2014

To feed a population of 1.4 billion by 2025, India will need to produce 301Mt food grains in addition to other commodities; at least 45 Mt of plant nutrients would be needed. Estimates show that with the current food production of 196 Mt in 2000-2001, India has the compulsive need to raise food grain output at rate of more than 5Mt per annum. Technological adoption, using required inputs, especially seeds; plant nutrients, water and energy would be the major determinant to meet the challenges of food growth in future. Among these, fertilizer is the one of the most important inputs, demand of chemical fertilizers would be 35 Mt consisting from 5.6-8.8 Mt P<sub>2</sub>O<sub>5</sub>, 2.3-4.7Mt K<sub>2</sub>O and the rest nitrogen. At least 10 Mt nutrients should come from organic sources, crop and biofertilizer. The most conservative estimates have shown that hardly 270-300 Mt of organic manures of different kinds contributing around 4 to 6 Mt of NPK are available in the country. The food security of the future will be closely linked up with nutrient input as high profitable yields depend on mainly the proper nutrient balance in soils (Tiware, 2002). In India wheat crop is the second most important cereal crop after rice, grown under diverse agro-climatic conditions and occupies more than 25 million hectare area with a production of about

70.26 million tones from an area of 24.23 million hectare with productivity of 2.9 t ha<sup>-1</sup> (Motsara, 2004). In Chhattisgarh state the production of wheat was 97.26 thousand tones from an area 102 thousand hectare with very low productivity of 952 kg ha<sup>-1</sup> (Anonymous, 2003). As rice-wheat cropping system in Chhattisgarh is gaining importance and is being practiced by farmers in irrigated situation. Imbalance use of fertilizers has been one of the key factors in declining the crop productivity and sustaining the soil fertility. Hence, to evolve an efficient nutrient management system with organic, inorganic and biological sources of nutrients for sustainable productivity of wheat crop with maintaining soil fertility summed essentially prioritized to increase farmer's profitability.

## RESEARCH PROCEDURE

Field investigation was undertaken to study the effect of organic and inorganic fertilizer nutrients on yield and yield attributes in wheat crop during 2003-04 at the Research Farm of IGAU Raipur (C.G.). The region generally experiences for sub hot sub humid climate having annual precipitous in the

range of 1200-1400 mm. The experimental soil was vertisol (kanhar) in order having pH 7.7, organic carbon 6.2 g.kg<sup>-1</sup> and EC 0.20 dsm<sup>-1</sup>, in this soil available N (KMnO<sub>4</sub>), P (Olsen-p) (Olsen *et al.*, 1954), K (Neutral 1 N NH<sub>4</sub>OAc - k) and Zn, Cu, Fe, Mn (Lindsey and Norvell, 1978) were analyzed. The organic fertilizer was applied in *Kharif* only and residual effect of *Rabi* crop. Treatment applied in *Kharif* crop was T<sub>1</sub>, control T<sub>2</sub>, 50 per cent NPK T<sub>3</sub>, 100 per cent NPK T<sub>4</sub>, 150 per cent NPK T<sub>5</sub>, 100 per cent NPK+S T<sub>6</sub>, 100 per cent NP T<sub>7</sub>, 100 per cent N T<sub>8</sub>, 100 per cent NPK+FYM T<sub>9</sub>, 50 per cent NPK+BGA T<sub>10</sub>, 50 per cent NPK+GM and in *Rabi* crop only inorganic fertilizer was applied.

## RESEARCH ANALYSIS AND REASONING

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads :

### Nitrogen content and uptake :

The data analyzed for nitrogen content in wheat grain and straw ranged from 1.71 to 2.1, 0.55 to 0.72 per cent and total N uptake ranged from 21.5 to 75.0 kg ha<sup>-1</sup>, respectively are presented in Table 1. The results showed that application of 100 per cent NPK + FYM (T<sub>8</sub>) and 150 per cent NPK ha<sup>-1</sup> (T<sub>4</sub>) recorded the highest nitrogen content in grain (2.1%) and straw (0.72%) as well as the total uptake of nitrogen (75.0 kgha<sup>-1</sup>) followed by T<sub>4</sub> (150% NPK) treatment by wheat crop and the lowest (35.8 kgha<sup>-1</sup>) was found under 100 per cent N alone treatment (T<sub>7</sub>). Increased content and uptake with applied super optimal and optimal levels of applied NPK fertilizers in combinations with organic sources could be assigned to mineral nutrient supplementation and mineralization of organic nitrogen, enhanced microbial activity, balance supply of nutrients in soil solution must have helped the increased content and uptake of wheat as compared to lower levels of applied fertilizer nutrients and control. The results are in conformity with the findings of Swarup and Ghosh (1984) and Hulagur and Dangrwal (1983).

### Phosphorus content and uptake :

The data analyzed for phosphorus content in wheat grain and straw ranged from 0.33 to 0.51, 0.038 to 0.058 per cent, respectively and total P uptake ranged from 3.3 to 14.7 kgha<sup>-1</sup> are presented in Table 2. The results showed that application of 100 per cent NPK + FYM (T<sub>8</sub>) and 150 per cent NPK ha<sup>-1</sup> (T<sub>4</sub>) recorded the highest phosphorus content in grain (0.51%) and straw (0.058%) as well as the total uptake of phosphorus (14.7 kgha<sup>-1</sup>) followed by T<sub>4</sub> (150%NPK) treatment by wheat crop and the lowest (6.9 kgha<sup>-1</sup>) was found under 100 per cent N alone treatment (T<sub>7</sub>). The trends of content and uptake of phosphorus by wheat crop under the applied fertilizer treatments were the same as nitrogen and significantly influenced with

Table 1 : Effect of fertilizer treatments on nitrogen content (%) and uptake (kgha<sup>-1</sup>) of wheat crop

Treatments	Nitrogen content (%)		Nitrogen uptake (kgha <sup>-1</sup> )		Total
	Grain	Straw	Grain	Straw	
T <sub>1</sub>	1.71	0.55	14.90	6.50	21.40
T <sub>2</sub>	1.81	0.55	28.24	12.51	40.76
T <sub>3</sub>	1.94	0.56	48.63	14.92	63.56
T <sub>4</sub>	2.09	0.68	55.40	17.74	73.20
T <sub>5</sub>	1.92	0.58	48.32	14.39	62.71
T <sub>6</sub>	1.83	0.56	43.83	14.95	58.77
T <sub>7</sub>	1.78	0.54	23.46	12.30	35.3
T <sub>8</sub>	2.10	0.72	55.02	20.0	75.00
T <sub>9</sub>	1.87	0.61	30.32	15.22	45.55
T <sub>10</sub>	1.99	0.61	37.77	15.07	52.82
C.D. (P=0.05)	0.07	0.049	8.63	4.54	8.63

**Table 2 : Effect of fertilizer treatments on phosphorus content (%) and uptake (kg ha<sup>-1</sup>) of wheat crop**

Treatments	Phosphorus content (%)		Phosphorus uptake (kg ha <sup>-1</sup> )		Total
	Grain	Straw	Grain	Straw	
T <sub>1</sub>	0.33	0.038	2.84	0.44	3.30
T <sub>2</sub>	0.37	0.045	5.71	1.07	6.79
T <sub>3</sub>	0.39	0.05	9.75	1.32	11.07
T <sub>4</sub>	0.45	0.056	11.37	1.60	12.90
T <sub>5</sub>	0.33	0.051	8.72	1.30	10.03
T <sub>6</sub>	0.36	0.057	8.09	1.50	9.60
T <sub>7</sub>	0.42	0.055	5.40	1.50	6.92
T <sub>8</sub>	0.51	0.058	13.40	1.23	14.70
T <sub>9</sub>	0.42	0.052	6.82	1.52	8.34
T <sub>10</sub>	0.43	0.053	8.25	1.50	9.76
C.D. (P=0.05)	0.041	0.00219	2.88	0.345	1.41

**Table 3 : Effect of fertilizer treatments on potassium content (%) and uptake (kg ha<sup>-1</sup>) of wheat crop**

Treatments	Potassium content (%)		Potassium uptake (kg ha <sup>-1</sup> )		Total
	Grain	Straw	Grain	Straw	
T <sub>1</sub>	0.70	1.58	6.11	18.20	24.30
T <sub>2</sub>	0.77	1.84	12.01	44.06	56.07
T <sub>3</sub>	0.83	1.91	20.80	54.49	75.30
T <sub>4</sub>	0.85	2.10	23.60	56.0	79.60
T <sub>5</sub>	0.81	1.91	20.10	48.63	68.76
T <sub>6</sub>	0.83	1.87	17.49	49.11	66.60
T <sub>7</sub>	0.74	1.90	9.52	42.31	51.83
T <sub>8</sub>	0.79	1.92	20.80	53.34	74.14
T <sub>9</sub>	0.76	1.96	12.28	43.98	56.25
T <sub>10</sub>	0.80	1.91	15.22	51.74	66.96
C.D. (P=0.05)	0.019	0.138	2.93	12.76	12.21

the higher levels of applied NPK fertilizers with organics. Higher content and uptake at higher levels of applied fertilizer nutrients could be ascribed due to increased root proliferation and better microenvironment within rhizosphere and residual effect of applied organic sources with mineral fertilizer nutrients. The results are in conformity with the findings by Singh and Ghosh (1995) and Brar *et al.* (1995).

#### Potassium content and uptake :

Data presented in Table 3 for potassium content in wheat grain ranged from 0.7 to 0.85 per cent and straw ranged from 1.58 to 2.1 per cent and total K uptake ranged from 24.3 to 79.6 kg ha<sup>-1</sup>. The findings revealed that The K content in wheat grain and straw and total potassium uptake by wheat crop increased significantly with applied treatments over control. The highest potassium content 0.85 and 2.1 per cent in grain and straw and potassium uptake 79.6 kg ha<sup>-1</sup> was recorded with treatment T<sub>4</sub> (150% NPK). Among the applied treatments, the lowest K uptake was observed under treatment T<sub>7</sub> (51.83). The increase in content and uptake with applied fertilizer nutrients with residual influence of organics is supported by the findings of Brar *et al.* (1995); Benbi and Biswas *et al.* (1999); Singh *et al.* (2000); Fageria *et al.* (1991) and Brag (1972).

#### LITERATURE CITED

- Benbi, D.K.** and Biswas C.R. (1999). Nutrient budgeting for phosphorus and potassium in long term fertilizer trial. *Nutrient Cycling Agro Ecosyst.*, **54** (2) : 125-132.
- Brag, H.** (1972). The influence of potassium on the transpiration rate and stomatal opening in *Triticum aestivum* and *Pisum sativum*. *Plant Physiol.*, **26** (2) : 250-255.
- Brar, B.S.**, Dhillon, N.S. and Chad, M. (1995). Effect of farm yard

manure application on grain yield and uptake and availability of nutrient in rice-wheat rotation. *Indian J. Agric. Sci.*, **5**: 350-353.

- Fageria, N.K.**, Baligar, V.C. and Jones, C.A. (1991). Wheat and barley In: Growth and mineral nutrition of field crops. Marcel Dekker, NEW YORK, U.S.A.
- Hulagur, B.F.** and Dangarwala, R.T. (1983). Effect of Zn, Cu and P fertilization on the content and uptake of nitrogen and secondary nutrients by hybrid maize. *Madras Agric. J.*, **70** (2): 80-91.
- Lindsay, W.L.** and Nervell, W.A. (1978). Development of DTPA micronutrient soil test for zinc, iron, manganese and copper. *Soil Sci. AM.J.*, **42** (3) : 421-428.
- Motsara, M.R.** (2004). Survey of Indian Agriculture. The Hindu, 35pp.
- Olsen, S.R.**, Cole, C.V., Watanable, F.S. and Dean, L.A. (1954). Estimation of available phosphorus in soil by extraction with sodium bicarbonate. United States Department of Agriculture, CIRC, 939, WASHINGTON, D.C.
- Singh, B.P.** and Ghosh, D.C. (1995). Nutrient and soil fertility status in rice-wheat sequence as affected by cultural practices. *J. Res. Birsa-Agric. Univ.*, **7** (2): 117-120.
- Singh, J.**, Sharma, H.L. and Singh, C.M. (2000). Effect of levels and phases of potassium application on growth and yield of rice and wheat. *J. Pot. Res.*, **16**(1-4): 35-40.
- Swarup, A.** and Ghosh, A.B. (1984). Effect of continuous cropping and manuring on available nitrogen status in soil and uptake of nitrogen by crops. *Bull. Indian Soc. Soil Sci.*, **13**: 243-249.
- Tiwari, K.N.** (2002). Nutrient management for sustainable agriculture. *J. Indian. Soc. Soil Sci.*, **50** (4): 374-397.

#### WEBLIOGRAPHY

- Anonymous (2003). [agridept.cg.gov.in/agriculture/Rabi-01-03.htm](http://agridept.cg.gov.in/agriculture/Rabi-01-03.htm) #wheat.

5<sup>th</sup>  
Year  
★★★★★ of Excellence ★★★★★