

# Effect of integrated nutrient management practices on yield and nutrient uptake by wheat and their residual effect on succeeding mung crop in wheat-mung cropping system

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## ABSTRACT

A field experiment was conducted at Research Farm of A.S (P.G) college, Lakhaoti, Bulandshahr (U.P) to find out the effect of INM practices on yield and nutrient uptake by wheat and their residual effect on succeeding mung crop in wheat mung cropping system. Conjunctive use of PSB, Zn and FYM in collaboration with 100% rec. NPK produced significantly higher grain and straw yield of wheat as compared to its counter part of 50% Rec., NPK, whether applied alone or in combination with FYM, PSB and zinc as well as with absolute control. The yield attributes like earhead length (cm), number of grains per earhead and 1000 – grains weight (g) increased significantly by increasing fertility levels from 50% to 100% and with the integration of organics with in-organics. Significant improvement owing to appropriate combination of NPK, PSB, zinc and FYM was observed for the nutrient uptake by the wheat and the maximum nutrient uptake was noticed due to 100% Rec. NPK +PSB+Zn +FYM and minimum with control. The yield and nutrient uptake of succeeding mung crop grown on residual fertility showed a significant effect under INM treatments and were highest for treatment T<sub>17</sub> comprising of 100 % rec. NPK +PSB+ Zn+ +FYM. Soil fertility in terms of available NPK and Zn after the harvest of mung crop had shown a significant effect by adopting INM practices. In economic consideration, it was found that integration of PSB, Zn, and FYM with 100% rec. NPK gave highest net income (Rs. 27245/ha) and benefit: cost ratio (1.54).

**Key words :** Wheat-mung system, INM, Residual fertility, Nutrient uptake

## INTRODUCTION

Wheat (*Triticum aestivum* L.) is the world's most widely cultivated food grain crop. In India, it is second staple food crop next to rice. Lack of manuring and balanced fertilization is one of the most important causes of low yield. Integrating chemical fertilizers with organic manures has been found to be quite promising not only in maintaining higher productivity but also in providing greater stability in crop production. Mung (*Vigna radiata*) is grown in *kharif* as well as in *zaid* as a bonus crop. It enriches the soil through biological nitrogen fixation and organic residues. The crop is grown on marginal lands with low inputs particularly fertilizers and moisture and thus it is most suitable crop grown on residual fertility after the harvest of wheat crop. Considering these facts in mind present investigation was carried to find out the effect of INM practices on yield and nutrient uptake by wheat and their residual effect on succeeding mung in wheat- mung cropping system.

## MATERIALS AND METHODS

A field experiment was carried out at the Research Farm of A.S. (P.G) College, Lakhaoti, Bulandshahr (U.P) during the *rabi* season of 2005-06 and 2006-07. The soil of the experimental field was well drained, sandy loam, slightly alkaline in reaction (pH 7.8 and 7.6), having E.c.- 0.29 and 0.32 dsm<sup>-1</sup>, organic carbon- 2.80 and 3.20 g per

kg soil, available N – (196.0 and 198.0 kg/ ha), available P-(14.0 and 16.0 kg/ha<sup>-1</sup>), available K (110.0 and 112.0 kg ha<sup>-1</sup>) and DTPA- Zn (1.40 and 1.60 mg/kg soil) during the respective years. Seventeen treatments consisted of two levels of NPK (50% and 100%) alone and in combination with FYM, PSB and Zn were laid out in Randomized Block Design (R.B.D) along with one absolute control and were replicated thrice. Nitrogen, phosphorous, potassium and zinc @ 120:60:40:25, respectively were applied in the form of urea, DAP, MOP and zinc sulphate. The whole quantity of P, K and Zn and half quantity of nitrogen was applied at the time of sowing and rest half of nitrogen was applied in two splits, first at CRI and second at tillering stage. FYM @ 10t/ha and PSB @ 100ml per ml 500- 600 ml water for 10 kg seeds were applied at the time of sowing as basal dressing and seed dressing, respectively. After the harvest of wheat crop (PBW-373) in mid April, certified seeds of mung (Pant mung 1) were sown on the same fertility (residual fertility) after a week time during both the years.

## RESULTS AND DISCUSSION

The yield components (Table 1) *viz.* earhead length (cm), number of grains/ earhead and 1000 – grain weight (grams) and yield of wheat grain and straw increased consistently with the integration of organics (FYM and PSB) with in-organics (NPK and Zn) and by increasing the fertility levels (NPK) from 50% to 100%. However,

**Table 1 : Effect of INM on yield attributes, yield and economics of wheat and mung in wheat mung cropping system (Mean of two years)**

Treatments	Wheat				Mung		Economics		
	Yield attributes			Yield (q/ha)		Yield (q/ha)		Net income Rs./ha	B:C ratio
	Earhead length (cm)	Number of grains per ear head	1000 – grain wheat (g)	Grain	Straw	Grain	Straw		
T <sub>1</sub> : Absolute control	10.60	41.0	33.0	26.08	37.55	3.60	3.21	11093.80	1.00
T <sub>2</sub> : 50% rec. NPK	12.70	46.0	36.5	29.90	41.87	4.10	3.33	12956.00	1.02
T <sub>3</sub> : 50% rec. NPK + PSB	13.35	48.5	38.1	31.90	43.55	4.47	3.51	14599.00	1.12
T <sub>4</sub> : 50% rec. NPK + zinc	13.20	48.0	37.7	35.62	46.30	4.37	3.50	16593.20	1.23
T <sub>5</sub> : 50% rec. NPK + PSB+ zinc	13.50	49.5	38.9	39.52	46.50	4.69	3.62	17342.20	1.26
T <sub>6</sub> : 50% rec. NPK + FYM	13.45	49.0	40.9	34.65	44.30	4.30	3.42	15176.50	1.03
T <sub>7</sub> : 5% rec. NPK+PSB+FYM	13.90	49.5	42.8	36.75	45.65	4.61	3.60	16757.50	1.11
T <sub>8</sub> :50% rec. NPK+zinc+FYM	14.10	51.0	42.9	38.30	46.70	4.49	3.52	17228.00	1.11
T <sub>9</sub> :50% rec. NPK+PSB+zinc+ FYM	14.55	52.5	44.4	46.06	47.85	4.81	3.67	18596.60	1.18
T <sub>10</sub> :100% rec. NPK	14.90	53.5	46.6	41.35	48.95	5.81	4.16	20093.50	1.37
T <sub>11</sub> :100% rec. NPK+PSB	14.90	55.0	47.5	42.60	50.20	6.17	4.30	21116.00	1.41
T <sub>12</sub> :100% rec. NPK +zinc	15.10	55.0	47.6	45.10	52.67	5.97	4.23	22293.00	1.45
T <sub>13</sub> :100% rec. NPK+PSB +zinc	15.05	55.5	47.8	47.25	55.00	6.44	4.49	22742.50	1.45
T <sub>14</sub> :100% rec. NPK +FYM	15.10	56.0	48.2	49.45	57.44	6.10	4.40	24423.50	1.47
T <sub>15</sub> :100% rec. NPK+PSB+FYM	15.25	56.5	47.5	50.90	58.90	6.60	4.51	25649.00	1.51
T <sub>16</sub> :100% rec. NPK+zinc+FYM	15.35	56.0	48.6	52.35	60.37	6.50	4.55	26102.50	1.50
T <sub>17</sub> :100% rec. NPK+PSB+zinc+ FYM	15.60	57.0	49.2	53.50	61.20	6.82	4.62	27245.00	1.54
C.D. (P=0.05)	0.74	1.55	1.16	2.98	2.89	0.35	0.85		

**Table 2 : Effect of INM on nutrient uptake in wheat and mung in wheat-mung cropping system and available nutrients after the harvest of crops (Mean of 2 years)**

Treatments	Nutrient uptake								Available nutrients after harvest of crops			
	Wheat				Mung				N (kg/ha)	P (kg/ha)	K (kg/ha)	Zn (mg)
	N (kg/ha)	P (kg/ha)	K (kg/ha)	Zn (mg/kg)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Zn (g/ha)				
T <sub>1</sub>	35.13	10.86	10.88	51.24	9.88	1.34	2.89	10.69	146.1	8.1	80.2	1.01
T <sub>2</sub>	46.07	14.39	15.22	61.38	12.73	1.68	3.94	12.77	186.7	14.3	116.4	1.22
T <sub>3</sub>	49.94	16.23	16.25	66.97	13.90	1.89	4.34	14.39	182.0	15.4	115.5	1.13
T <sub>4</sub>	55.93	17.83	18.48	100.06	13.79	1.81	4.28	14.51	194.2	15.6	118.6	1.53
T <sub>5</sub>	57.04	19.29	17.90	105.98	14.70	2.00	4.72	15.93	199.4	16.4	116.3	1.54
T <sub>6</sub>	51.22	16.32	16.94	72.32	14.19	1.81	4.25	13.99	212.1	15.2	120.2	1.25
T <sub>7</sub>	54.77	19.01	15.51	79.41	15.56	2.02	4.62	15.34	212.3	16.1	118.1	1.25
T <sub>8</sub>	57.57	18.49	18.83	107.71	15.01	1.94	4.54	15.20	212.0	15.4	118.2	1.56
T <sub>9</sub>	59.72	21.09	20.46	115.55	16.43	2.10	4.94	16.65	219.1	16.5	116.2	1.67
T <sub>10</sub>	65.18	22.47	23.77	97.09	21.21	2.82	6.83	20.31	227.0	18.0	126.3	1.26
T <sub>11</sub>	68.13	24.93	24.55	101.10	22.66	2.98	7.26	21.62	224.2	18.1	125.5	1.33
T <sub>12</sub>	73.74	25.25	26.49	113.11	21.65	2.73	7.16	21.94	224.2	16.8	128.7	1.64
T <sub>13</sub>	77.47	28.24	28.46	140.12	23.81	3.08	7.77	24.09	220.3	18.8	122.1	1.66
T <sub>14</sub>	81.56	27.82	29.17	117.71	23.16	2.94	7.60	21.73	227.4	17.6	124.4	1.21
T <sub>15</sub>	85.31	31.49	29.60	122.86	24.26	3.22	8.02	23.15	213.5	18.2	125.5	1.20
T <sub>16</sub>	88.47	30.14	29.63	158.52	23.14	3.11	7.89	23.48	228.4	17.4	126.6	1.52
T <sub>17</sub>	90.22	33.66	31.64	165.25	25.24	3.40	8.49	25.68	229.8	18.6	130.0	1.51
C.D. (P=0.05)	7.1	1.40	1.12	4.32	3.40	0.35	1.12	3.10	2.82	1.84	3.65	0.18

the increase was more pronounced by the application of FYM, PSB and Zn along with higher level of fertility (100% NPK). The treatment T<sub>17</sub> comprising of 100% rec. NPK+PSB+ Zn + FYM gave highest mean earhead length (15.60 cm), number of grains/earhead (57.0), 1000-grain weight (49.2g), grain yield (53.50q/ha) and straw yield (61.20q/ha). This may be attributed to balanced and complete nutrition of plant growth with judicious combination of organics and in-organics. The beneficial effect of PSB and FYM clubbing may be due to adequate nutrient supply from its decomposition, enhanced mobilization of nutrients from the soil, activation of beneficial soil biological activities through which nutrient availability was increased as well as improved physical condition of soil which provides the plant a good food hold to grow and develop. This all consequently led to high crop productivity. The results are in conformity with the findings of Shekhawat *et al.* (2004) and Kaushik *et al.* (2006). In case of mung, the treatments having PSB gave significantly more yield compared to FYM and Zn whether with lower or higher fertility levels. The maximum yield was noted with treatment comprising of 100% rec. NPK + PSB +Zn + FYM. This is due to residual effect of nutrients which remain in the soil after the harvest of wheat crop. Similar results were observed by Dudhat *et al.* (1996). A pronounced increase in uptake of N, P, K and Zn was registered while using organics and in-organics together at higher fertility level (100% rec. NPK). The highest mean uptake of N, P, K and Zn by wheat and mung were found from treatment T<sub>17</sub> being (90.22 and 25.24 kg/ha<sup>-1</sup>), (33.66 and 3.40 kg/ha<sup>-1</sup>) (31.64 and 8.49 kg/ha) and (165.25 and 25.68mg/kg soil), respectively. This might be due to liberal supply of nutrients by the crops through organics and in-organics which are ultimately absorbed by plants. Rawat and Pareek (2003) also observed the same results. The residual available N, P, K and Zn in soil after the harvest

of mung crop was improved from its initial values by the integration of FYM and PSB along with inorganic fertilizers (NPK and Zn) and by increasing fertility levels from 50% to 100%. The treatment T<sub>17</sub> (100% NPK + Zn + PSB + FYM) gave maximum available nutrients N (229.0 kg/ha), P(18.6 kg/ha), K(130.0 kg/ha) and Zn (1.51 mg/kg). Similar results were also observed by Singh (2007). The highest net income (Rs. 27245/ha) and B:C ratio (1.54) was obtained with treatment T<sub>17</sub> in which FYM, PSB and Zn was clubbed with 100% rec. NPK. It is apparently due to more seed and straw yield under this treatment. The results are in conformity with the findings of Rawat and Pareek (2003).

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