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Effect of integrated nitrogen management on growth, yield and yield attributing characters of wheat, (*Triticum aestivum* L.) in alluvial soil

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Abstract
The present investigation was conducted in two rabi seasons during 2001-02 and 2002-03 at the institutional research farm of Tilak Dhari Post Graduate College, Jaunpur, Uttar Pradesh to study the effect of integrated nitrogen management on growth, yield and yield attributing characters of wheat, (*Triticum aestivum* L.) in alluvial soil. The results revealed that the substitution of 75% N recommended dose through pressmud recorded significantly the highest grain yield (34.10 and 34.60 q/ha) and straw yield (48.30 and 49.35 q/ha) over the recommended dose of nitrogen through urea in respective years. However, the tillers per meter were found non-significant. The plant height, grain per ear, 1000-seed weight, dry matter accumulation and total biomass were also recorded significantly superior over recommended dose of N through urea. Thus, integrated nitrogen management improved the crop yield, dry matter accumulation and total biomass in wheat crop.
Keywords: Integrated nitrogen management, Wheat, yield and biomass

Introduction

On account of containing world energy crisis and spiraling cost of chemical fertilizers the use of manure as a renewable source of plant nutrients is assuming importance. In this endeavor proper blending of organic and inorganic fertilizers is important not only for increasing the yields but also sustaining yield (Devi *et al.* 2011). Wheat is a premier food grain crop of India. There has been a phenomenal increase in its production after mid sixties with the introduction of high yielding verieties. Due to indiscriminate use of chemical fertilizers stagnation or decreasing wheat yield is an emerging problem thus, there is a urgent need to adopt the concept of integrated nutrient management. Nitrogen is very important nutrient for any crop production. It is major constituent of chlorophyll and protein in grains. The loss of nitrogen through leaching and volatilization is very common. Therefore, it is necessary to optimize the nitrogen use efficiency to the crop and minimize the cost of fertilizer in crop production long with reducing its hazardous effects on soil, environment and human health.

Integrated nutrient management has assumed a great importance and has vital significance for the maintenance of soil productivity. However, FYM is an important component of INM not only supply of macronutrients but also meet the requirement of micronutrients, besides improving soil health (Sharma *et al.* 2013).

Organic waste such as pressmud is a byproduct of sugar cane factory and reported to be a valuable source of plant nutrients and may therefore affect physical, chemical and biological properties of soil (Rangraj *et al.* 2007, Muhammad & Khattak 2009).

Sewage and sludge contains useful concentration of N P K and Zn which are beneficial for crops and improve soil fertility. Keeping this in view, the present investigation was planned to study the effect of integrated nitrogen management on growth, yields and yield attributing characters of wheat (*Triticum aestivum* L.) in alluvial soil.

Materials and method

The field experiment was conducted during rabi 2001 to 2002 and repeated in 2002 to 2003 at

the institutional research farm of Tilak Dhari Post Graduate College, Jaunpur to study the effect of integrated nitrogen management on growth, yield and yield attributing characters of wheat, (*Triticum aestivum* L.) in alluvial soil. The experiment was laid out in a randomized block design with ten treatments comprising different combinations of inorganic fertilizers and organic manure were replicated four times and wheat crop variety HUW-234 was taken as a test crop. The following treatments were taken to test the response of wheat crop –

Table 1 Details of treatments

Treatments	Treatment combinations	Symbol
T,	Recommended dose of N (120kg ha^{-1}) through urea	Control
T_2	90kg N ha^{-1} through pressmud + 30 kg N ha^{-1} through urea	PM-N90+U-N30
T_3	60kg N ha^{-1} through pressmud + 60 kg N ha^{-1} through urea	PM-N60+U-N60
T_4	30kg N ha^{-1} through pressmud + 90 kg N ha^{-1} through urea	PM-N30+U-N90
T_5	90kg N ha^{-1} through FYM + 30 kg N ha^{-1} through urea	FYM-N90+U-N30
T_6	60kg N ha^{-1} through FYM + 60 kg N ha^{-1} through urea	FYM-N60+U-N60
T_7	30kg N ha^{-1} through FYM + 90 kg N ha^{-1} through urea	FYM-N30+U-N90
T_8	90kg N ha^{-1} through sewage sludge + 30 kg N ha^{-1} through urea	SS-N90+U-N30
T_9	60kg N ha^{-1} through sewage sludge + 60 kg N ha^{-1} through urea	SS-N60+U-N60
T_{10}	30kg N ha^{-1} through sewage sludge + 90 kg N ha^{-1} through urea	SS-N30+U-N90

Where:
PM= Pressmud
FYM= Farm Yard Manure
SS= Sewage and sludge

Result and Discussion

It is observed that the tillers per meter were found non significant difference. The plant height was significantly influenced over fertilizer nitrogen except FYM-N30 + U-N90 and SS-N30 + U-N90 (Table 2). This increased may be due to better nutrient availability and their uptake. These results are conformity with the Singh *et al.* (1996) and Desai *et al.* (2000).

The grain per ear was significantly increased in integrated nitrogen treatment over control except treatments supplied FYM-N30 + U-N90 and SS-N30 + U-N90. This may be due to on the basis of balance nutrient supply, which in enhances cell division, photosynthesis, and latter on converted into reproductive phase resulted more number of grains per ear (Table 2). Similar findings have been reported by Singh *et al.* (1996).

Table 2 Effect of INM in wheat crop on plant height, number of tillers and grain per ear

Treatments	Plant height (cm)		Number of tillers m"[1]		Grains/ear	
	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03
T_1	95.30	96.70	94.40	95.20	37.80	38.53
T_2	97.65	99.00	96.75	97.60	42.00	42.70
T_3	97.00	98.35	95.50	96.40	41.35	42.08
T_4	96.10	97.40	95.00	96.05	38.95	39.70
T_5	97.00	98.40	96.30	97.10	41.37	42.10

Table Contd.

T_6	96.15	97.45	95.00	96.00	39.30	40.00
T_7	95.85	97.10	94.80	95.65	38.15	38.85
T_8	96.90	98.15	96.10	97.15	41.00	41.75
T_9	96.00	97.20	95.00	95.80	39.20	39.93
T_{10}	95.70	97.00	94.75	95.60	38.00	38.75
SE-m±	0.777	0.413	-	-	0.257	0.215
CD at 5%	1.57	0.81	NS	NS	0.530	0.443

1000 seed weight influenced by various integrated nitrogen management revealed that maximum (1000 seed) weight were recorded with the application of PM-N90 + U-N30 increased 1000 seed weight with these treatments could be explain on the basis of balanced nutrient supply which improved reproductive phase resulted more 1000 weight (Table 3). Similar findings were reported by Singh (1999).

Dry matter accumulation was significantly enhanced by the application of PM-N90 + U-N30, PM-N60 + U-N60, FYM-N90 + U-N30 and SS-N90 + U-N30 over all the treatments/Increment in dry matter accumulation may be attributed due to the fact that higher nutrient absorption and beneficial effect causing accelerated that of photosynthate accumulation, cell division, vegetative and reproductive growth (Table 3). These results are in agreements with the finding of Desai *et al.* (2000).

Table 3 Effect of INM in wheat on 1000 seed weight and dry matter accumulation

Treatments	1000 seed weight (g)		Dry matter accumulation (gm/Mow length)	
	2001-02	2002-03	2001-02	2002-03
T_1	38.41	38.57	291.54	294.40
T_2	41.65	41.80	304.60	307.65
T_3	40.60	40.77	299.05	302.15
T_4	40.51	40.65	294.70	297.70
T_5	41.05	41.20	299.29	304.45
T_6	40.60	40.71	295.60	299.00
T_7	40.41	40.56	292.60	295.75
T_8	40.92	41.04	299.12	303.85
T_9	40.59	40.7	294.40	298.10
T_{10}	40.40	40.55	291.65	294.30
SE™±	1.03	1.06	2.96	3.26
CD at 5%	2.12	2.19	6.12	6.740

The increase in seed yield, straw and total biomass influenced by the integrated nutrient management system maximum yield of grain, straw and total biomass were recorded in treatment where nitrogen was applied in 3:1 ratio through press mud + Urea in both the years of investigation. Yield is the function of complex inter-relationship of its components, which are determined from the growth rhythm in vegetative phase and from its subsequent reflection in reproductive phase. The increase in yields of grain and straw with nitrogen irrespective of

source, may be ascribed to the increase in tillers per meter length grain per ear and 1000 seed weight as discussed earlier and cumulative effect of growth and yield parameter both the years (Table 4). These findings are in agreements with Mahajan *et al.* (2002), Prasad *et al.* (2003) and Singh & Singh (2003).

Table4 Effect of INM in wheat on grain yield, straw yield and total biomass (q ha^{1}).

Treatments	Grain yield		Straw yield		Total biomass	
	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03
T_1	28.50	28.95	40.60	41.55	69.10	70.50
T_2	34.10	34.60	48.30	49.35	82.40	83.95
T_3	32.40	32.90	46.40	47.40	78.80	80.30
T_4	30.65	31.10	43.40	44.45	74.05	75.55
T_5	32.70	33.25	46.65	47.60	79.35	80.85
T_6	31.65	32.15	45.50	46.55	77.15	78.70
T_7	29.75	30.20	42.90	43.85	72.65	74.05
T_8	32.55	33.00	46.50	47.50	79.05	80.50
T_9	31.50	32.05	45.00	46.00	76.50	77.05
T_{10}	29.47	29.95	41.75	42.70	71.22	72.65
SEtni	0.657	0.633	0.435	0.515	1.757	1.791
CD at 5%	1.350	1.300	2.49	2.57	3.61	3.68

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