

Effect of integrated nitrogen management on yield and economics of wheat (*Triticum aestivum L.*) in salt affected soil

S. K. Tripathi

Department of Agricultural Chemistry, K.A.P.G. College, Allahabad, U.P.

Abstract

The results of field experiment conducted in 2002-03 and 2003-2004 revealed that yield of grain and straw was higher with pressmud followed by farm yard manure and water hyacinth than recommended dose of chemical fertilizer. The 1:1 ratio of urea + pressmud combination produced highest grain and straw yield which was significantly superior over unfertilized, recommended dose of chemical fertilizer and 1:3 ratio of inorganic plus organic fertilizer nitrogen during both the years. maximum profit and benefit: cost ratio were noticed in the treatment receiving urea + pressmud nitrogen in 1:1 ratio.

Keywords: INM, wheat, yield, economics, salt affected soil.

Introduction

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 (Yadav *et al.* 2003). Wheat is second most important crop after rice in respect of area, production and productivity in India. It is considered to the backbone of nations food security. Salt affected soils are extremely poor in nitrogen and zinc. Besides, there is tremendous loss of applied nitrogen from these soils due to high pH, ESP and dominance of carbonate, bicarbonate and hydroxyl ions. Due to energy crises, escalating prices of chemical fertilizers, their short supply and poor purchasing power of marginal and small farmers cost of cultivation of wheat crop has been increased. Therefore, it is imperative to develop strategy to combined use of organic manures and chemical fertilizers to enhance the productivity and reduce the cost of production of wheat crop. The use of adequate doses of organic sources coupled with chemical fertilizers is expected to ensure optimum growth conditions under intensive pattern of farming using high yielding varieties. The organic material such as Pressmud and water hyacinth available in abundance quantity, may be an alternative for the organic manures. Keeping in this view experiment was carried out to study the

effect of integration of chemical nitrogen with FYM, Pressmud and water hyacinth on yield and economics of wheat crops in salt affected soils.

Materials and Methods

The experiment was conducted at the Instructional Farm of Narendra Deva University of Agriculture and Technology Kumarganj, Faizabad U.P., during Ravi seasons of 2002-03 and repeated in 2003-04. Geographical location of Faizabad district lies between latitude 24° 47' and 25° 56' north and longitudes 81° 12' and 83° 08' east. The district falls in semi arid zone receiving the mean annual rainfall about 1100 mm. The soil of the experimental area was heavy in texture, alkaline in nature which exhibits pH values of 8.8 to 8.9. The treatments, viz. T₁ Control, T₂ recommended (120:60:40:25 NPK, ZnSO₄) T₃ 90 kg N /ha through urea+ 30 kg N/ha through FYM, T₄ 60 kg N/ha through urea+ 60 kg N/ha through FYM T₅ 30 kg N/ha through urea+ 90 kg N/ha through FYM T₆ 90 kg N/ha through urea+30 kgN/ha through pressmud T₇ 60 kgN/ha through urea+60 kgN/ha through pressmud, T₈ 30 Kg N ha⁻¹ through urea + 90 kg N ha⁻¹ through pressmud, T₉, 90 Kg N ha⁻¹ through urea + 30 kg N ha⁻¹ through water hyacinth, T₁₀, 60 Kg N ha⁻¹ through urea + 60 kg N ha⁻¹ through water hyacinth, T₁₁ 30 Kg N ha⁻¹ through urea + 90 kg N ha⁻¹ through water hyacinth were laid out in randomized block design with three

replications. The wheat variety NW-1014 was taken as test crop. pressmud, FYM, chopped water hyacinth were applied two weeks before sowing of wheat. Fertilizer NPK and Zinc were applied in the forms of urea, DAP, muriate of potash and Zinc sulphate respectively. Half of urea nitrogen and full dose of phosphorus and potash were applied at the time of sowing. Remaining half of nitrogen was applied as top dressing after first irrigation of wheat crop. The cost of cultivation was worked out by considering all the expenses incurred. Gross returned was worked out by multiplying grain and straw yield by its price prevailing in the market on per hectare basis under varies treatment net return was calculated by subtracting the cost cultivation from the gross return of the individual treatment. The benefit: cost ratio was calculated by adopting following formula

$$\text{Benefit : cost ratio} = \frac{\text{Net return (Rs ha}^{-1}\text{)}}{\text{Cost of cultivation (Rs ha}^{-1}\text{)}}$$

Results and discussion

The grain and straw yield of wheat increased significantly in all treated plots as compare to control (Table 1). The significant higher yield of wheat was obtained with the application of urea + FYM and urea + pressmud

at both ratio i.e. 1:1 and 3:1 as well as urea + water hyacinth at 1:1 ratio in comparison to recommended does of chemical fertilizer during both the years. The highest yield of both grain and straw were recorded in treatment T₇ (U - N₆₀ + PM - N₆₀). Yield is function of complex inter-relationship of its component, which are determine from the growth rhythm in vegetative phase from its subsequent reflection in reproductive phase. Maximum crop yield was recorded with T₇ (UN – 60 + PM - N60) because of its greater role in soil improvement. Pressmud is a excellent source of N, P, K, Ca and Zn than other organic material tested (Raman et al 1999). Gradual release of nutrients from pressmud may be helpful in better yield (Ram *et al.* 2000, Chauhan 2001, Singh 1999). The maximum benefit : cost ratio was found to bemaximum when 1:1 ratio of chemical fertilizer and pressmud was used. Dhanker & abrol (1980), rathore (1996), Pandey (1997), Swarup (2010) also observed that integrated use of organic and fertilizer nitrogen found to be more beneficial than the application of fertilizer nitrogen alone at the same level (Table 2 & 3).

Table 1 Effect of integrated nitrogen management on grain and straw yield of wheat

Treatment	Grain yield		Straw yield	
	2002-03	2003-04	2002-03	2003-04
Control	22.00	21.80	36.50	36.10
Recommended (NPK Zn)	34.60	35.70	47.20	47.40
U-N ₉₀ +FYM-N ₃₀	38.60	39.50	52.00	52.30
U-N ₆₀ +FYM-N ₆₀	40.20	41.60	53.40	54.80
U-N ₃₀ +FYM-N ₉₀	35.20	37.50	47.90	49.30
U-N ₉₀ +PM-N ₃₀	39.00	39.60	52.20	53.60
U-N ₆₀ +PM-N ₆₀	40.70	42.20	54.50	55.80
U-N ₃₀ +PM-N ₉₀	35.80	38.30	49.10	50.80
U-N ₉₀ +WH-N ₃₀	37.70	38.60	51.50	51.50
U-N ₆₀ +WH-N ₆₀	39.10	40.30	52.80	53.10
U-N ₃₀ +WH-N ₉₀	34.80	36.10	48.10	48.20
SEM±	1.20	1.25	1.50	1.63
CD at 5%	3.55	3.70	4.60	4.83

Table 2 Economics of the various treatment combinations in wheat crop during 2002-03

Treatments	Gross income (Rs ha ⁻¹)	Cost of cultivation (Rs ha ⁻¹)	Net income (Rs ha ⁻¹)	Benefit cost ratio (Rs ha ⁻¹)
Control	17982.50	12029.50	5953.00	0.49
Recommended (NPK Zn)	27006.00	17831.24	9174.76	0.51
U-N ₉₀ +FYM-N ₃₀	30046.00	17119.36	12926.64	0.76
U-N ₆₀ +FYM-N ₆₀	31197.00	17707.48	13489.52	0.76
U-N ₃₀ +FYM-N ₉₀	27459.00	18295.60	9163.90	0.50
U-N ₉₀ +PM-N ₃₀	30315.00	16545.70	13769.30	0.83
U-N ₆₀ +PM-N ₆₀	31639.50	16560.15	15079.35	0.91
U-N ₃₀ +PM-N ₉₀	27975.50	16574.61	11400.89	0.69
U-N ₉₀ +WH-N ₃₀	29434.50	16898.88	12535.62	0.74
U-N ₆₀ +WH-N ₆₀	30451.00	17267.56	13183.44	0.76
U-N ₃₀ +WH-N ₉₀	27240.50	17635.72	9604.78	0.54

Table 3 Economics of the various treatment combinations in wheat crop during 2003-04

Treatments	Gross income (Rs ha ⁻¹)	Cost of cultivation (Rs ha ⁻¹)	Net income (Rs ha ⁻¹)	Benefit cost ratio (Rs ha ⁻¹)
Control	18246.50	12302.52	5943.98	0.48
Recommended (NPK Zn)	28416.00	18104.26	10311.74	0.57
U-N ₉₀ +FYM-N ₃₀	31422.50	17392.38	14030.12	0.81
U-N ₆₀ +FYM-N ₆₀	33058.00	17980.50	15077.50	0.84
U-N ₃₀ +FYM-N ₉₀	29787.50	18568.62	11218.88	0.60
U-N ₉₀ +PM-N ₃₀	31648.00	16818.72	14829.28	0.88
U-N ₆₀ +PM-N ₆₀	33561.00	16833.17	16727.83	0.99
U-N ₃₀ +PM-N ₉₀	30419.00	16487.63	13631.37	0.81
U-N ₉₀ +WH-N ₃₀	30755.00	17171.90	13583.60	0.79
U-N ₆₀ +WH-N ₆₀	32026.00	17540.58	14485.92	0.83
U-N ₃₀ +WH-N ₉₀	28768.00	17908.74	10859.26	0.61

References

- Chauhan, R.P.S. 2001. Integrated use of nitrogen sources in wheat grown in partially reclaimed sodic soil. *Ann. Pl. Soil Res.*, **3** (1): 17-25.
- Dhankar, O.P. & I.P. Abrol 1980. Rice-husk mulching, a cheap and efficient methods for reclaiming salt affected soils. *Haryana Fmg.*, **9**: 7.
- Raman, S., R.G. Patel & N.M. Jalwadia 1999. Pressmud as a source of nutrient, amendment and wax. *Fert. News*, **44** (11): 29-31.
- Ram, S., R.P.S Chauhan, B.B. Singh & V.P. Singh 2000. Integrated nitrogen supply to rice in sodic soil. *Indian J. Agric. Sci.*, **90**(2): 114-116.

S. K. Tripathi

- Rathore, A.L. 1996. Economics of bio-organic and inorganic sources of nutrient in rice-wheat cropping system. *Indian J. Agron.*, **41(3)**: 502-504.
- Pandey, V.P. 1997. Integrated use of organic and fertilizer nitrogen sources in wheat under partially reclaimed sodic soil, Ph. D. Thesis submitted to Narendra Deva University of Agriculture and Technology, Faizabad.
- Yadav ,R.S., P.C. Yadav & A.K. Dharma 2003. Integrated nutrient management in wheat (*Triticum aestivum*)-mungbean (*phaseolus radiatus*) cropping sequence in arid region *Indian J. Agronomy*, **48(1)**: 23-46
- Swarup, A. 2010. Integrated plant nutrient supply and management strategies for enhancing soil quality, input use efficiency and crop productivity. *J. Indian Soc. soil Sci.*, **58(1)**: 25-31
- Singh, V.P. 1999. Effect of organic and inorganic sources of nutrients on rainfed wheat (*Triticum aesticum* L.). *Indian J. Agron.*, **44(2)**: 347-352.