Indian Journal of Agronomy **50** (1) : 52–53 (March 2005)

Effect of zero tillage and nitrogen level on wheat (*Triticum aestivum*) after rice (*Oryza sativa*)

D.S. YADAV, R.P. SHUKLA, SUSHANT AND BIRENDRA KUMAR

Department of Agronomy, Narendra Deva University of Agriculture and Technology, Faizabad, Uttar Pradesh 224 229

Received : August 2003

ABSTRACT

A field experiment was carried out during the winter seasons of 1999–2000 and 2000-2001 to assess the performance of zero tillage in wheat (*Triticum aestivum* L. emend. Fiori & Paol.) under varying levels of nitrogen. The pooled analysis of data revealed that grain yield and number of effective tillers/m row increased significantly by 7.7 and 6.6%, respectively, with zero tillage over conventional tillage. Significant reduction in dry weight of weeds was observed with zero tillage over conventional tillage. Application of 150 and 180 kg N/ha being at par resulted in significantly higher grain yield over 120 kg N/ha. The growth and yield parameters showed significant variation owing to N application. The dry weight of weeds was minimum with 120 kg N and it increased significantly up to 180 kg N/ha.

Key words: Zero tillage, Nitrogen, Wheat

Rice–wheat is the most predominant cropping system, occupying 10.5 m ha in India, specially in North India. Sowing of wheat in this tract is generally delayed due to the cultivation of long- and medium-duration rice varieties and time required in field preparation of wheat. The advancing of wheat seeding is possible by using Pantnagar zero till drill on residual soil moisture after the harvest of rice, as there is no need to prepare the field for sowing. It has been observed that zero-tillage technique ameliorates late planting, reduces weeds and improves fertilizer and water-use efficiency. Keeping this in view, present experiment was conducted to assess the performance of zero tillage in wheat with different N levels.

MATERIALS AND METHODS

The experiment was conducted during the witner seasons of 1999–2000 and 2000–2001 at Crop Research Station, Masodha, Faizabad. The soil was silty loam, neutral pH (7.6), low in available N (132.5 kg/ha), medium in available P (16.23 kg/ha) and K (152.50 (kg/ha). The treatments comprising 2 tillage practices (zero and conventional tillage) were assigned to the main plots and 3 nitrogen levels (120, 150 and 180 kg N/ha) to the subplots in split-plot design and replicated 4 times. The wheat variety 'HUW 234' was sown on 16 December 1999 and 18 December 2000. Sowing of both zero and conventional plots were done on the same day. Spraying of Paraquat @ 0.5 kg a.i./ha was done in zero tillage plots 1 day before sowing. Full dose of P and K was applied at the time of seeding through diammonium phosphate and the remaining N (excluding supplied by diammonium phosphate was top-dressed as per treatment in 2 equal splits, half at first irrigation and half at second irrigation. Four irrigations were applied uniformly to all the treatments as per requirement of the crop. Spraying of Isoproturon @ 0.75 kg a.i./ha was done at 32 days to control the *Phalaris minor*. The major weed flora infesting the experimental field comprised *Phalaris minor, Cyperus rotundus, Cynodon dactylon, Anagallis arvensis, Vicia sativa* and *Polygonum plebeium*. The crop was harvested on April 30 in 2000 and April 28 in 2001. The rainfall received during the crop period was 27.0 and 11.4 mm during first and second year respectively.

RESULTS AND DISCUSSION

Effect of tillage

Zero tillage led to improvement in growth and yield attributes, viz. plant height, effective tillers, grains/ear and 1,000-grain weight (Table 1), though the improvement was significant only for effective tillers/m row length. The improvement in yield attributes might have occurred owing to better establishment of plants as a result of less weed completion under zero tillage. The significantly higher (7.7%) yield of wheat was recorded with zero tillage in comparison to conventional tillage (Table 2). This yield difference was mainly attributed to increase in effec-

tive tillers/m row, grains/ear and 1,000-grain weight in zero tillage. Dhiman and Sharma (1986), Verma *et al.* (1991) and Tripathi and Chauhan (2000) also reported similar results.

Weed dry weight decreased significantly with zero tillage sowing of wheat (Table 3). The decrease was 28.6 and 21.2% with zero tillage over conventional tillage at 60 days and at harvest respectively. Nitrogen uptake in grain and straw and protein content in grain were not influenced by tillage.

Effect of nitrogen

Plant height and effective tillers/m row increased significantly with each successive increment of N from 120 to 180 kg/ha (Table 1). While grains/ear increased significantly with 180 kg N/ha over 120 kg N/ha. Effective tillers/m row length increased by 29.3% with 180 kg N/ha over 120 kg N/ha. This might be due to the fact that nitrogen plays a vital role in both cell division and cell enlargement as well as increased sink size. The 1,000-grain weight was not influenced by N levels.

Application of N up to 150 kg/ha significantly increased the grain yield (Table 2). The increase in grain yield was 12.3 and 17.3% with 150 and 180 kg/ha, respectively, over 120 kg N/ha. Under zero tillage, yield was improved significantly by higher N levels probably due to less lodging, better utilization of water and other favourable factors. The results confirm the finding of Narang *et al.* (1992).

Dry weight of weed increased significantly with increasing levels of nitrogen up to 180 kg N/ha at both 60 days and at harvest (Table 3) stages. Increasing level of N up to 150 kg/ha significantly increased the N uptake in grain while in straw response was significant up to 180 kg/ha (Table 3). The higher uptake of N might be due to better plant growth and higher yield. Significantly higher protein content in grain was found with 150 and 180 kg N/ha over 120 kg N/ha. However, the difference between 150 and 180 kg N/ha was non-significant.

Table 1. Growth and yield-contributing characters of wheat as influenced by different tillage and levels of N (pooled data of 1999–2000 and 2000–2001)

Treatment	Plant height (cm)	Effective tillers/ m row	Grains/ ear	1,000-grain weight (g)
Tillage				
Zero tillage	97.3	58.0	43.9	39.7
Conventional tillage	94.8	54.4	43.6	39.1
CD (P=0.05)	NS	2.58	NS	NS
Nitrogen (kg/ha)				
120	89.1	48.2	42.2	39.1
150	96.5	58.2	43.7	38.3
180	102.7	62.3	45.2	37.6
CD (P=0.05)	3.39	3.65	1.87	NS

Table 2. Yield of wheat as influenced by different tillage and levels of N (pooled data of 1999–2000 and 2000–2001)

Treatment	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)
Tillage			
Zero tillage	38.24	48.62	43.88
Conventional tillage	35.52	46.22	43.27
CD (P=0.05)	1.86	NS	NS
Nitrogen (kg/ha)			
120	33.56	42.57	43.86
150	37.70	47.90	43.76
180	39.38	51.78	43.11
CD (P=0.05)	1.8	2.21	NS

Table 3. Weed dry weight, nitrogen uptake and protein content as influenced by tillage and N levels (pooled data of 1999–2000 and 2000–2001)

Treatment	Weed dry weight/m² (g)		Nitrogen uptake (kg/ha)		Protein content in grain (%)
	60 DAS	At harvest	Grain	Straw	
Tillage					
Zero tillage	14.40	17.81	80.33	28.84	12.56
Conventional tillage	20.18	22.61	78.44	27.68	12.53
CD (P=0.05)	1.71	1.69	NS	NS	NS
Nitrogen (kg/ha)					
120	13.76	16.83	74.55	26.25	12.20
150	19.21	22.23	80.45	28.97	12.63
180	20.42	23.32	83.20	31.06	12.80
CD (P=0.05)	0.81	0.98	2.88	1.85	0.24

REFERENCES

Dhiman, S.D. and Sharma, A.P. 1986. Zero tillage in wheat crop under heavy soils. *Agricultural Mechanization in Asia, Africa and Latin America* **17**(2) : 15–16.

Narang, R.S., Brar, S.S. and Grewal, D.S. 1992. Tillage management of crops in different cropping systems/situations. Final Technical Report, Department of Agronomy, Punjab Agricultural University, Ludhiana, pp. 14–31.

Tripathi, S.C. and Chauhan, D.S. 2000. Evaluation of fertilizer and seed rate in wheat under different tillage conditions after transplanted rice. *Indian Journal of Agricultural Sciences* **70** : 574–576.

Verma, U.N., Sinha, M.K. and Srivastava, V.C. 1991. Effect of tillage and N management in late sown wheat after transplanted rice. *Indian Journal of Agricultural Sciences* **61** : 795–798.