Indian J. Agron. **40** (4) : 598–600 (December 1995)

Effect of soil and foliar application of nitrogen and zinc with farmyard manure on late-sown wheat (*Triticum aestivum*)

A. L. RAJPUT, D. P. SINGH AND S. P. SINGH[1]

Crop Research Station, Narendra Deva University of Agriculture and Technology, Bahraich, Uttar Pradesh 271 801

Received: August 1993

ABSTRACT

A field experiment was carried out during the winter (*rabi*) season of 1991–92 and 1992–93 to study the effect of N splits and Zn application methods on wheat (*Triticum aestivum* L. emend. Fiori & Paol.). The application of farmyard manure @ 10 tonnes/ha + full N (20 kg N/ha) as foliar in equal 3 splits proved superior and half N as basal + half N as foliar in 3 splits, giving higher returns than other treatments. The application of 10 kg $ZnSO_4$/ha as basal and 5 kg $ZnSO_4$/ha as foliar were found equally efficient. A dose of 5 kg $ZnSO_4$/ha as foliar application gave higher yields, net returns and N uptake than 10 kg $ZnSO_4$/ha as basal and no zinc.

The micronutrients play an important role in grain filling and grain yield of wheat (*Triticum aestivum* L. emend. Fiori & Paol.). Application of N at various times may be a important factor which can be used for exploiting the yield potential as well as the N-use efficiency (Gaur and Sadasivam, 1981). High price index of fertilizers coupled with their limited production made it imperative that a part of N may come from recycling of organic residues and biological N fixation. Hence the present investigation was undertaken to find out suitable time of N and Zn application in wheat under late-sown condition.

MATERIALS AND METHODS

A field trial was conducted during the winter season of 1991–92 and 1992–93 on sandy-loam soil (Vertisol) of alluvial origin, with pH 8.3 and 8.1 . The soil was low in available N (163 and 170 kg/ha) and medium in available P (31 and 34 kg/ha) and K (340 and 331 kg/ha) in both the years. The treatment consisting of zinc application (without Zn, basal Zn @ 10 kg/ha and foliar Zn @ 5 kg/ha) and 6 methods of N application (half N as basal + half N as foliar in 2 splits (T_1), half N as basal + half N as foliar in 3 splits (T_2), one-third N as basal + two-thirds N as foliar in 2 splits (T_3), one-third N as basal + two-thirds N as foliar in 3 splits (T_4), farmyard manure (FYM) @ 10 tonnes/ha as basal + full N as foliar in 2 splits (T_5), and FYM @ 10 tonnes/ha as basal + full N as foliar in 3 splits (T_6) were replicated 3 times in randomized block design. The FYM before a month, full dose of N (120 kg/ha) and Zn were applied as per treatments. A common dose of P and K (each at 60 kg/ha) was applied at sowing time. Cultivar 'HD 2285' wheat was sown at 20 cm row

Present address: [1]Agricultural Research Station, NDAUT, Basuli, Maharaj Ganj, Uttar Pradesh.

spacing using 120 kg seed/ha on 8 and 3 December and harvested on 17 and 13 April in first and second year respectively. Plant samples were collected at harvest.

RESULTS AND DISCUSSION

Plant height

The plant height was significantly influenced by the time and method of N application. The plots which received FYM @ 10 tonnes/ha as basal + full N as foliar in 3 splits (T_6) showed maximum plant height than other treatments. Application of half N as basal + half N as foliar in 2 splits (T_1) and half N as basal + half N as foliar in 3 splits (T_2) were at par in plant height. Application of $ZnSO_4$ also significantly increased the plant height compared with the control. Application of $ZnSO_4$ @ 10 kg/ha as basal (Z_1) resulted in slighly less plant height than 5 kg $ZnSO_4$/ha as foliar (Z_2), but it was not statistically significant (Table 1).

Grain and straw yields

Split application of N (T_6) gave significantly higher grain and straw yields. It was significantly superior to all other modes of N application (Table 1). Nitrogen application in 3 splits as foliar was found superior to 2 splits, and one-third N as basal + two-thirds N as foliar was significantly superior to half N as basal + half N as foliar. N application when applied basal at sowing time might have been subjected to losses by weeds or remained unutilized due to slow growth, leading to lower yields. The lowest grain and straw yields were obtained under T_1 which was at par with T_2. Similar results were also reported by Dhuka *et al.* (1992).

The grain and straw yields of 5 kg $ZnSO_4$/ha as foliar (Z_2) and 10 kg $ZnSO_4$/ha as basal (Z_1) did not differ markedly, but were significantly higher as compared with

Table 1. Effect of time of N and Zn application on plant height, yield, economics and N uptake of wheat (mean data of 2 years)

Treatment	Plant height (cm)	Straw yield (q/ha)	Grain yield (q/ha)	Net returns (Rs/ha)	Nitrogen uptake (kg/ha)		
					Grain	Staw	Total
N-application method							
T_1	85.37	48.03	38.30	3,673	66.95	36.50	103.45
T_2	85.73	48.86	38.91	3,816	67.85	37.80	105.65
T_3	86.55	50.80	40.55	4,554	70.00	37.55	107.55
T_4	88.16	53.32	42.78	5,316	70.95	38.90	109.85
T_5	88.77	54.13	43.82	4,334	71.85	41.25	113.10
T_6	89.70	57.13	45.58	4,931	72.80	42.30	115.10
CD (P = 0.05)	0.62	1.43	0.93		1.08	1.92	2.83
Zn-application method							
Z_0	85.14	48.43	38.60	4,249	68.45	37.50	105.95
Z_1	87.70	53.55	42.78	5,684	70.55	39.50	109.80
Z_2	89.81	54.74	43.59	6,111	71.20	40.45	111.65
CD (P = 0.05)	2.11	1.89	1.50		1.13	1.67	3.39

Details of treatments are given in text

no zinc (Z_0). The increase in grain and straw yields with zinc sulphate might be due to low availability or deficiency of zinc in the soil. It indicates that foliar application of zinc sulphate has beneficial influence in increasing the grain and straw yields of wheat in sandy-loam soil. Similar results were reported by Pal *et al.* (1991).

Economics

The treatment T_4 gave maximum net returns, followed by T_6 of (Table 1). Application of FYM resulted in lowest net returns compared with no FYM. The possible reason for this is the cost of FYM which resulted in lower net return. In view of the long-term effect of FYM in improving the physical properties of soil, this loss in net returns may not in any way discourage the use of FYM.

The highest net return was obtained with 5 kg $ZnSO_4$/ha as foliar (Z_2) application. The treatment Z_1 gave more net return than Z_0. The results are in close confirmity with those reported by Yadav and Verma (1991).

N uptake by grain and straw

The highest N uptake by grain and straw was recorded under T_6 (Table 1). The increase in N uptake also enhanced physiological activities of plants and thereby increased the growth and yield of wheat. Therefore under late sowing of wheat, 3 splits of N is desirable in the sandy-loam soil. The lowest N uptake was observed when half N as basal + half N as foliar in 2 splits (T_1) was applied, which was at par with T_2, T_3 and T_4 treatments. The N uptake by grain was 1.79 times higher than that by straw in all the treatments. Venkateswarlu and Mishra (1987) and Dhuka *et al.* (1992) reported similar results.

The treatments Z_2 and Z_1 significantly increased the N uptake by grain and straw over Z_0. This may be due to the favourable effect of zinc on metabolic processes. There was no significant difference between foliar and soil application of zinc. Similar application of zinc was reported by Venkateswarlu and Mishra (1987).

REFERENCES

Dhuka, A. K. Sadaria, S. G., Patel, J. C. and Patel, B. S. 1992. Effect of rate and time of nitrogen application on late sown wheat. *Indian Journal of Agronomy* **37** (2) : 354–355.

Gaur, A. C. and Sadasivam, K. V. 1981. Organic management in aid of fertilizers. *Indian Farming* **31** (7) : 31–32.

Pal, A, Roy, Basudev, Ahasan, A. K. M. M. and Samui, R. C. 1991. Effect of foliar Spray of miscronutrients on wheat in acid soil of West Bengal. *Indian Journal of Agronomy* **36** (4) : 589–590.

Venkateswarlu, S. and Mishra, N. M. 1987. Effect of Zinc and copper on yield and nutrient uptake in rainfed wheat. *Indian Journal of Agronomy* **32** (4) : 306–309.

Yadav, G. L. and Verma, J. K. 1991. Effect of irrigation regime, nitrogen and zinc fertilization on growth and yield of late sown wheat. *Indian Journal of Agronomy* **36** : 50–56.