The effect of four nitrogen fertilizers on N use efficiency (NUE) of a high yielding barley (var. Triumph)

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Recent studies using a barley cultivar, (Triumph), have shown a high yield potential under local conditions (1). We have investigated the effect of four different N sources on NUE of this variety grown in a solodic, with a sandy loam A horizon (pH 5.3-5.5). NUE is expressed in terms of % grain N recovery efficiency (RE), physiological efficiency (PE), and yield efficiency (YE), on incremental basis, with respect to increases in the fertilizer rate (2).

Materials and Method

Four forms of N fertilizers - urea (ur), $Ca(NO_1)_2$ (CN), NH_4NO_3 (AN), $(NH_4)\ SO_4$(AS), at two different rates (1- 50 and 2- p0 kg N/ha), were broadcast after sowing in June 1986. Quadrat samples (0.25 m) were used to determine total content of grain (NG) and yields were taken from final harvest of 15 m plots. Total N analysis was carried out using the Kjeldahl digestion method (3).

Results and Discussion

Fert. type	Cont.	UR		CN		AN		AS		LSD p=.05
Rate	0	1	2	1	2	1	2	1	2	
kg(N/ha)Ni	0	50	120	50	120	50	120	50	120	
Y (t/ha)	4.9	5.57	5.88	6.18	6.39	5.79	6.22	5.1	5.92	0.52
NG (kg/ha)	66.7	82.6	91.3	96.3	104.2	94.51	112.7	79.3	99.3	9.58
N Use efficiency (incremental)										
RE	-	33.06	13.19	57.37	11.51	55.23	25.39	25.00	28.7	5.05
PE		39.13	28.93	42.5	27.66	31.43	24.5	16.4	39.03	5.05
YE		39.92	3.9	25.27	12.31	17.31	10.86	5.46	8.27	3.61

$RE=(NG_i-NG_{i-1})\ /\ (N_i-N_{i-1})$; $PE=(Y_i-Y_{i-1})/(NG_i-NG_{i-1})$; $YE=(Y_i-Y_{i-1})/(N_i\ N_{i-1})$

The effect of increased rate of fertilizer application on yield was significant only for AS (p=0.05).At both rates of fertilizer application, NH_4-N supplying fertilizers always gave poor yields in comparison with similar rates of NO -N fertilizers. This could be attributed to possible loss of N as NH_3 volatilisation or to "fixation" of NH_4 on the exchange complex. In contrast, the loss of nitrate N due to leaching would have been minimal since the relatively impermeable clay horizon may have prevented extensive drainage.

When rates were increased from 0 to 50 kg N/ha, the increases in the RE, PE, and YE were greater than those from 50 to 120 kg N/ha with all fertilizers except for AS. The low NG of the AS-1 treatment resulted in significantly low efficiencies when compared to Ur-1, CN-1, AN-1 treatments. Since NH_4 fertilizers are used extensively in agricultural production further studies on the effects of such fertilizers on NUE are required.

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