

## EFFECT OF N-SOURCES ON GROWTH OF WHEAT

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### Abstract

Effect of urea,  $(\text{NH}_4)\text{NO}_3$  and  $\text{NH}_4\text{Cl}$  on the growth of wheat cv. Lu-26-S in sandy clay loam was studied. N fertilizers significantly increased plant height, number of tillers, straw weight and grain yield with marked effects where urea was used. Maximum uptake of N, P and K by wheat plant was recorded under urea fertilization, indicating urea as a better N-source for growth of wheat.

### Introduction

The productivity or fertility of a soil is determined to a large extent on its ability to supply N for plant growth. Due to environmental effects, losses of nitrogen from the soil is substantial and thus fertilization becomes essential for maximizing crop productivity. Since the introduction of high yielding cereal varieties global requirement of the fertilizers has increased. Some commonly available nitrogen sources are urea, ammonium sulfate  $(\text{NH}_4)_2\text{SO}_4$ , ammonium nitrate  $(\text{NH}_4\text{NO}_3)$ , ammonium chloride  $(\text{NH}_4\text{Cl})$ , sulfur coated urea (SCU), sulfurgranules and isobutylidene diurea (IBDU). Urea is the major N source used for crop production in tropical and subtropical countries (Mudahar & Hignet, 1983) and its use as N fertilizer has increased during the past 20 years (Cook, 1969; Engelstad & Hauck, 1974; Beaton, 1978; Tomlison, 1970). In the present study the effects of four types of nitrogenous fertilizers on the growth and nutrient content of wheat crop is reported.

### Materials and Methods

Soil used was clay loam pH 7.5, organic matter 1.02% and the total initial N 0.069%, available P 3.5 ppm. The soil was powdered and fertilized with each of the N-source viz. urea (46% N),  $(\text{NH}_4)_2\text{SO}_4$  (21%N),  $\text{NH}_4\text{Cl}$ (26% N), and  $\text{NH}_4\text{NO}_3$  (35% N) separately in a single dose of 200 mg N/kg soil. Six healthy seeds of wheat cv. Lu-26-S were sown in each pot containing 9 kg soil. After germination, the seedlings were thinned to four in each pot. Each treatment was replicated in four folds and the pots were kept in a pot house in a randomized block design. After 2 months of growth, second leaf from each of the plant in a pot was collected, dried at 70°C and weighed. Plant height and number of tillers were also recorded. At maturity, the plants were harvested and different yield parameters recorded. The dried leaf sample was ground, digested with  $\text{H}_2\text{SO}_4$  and 30%  $\text{H}_2\text{O}_2$  and analyzed for N, P, K and Ca. Total P was determined by vandomolybdo phosphoric

acid yellow colour method (Jackson, 1958). Nitrogen was determined by microkjeldahl method. Potassium content was estimated by flame photometer. All the data were statistically analyzed.

### Results and Discussion

Application of N-sources affected various yield parameters and uptake of N, P and K in wheat (Tables 1-2). Of the N-sources, urea caused highly significant increase in plant height, number of tillers, leaf dry weight at the first harvest. At maturity also urea increased number of productive tillers, straw weight and grain yield (Tables 1-2), followed by  $(\text{NH}_4)_2\text{SO}_4$  and equally by  $\text{NH}_4\text{NO}_3$  and  $\text{NH}_4\text{Cl}$ . Promising results have been reported by the use of urea in greenhouse and field experiments on cereal crops (Matzel *et al.*, 1978; Vlek *et al.*, 1980; Byrnes *et al.*, 1983; Kampfe *et al.*, 1983). High response of urea might be attributed to greater availability of N through mineralization by soil enzymes such as urease (Vlek *et al.*, 1980) whereas low response of N from  $\text{NH}_4\text{NO}_3$  and  $\text{NH}_4\text{Cl}$  may be due to leaching of nitrate from ammonium nitrate and accumulation of chloride in the soil from ammonium chloride.

N concentration significantly increased with the application of N-sources and this increase was more pronounced in urea compared to  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NH}_4\text{NO}_3$  and  $\text{NH}_4\text{Cl}$ . Application of N @ 200 ppm in the form of four N-sources, apart from some fluctuations, had a stimulatory effect in wheat plant, since maximum uptake of P and K were recorded in the case of urea as compared to other N-sources. The uptake of N, P and K by wheat plant from urea treatment was related to an increase in growth and yield parameters. The

**Table 1. Effect of N-sources on growth and nutrient content of wheat leaf at 60 days of growth.**

Fertilizer source	Growth parameters of wheat crop			Nutrient content % of dry wt.		
	Plant height (cm)	Tiller number	Leaf dry Wt (g)	N	P	K
Control (No N)	47.7c	8.7bc	1.32b	2.12c	0.28a	3.38c
Urea	58.3a (+ 22)	11.5a (+ 32)	2.83a (+ 114)	2.78a	0.29a	3.93a
Ammonium sulphate	54.7ab (+ 15)	9.2bc (+ 6)	1.70b (+ 29)	2.39b	0.23b	3.89a
Ammonium chloride	53.2b (+ 12)	8.2bc (- 6)	1.40b (+ 6)	2.17c	0.28a	3.62b
Ammonium nitrate	52.3bc (+ 10)	6.0c (- 31)	1.57b (+ 16)	2.26c	0.23b	3.58b
LSD (0.01)	4.56	3.29	1.12	0.18	0.04	0.12

\*Values in brackets represent percent increase or decrease over control.

**Table 2. Effect of N-sources on yield contributing characters of wheat.**

N fertilizer source	Yield parameters recorded at maturity			
	Plant height (cm)	Productive tillers	Straw yield g/pot	Grain yield g/pot
Control (No N)	64.0b	4.5b	4.40	5.8b
Urea	73.0a (+ 14)	8.8a (+ 73)	4.98 (+ 13)	10.8a (+ 86)
Ammonium sulphate	65.0b (+ 1.6)	5.0b (+ 11)	4.75 (+ 8)	7.3b (+ 26)
Ammonium chloride	63.5b (- 0.78)	4.8b (+ 7)	3.30 (- 25)	5.8b (0.0)
Ammonium nitrate	64.3b (+ 0.78)	4.8b (+ 7)	3.85 (- 13)	6.0b (+ 4)
LSD (0.01)	5.4	1.96	NS	2.53

results would indicate that urea is a better source of N fertilizer for the growth and development of wheat crop under the present experimental condition.

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