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COMPARISON OF METHODS AND RATES OF NITROGEN APPLICATION IN WHEAT

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The efficiency of two nitrogen sources, urea and slow-release, sulfur-coated urea (SCU), was evaluated using different rates and application methods during 1976-77 on Chenab-70 wheat on a clay loam soil at the University of Agriculture, Faisalabad. A randomized complete block design, with 12-m^2 plots and four replications was used. The higest rate, 112 kg N ha^{-1} increased plant height and fertile tillers per unit area, more than other treatments. In general, banding gave greater yield than broadcasting or broadcasting and incorporating nitrogen regardless of source or rate of application. Urea nitrogen was used more efficiently than slow-release SCU.

Key words: Wheat, Urea, Sulfur-coated urea, Banding, Broadcasting, Broadcasting and Incorporating

INTRODUCTION

Wheat is well adapted to a wide range of climatic conditions and has a high yield potential when managed properly. Inadequate soil fertility often limits its high production potential. The best way to get a better yield of plant food material is the efficient use of the nutrients applied.

The commonly used nitrogen fertilizer such as urea, quickly releases all the nitrogen which is made rapidly available for plant use, while sulfur-coated urea (SCU) releases nitrogen slowly resulting in a regular supply being maintained during the whole growth period. SCU minimizes losses of nitrogen due to leaching and denitrification.

Extensive experiments have been conducted to compare fertilizer application methods on winter wheat [2,11]. Better yields were reported when nitrogen and phosphorus were placed in the root zone as compared to nitrogen applied broadcast. Weidmann [1] did not find deep placement of fertilizer as effective as broadcast application and incorporation into the soil in increasing yield. Rind *et al.* [3] stated that SCU gave better yields than ordinary urea both in greenhouse and field tests. In contrast, Bhatti [5] reported that urea was more effective than SCU. These contradictory findings indicate that further research is needed to evaluate, how wheat can use nitrogen efficiently. Therefore, this paper presents the results of the influence of different sources, rates, and application methods of nitrogen on wheat yield and its yield components.

MATERIALS AND METHODS

The efficiency of two nitrogen sources, urea and slowrelease sulfur-coated urea (SCU), was evaluated using different rates and application methods during 1976-1977 on Chenab-70 wheat on a clay loam soil at the University of Agriculture, Faisalabad. The experiment was laidout in a randomized complete block design in 12-m^2 plots with four replications. The soil analysis before planting indicated 650 ppm nitrogen, 8.5 ppm available phosphorus and pH of 7.8. The following treatments of nitrogen were applied.

0 (control)			
112 kg ha ⁻¹ urea banded			
112 Kg ha ⁻¹ SCU banded			
56 kg ha ⁻¹ urea banded			
56 kg ha ⁻¹ SCU banded			
56 kg ha ⁻¹ urea broadcast			
56 kg ha ⁻¹ SCU broadcast			
56 Kg ha ⁻¹ urea broadcast and inco	orporated		
56 Kg ha ⁻¹ SCU broadcast and inco	orporated		

Phosphorus was applied at 56 kg ha⁻¹ as triple super phosphate before sowing and 80 kg ha⁻¹ seed was planted with a single-row, hand drill in rows 20 cm apart. Fertilizer was banded in rows 20 cm apart, broadcast above ground, or broadcast and incorporated. Three irrigations of 7.5 cm of water were applied, and rainfall was 29.6 mm during the growing season. Grain yield, number of fertile tillers, 1000grain weight, and plant height at maturity were recorded. Fertile tiller number was determined on three unit areas 0.42 m^2 each), randomly selected per plot. Twenty plants were randomly selected from each plot for plant height measurements. A representative sample (454 grams) of grain was taken for 1000-grain weight determination.

N rates kg ha ⁻¹	Method applied	Sources	Grain yield	Fertile tillers	1000-Grain weight	Plant height
THE REPORT OF			Q ha ⁻¹	.42 m ²	gm	cm
0	_	Uderuber 26. 1981	31.9 c ¹	117.5 e	41.1 a	108.3 b
112	Banded	Urea	44.3 a	153.7 a	43.4 a	113.9 a
112	Banded	SCU	40.5 ab	140.2 bc	42.0 a	111.8 ab
56	Broadcast	Urea	40.8 ab	144.5 b	42.1 a	109.6 b
56	Broadcast	SCU	38.5 b	137.7 с	41.9 a	111.6 ab
56	Banded	Urea	41.8 ab	138.7 c	42.4 a	110.6 ab
56	Banded	SCU	40.1 b	131.7 d	42.2 a	110.3 b
56	Broadcast & incorporated	Urea	39.4 b	136.7 c	42.5 a	108.2 b
56	Broadcast & incorporated	SCU	39.5 b	136.3 c	41.3 a	110.3 ab

Table 1. Effects of nitrogen rates, sources and application methods on the traits of Chenab-70 wheat.

! a-d Means with same letter do not differ significantly (P < 0.05).

RESULTS AND DISCUSSION

The results presented in Table 1 indicate that banding 112 kg ha⁻¹ as urea produced the highest yield but not significantly more than either 56 kg ha⁻¹ banded or broadcast as urea or 112 kg ha⁻¹ banded as SCU. The lower yield at high N rates resulted partially due to lodging, which reduced grain yield.

McCutchen *et al.* [15] found that 100 kg N ha⁻¹ applied as SCU gave the highest grain yield (51 bu grains/ ha.). They suggested that later availability of nitrogen in the growing season stimulated grain filling and, thus, increased grain yield. Conversely, Bhatti [5] reported that SCU did not give any yield benefit over urea but its application depressed grain yield in wheat. Furthermore, kg ha⁻¹ ammonium sulphate gave the highest yield. Little [8] reported that 224 kg N ha⁻¹ applied as urea produced the highest grain yield but that 56 to 112 kg N ha⁻¹ was more economical. Ernest and Pearson [13], Boatwright and Hass [4], and Beaton *et al.* [6] also demonstrated that the highest applications of nitrogen were less economical.

Tiller number is an important yield component of wheat. The number of fertile tillers were the highest in the plots receiving 112 kg ha⁻¹ banded as urea (Table 1). Banding SCU was not effective as banding urea. Similarly Oertli and Lunt [7] obtained greater response with urea than with SCU. Slow dissolution of SCU may not provide adequate nitrogen for wheat plants during active vegetative growth. Increased tillering with 112 kg ha⁻¹ banded as urea may result from accelerated plant growth, and is in agreement with the results of Rana [9] and Ernest and Pearson [13].

Troite

Applied nitrogen had no significant effect over control (Table 1) on 1000-grain weight. Maximum 1000-grain weight resulted from banding 112 kg ha⁻¹ as urea and minimum 1000-grain weight was obtained in control plants. Without the high fertility of the experimental field and low stand density in control plots, 1000-grain weights might have differed. Control plants used soil resources efficiently for grain filling. These findings are in accord with those reported by Hobbs [14].

Nitrogen application also influenced plant height. Banding 112 kg N ha⁻¹ as urea increased plant height significantly over control (Table 1), and agreed with the findings of Woodward [12], and Ashour and Salch [10].

The results of this study showed that a wheat crop uses urea better than SCU, because urea is readily available while slow release SCU may be too late to benefit from soil moisture. Therefore, we suggest that residual effects of SCU to the next crop be examined. Wheat is a short-season crop and SCU may be better utilized by long-season crops such as sugarcane or rice because the slow release of N may reduce the leaching of nitrogen.

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with regards to genetration, case inights an and storese contents in case but differed agains and the one another in respect of case inights mumber of harvestable case-turn area and their case yield the bugatence blanted in J-now simps 120 are apart give the bigest case yield of 53 67 rounds have against cropped with bettern gave dentificantly planting systems respectively. Sugatume incocropped with bettern gave againfeantly invested as an even with the respectively. Sugatume incointercropped sugaecase. The reduction in case yield/ha than that the transcorport with wheat or nonintercropped sugaecase. The reduction in case yield/ha at a tessilt of neuroments and intercropping amounted to 16.38 and 2.94 percent, respectively. However, as the corr of the reductions of wheat grain harvest of 68.54 to 71.09 tournas/ha of between stream field in the corr of the reductions of wheat grain harvest of 68.54 to 71.09 tournas/ha of between stream field in the correct from the transment of the reduction in case wheat stream stream fields and 1.15 to 7.45 tournes of the tour harvest of 68.54 to 71.09 tournas/ha of between stream fields can due to the transment of the transment of the transment of the second between and other compensated from the tournes of the tournastic production.

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Sugarcane is an important sugar crop of Pakastan and is mainly grown in the spiring season. Now-a days some people have starfled cultivating sugarcane in atturnet as it is considered to be a more productive practice compared to conventional spiring planting. Since this practice will keep into field under negations for a longer period, it is highly imperative to develop information on the leasibility of more and infiguitan resources besides increasing productivity soil and infiguitan resources besides increasing productivity wheat or barseam in it. However, present motion of planting magnitude in autumn into made in possible to interconsubjance in autumn into made in possible to interconmag sugarcane in 60 cm apart rows is not suitable and inconmaly make it accorregation such a system of planting the there is need to develop such a system of planting in autumn cane without of thereage heating which wheat or between in the interconbies there is need to develop such a system of planting in autumn cane without adversely affecting the linal cane for there is need to develop such a system of planting which is autumn cane without adversely affecting the linal cane in autumn cane without adversely affecting the linal cane facilitating intercropping and other agrounding sugarcane facilitating intercropping and other agrounding sugarcane facilitating intercropping and other agrounding sugarcane have been designed which need to be rested both at tom of

Consequentity the privert study was taken up to evallease the leastfulity and productive efficiency of the newly

inggested geometry of planting sugarouse to autumn as against the corrections bestud of planting & constant novel-close resize velocit and becasern as intercrops.

section of processes -

Nour et al. [4] found that a souring of one instrebetween the rows and one row of social material amounting Eachi et al. [3] youdied the effect or sub-solding and row sparing on the visid and qualit, of sugarcane variery 81.4. The args was diatied and qualit, of sugarcane variery 90 and 120 are raid to trenches at 126 can row dimance ating, the seed nere of 55,000 double budded acts par ating, the seed nere of 55,000 double budded acts par better than 90 are and the remeles at 126 can row dimance better than 90 are and to trenches at 126 can respect of better than 90 are and the number of cane stalks per better than 90 are and the number of cane stalks per better than 90 are and there of an excerting at respect of the reserve and sharms [2] by a comparison of 5 higher tiller population in closes status have better than 90 are stalken at the status per better than 90 are and sharms [2] by a comparison of 5 (11] stated that 90 cm society give significantly ligher [11] stated that the standard [30 cm for the status per [11] stated that the standard [30 cm for the status per [31] reported the cane yield by 15 tonnes/ha, while higher maize reduced the cane yield by 15 tonnes/ha, while higher [4] reported the cane yield by 15 tonnes/ha, while jurce quality was slightly improved. Nervel and Bald [7]