

FERTILIZATION OF WINTER WHEAT

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For most farmers growing winter wheat for the first time in 1984-85 this is a new crop with many similarities and many differences from spring wheat. In the matter of fertility responses there is naturally a great deal less research and farmer experience to draw upon as compared with spring wheat. The Saskatchewan Soil Testing Laboratory guidelines recommend 5 to 15 pounds per acre higher N application on winter wheat, with the same application of P_2O_5 , K_2O and S as for spring wheat.

The greatest need for additional fertility information relates to N, and here the needs relate to the effectiveness of the various forms of N, placement and timing of applications. In addition to its effects on growth, N has important effects on winter hardiness, disease reactions and protein content. The latter has grading implications because of the common occurrence of piebald kernels.

This report covers the preliminary results of N fertilizer work conducted in 1982-84 at the Kernen Crop Research Farm, Saskatoon, and N-P-K tests conducted in 1983-84 in farmers' fields at six locations in Saskatchewan.

Nitrogen Source, Rate and Placement Studies

MATERIALS AND METHODS

Norstar winter wheat was sown into untilled wheat stubble on Sutherland heavy clay on Sept. 9, 1982 and Aug. 29, 1983, using two seeders. One seeder was a Haybuster "812" which is a furrow drill with split hoes for applying seed and fertilizer in separate bands. The other seeder was a Haybuster "1206" double disc press drill which placed seed and fertilizer together.

Two N sources, ammonium nitrate (34-0-0) and urea (46-0-0) were applied at rates of 0, 20, 40 and 60 kg N/ha in the seeding operation. The same N treatments were also broadcast on separate plots in October, 1982 and 1983. All plots received 25 kg/ha of P_2O_5 placed with the seed.

RESULTS AND DISCUSSION

The growing seasons in 1983 and 1984 were both very abnormal in precipitation, with 35% more than the long-term average in 1983, and 47% less than the long term average in 1984. In spite of these differences the average yields between years were surprisingly close.

There was little difference between the two seeders, i.e., seed placing versus banding with either N source and any N rate (Table 1). This is at variance with fertilizer placement guidelines in use in Saskatchewan, which state "Up to 25 lb/a of N may be applied with the seed under any conditions. When a discer or hoe-drill are used and when moisture is adequate, up to 40 lb/a of N in any form except urea may be applied with the seed."

At N rates of 20, 40 and 60 kg/ha differences between the two sources and between the two seed-placement methods were of little practical significance. When N was broadcast in October ammonium nitrate produced consistently higher yield responses than did urea, averaging 12.5% over all levels.

Averaging all N rates seed placement outyielded broadcasting by 17.8% when the source was urea and by 6.0% when the source was ammonium nitrate.

If it can be found that seed placement or banding of all N requirements generally outyields broadcast applications, without causing seedling injury or a reduction in winterhardiness, this method would save farmers an additional field operation as well as increasing their gross returns.

Table 1. Effect of N source, rate and placement on winter wheat yields in kg/ha at the Kernen Crop Research Farm, 1982-83 and 1983-84.

Rate of N, kg/ha	Urea (46-0-0)			Ammonium nitrate (34-0-0)		
	Seed placed	Banded	Broadcast	Seed placed	Banded	Broadcast
0	1940	1840	1940	1940	1840	1940
20	2330	2170	1730	2240	2170	2040
40	2380	2360	2200	2540	2540	2320
60	2630	2700	2300	2650	2550	2670
\bar{X}	2450	2410	2080	2480	2420	2340

N-P Trials in Farm Fields

MATERIALS AND METHODS

In fall 1983, N&P fertilizer tests using Norstar winter wheat were established in standing stubble at Kipling, Kamsack, Tisdale, Meadow Lake, Handel and Golden Prairie, Saskatchewan. The objective was to obtain additional information on fertilizer responses in winter wheat under a wide range of environments.

Treatments of N&P were applied in all combinations at rates related to soil tests made before planting. The N treatments, all using 34-0-0 were as follows:

Rates: 0, 34, 67 & 134 kg N/ha; or 0, 45, 90 & 180, depending on soil N levels (0, 30, 60 & 120; or 0, 40, 80 & 160 lb N/a)

Dates: Broadcast in late September (after seeding)
Broadcast in early May
The 120 & 160 rates were split between fall and spring

The P treatments, all applied with the seed were as follows:

Rates: 0, 22, & 45 P₂O₅ kg/ha of 11-51-0; or 0, 28 & 56 depending on soil P levels (0, 20 & 40 or 0, 25 & 50 lb P₂O₅/a).

RESULTS AND DISCUSSION

Fall establishment and winter survival were good at all sites. Summer drought in 1984 was severe at Kipling, Golden Prairie and Handel, but was not a problem at Kamsack, Tisdale and Meadow Lake. Responses to fertilizers were as might be expected with these differences in water stress.

At Kipling there was a significant NxP interaction resulting from a negative response to N at the zero level of P. The only treatment that returned the fertilizer cost was 28 kg/ha of P₂O₅ (25 lb/a). This return was \$10/ha (\$4/a) with wheat valued at \$4/bu.²₅

At Golden Prairie there was a significant response to N at the 34 kg/ha (30 lb/a) N rate. Higher levels of N did not affect wheat yields. The 34 kg/ha rate returned \$20.25/ha (\$8.10/a) over fertilizer cost.

At Handel there were no significant responses to N or P, and none of the fertilizers returned their cost.

At Kamsack there were significant responses to N and to date of application of N. The returns over fertilizer costs were \$180.40/ha, \$247.00/ha and \$294.00/ha at N rates of 45, 90 and 180 kg/ha, respectively (\$72.20/a, \$98.80/a and \$117.70/a). Differences between dates of N application varied with N rates. At 45 kg N/ha fall application produced 33% more wheat than spring application, whereas at 90 kg N/ha spring application was 6% better than fall application. At the heaviest rate applications were split and it made no difference whether it was mostly fall or mostly spring-applied.

At Kamsack the soil tested low in K and applications of 0 and 60 kg K₂O/ha with the seed were compared. No significant responses in wheat yield occurred.

At Tisdale there were significant responses to N & P. The largest return over cost of fertilizer (\$185.60/ha) occurred at the 90 kg N/ha with 56 kg P₂O₅/ha (\$75.25/a at 80 lb N/a and 50 lb P₂O₅/a).

At Meadow Lake there were significant responses to N rates only. The cost of fertilizer was returned only at the lowest rate of N application (45 kg N/ha, 40 lb N/a), and amounted only to \$8.60/h (\$3.40/a).

Similar fertilizer tests on winter wheat were established in the fall of 1984 at five of the six locations, with Maidstone substituted for Meadow Lake. It is planned to continue with these in 1985-86 to obtain 3 years of data from each of the six extension regions in Saskatchewan.