

NITROGEN MANAGEMENT TO CONTROL PROTEIN IN NO-TILLAGE WHEAT FOLLOWING CORN OR FULL- SEASON SOYBEAN

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OBJECTIVE:

Determine how grain protein levels in no-tillage wheat cultivars following corn or soybean will differ with management of late season fertilizer N rates and timings.

METHODS:

Location	Fayette County/Spindletop
Soil Type and Drainage	Loradale silt loam – well drained
Previous Crops	Corn or Soybean
Tillage	No-Tillage (Lilliston 9680)
Cultivar	Pioneer 2540 and Pioneer 25W33
Planting Date	Oct. 19, 2000
Seeding Rate	36.9 (P2540) and 35.5 (P25W33) seed/sq. ft
Harvest Date	June 26-27, 2001
Fertilizer:	
Basic Nitrogen (all plots)	25 lb N/acre as urea on 3/12/01 50 lb N/acre as urea on 4/9/01
Late Nitrogen (wheat after full-season soybean)	0, 20, 40 lb N/acre as urea on May 1 0, 20, 40 lb N/acre as urea on May 10 0, 20, 40 lb N/acre as urea on May 16 0, 20, 40 lb N/acre as urea on May 23
Herbicides:	
Harmony	0.5 oz/ac on 4/13/01
Brominal ME4	0.75 pint/ac on 4/13/01
Fungicides:	Tilt 3.2EC – 4 fl oz/ac on 5/11/01
Results:	Average of 4 replications - see Table 1

DISCUSSION/CONCLUSIONS:

Wheat after corn exhibited erratic tillering and stand development and was not used in the protein study. However, wheat after corn yielded fairly well, when compared to wheat after soybean that did not receive late N (Table 1). There was an interaction between cultivar and prior crop. There was little difference between the two varieties when grown after soybean, but Pioneer 2540 yield declined more (-21.8 bu/acre) when planted after corn than did Pioneer 25W33 (-12.9 bu/acre).

The first of the late N applications to wheat after soybean was made between flag leaf emergence and “boot” growth stages (Feekes 9.5). The second was made during flowering (Feekes 10.2), while the third and fourth were made one and two weeks after flowering. All late N was broadcast over the top of the crop. Late fertilizer N addition positively influenced yield (Table 2), but there was no difference due to cultivar or the date that the late N application was made. Grain protein was positively related to late N application rate, was generally greater for the soft red wheat (Pioneer 2540), but was not affected by late N application date (Table 2).

There were significant interactions between cultivar and both late N application date and rate on grain protein concentration (Table 3). Pioneer 2540 was more sensitive to the other treatment factors than Pioneer 25W33. First, grain protein concentrations in P2540 rose over the first three application dates, while that for P25W33 did not (Table 3). Second, as the rate of late N was increased the grain protein concentration in P2540 increased more (+2.1%) than did that for P25W33 (+1.5%). It is not clear why P2540's grain protein concentrations were more sensitive to the timing of the late N. We observed that leaf chlorophyll levels (measured with a chlorophyll meter) were generally higher in P2540 and were raised more by 40 lb N/acre late N rate (data not shown). The P25W33 may not have been as able to recover the late N from the soil, or, more likely, its demand for grain protein N was being met by retranslocation from vegetative tissues. It is clear from this research that the grower's choice of cultivar can play a large role in the response to late N management. The research will be repeated in the 2001-2002 wheat production season.

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Table 1. Effect of Previous Crop and Cultivar on Yield of No-Tillage Wheat

Previous Crop	Wheat Yield - by Cultivar		Previous Crop Average
	Pioneer 2540	Pioneer 25W33	
grain yield (bu/acre)			
corn	63.5c	74.4b	69.0b
soybean	85.3a	87.3a	86.3a
cultivar average	74.4b	80.9a	

Table 2. Main Effects of Cultivar and the Rate and Timing of Late Fertilizer N on Yield and Protein for No-Till Wheat Following Full-Season Soybean

Cultivar	Late N Date	Late	Grain	Grain
		N Rate	Yield	Protein
		lb N/acre	bu/acre	%
P2540			87.9a	13.2a
P25W33			91.8a	12.1b
	1-May		90.8a	12.7a
	10-May		91.1a	12.8a
	16-May		89.5a	12.7a
	23-May		88.2a	12.5a
		0	86.3b	11.7c
		20	90.7ab	12.7b
		40	92.7a	13.5a

Table 3. Interactive Effects of Cultivar and the Rate and Timing of Late Fertilizer N on Grain Protein in No-Till Wheat Following Full-Season Soybean

Cultivar	Late N Date	Late N Rate	Grain Protein
		lb N/acre	%
Interaction of Cultivar and Late N Application Date			
P2540	1-May		13.1
	10-May		13.4
	16-May		13.5
	23-May		12.9
P25W33	1-May		12.2
	10-May		12.2
	16-May		11.9
	23-May		12.1
Interaction of Cultivar and Late N Application Rate			
P2540		0	12.2
		20	13.2
		40	14.3
P25W33		0	11.3
		20	12.3
		40	12.8