Effect of Split Applications of Nitrogen on Hard Red Spring Wheat

Paul Hendrickson, Matt Swanson, and Terry Gregoire

Field experiments were conducted to study split applications of nitrogen (N) on hard red spring wheat (HRSW). A yield goal estimate of 72 bu/A was used, for which 180 lbs. of total N is recommended. Treatments included 50 percent, 75 percent, or 100 percent of the recommended total N (soil test + soybean credit + applied N) broadcast and incorporated into the soil prior to planting. In addition, the 180 lbs. N was divided into split applications of 50 percent preplant incorporated (PPI) and 50 percent post-emergence (POST), or 75 percent PPI and 25 percent POST. The POST applications were applied at the 3.25-leaf, 4.5-leaf, 5.5-leaf, or the 2nd node growth stage. The study was conducted under both irrigated and dryland conditions within the same field and, unless otherwise stated, the following information is applicable for both sites. Predominant soils at the site include Heimdal-Emrick loams and Fram-Wyard loams with a fall 2002 soil test of 44 lbs. NO^-_3-N, 7.75 pH, and 3.4% O.M. The previous crop was soybean. 'Briggs' HRSW was seeded on April 23, 2003, in 7-inch rows at 1.8 million PLS/A. POST N application dates and rainfall and irrigation events are listed in Table 1. The POST-applied 28% UAN liquid fertilizer treatments were applied with a CO_2 pressurized hand-held plot sprayer using stream bars. The dryland site was harvested August 12 and the irrigated site was harvested August 16.

Table 1. POST N application dates and rainfall and irrigation events[a].

Date	POST N Application Timing	Rainfall[b]	Irrigation
	growth stage	inches	inches
5/23	3.25-leaf stage	0.22	0.00
5/27		0.06	0.00
5/31	4.5-leaf stage	0.00	0.50
6/3		0.10	0.00
6/4	5.5-leaf stage	0.13	0.00
6/5		0.04	0.35
6/6		0.05	0.00
6/9		0.54	0.00
6/10	2nd node detectable	0.53	0.00
6/11		0.00	0.00
6/12		0.93	0.00

[a]Amounts recorded on the day of application
[b]Both irrigated and dryland sites.

Foliage burn from the stream bar applied UAN was very low. Less lodging occurred when 50 or 75 percent of the total recommended N was applied PPI compared to 100 percent (Table 2). Lodging was also reduced when the total N was split 50/50 PPI/POST vs. 75/25 PPI/POST. No significant differences among any N treatments were observed in plant population, number of heads, heading date, or physiological maturity (Data not shown).

Under dryland conditions, 1.48 million plants and 1.72 million heads per acre were established. Heading occurred 62 days after planting and the crop reached physiological maturity 102 days after planting. When only 50 percent of the total recommended N was applied, yield and protein were significantly lower (Table 2). There was no difference in grain yield when 100 percent of the N was applied PPI compared to 75/25 or 50/50 PPI/POST split applications. There was a reduction in percent protein content when 50 percent of the total N was applied at either the 3.25- or 4.5-leaf stage. Rainfall amounts seven days after application were less than 0.3 inches on both occasions. Seed yield and test weight were not affected by the timing of the POST N application.

Under irrigated conditions, 1.42 million plants and 1.92 million heads per acre were established. Heading occurred 65 days after planting and the crop reached physiological maturity 106 days after planting. The 50 percent total N treatment should have only been adequate for a 36 bu/A yield but an 80.1 bu/A yield was harvested (Table 2). This indicates that there was N available that did not show up in the fall soil test making it difficult to determine impacts of the various N treatments.

Table 2. Dryland hard red spring wheat response to split application of nitrogen.

Percent of Total N[a]			Dryland				Irrigated			
PPI	POST N	POST N Timing	Lodging	Grain Protein	Test Weight	Grain Yield	Lodging	Grain Protein	Test Weight	Grain Yield
— % of total —		growth stage	0-9[b]	%	lb/bu	bu/ac	0-9[b]	%	lb/bu	bu/ac
50	0		0	11.0	63.8	45.5	2.0	13.3	63.4	80.1
50	50	3.25-lf	0	13.0	64.5	60.7	2.5	14.6	63.9	87.1
50	50	4.5-lf	0	12.7	63.7	59.5	2.3	13.4	64.0	82.9
50	50	5.5-lf	2.5	14.4	63.9	61.7	3.3	14.8	63.5	87.5
50	50	2nd node	0.5	14.2	63.8	59.7	3.3	14.4	63.9	89.6
75	0		0	12.2	64.8	56.6	2.0	13.7	64.0	86.8
75	25	3.25-lf	3	14.4	63.9	61.8	3.3	15.1	63.4	78.2
75	25	4.5-lf	4	14.4	63.7	63.2	3.8	15.4	63.2	74.0
75	25	5.5-lf	4.5	14.5	64.0	65.2	4.5	15.6	63.4	78.6
75	25	2nd node	2.5	14.3	64.5	65.4	3.8	15.3	63.3	83.2
100	0		2.5	14.2	64.3	63.0	4.8	15.8	62.9	73.2
LSD (P=0.05)			1.5	1.2	NS	8.6	1.4	0.8	1.0	8.8

[a]Based upon 180 lbs. total N (fall soil test + soybean credit + fertilizer) per acre for a 72 bu yield goal. Soil test = 44 lbs. NO_3^--N. Soybean credit = 40 lbs. N.

[b]1 = erect, 9 = flat