

**Post-anthesis N application studies North Dakota, region and elsewhere-
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Carrington, 1988-1991, G. Endres and B. Schatz.

Fertilizers were applied preplant for a 40 bushel/acre yield goal. Foliar N was applied immediately after anthesis (flowering, about 7-10 days after heading). Foliar N source was 28% at a total liquid volume of 20 gal/acre (28% = 3 lb N/gal, so lower rates were diluted to 20 gal total volume). Greatest protein increase was provided with 30 lb N (10 gal/acre 28%). Additional N increased protein in some years, but with less efficiency. Under irrigation, yield was depressed at N rates greater than 30 lb N/acre.

**Protein and yield with foliar N rates applied post-anthesis,
Carrington, 1988-1991, dryland.**

Year	Pounds N/acre				
	0	15	30	45	60
	Protein, %				
1988	16.0	16.5	16.9	16.8	16.8
1989	11.6	12.1	12.8	13.0	13.8
1990	13.6	13.2	13.6	13.6	14.0
1991	13.4	13.6	15.3	14.1	16.1
Ave Protein	13.6	13.8	14.7	14.4	15.2
Yield Average	27.4	28.3	27.6	27.7	27.7

**Protein and yield with foliar N rates applied post-anthesis, Carrington, 1988-1991,
irrigated.**

Year	Pounds N/acre				
	0	15	30	45	60
	Protein, %				
1990	12.0	12.3	12.5	12.6	13.2
1991	12.9	13.6	15.9	16.4	16.9
Ave Protein	12.4	12.9	14.2	14.5	15.0
Ave Yield	50.3	50.6	49.7	46.7	43.4

Carrington Post-Anthesis survey, 1993. G. Endres and B. Schatz.

The survey compiled responses from 27 growers using post-anthesis N strategies during 1993. Thirty-two growers used 28%, two used Nisol. Acres treated ranged from 5 to 1,750, with a mean of 275.

Twenty-nine were applied by air and one by ground.

Rates of N ranged from 10-50 lb/acre (60% used 30 lb/acre, 15% used 15 lb/acre).

Four growers diluted their fertilizer and 26 did not.

89% of growers applied during the morning or evening hours. Temperature averaged 55-73 degrees. One-third of the growers received rain within 24 hours (0.03-0.25 inches).

Flag-leaf damage-

Damage,

0-5%, 73% of growers

10-35%, 23% of growers

80-90%, 3% of growers

Yield differences-

Range- -7 bu to +15 bu/acre, average 0.2 bu/acre

Protein differences-

Range- -0.4% to +2.2%, average 0.7 %

A couple notes from Gooding, M.J. and W.P. Davies. 1992. Foliar urea fertilization of cereals: a review. Fertilizer Research 32:209-222.

Optimal timing for foliar N for protein enhancement is directly post-anthesis. Efficiency of N uptake and transfer into the grain rapidly declines following the time directly after anthesis and before. Under the right circumstances, as much as 1% protein increase from about 30 lb N/acre can be realized. Care should be taken to prevent undue burning of leaves.

Crookston, MN. J. Wiersma, M.A. Hanson, E.L. Peters, and R.J. Bouvette.1993.

Trial used four varieties of spring wheat. Foliar N was supplemental to 150 lb N from fertilizer preplant and soil test N.

N rates of 30, 60, 90 and 120 lb N/acre were sequentially applied every fourth day (7.5, 15, 22.5, and 30 lb N/application) starting 7 days after anthesis.

The sequential 30 lb total N rate provided 0.5% greater protein; sequential 60 lb total N rate 1%; sequential 90 lb total N 2%; sequential 120 lb total N 2.5%. All varieties exhibited similar responses to foliar N for protein increase.

Yields tended to decrease slightly at sequential rates above 30 lb N/acre.

1995 HRS Wheat Grain Enhancement with Fertilizer Trial, Tri-County (Wishek) Test Plot. M. Hanson, G. Endres, B. Schatz.

2-year summary-

	Yield	Protein
50 lb N preplant-	21.8	12.6%
75 lb N preplant-	22.4	12.7%
50 lb N preplant + 25 lb N post-anthesis	21.8	13.0%

H. Woodard and A. Bly. 1995-2000. South Dakota State University. Reported by J. Bauder, Montana State, Agronomy Note 290, 2001.

Summary of 1995-2000 studies on hard red spring wheat, South Dakota

Treatment	Yield, bushels/acre	Protein, %
Check	42.5 a	14.2 c
30 lb N/acre at boot stage	40.2 b	14.4 b
30 lb N/acre post-anthesis	41.2 ab	14.7 a

Summary of 1995-2000 studies on hard red winter wheat, South Dakota

Treatment	Yield, bushels/acre	Protein, %
Check	70.5 a	11.8 c
30 lb N/acre at boot stage	70.1 a	12.2 b
30 lb N/acre post-anthesis	69.7 a	12.6 a

Summary of these reports-

These data are all very similar in that they consistently suggest that 30 lb N as 28% diluted and sprayed in the cool of the day to minimize leaf burn will provide about ½% protein increase. Growers will need to determine the cost of fertilizer and application, and compare that with the expected returns of ½ % greater protein in either reducing possible protein dockage at the point of sale or a possible protein premium for levels above 14% at harvest.