On-farm-tests evaluate nitrogen rate, source and timing for spring wheat yield and protein

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Traditional nitrogen (N) management practices may be inadequate to fulfill yield and protein potential of recently introduced high yielding hard red spring wheat varieties. Three N management strategies being studied in concurrent traditional, small plot research were suggested to interested wheat growers for on-farm-testing.

a) Farmer's standard base N rate plus 30 and 60 lb N/ac at or near seeding (sites A-L),
b) blends of standard N source with the controlled release N source, ESN (sites M-O)
c) post anthesis nitrogen (PAN) as UAN at 30 lb N/ac (sites P-d).

Field strips were replicated 3-4 times, scouted, combined and weighed with weigh wagon, and when available yield monitor and grain cart (Figure 1 to right).

Nitrogen Rate

There was a wide range of farmer standard base N rates (70-145 lb N/ac) and with soil nitrate-N (0-24"), total base rate N supply was 105-173 lb N/ac.

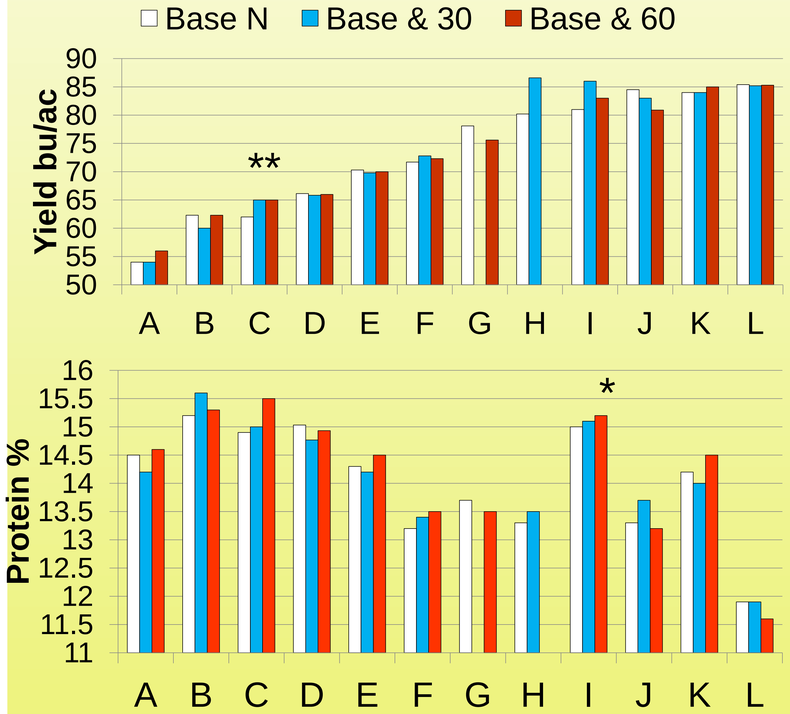

Figure 2 & 3. Wheat yield and protein response to additional N rates. (* over columns indicates significantly different than base N at the 10% probability level.)

Of 12 sites, only once was there yield or protein advantage to increasing N above farmer base rates. Average yield was 73.3, 73.8 and 73.9 bu/ac at base, &30 and & 60 N rates. Average protein was 14.0, 14.1 and 14.2 % at base, &30 and & 60 N rates.

Figure 1. On-farm-test plot harvest.

Nitrogen Source:

Controlled release N (ESN 44-0-0) was applied as a proportion of the standard source N rate at seeding.

- Site M = midrow banded 160 lb N/ac as NH_3 vs 100 N plus 60 lb N/ac as seedplaced ESN.
- Site N = side banded 130 lb N/ac as urea vs. a 50:50 urea:ESN blend.
- Site O = sidebanded 98 lb N/ac as UAN vs 49 N plus 49 lb N/ac as seedplaced ESN.

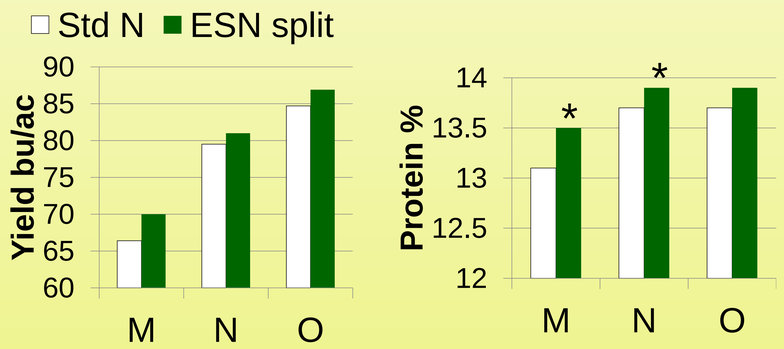

Figure 4 & 5. Wheat yield and protein response to a portion of N as ESN. (* over columns indicates a significant difference at the 10% probability level.)

Yield was not significantly influenced by ESN but protein increased significantly by 0.2 and 0.4 % points at 2 of the 3 sites.

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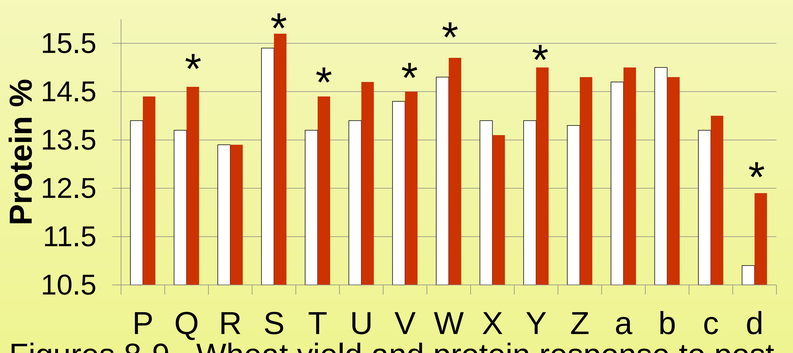
Nitrogen Timing: PAN

UAN was applied at 30 lb N/ac some 7-10 days after anthesis, mixed 50:50 with water. (Figure 6). Application caused leaf burn (Figure 7) which only reduced yield at one location (T) with application at mid day in high heat and humidity. (Figures 8-9).

Figures 6-7. PAN application and typical leaf burn.



Figures 8-9. Wheat yield and protein response to post anthesis N. (* over columns indicates a significant difference at the 10% probability level.)

Of 15 sites, yield was reduced once but protein increased at 7 sites. Average yield was 69.6 and 68.8 bu/ac at base, & PAN rates, respectively. Average protein was 13.9% and 14.4% at base, & PAN rates, respectively.

Summary

Protein increases were low to modest likely owing to sufficient base N supply. Nitrogen additions applied at seeding were less consistent in increasing grain protein than ESN blends or PAN treatments.