Low Salt Fluid NPK Fertilizer

Increases wheat production in Idaho.

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Summary: *Wheat yields and crude protein increased as the 6-24-6 rate increased from 3 to 9 GPA. Banding all of the fertilizer proved to be more effective than banding plus split foliar applications for increasing nutrient uptake and yield, although the differences in grain yield were comparatively small.*

Enhancing early-season growth and extending NPK nutrient availability are essential parts of a good wheat fertilization program. Maintaining adequate P availability during the growing season can be a significant challenge because of calcareous soils. Orthophosphate can be tied up quickly, reacting with antagonistic cations in the soil, tying up the orthophosphate before it is taken up by plants.

Simplot manufactures an ortho-poly (50/50) 6-24-6 low salt NPK fluid fertilizer that provides early-season P availability to crops, as well as enhanced P availability later in the growing season. Orthophosphate is readily absorbed by plant roots and leaves, which enhances P fertilizer efficiency. Polyphosphates are initially protected from reacting with antagonistic cations in the soil because it is a long, less reactive chain and then in favorable conditions it hydrolyzes to orthophosphate, which is available for plant uptake. Low-salt NPK fluid fertilizers are safer for application with the seed at planting because of reduced salt impact on germination. They are also compatible with many micronutrient products for application at planting, placing the nutrients next to the seed to promote good wheat growth.

Objective

The purpose of this study was to evaluate the application of a low salt NPK fluid fertilizer either as a starter at planting or as a combination of starter + foliar application on hard red winter wheat (HRWW) and hard red spring wheat (HRSW).

Methodology

Soil. Whetstone hard red winter wheat (HRWW) and Cabernet hard red spring wheat (HRSW) were grown on a calcareous high pH sandy loam soil at the Aberdeen Research and Education Center, University of Idaho, during the 2014-2015 growing season.

Soil test. Preplant soil test concentrations were 12-14 ppm NO3-N, 20-24 ppm P and 195 K.

Table 1. Rates for banded and foliar applications of 6-24-6 in the 2015 winter wheat and spring wheat studies.

Treatment	Banded 6-24-6 (gallons/acre)	Foliar 6-24-6[1] (gallons/acre)	Total P applied (lbs. P_2O_5/acre)	N applied[2] lb N/acre	K applied lb K_2O/acre
1	0	0	0	0	0
2	3.0	0	8	66	6
3	6.0	0	16	71	11
4	9.0	0	24	77	17
5	1.5	1.5 (2x0.75)	8	66	6
6	3.0	3.0 (2x1.50)	16	71	11
7	4.5	4.5 (2x2.25)	24	77	17

[1]Foliar 6-24-6 applications were split between equal amounts applied at tillering and booting growth stages
[2]Includes 30 lb N/acre topdressed at at tillering and 30 lb N/acre at boot stage.

Table 2. Whetstone winter wheat N-P-K response to 6-24-6 rate and timing, Aberdeen, Idaho, 2014-2015.

Total			Preplant Banded gal/acre	Split *Applied Foliar gal/acre	Yield bu/A	Protein %	Test Weight lb/bu
N	P	K					
---------- lb/acre ----------							
0	0	0	0	0	89.8	13.0	60.1
6	8	6	3	0	92.4	13.6	59.7
11	16	11	6	0	95.8	13.8	59.5
17	24	17	9	0	112.7	13.9	59.2
6	8	6	1.5	1.5*	88.2	13.3	59.3
11	16	11	3.0	3.0*	93.8	13.7	59.9
17	24	17	4.5	4.5*	109.4	13.9	59.5
Pr> F					0.037	0.058	0.687
LSD@0.10					6.3	0.6	NS
*Applied April 23 and May 12, 2015							

Applications. Zero, 3, 6, and 9 gallons per acre of 6-24-6 fertilizer were applied at planting with the seed (0.75 inch depth) compared to half of the NPK fluid at planting and half as a foliar spray applied equally at tillering and booting stages of growth (see Table 1). Two broadcast applications of 30 lbs. N/acre as urea were applied across all plots at tillering and booting.

Planting. Winter wheat was planted on September 25, 2014. Spring wheat was planted on April 21, 2015. Plots (50 ft. by 8 ft.) were planted with a grain drill in 7-inch rows in a randomized complete block design (replication = 5).

Pesticides. All pesticides were applied according to U of Idaho guidelines.

Irrigation. The fields were irrigated with a solid set sprinkler system to maintain available soil water content above 60% throughout the growing season.

Harvesting. A 30 ft. by 4 ft. section out of each plot was harvested for grain yield and protein concentration on August 11 (HRWW) and September 3 (HRSW).

Results

Grain yields. HRWW grain yields increased with 6-24-6 applications up to 9 gpa (Table 2). Grain yields for the split treatments were only slightly lower than those for the band treatments at each of the three fertilizer rates. Average grain yield for the band treatments was 100.3 bu/acre, while the split treatments averaged 97.1 bu/acre. Banded and split applied 6-24-6 increased HRSW grain yield compared to the check (Table 3). Within each application method there were no differences in grain yield produced by band or the band + foliar treatments for the 3, 6, and 9 GPA application rates. However, there were differences between the grain yields produced by the band and split treatments at the 3 and 6 GPA application rates. In both cases, the band treatments produced significantly higher yields than the split treatments, indicating that for spring wheat, seed banded applications of 6-24-6 at planting appear to be more efficient than split band + foliar applications with regard to grain production.

Table 3. Cabernet spring wheat yield and protein as influenced by 6-24-6 application method, rate and timing, at Aberdeen, Idaho, 2015.

Total			Preplant Banded gal/acre	Split *Applied Foliar gal/acre	Yield Bu/A	Protein %	Test Weight lb/bu
N	P	K					
---------- lb/acre ----------							
0	0	0	0	0	102.1	13.8	56.3
6	8	6	3	0	116.5	14.3	60.4
11	16	11	6	0	117.5	14.8	60.5
17	24	17	9	0	116.4	14.7	60.7
6	8	6	1.5	1.5*	107.5	14.5	60.5
11	16	11	3.0	3.0*	109.3	14.9	60.5
17	24	17	4.5	4.5*	112.2	14.6	61.1
Means					111.6	15.0	60.0
Pr> F					0.057	0.047	0.029
LSD@0.10					6.2	0.4	2.3
*Foliar applications made on June 3 and June 14.							

Grain protein content in Table 2 also increased as the fertilizer rate increased, although the increases were smaller. There were no significant differences in grain protein content between the band and split treatments.Grain protein content for both the band and split treatments in Table 3 increased with increasing 6-24-6 rates up to 6 GPA, but leveled off or declined at the 9 GPA rate. However, there were no significant differences between the band and split treatments at each application rate.

Test weights. Test weights in Table 2 were not affected by any of the treatments. Test weights in Table 3 increased significantly with the application of 6-24-6, but there were no differences among the fertilized treatments.

Summing up

The study was conducted under conditions of moderately low N availability to allow focus on the effects of the band and band + foliar 6-24-6 treatments. Improved winter wheat and spring wheat responses to 6-24-6, across a range of application rates, demonstrate the versatility and efficiency of low salt NPK fluids as a starter or for foliar applications. Grain yield and crude protein increased as the 6-24-6 rate increased from 3 to 9 GPA. Banding all of the fertilizer proved to be more effective than banding plus split foliar applications for increasing nutrient uptake and yield, although the differences of grain yield were comparatively small.

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