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Fluids Uniquely Suited For Forage Grasses

Superiority of fluids demonstrated in Texas, Kansas, and Georgia studies.

While much effort is directed at improved management of nutrients for crops such as corn, wheat, soybeans, vegetables, and various tree crops, forage crops are often left out of the mix. Warm and cool-season smooth grasses, such as bromegrass, tall fescue, and bermudagrass likewise respond profitably to proper nutrient management.

Like alfalfa, forage grasses are heavy users of phosphorus (P) and potassium (K), and continual harvesting can quickly deplete soil reserves of P and K. While estimates vary, each ton of bromegrass, bermudagrass, and tall fescue contains about 30 to 40 lbs/A of N, 10 to 12 lbs/A of P_2O_5 and 35 to 40 lbs/A of K_2O. Thus soil testing is crucial since dramatic drops in P and K soil test levels can seriously limit forage production and reduce N-use efficiency (NUE). Forage grass stands may become stressed and thinned, which results in the encroachment of undesirable plant species.

Accuracy a must

The superiority of fluids for uniformity and accuracy of application has long been recognized. And while everyone may recognize the need for applying adequate rates, it is also important to apply these needed nutrients in an efficient manner. Surface dribbling (surface banding) of fluid fertilizers to forage crops has long been recognized as more efficient than broadcasting. Briefly, let's look at how banding benefits three of our principal nutrients: N, P, and K.

Nitrogen. A main advantage of surface banding vs. broadcasting N is that by concentrating N solution in surface bands, exposure of the applied N to soil microbes is minimized, reducing the potential for immobilization. Surface banding also helps manage potential N loss via ammonia volatilization (providing conditions conducive to ammonia volatilization exist). By concentrating the N solution in surface bands, some of the applied N is more likely to be pushed past the immediate soil surface, reducing the potential for N loss. Higher concentrations of urea-N (in liquid bands or very large granules) have been shown to reduce potential N loss if conditions conducive to ammonia volatilization are present. Similar results have been reported involving small grains grown on high-residue production systems (no-till, very reduced-till).

P and K. Since perennial forage crops have a massive root system at the soil's surface, surface banding of P and K performs very well compared to surface banding in traditional conventional-till systems with annual crops. The concentrated zones of P and K on the soil's surface associated with banding minimize contact of the applied nutrients with soil constituents, delay reversion to less soluble P forms and, as a result, improve nutrient availability and uptake. Past research has demonstrated positive synergistic effects of ammonium-N on fluid P use by crops. A high ammonium N concentration in the band, along

Table 1. Effect of surface dribbled N, P, and S on bromegrass production, nutrient uptake, and apparent NUE. R. Lamond, KSU - 31 site-year average										
			Bromegrass forage				Nutrient Uptake			Apparent
N	P_2O_5	S	Yield	Protein	P	S	N	P_2O_5	S	NUE
------------------Lbs/A------------------				-----------------%-----------------			---------Lbs/A---------			---%---
0	0	0	2530	7.2	0.17	0.15	29.1	9.8	3.8	---
40	0	0	4720	7.9	0.15	0.13	59.7	16.2	6.1	76.3
40	30	0	5320	7.6	0.18	0.13	64.7	21.9	6.9	88.9
80	0	0	5360	8.9	0.14	0.14	76.3	17.2	7.5	59.0
80	30	0	6310	8.5	0.18	0.13	85.8	26.0	8.2	70.8
80	30	20	6710	8.8	0.17	0.17	94.5	26.1	11.4	81.7
120	0	0	6100	10	0.14	0.14	97.6	19.6	8.5	57.0
120	30	0	6930	9.7	0.17	0.14	107.6	27.0	9.7	65.3

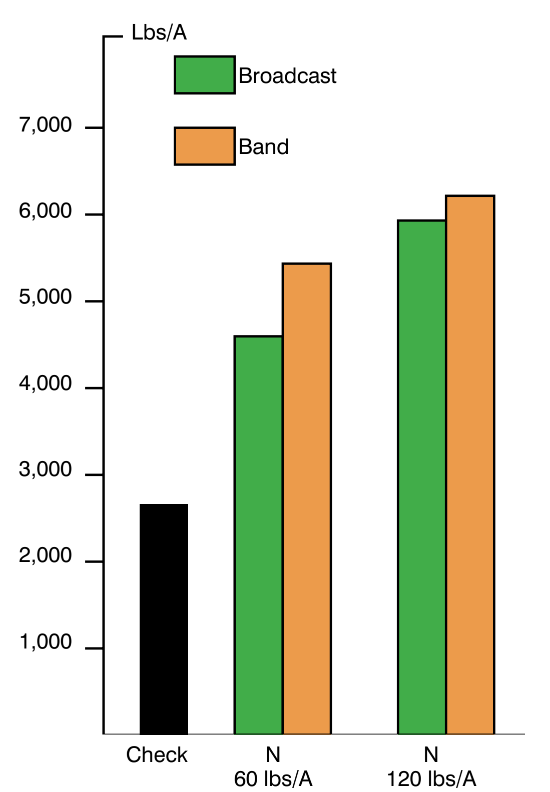

Figure 1. Yield returns in surface banding vs. broadcast in N management trials for bromegrass, 5-year average, KSU, 1987-1991.

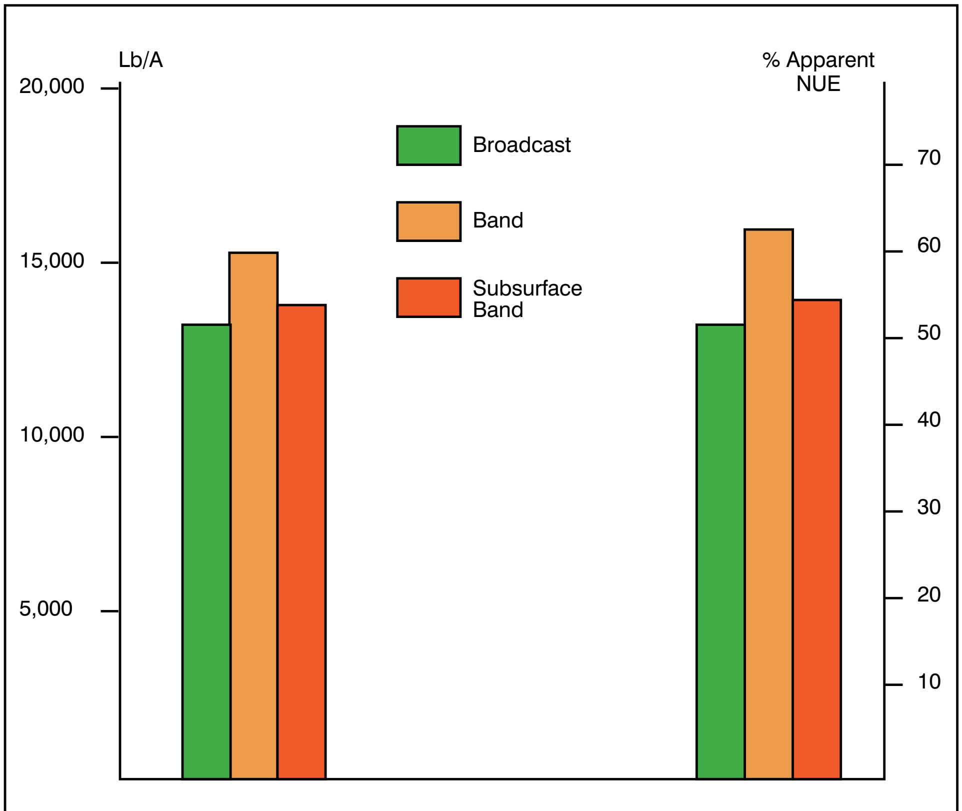

Figure 2. Yield returns in surface banding vs. broadcast of UAN in N management trials for bromegrass, 3-year average, Texas A & M.

with fluid P, is recognized as a way of improving P availability/uptake and NUE.

Field proven

Kansas. Kansas State University (KSU) research has demonstrated that surface banding N outperforms broadcasting N. In one study surface banding N at 60 lbs/A (versus broadcasting) averaged about one-third of a ton more bromegrass hay annually over the five-year study (Figure 1). As N rates increased to 120 lbs/A, N was not limiting crop growth and method of application was not important.

The results of 31 site-years of KSU research, which included sulfur (S) applications to bromegrass, are summarized in Table 1. While yield varied considerably from one site to another and one year to the next, N, P, and S fertilization provided large responses in bromegrass yield, quality, and NUE. As in other studies, P responses were noted at each N rate and NUEs improved markedly with P additions. In addition, banding S produced an additional 400 lbs/A of forage annually and further increased NUE from 71 percent for NP banding to about 82 percent for NPS banding.

Texas. Presented in Figure 2 are three-year summary results of studies conducted at Texas A&M on bermudagrass. UAN was surface broadcast, surface banded, and subsurface banded. Forage yields and nitrogen NUE were greatest with surface banding of fertilizer N.

Georgia. Studies by the University of Georgia have shown that sulfur (S) is often required for optimum forage production (Figure 3). Though this research was conducted to evaluate the effect of ammonium thiosulfate (ATS) on urea volatilization loss, the researchers indicated that while there was little or no ammonia volatilization there were consistent responses

Table 2. Effect of dribble band spacing on bermudagrass production Haby et al., Texas A&M – 3-year average			
Dribble Band Spacing	Bermudagrass Yield	Forage N	Apparent NUE
	Lbs/A	%	%
7 inches	14945	1.53	56.1
14 inches	14506	1.75	64.9
21 inches	14814	1.67	62.6
28 inches	14470	1.74	65.1

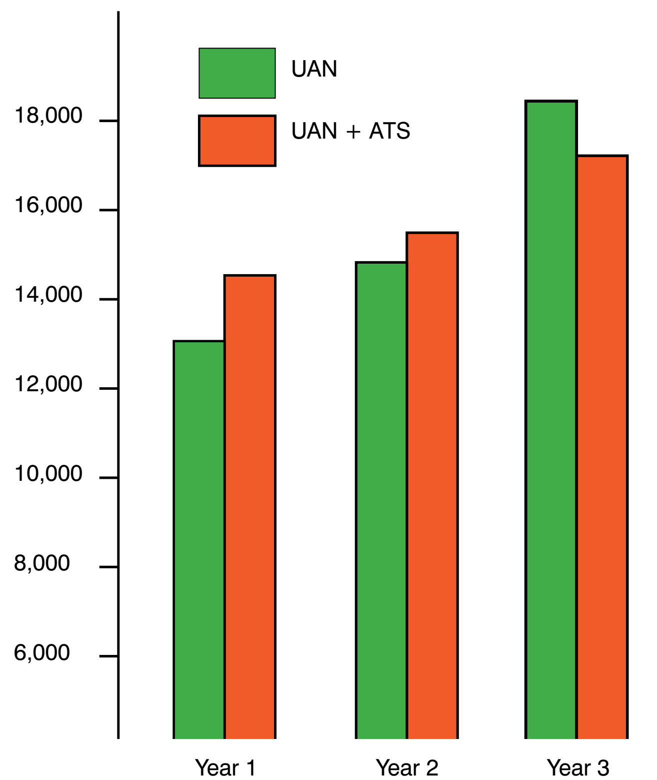

Figure 3. UAN vs. UAN + ATS in yield trials on bermudagrass, 3-year average, University of Georgia.

to applied S in two out of three years. Because of the specific treatments used, it was not possible to estimate apparent NUE. However, N removal in the forage was significantly increased when S was included in the fertility package, indicating higher NUE with S addition.

Spacing

Finally, there is the question of surface band spacing. What spacing is too wide? Is narrow spacing better? Some Texas research, evaluating surface band spacing on bermudagrass from 7 through 28 inches (Table 2), measured very little effect of spacing on yield, quality, or NUE. However, significant "streaking," owing to N deficiency between the 28-inch bands after N application, was noted but became less visually apparent with time. The researchers concluded that the 28-inch band spacing was too wide for these production systems.

Based on earlier NP research for winter wheat and past observations, some suggest that a spacing of 10 to 15 inches would likely be optimum with the potential for streaking at a wider spacing being greater for later applications and when P is included in the fertility program. While narrower spacing reduces the potential for streaking, very narrow spacing would gradually begin to resemble broadcasting in terms of fertilizer distribution.

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