

Cool Season Grasses Need Phosphorus

By R.E. Lamond and K.C. Dhuyvetter

Cool season grasses are an important forage resource. They have the potential to produce high yields of quality forage when managed properly. Optimum production of quality forage requires application of nitrogen (N) fertilizer. A significant acreage of established cool season grasses has been in production (grazing and/or hay) in Kansas for 10 to 20 years or more. Complaints of reduced production on these established grasses are common.

Why are yields falling? Soil testing often shows that problem pastures have low soil P levels. These low soil P levels exist because P has frequently been overlooked as part of the overall nutrient management plan.

Like alfalfa, cool season grass forages are heavy users of P. Each ton of grass produced removes 8 to 12 lb P_2O_5/A . For example, a bromegrass pasture that produces 3 tons/A of hay would remove about 30 lb P_2O_5/A . Since N is the major component of cool season grass fertilization programs, the need for P is sometimes neglected. On soils high in P, fertilization with N alone initially produces excellent yields of high-quality forage. However, after several years of good forage production without P fertilization, soil test P values drop rapidly and P becomes the limiting factor. Unless P is included in the

nutrient management program, forage production potential drops and poor N use efficiency results.

Phosphorus-deficient pastures and meadows are characterized by thin stands and increasing levels of undesirable invading species that seem to thrive on low P soils. A routine soil test can easily determine if P is limiting. When low soil P is confirmed, fertilizer P application is critical for optimum production.

Kansas research emphasizes the importance of adequate phosphorus (P) in bromegrass fertilization. Production of higher yields of good quality forage ... and higher profitability ... depends on providing needed P.

Kansas Research

Recent research in Kansas confirms the importance of P as a critical part of a cool season grass fertilization program (Table 1). Nitrogen rates (40, 80, 120



COOL SEASON forage grasses such as bromegrass and tall fescue require adequate P for acceptable yields. Bromegrass plants shown on left received N only, those on the right received N plus P.

TABLE 1. Phosphorus fertilization increases bromegrass yields and N use efficiency.¹

N, lb/A	P ₂ O ₅ , lb/A	Miami Co.		Douglas Co. "A"		Douglas Co. "B"	
		Yield lb/A	N use eff. ² %	Yield lb/A	N use eff. %	Yield lb/A	N use eff. %
0	0	2,560	—	2,960	—	3,040	—
40	0	3,490	30	4,440	35	5,900	58
80	0	4,450	38	6,180	48	6,970	48
120	0	4,570	32	6,330	43	8,010	45
40	30	5,100	60	6,690	80	9,070	133
80	30	5,510	45	7,570	64	9,170	70
120	30	6,160	45	7,580	45	9,690	63
LSD (0.05)		1,240	11	1,110	13	980	17

¹Soil P (Bray 1): Miami County = 6 lb/A (very low), both Douglas County sites = 7 lb/A (very low).
²N use efficiency = $\frac{\text{N uptake by specific treatment} - \text{N uptake of check plot}}{\text{N applied on a specific treatment}}$

lb/A) and P rates (0, 30 lb P₂O₅/A) were evaluated at three low P sites using urea and triple superphosphate, topdressed in late February. Phosphorus fertilization increased bromegrass yields significantly at all sites and at all N rates. Averaged across N rates and sites, application of 30 lb P₂O₅/A increased forage yields by 1,800 lb/A. At \$70/ton for brome hay and \$0.30/lb P₂O₅, this represents a return of \$63 for a \$9 investment. Nitrogen use efficiency was also significantly increased by P fertilization. Averaged over N rates and

sites, N use efficiency was increased from 42 percent to 67 percent with application of 30 lb P₂O₅/A, clearly illustrating the point that N use efficiency will be poor on low P soils until P is applied.

In summary, P fertilization is a key component of cool season grass productivity and profitability. **BC**

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