SPOKE INJECTION OF FERTILIZER PHOSPHORUS FOR GRASSES

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Fertilization of forge grasses with phosphorus has shown limited forage increases in South Dakota, even with low soil tests. Lack of response to added phosphorus may partially be due to fertilizer placement on established grass stands. Traditionally broadcasting fertilizer has been the only placement method available. Since P moves very little in the soil, root feeding from the added P must occur very close to the soil surface. A dry soil surface could limit P uptake by grasses, limiting any yield response to the added nutrient.

Innovation in fertilizer placement equipment in the past few years include the spoke injector. Such equipment has been studied on limited till situations but research on permanent sod has been limited. The applicator does little disturbance of the sod and can apply liquid fertilizer from 1 to 4 inches below the soil surface. This placement may increase phosphorus use efficiency on established grass.

The objective of the following study was to determine if subsurface applied P is more effective than surface applied P in established grass.

METHODS AND MATERIALS

A field study utilizing nine site-years containing primarily cool-season grasses was used to evaluate placement method. Phosphorus tests at the sites were all interpreted as low or very low in South Dakota. Four of the sites had treatments applied for multiple years.

Treatment design consisted of a split-plot replicated four times. The whole plot was rate of phosphorus (0 or 67 kg P_2O_5/ha) and the placement (broadcast or spoke applied) was the split. The equipment was run empty through the spoke check. Phosphorus material used was 10-34-0. The broadcast treatment was sprayed over the surface. The subsurface treatment was injected at a 8 cm depth applied with the spoke injector at 30 cm spacings. All treatments were balanced with respect to nitrogen by broadcasting ammonium nitrate over the surface at the rate of 112 kg N/ha.

Harvests were completed by cutting and weighing forage from an area of 0.9 m x 6 m or 0.4 m x 6 m for the sites. A subsample of the forage was taken for dry weight and plant P analysis.

RESULTS AND DISCUSSION

Forage yields at the sites ranged from poor because of drought to excellent with over 6.7 Mg ha^{-1} dry forage (Table 1). Phosphorus application influenced yield at only four site-years (where pr > F was less than 0.10). At these sites, placement of phosphorus had no influence on dry matter produced. These results indicate that a spoke subsurface placement has no advantage over broadcast applied phosphorus for grass forage production. Therefore, spoke injection or subsurface placement of phosphorus for grass is not a recommended practice in South Dakota. Plant P Concentrations will be discussed in the paper.

Table 1. Dry matter grass yields as influenced by phosphorus and P placement.

		---------- P_2O_5 Rate (lb/acre) ---------						
		-------- 0 ---------		-------- 60 --------		---------- Pr > F[1] ----------		
SITE	YEAR	BCT.[2]	SPOKE	BCT.	SPOKE	RATE	PL[3]	Rate x PL
		---- yield, lb/acre dry matter -----						
Highmore-1	93	4636	4535	4662	4079	0.5	0.29	0.47
Hughes	93	3158	2989	2838	2836	0.52	0.61	0.62
Brookings	93	3551	4109	5569	4083	0.09	0.18	0.02
Brookings	94	2456	3063	4245	3656	0.02	0.98	0.11
Highmore-2	94	2658	2641	3137	3011	0.16	0.2	0.6
Brown	94	1378	1788	1937	1727	0.18	0.36	0.02
Brookings	95	2664	2656	3993	3879	0.07	0.84	0.86
Highmore-2	95	5663	5786	6089	6022	0.49	0.93	0.75
Brown	95	3520	3550	4672	4526	0.004	0.71	0.57

[1]Pr > F = probability that tabular F ratio exceeds F ratio calculated by analysis of variance.
[2]Bct. = broadcast.
[3]PL = placement.

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