Potassium Dynamics in Grass Seed Production

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Potassium (K) management for grass seed production differs greatly based on whether the straw is burned in place or baled and hauled away. Research is showing how best to manage the latter, a more environmentally desirable choice which removes substantially greater amounts of K from the fields.

GRASS SEED producers in Western Oregon traditionally employed open-field burning for straw disposal and field sanitation. Political pressure and increased regulation decreased the number of burn days, causing grass seed growers to modify their practices. Straw removal by baling is now the common alternative disposal method. Displacement of annual open field burning by physical straw removal interrupts nutrient cycling, especially K. When straw is burned, 6 to 7 lb/A K_2O is removed in seed. In contrast, K removed with tall fescue straw can be 35 to 360 lb/A K_2O.

Answering Questions

Growers and fertilizer dealers questioned the impact of straw removal on seed yield, the significance of rapidly declining K soil test values in fields where straw has been removed and fertilization changes necessary to maintain seed yields without field burning. To answer these questions, a 3-year field experiment was initiated with the following objectives: 1) monitor K soil test levels with straw removal and burning in the presence and absence of K fertilization; 2) measure K removal in straw and seed for various straw management and K fertilization regimes; 3) measure seed yield response to K fertilization and straw management.

High and low soil test K sites were planted to perennial ryegrass and tall fescue, respectively. Treatments imposed on these sites were burn or bale straw management in combination with K fertilization. Potassium treatments (KCl) for each of the first two years were 36 lb/A K_2O and 100 lb/A for the third year, topdressed in the early spring. Initial ammonium acetate-extractable K soil test levels for the high and low sites were 218 and 55 parts per million (ppm) for tall fescue and 164 and 78 ppm for perennial ryegrass, respectively. Straw yield, seed yield and soil test levels were measured annually at each site. Soils were sampled at the 0 to 1-inch and 0 to 6-inch depths. Tissue, soil and seed samples were analyzed for K.

Managing the Problem

Ash residue from burned straw and topdress K fertilization concentrate K at the soil surface. Therefore, tests of the surface inch should reflect these K sources. Surface-inch soil test K values from K fertilized baled straw management treatments after the second harvest increased when compared to the no-K controls (**Table 1**). In contrast, surface-inch K soil tests from plots where straw was burned show no difference between fertility treatments. The most noticeable difference in surface-inch soil test K values was found when straw management was compared. Plots where straw was burned generally produced higher soil test K values in the

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surface inch compared to plots where straw was removed.

Differences in surface-inch K soil test values due to straw management are explained by the K contribution from the burned straw (**Table 2**). Between 54 and 178 lb/A K_2O was recycled by burning straw, exceeding the 36 lb K_2O/A fertilization applied the first two years. The difference between average surface-inch soil test K for baled and burned plots at the high K soil tall fescue site was 220 ppm. This results in approximately 90 lb K_2O/A recycled K through straw burning.

Table 1. Soil test K after the second treatment year.

Crop	Soil test K rating	Soil depth, inches	Soil test K, ppm			
			Straw baled		Annual burn	
			+K	-K	+K	-K
Tall fescue	High	0-1	270	225	471	464
		0-6	266	225	305	317
Tall fescue	Low	0-1	60	57	89	88
		0-6	53	48	72	70
Perennial ryegrass	High	0-1	339	305	318	294
		0-6	192	173	182	193
Perennial ryegrass	Low	0-1	73	66	103	101
		0-6	56	59	83	70

Grass seed yield response to K fertilization was small and irregular, even at the low soil test K sites. A yield increase trend existed at the low-K tall fescue site in 1989 and 1990. A significant yield increase from K fertilization was found at the low-K perennial ryegrass site in 1990.

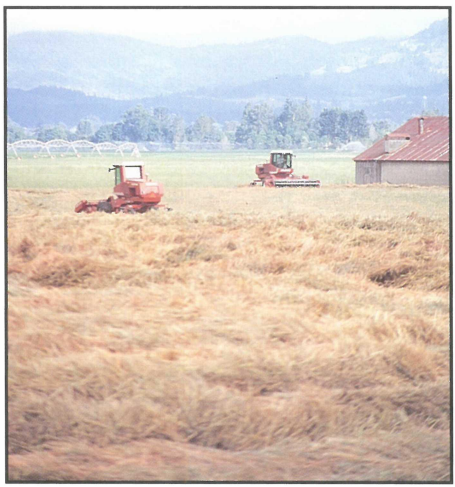
Summary

This study confirmed grower observations that soil test K decreased rapidly when grass straw management changed from burning to baling. Seed yield in this study did not decrease as soil test K decreased at the high soil test K sites (initial soil test K > 150 ppm). However, seed yields tended to increase with K fertilization at the low soil test K sites (initial soil test K < 100 ppm). These data substantiate Oregon State recommendations that K fertilization of grass for seed should begin when surface 6-inch soil test K values are below 100 ppm.

Tall fescue and perennial ryegrass are luxury consumers of K. High soil test K fields will produce grass straw with 1.5 to 2.5 percent K, while straw from low soil test K fields will be 0.5 to 0.7 percent K. Baling high K straw causes a proportional decrease in soil test K. Grass seed growers need to monitor soil test K as straw management changes from burning to baling, since straw harvest removes substantial quantities of K. ■

Table 2. Grass straw K uptake as affected by management.

Crop	Soil test K rating	Straw uptake of K_2O, lb/A			
		Straw baled		Annual burn	
		+K	-K	+K	-K
Tall fescue	High	241	220	164	178
Tall fescue	Low	54	31	75	64
Perennial ryegrass	High	70	59	90	79
Perennial ryegrass	Low	52	41	96	54



REMOVING straw in grass seed production removes large amounts of K.