Using Phosphorus, Ammonium-nitrogen and Strip-kill to Increase Tall Fescue Seed Production in Missouri

**Investigator:** Dale G. Blevins, Professor & Kemper Fellow, Division of Plant Sciences, University of Missouri-Columbia

**Objective:** to determine if tall fescue seed production in Missouri can be increased by late summer phosphorus (P) and ammonium (NH$_4^+$) applications in a strip-kill management system.

**Procedure:** During the summer of 2006, a PhD student, Will McClain, built a sprayer that will spray Roundup® approximately 7.5” wide strips and leave 7.5” wide strips for seed production (Fig. 1). The sprayer had a 10’ boom and eight 4002 Tarjet nozzles placed 15” apart. During mid-September 2006, tall fescue (K31, endophyte infected) pastures at the SW Center (SWC) near Mt. Vernon and at Bradford Farm (Agronomy Research Center) near Columbia were selected and forage was removed to a height of 4”. Soil samples were collected and tested for P, Mg, Ca and K concentrations. Plots were flagged at 10’ x 20’ (SWC) and 10’ x 25’ (ARC) with 5’ alleys. Ten days after forage removal, Roundup® was applied in 7.5” wide strips leaving 7.5” wide strips of live tall fescue on stripkill plots. A Roundup® concentration of 1.6 oz/gal of water with 0.5 oz of crop oil/gal and 1.2 oz/gal of a blue tracking dye were used for the strip-kill process. The total volume of application was 31 gal/acre. One half of the plot area was not treated with Roundup® and these plots were used for conventional tall fescue seed production (controls). In late June 2007, tall fescue plots at both locations were harvested for seed yield with a 5’ combine. Samples were weighed and seed yield was calculated. Subsamples of the seed were used for determination of weight per seed from the SWC study. On September 2007, plots were treated with 0 or 100 lbs P/acre from triple super phosphate (0-46-0) and 0 or 100 lbs of N/acre as either urea beads (N-guard) from Specialty Fertilizer Products, urea or ammonium nitrate. Starting the second week of June 2008, the tall fescue was scouted to determine seed maturation. Seed was harvested with a plot combine at the SWC on June 18. The seed was air-dried in a greenhouse for a few days, then sieved to removed stems and trash, before dry weight measurements and calculation of seed yield. Over 90% of the tall fescue plots at ARC were severely lodged; therefore these plots were not harvested. The data from the first year at ARC, where the plants were severely damaged from the Easter 2007 freeze were also compromised; therefore data from this location were eliminated from this report.

**Results:** The stripkill method worked well for establishing seed yield plots in tall fescue pastures. The strips were killed in September 2006 (Fig. 1) and by November, they showed up nicely (Fig. 2). 2007 was not a great year for tall fescue seed production, with control plots averaging less than 150 bu/acre, while untreated stripkill plots yielded around 200 lbs/acre, the normal Missouri average (Fig. 3). The P fertilization treatments produced average seed yields of around 400 lbs/acre with all three N treatments and stripkill. With standard pasture production ammonium nitrate and urea produced yields that were higher than N applied with beads, when all of these plots were treated with P.
One of our stripkill and P treated plots that received 0 N in the fall produced over 1000 lbs/acre of seed. This combination of stripkill, P treatment and 0 fall N, averaged about 875 bu/acre of seed (Fig. 3). With stripkill and P treatment, the ammonium nitrate and urea treatments were better that N supplied with the beads. With regular pasture production, and P treatment, ammonium nitrate was the best N source (Fig. 3).

In 2008, the combination of P fertilization, stripkill and 0 N treatment in August produced double the seed yield of the 0N, 0P and regular pasture production control (Fig. 3). It is obvious that the two years in this study were completely different, weather-wise. The first year with P fertilization, stripkill and all three N treatments, the seed yields were much superior to any of the other treatments. However, in 2008, the P fertilization, stripkill, and 0 N in the fall treatment was clearly the best (Fig. 3). This N result supports the recommendation made years ago by our forage extension agronomist, Howell Wheaton (ref.), who recommended no N in the fall, and around 100lbs N in Dec or Jan. (Just a reminder that in the current study, all plots received 75 lbs N in mid-winter).

Conclusions: In both growing seasons, the highest yielding plots received P fertilization and were from stripkill treatments. In the second year, the best production season, clearly late August N applications caused problems in the P treated, stripkill plots. This project successfully showed that in a good production year, application of P onto low P tall fescue pastures, and using the stripkill can greatly improve tall fescue seed production in Missouri.
Figure 1. Will McClain using his “homemade” spray rig with Roundup and a tracking dye to kill 7.5” strips in tall fescue plots in September 2006.
Figure 2. Killed strips in November 2006 in plots of tall fescue that will be used for seed harvest in June of 2007.
Figure 3. 2007 (top) and 2008 (bottom) tall fescue seed yields from plots at the University of Missouri Southwest Center near Mt. Vernon as a result of fall treatment with three nitrogen sources, two phosphorus treatment levels and stripkill versus conventional culture.