Missouri Fertilizer and Lime Board
2011 FINAL REPORT

Optimum Timing of Nitrogen and Phosphorus Applications for Improved Tall Fescue Seed Production

Dale G. Blevins
Professor & Kemper Fellow
Division of Plant Sciences
University of Missouri

Objective and Relevance – **The Problem:** Missouri produces large quantities of tall fescue seed, but average yields are very low. **The Hypothesis:** Optimal timing of nitrogen (N) and phosphorus (P) fertilization, along with the strip-kill production method, will greatly increase tall fescue seed yields in Missouri. **The Objective:** to determine the optimum timing of N and P applications for maximum tall fescue seed production in Missouri.

Procedures – A low phosphorus site (Bray I P 14-17 lbs P/acre) was selected at the Agronomy Research Center near Columbia in August 2009. The site selected was along the eastern edge of Bradford Farm just north of the east lake. The steps taken to setup and conduct this study are shown in the Timetable (Table 1).

Table 1. Timetable used to start this tall fescue seed production experiment in 2009.
Late Aug 2009 identified tall fescue sites at Bradford Farm and collected soil samples
Early Sept – Selected plot area that had low Bray I P level and a good fescue stand
Sept 3 Bushhog was used to mow the fescue
Sept 7 Raked the dried hay off the plot area
Sept 15 Plot areas were measured and flagged (10' x 25'with 5' borders
Sept 17 Specific plots were strip-killed by treating with Roundup (2oz/acre) + a surfactant and a blue tracking dye. Strips were approximately 7.5" wide. Dr. Will McClain did the spraying. A blue tracking dye was added to ensure the width and location of the sprayed areas.
Sept 30 2009 Strips were visible, and plots were treated with triple super phosphate or urea-N as shown in **Fig.1** with treatments randomly assigned. These treatments were repeated in Fall 2010. See treatments listed below.
Around Dec 18 of each winter, plots were treated with their second application of P and N fertilizer
June 22 2010 and June 28 2011. Seed was harvested with a plot combine, and air-dried in the attic of the main bldg at Bradford Farm
July 14, 2011 Seeds were cleaned, weighted and yields were calculated
July 15, 2011 Data were analyzed and graphs were drawn
December 2011 Final report was prepared

Plots were randomly assigned with the following treatments and replications:

N treatment splits: a) 0 lbs N late Sept + 100 lbs N in mid-Dec
b) 50 lbs N late Sept + 50 lbs N in mid-Dec
c) 100 lbs N late Sept + 0 lbs N in mid-Dec
P treatment splits: a) 0 lbs P in late Sept + 50 lbs P in mid-Dec
b) 25 lbs P in late Sept + 25 lbs P in mid-Dec
c) 50 lbs P in late Sept + 0 lbs P in mid-Dec

Production systems: Conventional pasture or Stripkill
Replications: Five replications of each treatment
Total plots = 90 (10' x 25') plots with 5' borders
(3 Ntrtmts x 3 Ptrtmts x 2 ProdSystems x 5 reps = 90 plots total)

Ammonium nitrate was used as the N source and triple super phosphate (0-46-0) was used as the P source. Seed will be harvested with a plot combine around June 18, 2011. After combining, seed will be screened to remove any stems and other trash prior to weighing and moisture determination for final seed yield determination. Total forage fresh weight will be determined at harvest time and weights of sub-samples will be determined before and after drying for dry weight determination. This will allow determination of total plant biomass production from each treatment and calculation of % seed vs % biomass for each plot.

2011 Results

In summer 2011, the strip-kill tall fescue seed production system clearly produced higher seed yield than the conventional system (Fig. 2). Although tall fescue seed yields were low around the state in 2011, the strip-kill system produced seed yields over 300 lbs/acre. With the strip-kill system, the split N application (50-50 N Sept-Dec) produced slightly higher yield that the two other N treatments. The 0-50 and 50-0 P treatments were slightly better that the 25-25 P treatments with strip-kill. The 50-0 P treatment produced higher yields than the other two P treatments across all three N treatments with the conventional production system (Fig. 3). The 0-50 P treatment produced conventional seed yields that were over 50 lbs/acre lower than the 50-0 P treatment. With strip-kill, the 0-50 and 50-0 P treatments produced the highest seed yields with the split 50-50 N treatment (Fig. 4). When all N treatments were pooled, the strip-kill system produced yields that were from 50 to 100 lbs seed/acre higher than conventional with the various P treatments (Fig. 5). When all P treatments were pooled, the strip-kill system produced yields that were around 100 lbs seed/acre higher with the 50-50 and 0-100 N treatments (Fig. 6). These two N treatments were superior to the 100-0 N treatment. When all N and P treatments were combined, tall fescue seed yield was around 70 lbs seed/acre greater with strip-kill than with conventional production (Fig. 7).

Project Summery

2010 was a very unusual year for tall fescue seed production with the strip-kill system. In our research program with about ten years of data, 2010 was the only year where conventional tall fescue seed production was greater than strip-kill seed production. In 20ll, strip-kill was clearly superior to conventional with 0-50 and 50-0 P treatments producing the best yield increases when combined with the 50-50 N treatment. Therefore with the strip-kill system, P can be applied either in September or December, but splitting the N application may be best for tall fescue seed production. Adding the 100 lbs N in September produced massive vegetative growth and caused lodging resulting in lower seed yields with both production systems. For conventional seed production on a pasture, 50 lb P in September was best.

Figure 1. A view of the conventional (left) and strip-kill (right) tall fescue plots about one month after spraying with Roundup in late September 2009 at Bradford Farm.

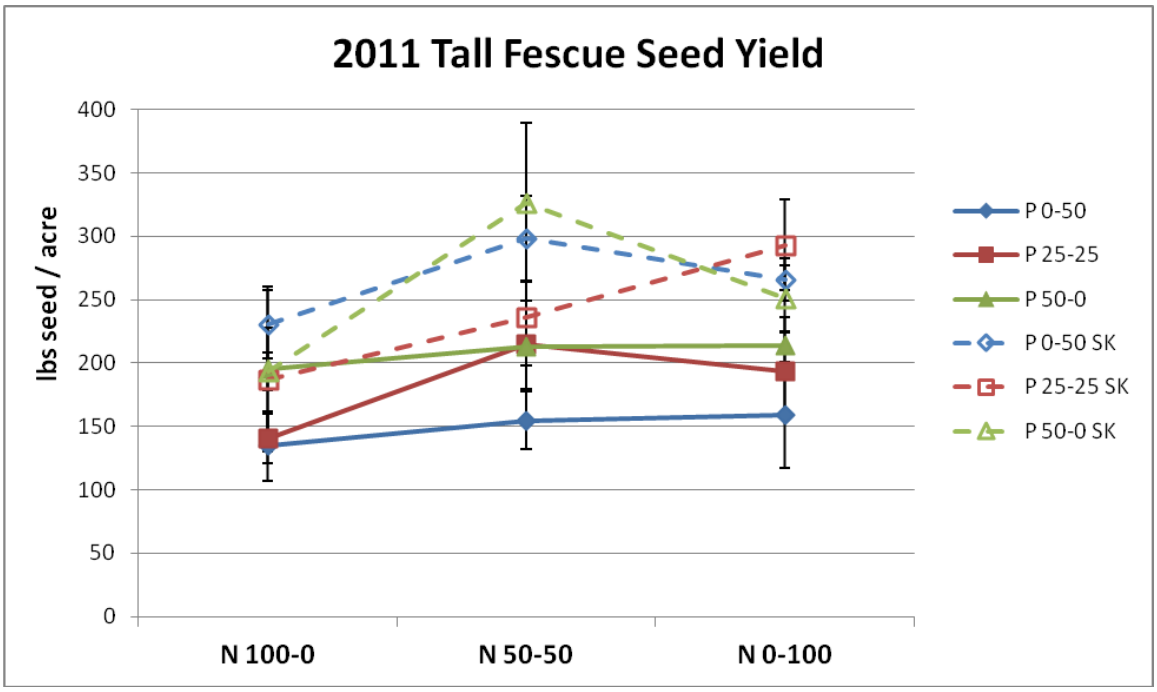

Figure 2. The June 2011 tall fescue seed yield from strip-kill and conventional plots treated with N and/or P in either September or December of 2010.

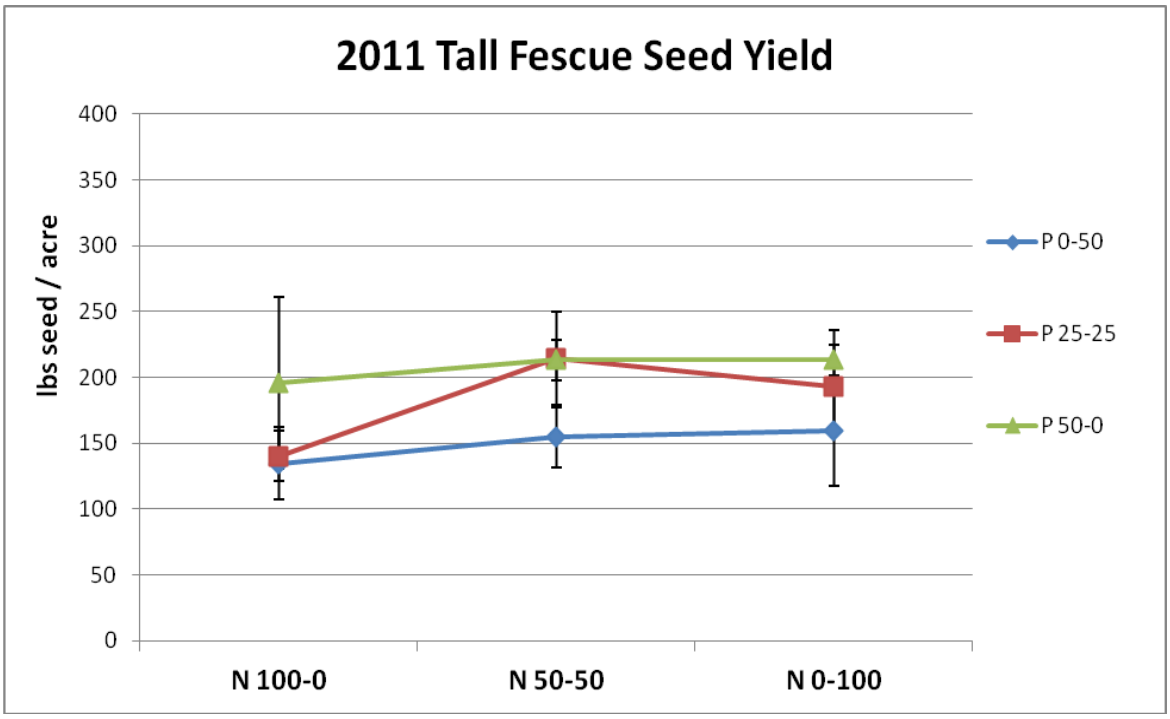

Figure 3. 2011 tall fescue seed yield from conventional plots treated with N and /or P in September and/or December 2010.

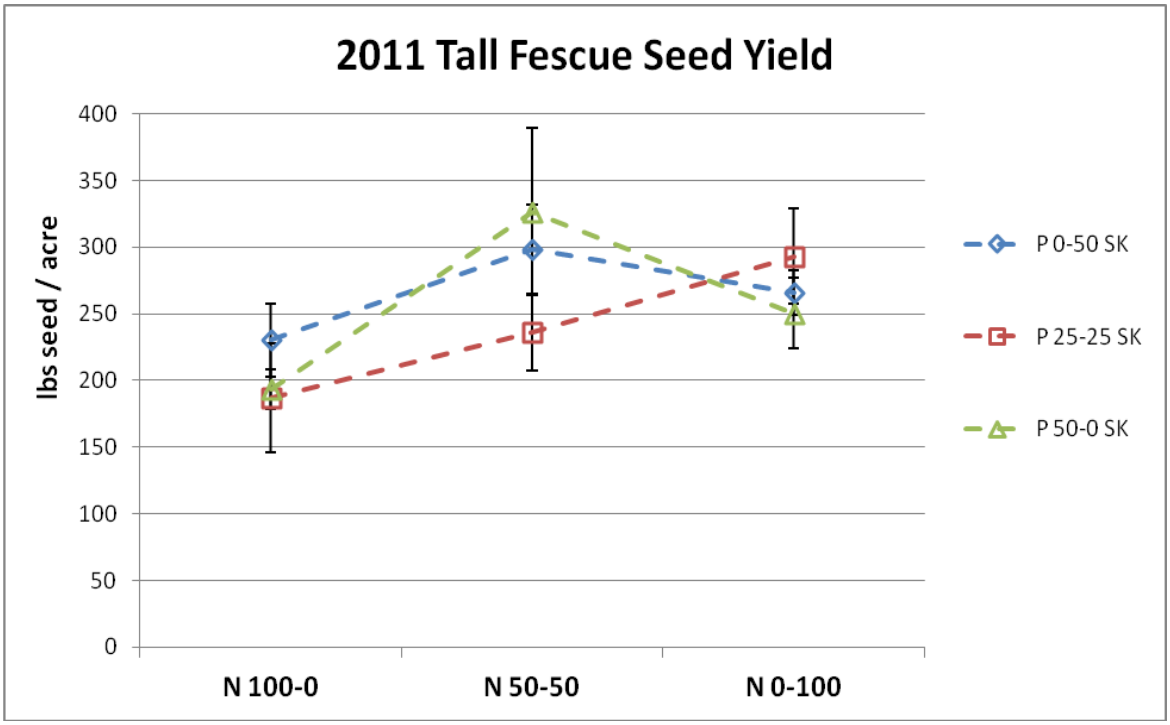

Figure 4. 2011 tall fescue seed yield from strip-kill (SK) plots treated with N and /or P in September and/or December 2010.

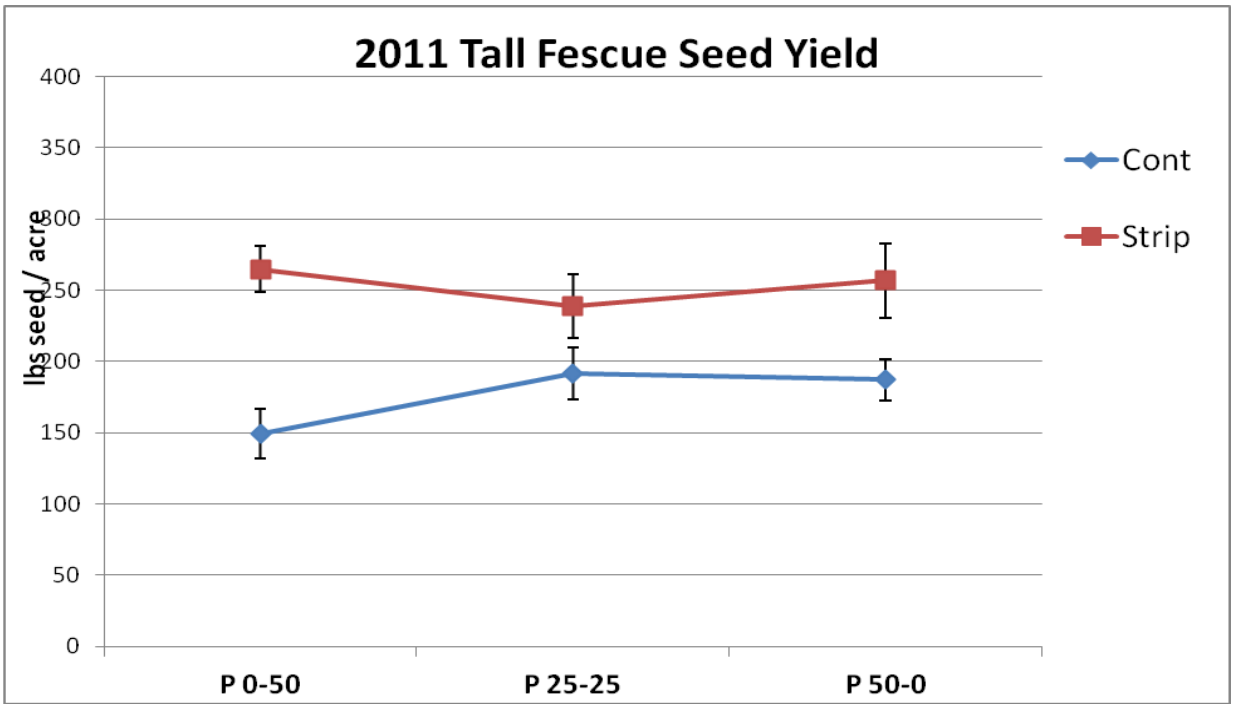

Figure 5. Tall fescue seed production in summer 2011 with various P treatments after pooling N treatments.

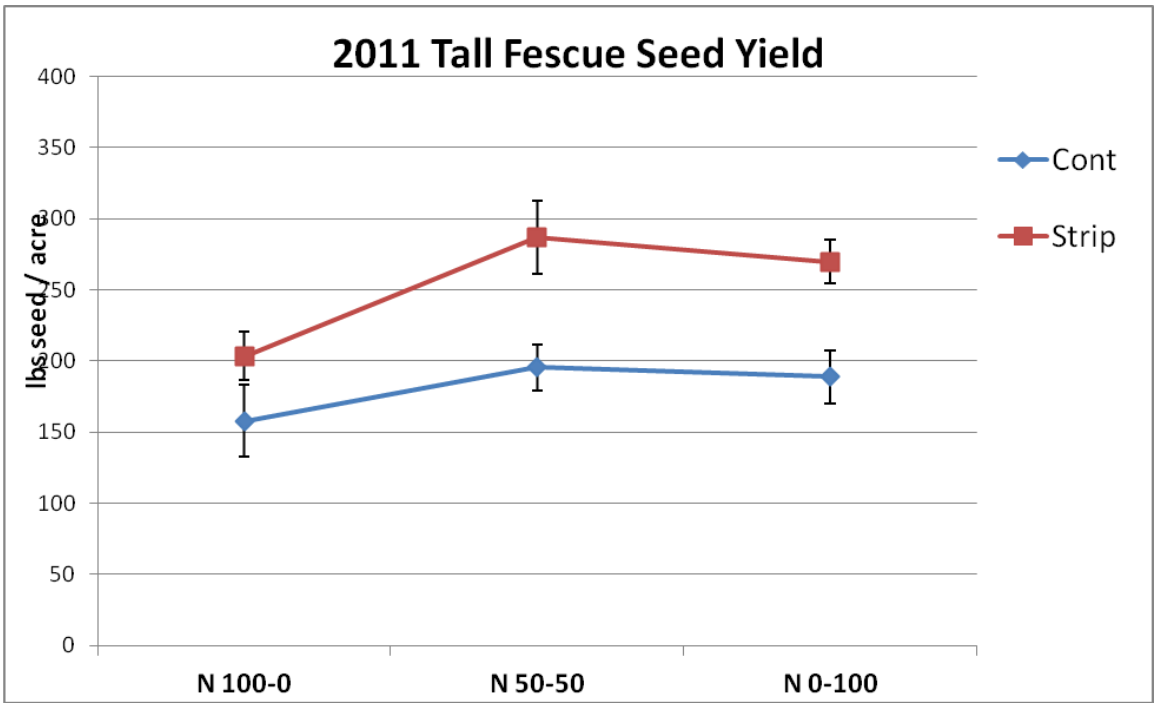

Figure 6. Conventional and strip-kill tall fescue seed yield from summer 2011 with various N treatments after pooling all P treatments.

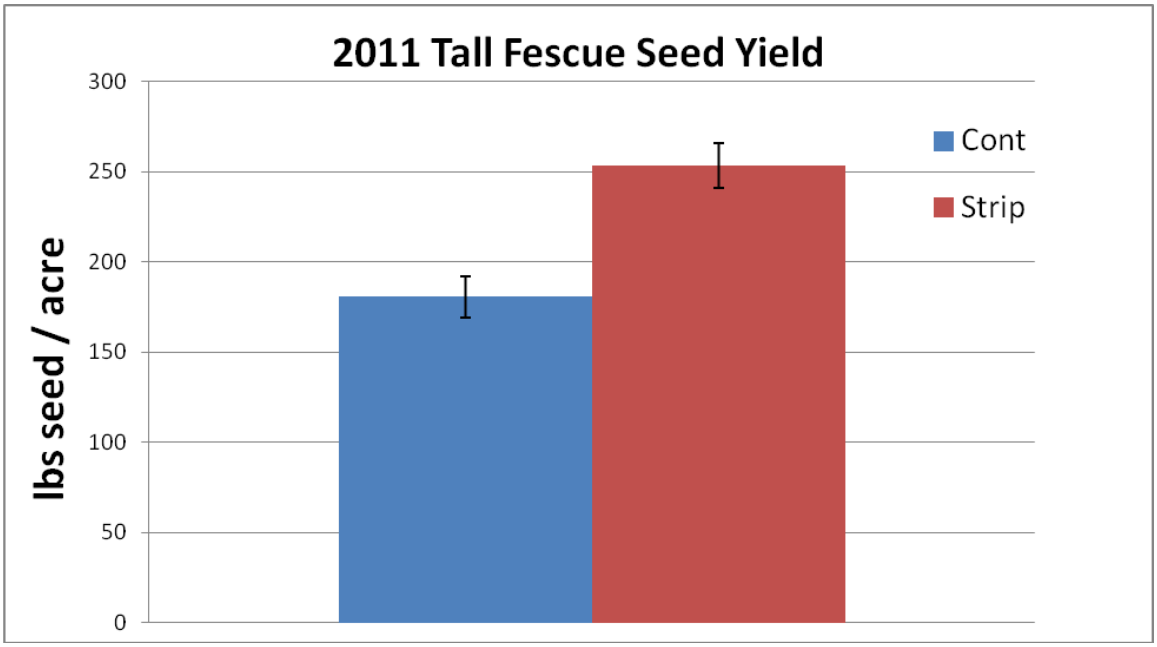

Figure 7. Conventional and strip-kill tall fescue seed yield from summer 2011 with all N and P treatments combined.