OVERSEEDING TEFF (*Eragrostis tef*) INTO ALFALFA

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Introduction

The purpose of this trial was to examine the usefulness of teff as a warm season annual forage crop to fill in declining alfalfa stands in Malheur County, Oregon. Overseeding alfalfa into declining alfalfa stand does not work as alfalfa has an autotoxicity that inhibits alfalfa seedlings. One option is to overseed alfalfa with a different species. Two characteristics of a good species to be used for overseeding are a competitive ability to establish in an existing alfalfa stand and the ability to produce quality hay. Teff is a warm season annual grass that has the potential to be a viable alternative forage crop, but further research is needed on this new crop for the Treasure Valley. Based on observations elsewhere, teff appears to grow well in warm mid-summer weather, but is reported to have almost no frost tolerance. Little research has been done on teff as a forage crop until very recently.

Materials and Methods

The experiment was planted on June 20, 2005 on an Owyhee silt loam soil at the Malheur Experiment Station in a declining alfalfa stand. Seedbed preparation for the field included disking twice and cultivating twice (groundhog) on June 6, 2005. The purpose of the tillage was to incorporate forage that had been flailed and blown back on the plots earlier in 2005 and to set the alfalfa back on all plots.

The experimental design was a randomized complete block with seven treatments and four replicates. The seven treatments included teff seeding rates of 0, 1.5, 3, and 6 lb/acre and an application of glyphosate (Roundup®) at 4 qt/acre followed by seeding rates of 1.5, 3, and 6 lb/acre. The glyphosate application and teff seeding were both done on June 20, but the glyphosate was allowed to dry prior to seeding. Seed was broadcast using an Earthway Hand Spreader Model 3500. At the time of seeding alfalfa had regrown from the tillage performed and ranged from 2 to 12 inches tall.

The experiment was irrigated with a microsprinkler irrigation system using R10 Turbo (Nelson Irrigation Corp., Walla Walla, WA) sprinkler heads. Sprinkler heads were placed every 25 ft in all directions within the field to get uniform coverage. Irrigation began on June 23 and was terminated with the study on August 1.

Watermark Soil Moisture Sensors model 200SS (Irrometer Co. Inc., Riverside, CA) were installed at 8-inch depth to monitor soil water tension. Sensors were connected to an AM400 data logger (M.K. Hansen Co., East Wenatchee, WA) equipped with a thermister to correct soil moisture calculations for soil temperature.

Statistics on all data were calculated by using Analysis of Variance (ANOVA) and treatment significance was based on the F test at the P = 0.05 level. If this analysis indicated significant treatment effects then Least Significant Difference (LSD) values were determined.

Results and Discussion

Emergence of the teff was very slow, so irrigation duration and frequency were increased (Figs. 1 and 2). Alfalfa in the treatments that were not sprayed with glyphosate grew back and was harvested on July 8. At this time the teff that had germinated was not large enough to contribute much to the total forage yield of the plot. Data from this harvest are not included since teff had very little influence on them. Teff stands were evaluated on July 21 by counting plants using a 4-ft^2 frame. On August 2 the percent dry matter of teff, weeds and alfalfa was visually estimated (Table 1).

The teff did not emerge well in any of the treatments. Some of the glyphosate-treated plots had as many as 15 plants/ft^2 emerge and in these areas teff did a much better job of competing with weeds. In general the plant stands were in the range of 3 plants/ft^2. One question still not answered is what constitutes an adequate stand? Teff emergence was not uniformly spread through the plots. Weed dry matter was more than double that of teff due to the poor teff emergence. Applying glyphosate significantly increased weed dry matter from 21 to 79 percent. The dominant weeds in this study were pigweed and barnyard grass. Barnyard grass is particularly troublesome in teff production since both are warm season annual grasses.

Possible reasons for poor teff emergence include poor seed-to-soil contact due to heavy surface residue, and inadequate initial irrigation management, or both. In this study very little teff emerged, and what did emerge competed poorly with alfalfa, pigweed, and barnyard grass.

Conclusion

Teff appears promising as an annual forage grass in monoculture. However, based on this experiment, using teff for overseeding into declining alfalfa stands did not show much promise. Some of the teff may have died during germination, since it took 2 weeks before the matric potential of soil at 8 inches lowered to 20 centibars. After significant irrigation occurred some teff did emerge. Preplant irrigation would have increased seed-to-soil contact, however, preirrigation will also encourage weed growth. In this experiment the teff that did emerge did not compete well with other species such as alfalfa, barnyard grass, or pigweed. Further research needs to be done to see where teff fits into agriculture in Malheur County.

Table 1. Teff stands on July 21 and visual estimate of dry matter percentage of teff, alfalfa, and weeds on August 2 at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

Treatments seeding rate	Teff stand	Species composition (based on dry matter)		
		Teff	Alfalfa	Weeds
lb/acre	No./ft^2	%	%	%
No glyphosate				
0	0	0	80	20
1.5	2.5	7	81	13
3	4.3	5	69	26
6	2.0	4	74	23
Avg.	2.9	5	75	21
Glyphosate				
1.5	1.7	6	8	86
3	3.4	12	7	81
6	4.1	25	7	69
Avg.	3.1	14	7	79
LSD (0.05)	NS	12	28	27

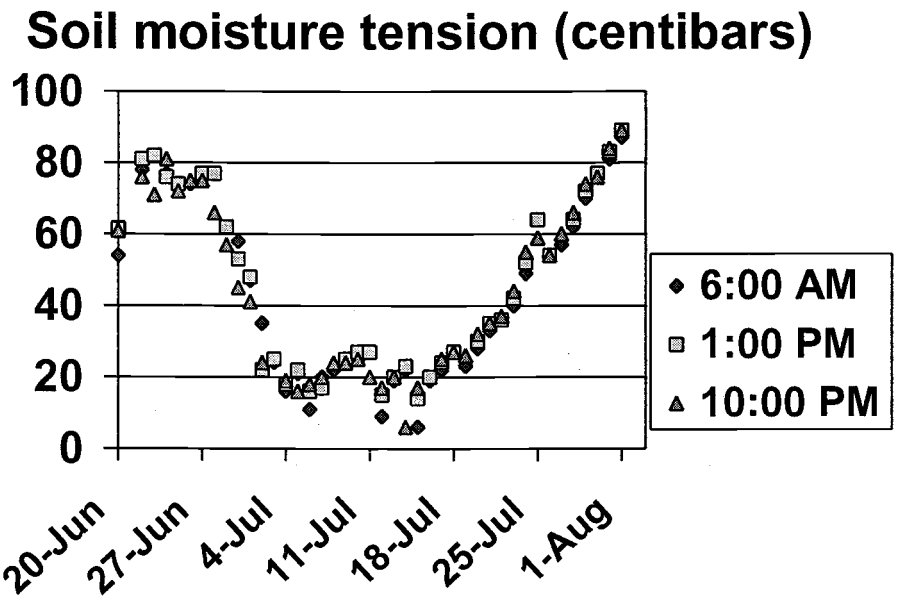

Figure 1. Soil moisture tension for the teff and alfalfa experiment at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

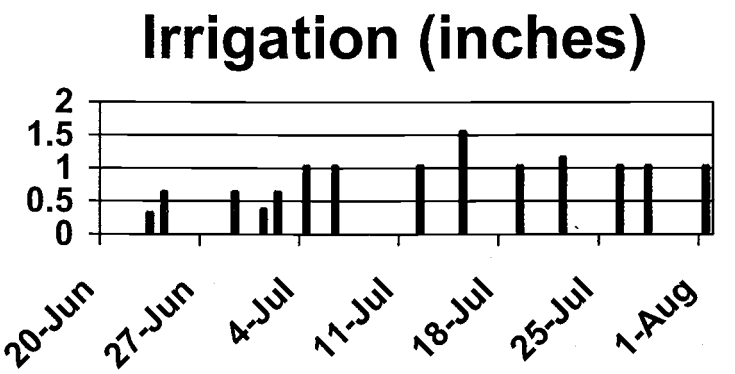

Figure 2. Irrigation water applied in inches during the teff and alfalfa experiment at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.