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'Travois' Alfalfa and Cool-season Grass Mixtures: A Demonstration Planting in Perkins County, South Dakota

*Wayne Markegard, Wayne Duckwitz, and Nancy Jensen

ABSTRACT

'Travois' alfalfa (*Medicago sativa* (L.) and cool-season grass cultivars were established in a demonstration planting in Perkins County, South Dakota near Bison in 2008-2013. The demonstration planting served as a field location to educate and train NRCS field office staff and landowners about grass-legume forage options, and collect general information on production potential of binary mixtures of Travois and cool-season grasses for haying and grazing in this region of South Dakota. Yield of Travois, and Travois and grass mixtures varied depending on year and yield contribution of each component in the mixture. The combination of Travois and cool-season grasses shows compatibility and persistence in this demonstration planting. Mixtures typically produced higher yields than Travois planted alone. Consult with the NRCS range conservationists or SDSU forage specialist for more information on planting and managing binary mixtures for hay and grazing in your county.

INTRODUCTION

A common practice in the Northern Great Plains is to plant legumes with cool-season grasses to improve quality, production, and digestibility of forage. Adding legumes to the mix can also reduce the need for added nitrogen fertilizer. Alfalfa (*Medicago sativa* L.) is typically the primary legume recommended for cool-season grass-legume mixtures (Sedivec and Printz, 2014). Travois alfalfa is one of the more popular pasture-type varieties grown for forage in the Northern Great Plains and interseeded into grasslands (Manske, 2005; Vigil et al., 1982).

To encourage the use of binary mixtures of Travois alfalfa with cool-season grasses in northwestern South Dakota, the Bismarck Plant Materials Center installed a demonstration planting in Perkins County, South Dakota, to serve as a visual for educating field office staff and landowners on the benefits of binary mixtures for hay and grazing.

MATERIALS AND METHODS

The Bismarck Plant Materials Center (PMC), in cooperation with Jim Lyon, a producer in Perkins County, South Dakota; Perkins County Conservation District; and the USDA-NRCS Perkins County field office, planted seven (7), non-replicated 11-ft x 57-ft plots on 30 April 2007 in Perkins County, South Dakota near Bison on a Reeder Loam soil. 'Travois' alfalfa (referred to as Travois throughout the remainder of the report) was planted alone and in a binary mixture of

*Wayne Markegard is Plant Materials Specialist, Wayne Duckwitz is PMC Manager, and Nancy Jensen is the Agronomist at the USDA-NRCS Bismarck Plant Materials Center, wayne.markegard@nd.usda.gov

'Manska' pubescent wheatgrass [*Thinopyrum intermedium* [Host] Barkworth & D.R. Dewey] (sym. T. *intermedium* ssp. *barbulatum* – pubescent wheatgrass); 'Fleet' meadow bromegrass [*Bromus biebersteinii* Roem. & Schult. [excluded]; 'NU-ARS AC2' crested wheatgrass [*Agropyron cristatum* (L.) Gaertn.] 'Mankota' Russian wildrye [*Psathyrostachys junceus* (Fisch.) Nevski]; 'Rush' intermediate wheatgrass [*Thinopyrum intermedium* (Host) Barkworth & D.R. Dewey] (sym. T. *intermedium* ssp. *intermedium* – intermediate wheatgrass); 'Newhy' RS wheatgrass (*Elymus hoffmannii* K.B. Jensen & K.H. Asay).

Plots were seeded at 1.5 times the recommended pure live seed planting rate on a well-prepared seedbed (Table1). The percentage of grass and Travois alfalfa in each mixture was 70% and 30%, respectively (fig. 1). Areas between and around the perimeter of the plots were planted to Bad River ecotype blue grama [*Bouteloua gracilis* (Willd. ex Kunth) Lag. ex Griffiths]. Bromoxynil was applied approximately one month after planting at a label rate for the control of Russian thistle (*Salsola kali* L) and other broadleaf weeds.

Fig. 1. Binary mixture of 'Newhy' RS wheatgrass and Travois alfalfa.

Visual stand ratings of Travois alfalfa and cool-season grass cultivars were determined at the beginning of the growing season in 2009-2013 using a scale of 1 to 9 where 1 = best and 9 = poor. Yield was determined in late July-early August in 2009, 2011 and 2012 by harvesting 2-ft x 10-ft swaths, representative of the stand of Travois alfalfa and perennial grass within each plot.

Table 1. Pure live seed planting rates of perennial cool-season grasses and 'Travois' alfalfa.

'Travois' alfalfa and grass mixtures[1/]	Seeding rate/acre	
	Grass	Legume
	--------PLS lb/acre--------	
AL		8.25
AL + CW	6.3	2.06
AL + IW	8.9	2.06
AL + MB	14.2	2.06
AL + PW	8.9	2.06
AL + RW	6.3	2.06
AL + WX	10.5	2.06

1/AL = 'Travois' alfalfa; AL + CW = 'Travois' alfalfa + 'NU-ARS AC2' crested wheatgrass; AL + IW = 'Travois' alfalfa + 'Rush' intermediate wheatgrass; AL + MB = 'Travois' alfalfa + 'Fleet' meadow bromegrass AL + PW = 'Travois' alfalfa + 'Manska' pubescent wheatgrass; AL + RW = 'Travois' alfalfa + 'Mankota' Russian wildrye; AL + WX = 'Travois' alfalfa + 'NewHy' RS wheatgrass

Samples were dried and dry matter yield was determined for each respective harvest date. Forage quality estimates of percent crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), total digestible nutrients (TDN), and relative feed value (RFV) were determined from representative samples collected from the 18 July 2012 harvest.

RESULTS AND DISUSSION

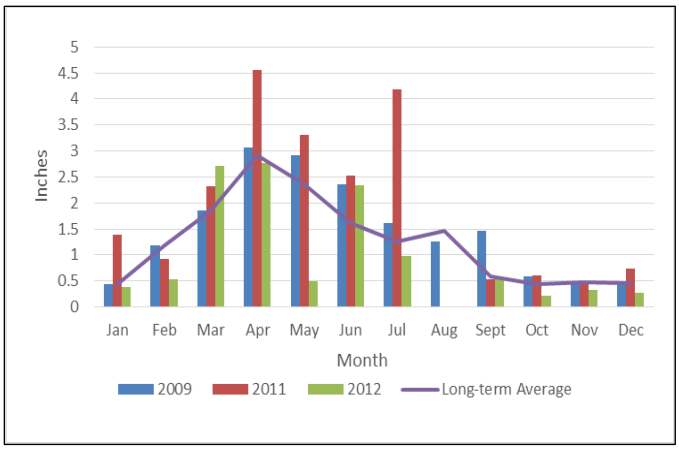

Fig. 2. Annual rainfall for 2009, 2011, 2012 and long-term average, Bison, SD.

Rainfall received during the primary growing season for cool-season grasses (April-June; Sedivec et al., 2007) near Bison, South Dakota, in 2009 and 2011 was near or above the long-term average. Rainfall during the same period in 2012 was slightly below average. During the late growing season (late August-October; Sedivec et al., 2007), rainfall amounts were average in 2009 and near or slightly below average in 2011 and 2012 (fig. 2).

Stand density of Travois, and Travois and grass mixtures in 2008-2009 were near average to slightly above average (data not shown). From 2010-2013, Travois, and Travois and grass mixtures were very similar in stand density. A near 1:1 Travois to grass ratio was observed in all plots with stand density estimated as very good to excellent (data not shown).

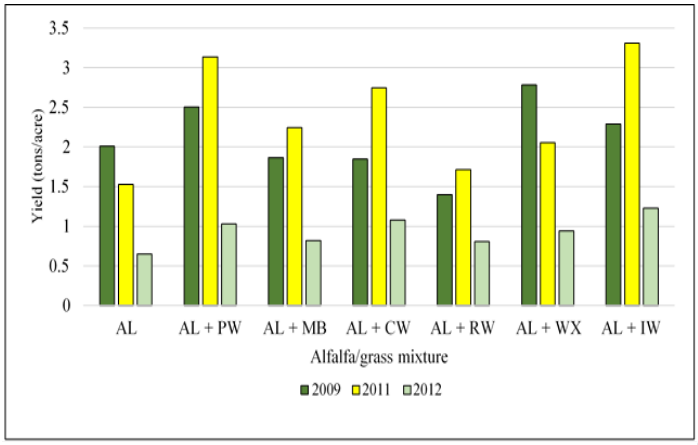

Fig. 3. Dry matter yield of 'Travois' alfalfa grown alone and in combination with perennial cool season grass harvested in late July-early August 2009, 2011, and 2012, Bison, SD.

AL = 'Travois' alfalfa; AL + PW = 'Travois' alfalfa + 'Manska' pubescent wheatgrass; AL + MB = 'Travois' alfalfa + 'Fleet' meadow bromegrass; AL + CW = 'Travois' alfalfa + 'NU-ARS AC2' crested wheatgrass; AL + RW = 'Travois' alfalfa + 'Mankota' Russian wildrye; AL + WX = 'Travois' alfalfa + 'NewHy' RS wheatgrass; AL + IW = 'Travois' alfalfa + 'Rush' intermediate wheatgrass.

Yield of Travois, and Travois and grass mixtures varied depending on year and yield contribution of each component in the mixture (fig. 3). Travois mixtures of Manska pubescent wheatgrass, and Newhy RS wheatgrass produced the highest yield in 2009, averaging 2.6 tons/acre, which was 23% more forage than Travois alone. In 2011, the wettest year of the trial (fig. 2), all of the mixtures produced more forage than Travois. The mixtures of Manska pubescent wheatgrass, NU-ARS AC2 crested wheatgrass, and Rush intermediate wheatgrass produced the highest yield, averaging over 3.2 tons/acre. Moreover, these three (3) mixtures produced 50% more forage than Travois. Although yields were substantially lower in 2012, mixtures of Travois and cool-season grasses continued to produce more forage than Travois planted alone.

Forage quality estimates of Travois and cool-season mixtures are presented in Table 2 for samples collected in mid-July 2012. As expected, Travois had the highest CP (12%) but only 1 percentage point higher than NU-ARS AC2 crested wheatgrass, Mankota Russian wildrye and Newhy RS wheatgrass (11%). Travois had the lowest TDN (52%) with NU-ARS AC2 crested wheatgrass and Manska pubescent wheatgrass the highest at 59 and 58%, respectively. The RFV were generally similar among mixtures with Travois exhibiting the highest at 94%.

Table 2. Forage quality estimates of 'Travois' alfalfa grown alone and in mixtures with cool-season grasses, Bison, SD. Samples collected for quality estimates 18 July 2012.

'Travois' alfalfa and grass mixture [1/]	Forage Quality Estimates				
	CP[2/]	ADF[3/]	NDF[4/]	TDN[5/]	RFV[6/]
	----------%----------				
AL	12	44	54	52	94
AL + PW	8	39	66	58	83
AL + MB	9	43	64	54	82
AL + CW	11	38	64	59	85
AL + RW	11	42	68	55	78
AL + WX	11	40	65	57	83
AL + IW	10	40	67	57	80

1/ AL = 'Travois' alfalfa; AL + PW = 'Travois' alfalfa + 'Manska' pubescent wheatgrass; AL + MB = 'Travois' alfalfa + 'Fleet' meadow bromegrass; AL + CW = 'Travois' alfalfa + 'NU-ARS AC2' crested wheatgrass; AL + RW = 'Travois' alfalfa + 'Mankota' Russian wildrye; AL + WX = 'Travois' alfalfa + 'NewHy' RS wheatgrass; AL + IW = 'Travois' alfalfa + 'Rush' intermediate wheatgrass; 2/ = crude protein; 3/ = acid detergent fiber; 4/= neutral detergent fiber; 5/ = total digestible nutrients; 6/ = relative feed value

CONCLUSIONS

The purpose of the demonstration planting was to serve as a training platform for NRCS field office staff and landowners on the benefit of a grass-legume forage system, and to collect general information on production potential of binary mixtures of Travois alfalfa and cool-season grass cultivars. The combination of Travois and cool-season grasses exhibited compatibility and persistence in this demonstration planting. Travois planted with cool-season grasses produced higher yields than Travois planted alone. Consult with the NRCS range conservationists or SDSU forage specialist for more information on planting and managing binary mixtures for hay and grazing in your county.

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