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Barley Versus Oat: Which Makes the Superior Forage Crop

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Abstract

Oat (*Avena sativa* L.) is the most popular, cool-season annual forage grown in North Dakota. Research in Minnesota and Wisconsin suggests that barley (*Hordeum vulgare* L.) is superior to oat for forage quality and, in some instances, comparable in yield. A study was begun to determine if barley is equal or superior to oat for forage yield and quality in southwestern North Dakota. Oat and barley cultivars were compared for forage yield in randomized and replicated plots. Selected cultivars also were intercropped with field peas (*Pisum sativum* sub. *arvense* Poir.). Dry matter (DM) yield averaged 2.3 tons/acre for oat but only 1.7 tons/acre for barley. Cultivars developed for forage tended to produce more DM than cultivars developed for grain. No yield advantage resulted when barley or oat was intercropped. These results suggest that oat is superior to barley for dry matter yield in southwestern North Dakota and similar environments.

Introduction

Oat is the most popular, cool-season, annual forage crop grown in North Dakota. Oat comprised approximately 83% of the small grain acreage devoted to hay production in 1997 (E. Stabenow, North Dakota Agric. Stat. Serv., per. comm.). The remaining acreage was comprised of barley (14%) and other (rye, wheat) small grain crops (3%).

Research indicates that barley produces higher quality forage compared with oats in sub-humid regions. Barley had greater nutritive value than oat, triticale (*Triticum x Secale*), and wheat (*Triticum aestivum* L.) in Minnesota (Cherney and Martin, 1982). Barley forage was highest in digestible dry matter concentration, and lowest in acid detergent fiber concentration. The crude protein (CP) concentration of barley forage was 1.6% greater than oats. Similarly, the CP concentration of barley and barley-pea forage was superior to the CP concentration of oat and oat-pea forage in a study at Dickinson, ND (Carr et al., 1998).

Barley forage yield has been equal or superior to forage yield of oats in sub-humid regions, whether grown alone (Cherney et al., 1982) or with pea as a companion crop for alfalfa (*Medicago sativa* L.) establishment (Chapko et al., 1991). Barley forage yield has been inconsistent compared with oat in North Dakota. 'Dumont' and 'Magnum' oats were superior to 'Bowman' and 'Horsford' barley for yield when the cultivars were grown alone and in combination with field pea in 1993 and 1994 (Carr et al., 1998). However, differences in yield between 'Chopper', 'Haybet', and 'B 7518' barley cultivars and Dumont oats were not detected in a subsequent study (Carr et al. 1996). These data indicate that cultivar selection impacts barley performance for forage yield compared with oat. Additional research is needed to determine the yield potential of barley and oat in North Dakota. The objective of this experiment is to determine if barley is superior to other cool-season, annual forage crops and crop combinations for yield and quality.

Materials and Methods

Six barley cultivars developed for forage (Horsford, Haybet, Westford, and three experimentals) and grain (2-rowed = Conlon, Stark, Logan; 6-rowed = Foster, Robust, Stander) were compared with three oat cultivars grown for forage (Celsia, Mammoth, Triple Crown) and two for grain (Paul and Whitestone) for forage yield and quality in 1999. These same cultivars along with Jerry oat will be compared in 2000. Selected barley and oat cultivars also were grown with field pea so that comparisons among barley and oat sole crops and intercrops can be made.

A randomized complete block with four replications was used in 1999. Data will be analyzed using appropriate statistical procedures available from SAS. Results of forage quality data were unavailable when this manuscript was prepared. Forage quality data will be presented in a future manuscript.

Results and Discussion

Moisture content of forage averaged 68% moisture at harvest (Table). Moisture content ranged from 62% for Mammoth oat and Logan and Stark barley, to 77% for Westford and BZ 593-159 barley.

Oat cultivars produced an average DM yield of 2.3 tons/acre compared with 1.7 tons/acre for the barley cultivars (Table 1). The highest yielding oat cultivar, Triple Crown, produced 2.5 tons DM/acre. In comparison, the highest yielding barley cultivar, Westford, produced 2.0 tons. These preliminary results concur with results of earlier research indicating that more forage is produced by oat compared with barley in southwestern North Dakota (Carr et al. 1998). If forage quality analyses determine that barley is a superior forage compared with oat, however, then barley still may produce more kcal/acre, even though the DM yield of oat is greater.

Intercropping barley or oat with pea failed to improve forage yield compared with cereal sole crop (Table 1). These data concur with results of previous research indicating that intercropping failed to provide a forage yield advantage in southwestern North Dakota (Carr et al., 1998). However, the crude protein concentration of forage produced by barley- and oat-pea intercrops generally was superior to the crude protein concentration of forage produced by cereal sole crop.

Conclusions/Implications of Research

First-year results of this multi-year study suggest that oat produces equal or greater amounts of DM/acre compared with barley in southwestern North Dakota and similar environments. However, it is premature to conclude that oat is superior to barley for forage production, in terms of kcal/acre, since results of forage quality analyses are not available. A thorough comparison of the forage value of barley and oat will reported once additional yield and quality data are generated.

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Table 1. Harvest moisture content and dry matter yield of barley, oat, and cereal-pea intercrops in a recropped, dryland environment during 1999 at Dickinson, ND.

Crop	Type	Cultivar[s]	Moisture at harvest	Dry matter
			- % -	- tons/acre -
Oats	Forage	Triple crown	74	2.5
		Mammoth	62	2.4

		Celsia	63	2.3
	Grain	Whitestone	63	2.4
		Paul	64	2.0
	Oat + pea	Whitestone + Trapper peas	68	2.6
		Paul + Arvika peas	68	2.4
		Paul + Trapper peas	72	2.3
		Whitestone + Arvika	67	2.2
Barley	Forage	Westford	77	2.0
		Haybet	63	2.0
		BZ 593-152	76	1.7
		ND 17577	67	1.6
		BZ 593-159	77	1.6
		Horsford	66	1.5
	2-rowed grain	Conlon	64	1.7

	Logan	62	1.6
	Stark	62	1.6
6-rowed grain	Robust	66	1.7
	Foster	67	1.6
	Stander	69	1.5
Barley + pea	Haybet + Arvika peas	70	2.2
	Robust + Arvika peas	71	2.1
	Robust + Trapper peas	76	1.9
Trial Mean		68	2
C.V. (%)		3.2	13.6
LSD .05		3	0.4
Treatment means	Oat	65	2.3

		Forage	66	2.4
		Grain	64	2.2
		Barley	68	1.7
		Forage	71	1.7
		Grain	65	1.6

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