OATS VARIETIES: FORAGE PRODUCTION, NUTRITIVE VALUE AND GRAIN YIELD

H.M. Arelovich[1], R. Miranda[2], G. W. Horn[3], C. Meiller[2] and M.B.Torrea[2]

Story in Brief

Forage dry matter yield and composition, and grain yield of six commercial and two experimental varieties of oats grown in Argentina were measured. The six commercial varieties were: Suregrain, Bonaerense Paye, Buck Epecuén, Buck 152, INTA Millauquen, and INTA Cristal. The two experimental varieties were: CA-5 and CA5-10. Plots for forage-grain evaluation (dual-purpose) were planted March 31, 1994 and clipped twice. The same varieties also were planted July 2, 1994 in separate plots to determine grain yield. Differences in forage quality (crude protein and fiber components) were small and would not be expected to affect animal performance greatly. Forage dry matter and grain yield were affected by variety; clipping decreased grain yield of most varieties. Because of greater forage yield in the early fall as well as high total forage yield and high grain yield after clipping, the best dual-purpose varieties were INTA Cristal, INTA Millauquen and CA5-10.

(Key Words: Oats, Variety, Nutritive Value, Forage Production, Grain Yield.)

Introduction

Oats are used as a crop for grazing by ruminants in many countries (Wheeler, 1981); they respond favorably to N fertilization and have high dry matter yields (Hogan and Weston, 1969). In semiarid and subhumid Argentina, oats pasture frequently is used for grazing cattle from late fall until early spring (May through September). This forage is used mainly for growing and finishing steers and heifers, but some is used for making hay and grain production.

The reason oats grazing is so widespread is because oats can be easily cultivated, develops rapidly, and yields high amounts of dry matter when managed properly. Daily gains average 1.54 lb when grazing oats pasture (Arzadún et al., 1989; Rosso and de Verde, 1992). However, regionally, gains are lower for cattle grazing oats at differerent stages of maturity.

Differences in chemical composition (Beever et al., 1978), low dry matter content (Vèritè and Journet, 1970) and low DM availability (NRC, 1987) may

[1]Graduate Assistant, [2]Staff, Universidad Nacionald del Sur, Argentina
[3]Professor

be associated with low weight gains on lush grasses. Most likely, the low weight gains in fall and winter result from some or all of these factors.

Specific oats varieties may vary in dry matter yield and nutritive value. Many producers harvest their own oats for seed and lack reliable information on the quantity and quality of forage that this seed may produce. Complete, up-to-date information on the quality and yield potential of small grain forages also is lacking in the southern United States (Burke, 1986).

Improved oat cultivars have been developed in Argentina that withstand lower winter temperatures, have drought resistance and higher forage and grain yield. Grain yield of oats is of interest because many producers seed oats early and interrupt grazing in the spring to allow grain production and harvest. Various varieties should be tested for quality and productivity under the different climatic conditions. The objective of this study was to evaluate forage dry matter and grain yield and dry matter composition of six commercial and two experimental varieties of oats.

Materials and Methods

This study was conducted at Cabildo ACA Experimental Station, Argentina, during 1994. The site is at 39º36' S and 61º64' W, 15 km SW from Cabildo in the Buenos Aires province. The mean annual precipitation and temperature are 658 mm (25.91in) and 14.3ºC (58ºF); rainfall totaled 700 mm (27.56 in) during the year of the study. Six commercial varieties (Suregrain, Bonaerense Paye, Buck Epecuén, Buck 152, INTA Millauquen and INTA Cristal) and two experimental varieties (CA-5 and CA5-10) were seeded in plots on a sandy-loam soil using a complete randomized block design.

Soil management prior to seeding included two consecutive years of oat-vetch being incorporated into the soil as green manure in November, 1993. No fertilizer was used at any stage of management or crop development.

The plot size was 4.5 x .90 m with six rows 15 cm apart; seeding rate was adjusted to have 250 plants/m^2. Each variety was evaluated for forage dry matter (DM) yield, DM composition and grain yield. The plots for forage-grain evaluation (dual purpose) were planted on March 31. The same varieties were also planted on July 2 in a separate set of plots to determine grain yield.

Dual purpose plots were clipped on May 19 and August 26 when height of oats averaged 25 cm. A linear meter was cut from each of the three central plot rows; after all samples were collected, the plots were clipped at the same height leaving a residue 5 cm high. The samples were weighed, dried and analyzed for DM, crude protein (CP), neutral and acid detergent fiber (NDF, ADF). Grain yield was determined after harvesting 2.7 m^2 of each plot. The harvest dates were November 26 for the clipped plots and December 5 for unclipped plots. Data were analyzed by analysis of variance, with differences due to variety and clipping date for forage DM yield and quality parameters and variety and clipping effects for grain yield.

Results and Discussion

Forage composition of the oat varieties is shown in Table 1. The DM, NDF and ADF contents were influenced by both variety and clipping date (P<.05); CP was affected only by clipping date (P<.05). A significant variety x clipping date interaction for DM and CP (P<.05) indicates that these variables were dependent on the sampling date during the season.

For most varieties, the general trend for DM and fiber components to increase and for CP to decrease with advancing maturity. However, the magnitude of the changes was not large and would not be expected to affect animal performance greatly. The lowest DM was observed in Suregrain (16.8%) at the first clipping date; high moisture content may depress total DM voluntary intake (Vèritè and Journet, 1970). CP content ranged between 28.5 and 23.8%, for the first and second clipping dates, respectively, both being for INTA Millauquen. The CP content was high for all varieties, and should not limit animal performance. In fiber content, Suregrain (53%) and Buck 152 (25.5%) had the highest NDF and ADF, respectively, on the second clipping date; the experimental variety CA5 had the lowest NDF (49.6%) and ADF (22.8%) on both dates; this may produce higher voluntary consumption and digestibility.

Since the second clipping was on regrowth after the first cutting date, no dead leaves or sheaths were present to decrease the quality of the remaining material and regrowth. This may partially explain why quality remained high on the second clipping date. However, high quality also may be related to the climatic conditions of the season and previous soil management.

The most important parameters many small grain researchers and producers are concerned with is forage and grain production as shown in Table 2. Both forage DM and grain yield were affected (P<.05) by variety. While INTA Millauquen was the most consistent in DM yield, forage yield was lower for most of the varieties on the second clipping date. The decrease on the second clipping date was greater for the experimental varieties CA5 and CA5-10 (822 and 600 lb DM/A); however, both surpassed 1700 lb DM/A on the first cutting, thereby showing the highest potential for DM production in the early season. Total DM yield ranged between 2356 and 2980 lb/A for CA5-10 and Buck Epecuén, respectively. Removal of forage by clipping decreased grain yield (P<.05) in all varieties with the exception of CA5-10 which yielded 1350 and 1189 lb/acre for clipped and unclipped plots, respectively. Suregrain (1623 and 2372 lb/A) and INTA Cristal (1293 and 2459 lb/A) had the highest grain production for clipped and unclipped plots, respectively. The best dual purpose varieties were INTA Cristal, INTA Millauquen and CA5-10; they had higher early fall DM yield and total DM yield and the best grain yield after clipping.

Only one year of evaluation was involved; significant year effects have been reported for both forage and grain yield (Kalmbacher et al., 1987). The experimental varieties CA5 and CA5-10 may be more adapted to harder weather than the commercial ones, and should be tested further. Due to the small magnitude of differences in quality, a variety probably should be chosen based on DM and grain yield rather than forage quality. However, if yields are similar, quality might help in making the final choice. Other nutrient fraction such as soluble protein, non-protein N, soluble carbohydrates and essential minerals also may be important when chosing an oat variety for forage production.

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Table 1. Mean dry matter composition of oat varieties.

	Dry matter		Crude protein		NDF		ADF	
Clipping Date[a]	1	2	1	2	1	2	1	2
Variety								
Bonaerense Paye	18.4[c]	20.1[e]	26.9[def]	24.0[fg]	47.8[de]	52.2[cd]	21.3[e]	22.9[d]
Buck 152	17.8[d]	20.1[e]	28.4[cde]	23.8[g]	45.8[e]	52.1[cd]	22.6[de]	25.1[c]
Buck Epecuén	17.2[ef]	20.2[e]	26.2[f]	25.2[def]	47.5[de]	52.5[cd]	25.0[c]	25.5[c]
INTA Cristal	17.3[de]	20.8[d]	27.8[cde]	24.9[efg]	52.1[c]	52.9[c]	23.6[cd]	23.6[cd]
INTA Millauquen	16.9[ef]	20.5[de]	28.5[c]	23.8[g]	45.9[e]	51.2[cd]	22.6[de]	23.0[d]
Suregrain	16.0[g]	20.6[de]	26.3[ef]	26.5[cd]	47.3[de]	53.0[c]	22.9[de]	24.0[cd]
CA5	16.7[f]	20.1[e]	25.5[fg]	26.8[c]	46.6[de]	49.6[d]	23.7[cd]	22.8[d]
CA5-10	16.8[ef]	23.0[c]	24.4[g]	25.8[cde]	48.5[d]	52.6[cd]	23.4[cd]	25.3[c]
Mean	17.1	20.7	26.8	25.1	47.7	52.0	23.1	24.0
LSD (.05)[b]	.6		1.6		3.1		2.0	

[a] Clipping dates, May 19 (1) and August 26 (2).
[b] For the comparison of the varieties within clipping date means.
[c,d,e,f,g] Means on a column with different superscripts differ ($P < .05$).

Table 2. Forage dry matter and grain yield in oat varieties.

	Forage dry matter yield			Grain yield	
	May 19	August 26	Total period	Unclipped	Clipped
Variety	lb/A			lb/A	
Bonaerense Paye	1669[b]	1196[b]	2865[bc]	2400[b]	1196[cd]
Buck 152	1611[b]	1143[b]	2754[bcd]	2001[cd]	1083[cd]
Buck Epecuén	1673[b]	1307[b]	2980[b]	1722[d]	937[d]
INTA Cristal	1601[b]	1163[b]	2764[bc]	2458[b]	1293[c]
INTA Millauquen	1357[c]	1230[b]	2587[cd]	2154[bc]	994[d]
Suregrain	1588[b]	867[c]	2455[de]	2372[b]	1623[b]
CA5	1729[b]	822[c]	2551[cde]	1656[d]	1120[cd]
CA5-10	1756[b]	600[d]	2356[e]	1189[e]	1350[bc]
Mean	1623	1041	2664	1994	1200
LSD (.05)[a]	231	213	342	367	290

[a] For the comparison among varieties.

[b,c,d,e] Means on a column with different superscripts differ (P<.05).