



FORAGE QUALITY OF OAT HAY VARIETIES

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INTRODUCTION

Oat (*Avena sativa* L.) hay acreage in North Dakota has averaged over 125,000 acres over the last 4 years. Previous work on oat hay quality by Ernie French at Williston in the 1960s indicated that the late-maturing cultivars had greater forage yield, but the early maturing cultivars generally had greater forage quality, especially crude protein. Brinkman and Forsberg (1988) in Wisconsin reported basically the same results, but they found a genotype, latter called 'Ensiler', that was late in maturity but had the forage quality of early maturing lines. With the increasing acreage, we wanted to know if a given cultivar should be recommended for oat hay production.

OBJECTIVE

To evaluate forage quality of oat hay as affected by genotype/cultivar.

MATERIALS AND METHODS

✓ Genotypes chosen:

- * Two early maturing cultivars: Jerry and Killdeer
- * Two mid-maturing cultivars: HiFi and AC Assiniboia
- * Two late-maturing cultivars: Ebeltoft and AC Ronald
- * Two forage-type cultivars: Ensiler and ForagePlus
- * Two naked oat cultivars: Paul and Stark
- * Two experimental dwarfs: ND001306 and ND000461

✓ Exp. 1: Three years: 2002, 2003, and 2004

✓ Exp. 2: Three locations: Fargo, Minot, and Williston

✓ Randomized complete-block design, three replicates

✓ Seeding rate: 1,000,000 seeds/acre

✓ Growth stage: Soft dough (5 consecutive random panicles with tip spikelet beginning)

✓ Quality components determined in the Animal and Range Sciences Department (wet chemistry).

RESULTS

✓ Significant cultivar effects for each quality component evaluated were detected even though year X cultivar or location X cultivar interactions were significant.

✓ Forage yield was highest from late-maturing genotypes; Paul and ND000461 were the highest yielding at Fargo (Table 1). ND001306 and ND001304 were the lowest yielding genotypes when included.

✓ Forage yield of forage oat cultivars was very similar to the early maturing cultivars.

✓ Forage quality of late-maturing genotypes generally was higher than early maturing and forage cultivars (Tables 1 and 2).

Table 1. Forage yield and quality of oat hays at Fargo, ND, in 2002-2004.

Cultivar/ genotype	Harvest date	Forage yield tons/A	Quality components ¹					RFV
			CP	ADF	ADL	NDF	IVDMD ²	
-----%								
Ensiler	3 July	3.47	11.8	39.0	4.4	58.3	60.4	93.5
ForagePlus	6 July	3.77	12.2	39.4	4.3	59.0	57.6	91.9
Jerry	30 June	3.58	13.0	36.9	4.2	58.4	60.3	95.9
Killdeer	30 June	3.42	13.1	38.0	4.1	59.5	61.2	93.2
HiFi	3 July	3.95	12.1	38.3	4.2	58.9	62.4	93.2
Morton [§]	--	4.02	13.7	40.2	4.1	58.9	--	91.1
AC Assiniboia	5 July	3.53	13.1	34.8	3.8	53.4	63.3	107.8
Ebeltoft	6 July	3.80	12.3	36.7	4.2	56.3	63.5	99.7
Paul	11 July	4.12	12.2	32.5	3.8	49.4	63.4	120.5
ND001304 [§]	--	3.08	15.4	35.8	3.3	54.6	--	104.1
ND000461	10 July	4.06	12.8	34.5	3.5	54.6	66.5	105.7
ND001306 [#]	--	3.21	12.7	31.4	3.3	50.8	64.7	118.7
Mean		3.75	12.8	36.5	4.0	56.1	62.3	101.0
LSD 0.05		0.18	3.8	5.7	0.9	8.5	19	2.5
CV, %		8.8	6.3	3.3	4.5	3.2	2.7	5.2

¹ CP = crude protein; ADF = acid-detergent fiber; ADL = acid-detergent lignin; NDF = neutral-detergent fiber; IVDMD = in vitro dry matter digestibility; RFV = relative feed value

² 2003 and 2004 only; [§]Grown in 2002 and 2003 only; [#]Grown in 2003 and 2004 only

Table 2. Forage quality of oat hays average over Williston, Minot, and Fargo locations in 2004.

Cultivar/ genotype	Quality components ¹						RFV
	CP	ADF	ADL	NDF	HEMI	CELL	
-----%							
Jerry	11.6	32.8	4.4	57.1	24.3	28.4	103.4
Killdeer	12.1	33.7	4.3	57.7	24.0	29.0	101.5
HiFi	11.3	35.1	4.3	59.6	24.5	30.8	96.3
AC Assiniboia	11.6	31.3	3.8	54.7	23.4	27.5	109.8
Ebeltoft	11.5	31.9	4.3	54.8	22.8	27.7	108.9
AC Ronald	11.5	31.4	3.6	55.7	24.2	27.8	107.8
Ensiler	11.6	35.6	4.4	59.2	23.6	31.2	96.3
ForagePlus	11.7	35.5	4.5	58.5	23.0	31.0	97.5
Paul	11.9	30.8	4.0	52.6	21.8	26.8	115.3
Stark	11.6	31.7	4.1	54.3	22.6	27.6	110.2
ND000461	13.2	31.9	3.6	56.3	24.4	28.2	106.8
ND001306	13.0	28.7	3.3	51.4	22.7	25.4	120.8
Mean	11.8	32.5	4.1	56.0	23.4	28.5	106.5
LSD 0.05	0.8	1.7	0.2	2.6	1.4	1.6	6.9
CV, %	4.7	3.5	5.5	2.9	3.2	3.9	4.3

¹ CP = crude protein; ADF = acid-detergent fiber; ADL = acid-detergent lignin; NDF = neutral-detergent fiber; HEMI = hemicellulose (NDF - ADF); CELL = cellulose (ADF - ADL); RFV = relative feed value

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✓ Paul (Fig. 1) and ND001306 had the lowest ADF and NDF of tested genotypes resulting in highest RFV (Tables 1 and 2).

✓ AC Assiniboia had the highest forage quality of the standard grain types tested at Fargo (Table 1), but Ebeltoft and AC Ronald were similar to AC Assiniboia across the three locations (Table 2).

✓ ND001304, ND001306, and ND000461 (low lignin dwarfs) had low ADL as expected. AC Ronald, AC Assiniboia, and Paul were lower in lignin than early maturing and forage cultivars (Tables 1 and 2).

✓ Stark, another naked oat, tended to be lower in forage quality than Paul (Table 2).

✓ IVDMD was highest from ND000461 (Fig. 2) and high in other low-testing ADL cultivars, HiFi and Ebeltoft are notable exceptions (Table 1).



Fig. 1. Paul oats, a naked cultivar, at harvest.



Fig. 2. ND000461 low lignin oat genotype at harvest.

CONCLUSIONS

✓ Paul, the naked oat, should be selected for oat hay since it had the greatest yield and forage quality of released cultivars.

✓ Late-maturing genotypes were higher in forage quality than early maturing genotypes.

✓ Forage oat cultivars were at best equal to early maturing cultivars in forage yield and quality.

✓ AC Assiniboia and AC Ronald were the best dual forage or grain cultivars of those tested.

✓ ND000461 has good potential for release as a forage cultivar.

LITERATURE CITED

Brinkman, M.A., and R.A. Forsberg. 1988. Oats for silage. p. 190-194. In B. Mattsson and R. Lyhagen (ed.) 3rd Int. Oat Conference. 4-8 July 1988. Lund Sweden.