

TALL FESCUE VARIETY QUALITY AND YIELD COMPARISON IN THEIR FOURTH PRODUCTION YEAR

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Abstract

Eight tall fescue cultivars were established in August 1987 at the Powell Butte research site of the Central Oregon Agricultural Research Center. 'Mozark' was the top yielder in 1991, while 'Tandem' (now bluegrass), which equaled 'Mozark' the first two years, was the poorest yielder (3.33 ton/ac less). 'Fawn', the check variety, had the lowest yields but it was only significantly lower from the top 2 yielding cultivars. Differences were observed between varieties for different quality variables. There were many quality differences between varieties for the individual 3 cuttings. All varieties were classed as good, premium, and premium for the three cuttings, respectively, based on USDA grass quality guidelines (protein).

Introduction

Grass hay and pasture are important agricultural crops in central Oregon either as pure stands, or in mixtures with alfalfa and clovers. Grass forage is important for many producers for the local, regional, and export hay markets, as well for utilization in grass pastures for the grazing of livestock. While forage quality is important, lack of funding in the past has not allowed any replicated tall fescue variety quality research. A grass variety trial was conducted from 1968 to 1972 at Redmond, Oregon. Species in that trial included, ranked in the order of most to least productive, orchardgrass, timothy, brome grass, meadow foxtail, intermediate wheatgrass, tall fescue, and Kentucky bluegrass. There was no quality information generated from that trial. This 1987 tall fescue variety trial was initiated because many new varieties had been introduced since 1968. There is also very little local information in Central Oregon on comparisons of Tall fescue variety quality. So a decision was made to test one year of tall fescue production from the 1991 production year of the 1987 tall fescue variety trial planted at COARC, Powell Butte, Oregon. In the past, variety recommendations were made on the basis of yield performance only, so quality analysis was conducted to determine if quality differences between varieties would alter variety recommendation in orchardgrass, though only based on one years comparison of data. Producers, buyers, and local crop consultants will benefit from the quality comparison information.

Material and Methods

Non-coated, non-treated seed of eight tall fescue cultivars was hand broadcast at the rate of 18 lb/acre into 6 x 20 ft, plots on August 21 and 22, 1987. The seed was raked in and rolled with a corrugated roller. The trial design was a randomized complete block with 4 replications.

Tall fescue grass names and sources of each variety planted at Powell Butte, Oregon are in Table 1.

Table 1. Variety names and seed source for the 1987 planted tall fescue variety trial planted at the Central Oregon Ag Research Center, Powell Butte in 1987.

Variety	Source*
1 Forager	Cenex/Land O'Lakes
2 Syn W	Cenex/Land O'Lakes
3Mozark	International Seeds, Inc.
4 Martin	International Seeds, Inc.
5 FA-293-86	Turf Seed, Inc.
6 Tandem	Turf Seed, Inc.
7 Johnstone	Willamette Seed & Grain
8 Fawn	CHECK

Table 2. Soil test results values from samples taken on June 1, 1987, at the Central Oregon Ag Research Center, Powell Butte site.

Soil Depth (in.)	pH	P (ppm)	K (ppm)	N-NO ₃ (ppm)
0-12	6.5	13	281	6.2

A broadcast fertilizer application of 16-20-0-15 at 410 lb/ac (65.5 N - 82 P₂O₅ - 0 K₂O - 61.5 S lb/acre) was incorporated into the seedbed in August 17, 1987 prior to planting. On April 4, 1988, 500 pounds/acre of 16-20-0-15 (80 N - 100 P₂O₅ - 0 K₂O - 75 S lb/acre) was top-dressed for the 1988 season. The rest of the fertility program is presented in Table 3.

Table 3. Fertilizer applications in lb/acre of nitrogen and sulfur for the tall fescue variety trial planted in August, 1987, at the COARC, Powell Butte.

Year	1 st Cut		2 nd Cut		3 rd Cut		Total	
	N	S	N	S	N	S	N	S
	(lb/acre)		(lb/acre)		(lb/acre)		(lb/acre)	
1987 (establish)	66-62		N/A		N/A		66-62	
1988	80 - 75		--		--		80-75	
1989	80 - 60		80 - 0		---		160-60	
1990	90 - 60		80 - 0		---		170-60	
1991	100 - 60		90 - 0		90 - 0		280-60	

Plot size harvested in 1991 was 3.5 x 15 ft. Yields were converted to tons per acre after a sample was taken from each plot and oven dried to determine dry matter. Moisture and quality samples were dried at 149°F. Yield and all quality variable results are reported on an oven dry weight basis.

Forage samples were ground with a Wiley mill with a 1.0 mm screen. The samples were then reground in a Udy mill with a 0.5 mm screen. The samples were submitted for NIRS quality prediction analysis at the Klamath Experiment Station in 1992. The NIRS has not been calibrated for every variable that was analyzed. No chemical analyses were performed on any of the tall fescue samples. NIRS provides good relative values between cuttings and varieties.

Term Definitions are as follows:

TDN = total digestible nutrients (Penn State calculation)

TDN CA = total digestible nutrients (California calculation)

TDN TRIST = total digestible nutrients (Tristate calculation)

RFV = relative feed value

Moist. = moisture %

DM = Dry matter %

Protein = crude protein %

AV Protein = available protein %

DProtein = digestible protein %

NEL = net energy of lactation (mcal/lb)

ENE = energy estimate (therms per cwt. weight)

ME = metabolizable energy (mcal/lb)

NEM = net energy of maintenance (mcal/lb)

NEG = net energy of gain (mcal/lb)

DDM = digestible dry matter %

DMI = dry matter intake %

NDF = neutral detergent fiber %

ADF = acid detergent fiber %

ADP = available digestible protein %

NDFD = 48 hour in vitro NDF digestibility as % of NDF

NFC = non fibrous carbohydrate (% of DM)

TDNL total digestible nutrients for alfalfa, clovers, and legume/grass mixtures

RFQ = relative forage quality

Definition of calculation equations:

$TDN = 4.898 + (89.796 * NEL)$

$TDN\ CA = (82.38 - (.7515 * ADF)) * 0.9$

$TDN\ TRIST = (54.32 + (0.7387 * protein)) - (0.2915 * ADF)$

$RFV = (DMI * DDM) / 1.29$

$Moist. = 100.0 - dry\ matter$

$AV\ Protein = (1.16 * protein) - (1.6 * ADP)$

$D\ Protein = 1.44 + (0.68 * protein) - (1.28 * ADP)$

$NEL = 1.044 - (0.0119 * ADF)$

$ENE = 82.6 * NEL$

$ME = 0.01642 * TDN$

$NEM = -0.508 + (1.37 * ME) - (0.3042 * ME * ME) + (0.051 * ME * ME * ME)$

$NEG = -0.7484 + (1.42 * ME) - (0.3836 * ME * ME) + (0.0593 * ME * ME * ME)$

$DDM = 88.90 - (0.779 * ADF)$

$DMI = 120 / NDF$

If (AV Protein > Protein) AV Protein = Protein

If (D Protein > Protein) D Protein = Protein

$NDFD = dNDF\ 48\ hour / NDF * 100$

$NFC = 100 - ((NDF - 2) + Protein + 2.5 + Ash)$

$TDNL = (NFC * 0.98) + (Protein * 0.93) + (1.5 * 0.97 * 2.25) + ((NDF - 2) * (NDFD / 100)) -$

$$\text{DMI1} = (((0.0120 * 1350) / (\text{NDF} / 100))) + ((\text{NDFD} - 45) * 0.374) / 1350 * 100$$

$$\text{RFQ} = (\text{DMI1} * \text{TDNL}) / 1.23$$

$$\text{Lb of uptake N per ton DM} = \text{N uptake} / \text{Yield (ton/acre)}$$

$$1 \text{ lb of uptake N} = \text{lb of DM (yield)} = \text{pounds of DM yield/acre} / \text{pounds of uptake N/acre}$$

$$\text{Lb of fertilizer N per ton of DM} = \text{pounds of fertilizer N applied} / \text{tons DM yield}$$

$$1 \text{ lb of fertilizer N} = \text{lb of DM} = \text{pounds of DM yield/acre} / \text{pounds of fertilizer N/acre}$$

$$\text{N uptake} = \text{total yield (lb/acre)} * \text{percent N}$$

$$\text{N use efficiency} = \text{N uptake} / \text{N applied}$$

$$\text{Extra N uptake} = \text{total N uptake} - \text{total N applied}$$

$$\text{Protein yield} = \text{percent protein} * \text{DM yield (lb acre)}$$

$$\text{ADF yield} = (100 - \text{ADF}) * \text{DM yield (lb/acre)}$$

$$\text{TDN yield} = \text{TDN} * \text{DM yield (lb/acre)}$$

$$\text{DDM yield} = \text{DDM} * \text{DM yield (lb/acre)}$$

Table 4. USDA grass hay quality guidelines.

Quality Designation	Crude Protein (%)
Premium	> 13
Good	9-13
Fair	5-9
Low	< 5

The tall fescue variety trial (field trial work) was partially supported by testing fees collected from Cenex/Land O'Lakes, International Seeds, Inc., Turf Seed, Inc. and Willamette Seed and Grain.

MSTAT statistical software (Michigan) was used for ANOVA's and separation of means.

Results and Discussion

The yield results for 1988 Tall Fescue variety trial are published in "Central Oregon Crop Research 1987-1988, OSU Agricultural Experiment Station Special Report 847, October, 1989". The yield results from 1989, 1990, 1991, and 1992 are also published in the "Central Oregon Crop Research 1990-1992, OSU Agricultural Experiment Station Special Report 922, October, 1993". Quality (and yield again) results presented in this article are only from 1991.

Total Yield and Totals for Other Variables

Total fourth year (1991) yield (DM), pounds of uptake N to produce 1 ton of DM, 1 pound of uptake N to produce pounds of DM, pounds of fertilizer N to produce 1 ton of DM, 1 pound of fertilizer N produces pounds of DM, total N uptake, N use efficiency, and total extra N uptake results for the tall fescue variety trial planted in 1987 at the COARC, Powell Butte, Oregon, are presented in table 5.

Differences between the varieties were observed for all of the variables, with the exception of pounds of uptake N to produce one ton of DM, and 1 lb of N uptake to produce pounds of DM. 'Mozark' and 'Syn W' were the top total yielding varieties. There was a total yield range of 3.98

ton/acre ('Tandem') to 7.31 ton/acre (Mozark) DM in 1991. Tandem had the lowest yields, because of stand reduction problems after the second production season. Beginning in the third year; bluegrass started to replace the stand. No total yield difference between Fawn', ranked 7th, to 'Forager', ranked 3rd, were observed.

Fawn tended to have the highest fertilizer N requirement to produce a ton of DM, which was not different though from some of the other tall fescue entries. 'Mozark' and 'Syn W' required significantly less pounds of fertilizer N to produce a ton of DM than 'Fawn', probably because of yield potential. 'Tandem' (bluegrass) had the highest overall pounds of N to produce 1 ton of DM requirement, significantly more so, because of its low yields and the intrusion of bluegrass.

There was an inverse relationship with fertilizer N needed vs. DM produced, based on the amount of fertilizer N applied (280 lb/acre of N); Tandem (bluegrass) had the lowest DM produced and Mozark the most from a pound of fertilizer N. The same relationship with some differences occurred between the varieties and total N uptake, total N use efficiency, and extra N uptake greater than applied N. Total yield (yield potential) plays a major role in these variables and their interaction. Tandem (bluegrass) was less in N-uptake than all of the other entries. There were also differences in N-uptake between the remaining tall fescue varieties. Mozark, Syn W, and Forager varieties, were higher in N-uptake than the rest of the entries.

Protein, ADF, TDN, DDM yields, total Ca uptake, total K uptake, total and Mg uptake results are presented in table 6. The relationship and ranking of varieties was the same for total protein yield, ADF yield, TDN yield, and DDM yield as in the previous discussion on N-uptake. Tandem (bluegrass) was significantly lower yielding for these variables. Calcium, K, and Mg uptake generally had similar relationships to N-uptake, due mostly to yield. An example exception is Mozark, which had higher yields than Syn W, yet Syn W had higher Ca uptake. Johnstone and FA 293-86 had less Ca uptake than the rest of the tall fescue entries.

Table 5. Total season yield (DM), pounds of uptake N to produce 1 ton of DM, 1 pound of uptake N to produce pounds of DM, pounds of fertilizer N to produce 1 ton of DM, 1 pound of fertilizer N produces pounds of DM, total N uptake, N use efficiency, and total extra N uptake > fertilizer applied results for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, Oregon. (Table sorted by yield from high to low)

Entry # / Variety	Total Yield DM (t/ac)	Lb Of Uptake N per ton of DM	1 lb of Uptake N = lb of DM	Lb of Fert N per ton DM	1 lb of Fert N = lb of DM	Total N Uptake (lb/ac)	Total N Use Eff. (%)	Total Extra N Uptake (lb/ac)
3 Mozark	7.31	39.9	50.2	38.5	52.2	291.4	104.1	11.4
2 Syn W	7.08	40.5	49.6	39.9	50.6	287.6	102.7	7.6
1 Forager	6.78	42.7	47.0	41.8	48.4	289.9	103.6	9.9
7 Johnstone	6.72	40.9	49.0	41.7	48.0	275.0	98.2	-5.0
5 FA-293-86	6.57	40.4	50.0	42.8	46.9	263.3	94.1	-16.7
4 Martin	6.49	40.4	49.6	43.2	46.4	262.2	93.6	-17.8
8 Fawn	6.43	40.9	49.1	43.7	46.0	264.0	94.3	-16.0
6 Tandem	3.98	40.1	51.4	70.5	28.4	155.2	55.5	-124.8
Mean	6.42	40.5	49.5	45.3	45.9	261.1	93.2	-18.9
PLSD 0.01	0.74	NS	NS	5.8	5.3	38.8	13.9	38.8
PLSD 0.05	0.55	NS	NS	4.3	3.9	28.5	10.2	28.5
PLSD 0.10	0.45	NS	NS	3.5	3.2	23.6	8.4	23.6
Prob. > F	0.0000	0.2000	0.2095	0.0000	0.0000	0.0000	0.0000	0.0000
CV %	5.8	4.1	4.1	6.4	5.8	7.4	7.4	102.4

Table 6. Total season protein yield, total ADF yield, total TDN yield, total DDM yield, total Ca uptake, total K uptake, total and Mg uptake results for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, Oregon. (sorted by ADF yield)

Entry # / Variety	Total Protein Yield (lb/ac)	Total ADF Yield (lb/ac)	Total TDN Yield (lb/ac)	Total DDM Yield (lb/ac)	Total Ca Uptake (lb/ac)	Total P Uptake (lb/ac)	Total K Uptake (lb/ac)	Total Mg Uptake (lb/ac)
3 Mozark	1,821	9,946	8,714	9,355	54.8	41.1	514.6	20.5
2 Syn W	1,798	9,906	8,750	9,275	58.5	39.3	497.2	20.8
1 Forager	1,812	9,422	8,305	8,831	55.7	37.8	469.6	20.2
7 Johnstone	1,719	9,274	8,160	8,703	50.0	37.8	474.7	19.8
5 FA-293-86	1,646	9,072	7,982	8,512	50.5	37.6	468.3	18.9
4 Martin	1,639	8,977	7,902	8,422	54.5	35.5	443.5	19.0
8 Fawn	1,650	8,974	7,920	8,406	54.5	34.6	453.5	18.5
6 Tandem	970	5,613	4,970	5,428	34.6	23.1	257.6	12.2
Mean	1,632	8,898	7,838	8,344	51.6	35.8	447.4	18.7
PLSD 0.01	243	1,023	902	959	4.8	8.0	58.7	2.8
PLSD 0.05	178	7551	663	704	3.5	5.9	43.1	2.0
PLSD 0.10	147	622	548	583	2.9	4.9	35.6	1.7
Prob. > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CV %	7.4	5.7	5.8	5.7	7.8	6.7	6.6	7.4

First Cutting

First cutting yield, dry matter, moisture, protein, ADF, NDF, TDN, DDM, DMI, and RFV data are presented in Table 7.

‘Mozark’ and ‘Syn W’ were the two highest yielding varieties, and Mozark was almost, significantly higher yielding than Syn W. There was no difference in yield between ‘Syn W’, 2nd highest yielding, and ‘FA-273’, 7th highest out of the 8 entries. Tandem was significantly lower yielding than the rest of the entries. There were differences between varieties for percent dry matter and moisture.

There were no differences between entries for percent protein, so all of the entries would have been placed in the “good” quality class based on the USDA grass quality guidelines (table 4). There were digestibility quality differences between the entries. ‘Tandem’ (bluegrass) had significantly lower percentage ADF, NDF, and the highest percentage TDN, DDM, DMI, and the highest RFV than most of the other entries. ‘Mozark’, the highest yielding entry, had the lowest overall quality. ‘Syn W’, the 2nd highest yielding entry also had the 2nd highest overall quality. Based on RFV ranking high to low, the entries were ranked Tandem, Forager and Syn W, Fawn, Martin, Johnstone, FA-233-86, and Mozark.

Table 7. First cutting yield, DM, moisture, protein, ADF, NDF, TDN, DDM, DMI, and RFV results for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (sorted by total yield)

Entry # / Variety	Total Yield DM (t/ac)	DM (%)	Moist. (%)	Protein (%)	ADF (%)	NDF (%)	TDN (%)	DDM (%)	DMI (%)	RFV
3 Mozark	2.95	30.1	69.9	10.6	31.5	51.5	60.1	64.4	2.33	116
2 Syn W	2.61	29.4	70.6	11.1	28.9	48.4	63.1	66.4	2.48	128
4 Martin	2.45	31.6	68.4	10.7	29.9	49.1	62.1	65.7	2.45	125
7 Johnstone	2.45	29.7	70.3	10.4	30.3	50.6	61.5	65.3	2.37	120
8 Fawn	2.36	29.7	70.3	10.8	29.9	48.7	62.0	65.7	2.47	126
1 Forager	2.32	31.1	68.9	11.0	29.0	48.4	63.0	66.3	2.48	128
5 FA-233-86	2.30	30.6	69.4	10.4	30.9	50.9	60.9	64.9	2.36	119
6 Tandem	1.64	27.0	73.1	9.9	27.6	46.9	64.7	67.4	2.57	135
Mean	2.38	29.9	70.1	10.6	29.7	49.3	62.2	65.8	2.44	124
PLSD 0.01	0.61	2.8	2.8	NS	2.4	NS	2.7	1.9	0.17	12
PLSD 0.05	0.45	2.1	2.1	NS	1.8	2.5	2.0	1.4	0.12	9
PLSD 0.10	0.37	1.7	1.7	NS	1.5	2.0	1.7	1.1	0.10	7
Prob. > F	0.0007	0.0063	0.0063	-----	0.0044	0.0132	0.0041	0.0043	0.0094	0.0076
CV %	12.7	4.7	2.0	7.9	4.1	3.4	2.2	1.4	3.4	4.8

----- = MSTAT does not print out a Prob. > F number when very high

First cutting N use efficiency, extra N uptake, pounds of uptake N to produce a ton of DM, 1 pound of uptake N produces pounds of DM, pounds of fertilizer N produces ton of DM, 1 pound of fertilizer N to produce pounds of DM, protein yield, ADF yield, TDN yield, and DDM yield are presented in Table 8.

‘Mozark’, in general, had significantly better numbers in all of the variables, compared to the rest of the entries, with the exception of ‘Syn W’. Yield potential is the major reason for this ranking. There were no differences for lb of N uptake to produce one ton of DM and 1 lb of uptake N produces pounds of DM. ‘Tandem’ had significantly lower values in all of the variables, than the rest of the entries.

Table 8. First cutting N use efficiency, extra N uptake, lb of uptake N produces 1 ton of DM, 1 lb of uptake N produces pounds of DM, pounds of fertilizer N produces 1 ton of DM, 1 pound of fertilizer N produces pounds of DM, protein yield, ADF yield, TDN yield, and DDM yield results for the 1991 tall fescue variety trial planted in 1987 at COARC, Powell Butte, OR. (sorted by N use efficiency)

Entry # / Variety	N Use Eff. > Fert N (%)	Extra N Uptake (lb/ac)	Lb of Uptake N = ton of DM	1 lb of Uptake N = lb of DM	Lb of Fert N = ton of DM	1 lb of Fert N = lb of DM	Protein Yield (lb/ac)	ADF Yield (lb/ac)	TDN Yield (lb/ac)	DDM Yield (lb/ac)
3 Mozark	99.7	-0.3	33.7	59.4	34.5	59.1	623	4,046	3,551	3,801
2 Syn W	93.3	-6.8	35.6	56.3	39.2	55.2	583	3,707	3,288	3,463
4 Martin	83.4	-16.6	34.2	58.6	41.1	48.9	522	3,429	3,031	3,209
7 Johnstone	81.7	-18.3	33.3	60.1	41.2	49.0	511	3,415	3,013	3,199
8 Fawn	81.5	-18.5	34.7	57.9	43.1	47.1	510	3,301	2,918	3,090
1 Forager	80.8	-19.2	35.0	57.3	45.0	46.3	505	3,291	2,921	3,073
5 FA-273	77.2	-22.8	33.2	60.8	44.2	46.0	483	3,180	2,800	2,983
6 Tandem	51.0	-49.1	31.7	64.4	62.7	32.8	319	2,378	2,124	2,212
Mean	81.1	-18.9	33.9	59.3	43.9	47.7	507	3,343	2,956	3,129
PLSD 0.01	21.3	21.3	NS	NS	13.8	12.1	133	857	763	800
PLSD 0.05	15.6	15.6	NS	NS	10.1	8.9	98	630	560	588
PLSD 0.10	12.9	12.9	NS	NS	8.4	7.4	81	521	463	486
Prob. > F	0.0002	0.0002	-----	0.4349	0.0008	0.0006	.0002	0.0019	0.0027	0.0016
CV %	13.1	-56.1	7.9	8.3	15.7	12.7	13.1	12.8	12.9	12.8

----- = MSTAT does not print out a Prob. > F number when very high

First cutting percent N, N uptake, percent P, P uptake, percent Ca, Ca uptake, percent K, K uptake, percent Mg, and Mg uptake are presented in Table 9.

There were differences between varieties for N uptake, percent P, P uptake, Ca uptake, K uptake, and percent Mg, and Mg uptake. ‘Mozark’ and ‘Syn W’ were the highest ranking varieties for N uptake, P uptake, K uptake, and Mg uptake. ‘Tandem’ was the lowest ranking entry in these same variables, but had the highest percent P and Mg.

Table 9. First cutting percent N, N uptake, percent P, P uptake, percent Ca, Ca uptake, percent K, percent Mg, and Mg uptake results for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (table was sorted by N uptake)

Variety	N (%)	N Uptake (lb/ac)	P (%)	P Uptake (lb/ac)	Ca (%)	Ca Uptake (lb/ac)	K (%)	K Uptake (lb/ac)	Mg (%)	Mg Uptake (lb/ac)
3 Mozark	1.70	99.7	0.242	14.4	0.385	20.7	3.17	187.0	0.122	7.3
2 Syn W	1.78	93.3	0.255	13.3	0.400	18.9	3.19	167.6	0.125	6.6
4 Martin	1.71	83.4	0.240	11.7	0.435	19.4	2.99	146.2	0.120	5.9
7 Johnstone	1.66	81.7	0.250	12.2	0.370	16.3	3.12	153.4	0.130	6.4
8 Fawn	1.73	81.5	0.240	11.3	0.430	18.7	3.13	146.9	0.125	6.0
1 Forager	1.76	80.8	0.235	10.9	0.410	17.4	3.07	141.6	0.122	5.7
5 FA-273	1.66	77.2	0.258	11.9	0.352	14.9	3.22	148.8	0.120	5.6
6 Tandem	1.58	51.0	0.270	8.8	0.407	12.3	2.88	92.8	0.140	4.6
Mean	1.70	81.1	0.249	11.8	0.399	17.4	3.09	148.0	0.126	6.0
PLSD 0.01	NS	21.3	NS	3.2	NS	NS	NS	39.8	NS	NS
PLSD 0.05	NS	15.6	*	2.3	NS	4.7	NS	29.2	NS	NS
PLSD 0.10	NS	12.9	*	1.9	NS	3.9	NS	24.2	*	*
Prob. > F	-----	0.0002	0.0233	0.0041	0.1305	0.0247	0.4348	0.0002	0.0843	0.0514
CV %	7.9	13.1	5.4	13.5	10.5	18.3	7.1	13.4	7.2	16.7

* significant but error mean square was too small (<0.000) to run PLSD's.

----- = MSTAT does not print out a Prob. > F number when very high

First cutting ADP, percent AV protein, percent D protein, NEL, ENE, ME, NEM, and NEG are presented in Table 10.

‘Tandem’ (bluegrass), the poorest performing entry for yield, in general, had the best energy (NEL, ENE, ME, NEM, and NEG). Mozark, the highest yielding entry, had the lowest energy.

Table 10. First cutting ADP, percent AV protein, percent D protein, NEL, ENE, ME, NEM, and NEG for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (Table was sorted by ENE)

Variety	ADP	AV Protein (%)	D Protein (%)	NEL (mcal/lb)	ENE (mcal/lb)	ME (mcal/lb)	NEM (mcal/lb)	NEG (mcal/lb)
6 Tandem	0.258	11.9	8.5	0.742	61.4	1.060	0.665	0.398
1 Forager	0.145	12.9	9.1	0.728	60.2	1.035	0.642	0.375
2 Syn W	0.150	13.2	9.2	0.728	60.0	1.035	0.643	0.377
4 Martin	0.127	12.6	8.9	0.713	59.1	1.017	0.625	0.363
8 Fawn	0.098	12.8	8.9	0.712	59.1	1.020	0.625	0.360
7 Johnstone	0.058	12.2	8.6	0.710	58.6	1.010	0.617	0.353
5 FA-293-86	0.090	12.2	8.7	0.700	58.0	0.998	0.608	0.348
3 Mozark	0.052	12.2	8.6	0.695	57.4	0.988	0.598	0.338
Mean	0.122	12.5	8.8	0.716	59.2	1.020	0.628	0.0095
PLSD 0.01	NS	NS	NS	*	2.5	0.063	*	*
PLSD 0.05	NS	NS	NS	*	1.8	0.047	*	*
PLSD 0.10	0.100	NS	NS	*	1.5	0.038	*	*
Prob. > F	0.0590	-----	-----	0.0074	0.0046	0.0070	0.0045	0.0095
CV %	69.9	7.4	5.9	2.2	2.1	2.3	3.3	5.5

* significant but error mean square was too small (<0.000) to run PLSD's.

----- = MSTAT does not print out a Prob. > F number when very high

Second Cutting

Second cutting yield, percent DM, percent moisture, percent protein, percent ADF, percent NDF, percent TDN, percent DDM, percent DMI, and RFV are presented in Table 11.

There was no significant difference in yield between the top 5 entries ('Syn W' to FA-273). 'Tandem' was significantly lower yielding than all of the other entries. There were differences between varieties in percent dry matter and percent moisture. There were no quality differences between varieties for protein, ADF, NDF, TDN, DDM, DMI, and RFV. All of the entries made "premium" quality based on the USDA grass hay quality guidelines (table 4).

Table 11. Second Cutting total yield, percent DM, percent moisture, percent protein, percent ADF, percent NDF, percent TDN, percent DDM, percent DMI, and RFV for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (table sorted by yield)

Variety	Yield		Moist. (%)	Protein (%)	ADF (%)	NDF (%)	TDN (%)	DDM (%)	DMI (%)	RFV
	DM (t/ac)	DM (%)								
2 Syn W	2.69	24.3	75.7	13.7	32.8	52.2	58.6	63.3	2.30	113
3 Mozark	2.62	25.6	74.4	13.6	35.0	55.8	56.1	61.6	2.16	103
1 Forager	2.61	26.6	73.5	14.5	34.2	54.6	57.0	62.3	2.20	107
7 Johnstone	2.52	23.9	76.1	13.9	34.1	54.8	57.2	62.4	2.20	107
5 FA-293-86	2.45	24.4	75.7	14.0	32.5	51.9	59.0	63.6	2.32	114
8 Fawn	2.39	24.5	75.5	13.9	32.5	51.6	59.0	63.6	2.33	115
4 Martin	2.29	25.6	74.4	14.3	34.2	54.3	57.1	62.3	2.22	107
6 Tandem	1.21	24.0	76.0	13.4	33.7	52.7	57.7	62.7	2.28	111
Mean	2.35	24.9	75.1	13.9	33.6	53.5	57.7	62.7	2.25	109
PLSD 0.01	0.42	NS	NS	NS	NS	NS	NS	NS	NS	NS
PLSD 0.05	0.31	1.7	1.7	NS	NS	NS	NS	NS	NS	NS
PLSD 0.10	0.26	1.4	1.4	NS	NS	NS	NS	NS	NS	NS
Prob. > F	0.0000	0.0472	0.0472	-----	0.2759	0.2782	0.2718	0.2754	0.2368	0.2350
CV %	8.9	4.8	1.6	7.0	4.7	5.0	3.2	2.0	4.7	6.4

----- = MSTAT does not print out a Prob. > F number when very high

Second cutting N use efficiency, extra N uptake (greater than fertilizer applied), pounds of uptake N to produce ton DM, 1 pound of uptake N produces pounds of DM, pounds of fertilizer N produces one ton of DM, 1 pound of fertilizer N produces pounds of DM, protein yield, TDN yield, and DDM yield are presented in Table 12.

There were significant differences between the entries for N use efficiency, and extra N uptake, though there are no differences between the top 5 varieties for N use efficiency and extra N uptake. There was a large difference in N use efficiency range of 134.8 percent (Forager) to a low of 57.6 percent (Tandem). Tandem (bluegrass) was significantly lower in N use Efficiency and extra N uptake compared to the other entries. There were differences between varieties for ADF yield, TDN yield, and DDM yield; ‘Tandem’ was significantly lower than the rest of the entries. Tandem produced only about half of the DM per pound of fertilizer N applied compared to the other entries. Bluegrass varieties have much lower yield potential in the summer. Fawn and Martin were also less efficient in production of DM for each pound of fertilizer N applied compared to the ‘Syn W’.

Table 12. Second cutting N use efficiency, extra N uptake (greater than fertilizer applied), pounds of uptake N to produce ton DM, 1 pound of uptake N produces pounds of DM, pounds of fertilizer N produces one ton of DM, 1 pound of fertilizer N produces pounds of DM, protein yield, TDN yield, and DDM yield for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (Table sorted by N use efficiency.)

Entry # / Variety	N Use Eff. N (%)	Extra N Uptake (lb/ac)	Lb of Uptake N = ton of DM	1 lb of Uptake N = lb of DM	Lb of Fert N = ton of DM	1 lb of Fert N = lb of DM	Protein Yield (lb/ac)	ADF Yield (lb/ac)	TDN Yield (lb/ac)	DDM Yield (lb/ac)
1 Forager	134.8	31.3	46.3	43.3	34.8	58.1	758	3442	2983	3256
2 Syn W	130.9	27.8	43.9	45.8	33.9	59.7	736	3606	3145	3400
3 Mozark	125.7	23.2	43.3	46.3	34.6	58.2	707	3393	2926	3218
7 Johnstone	124.7	22.2	44.5	45.1	36.2	56.0	701	3228	2888	3147
5 FA-273	121.6	19.4	44.6	45.0	37.2	54.5	684	3303	2884	3112
8 Fawn	118.7	16.8	44.5	45.6	37.8	53.2	668	3234	2826	3046
4 Martin	116.1	14.5	45.6	44.0	39.3	51.0	653	3018	2615	2855
6 Tandem	57.6	-38.2	42.7	47.1	76.4	26.8	324	1601	1391	1513
Mean	116.2	14.6	44.4	45.3	41.3	52.2	654	3115	2707	2943
PLSD 0.01	23.8	21.4	NS	NS	11.4	9.3	134	576	512	538
PLSD 0.05	17.5	15.7	NS	NS	8.4	6.8	98	423	376	395
PLSD 0.10	14.5	13.0	NS	NS	6.9	5.7	81	350	311	327
Prob. > F	0.0000	0.0000	-----	-----	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CV %	10.2	73.2	7.0	7.0	13.8	8.9	10.2	9.2	9.4	9.1

----- = MSTAT does not print out a Prob. > F number when very high

Second cutting percent N, N uptake, percent P, P uptake, percent Ca, Ca uptake, percent K, K uptake, percent Mg, and Mg uptake are presented in Table 13.

There were no significant differences for percentage N, percentage P, percentage K and percentage Mg. There were significant differences for N uptake, though there were no differences between the top 5 varieties (Forager to FA-273). ‘Tandem’ had significantly less N uptake than all of the other varieties. There were no differences between ‘Martin’, ranked 7th, and ‘Mozark’, ranked 3rd for N uptake. There were differences between varieties for P uptake, percent Ca, K uptake, and Mg uptake. ‘Mozark’ and ‘Johnstone’ had significantly lower percent calcium than the rest of the entries. ‘Tandem’ had significantly lower P, Ca, and K uptake than the rest of the entries.

Table 13. Second cutting percent N, N uptake, percent P, P uptake, percent Ca, Ca uptake, percent K, percent Mg, and Mg uptake for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (Table sorted by N uptake.)

Variety	N (%)	N Uptake (lb/ac)	P (%)	P Uptake (lb/ac)	Ca (%)	Ca Uptake (lb/ac)	K (%)	K Uptake (lb/ac)	Mg (%)	Mg Uptake (lb/ac)
1 Forager	2.32	121.3	0.297	15.7	0.357	16.9	3.83	200.8	0.165	8.7
2 Syn W	2.19	117.8	0.290	15.6	0.397	19.3	3.94	212.1	0.165	8.9
3 Mozark	2.18	113.2	0.303	15.8	0.315	15.0	3.95	206.4	0.150	7.9
7 Johnstone	2.22	112.2	0.292	14.8	0.318	14.8	3.99	200.8	0.158	8.0
5 FA-293-86	2.24	109.4	0.300	14.8	0.390	17.3	4.00	196.5	0.160	7.9
8 Fawn	2.22	106.8	0.278	13.3	0.390	17.0	3.93	188.1	0.152	7.3
4 Martin	2.29	104.5	0.293	13.4	0.365	15.2	3.96	181.3	0.168	7.7
6 Tandem	2.14	51.8	0.307	7.4	0.390	8.5	3.91	94.8	0.155	3.8
Mean	2.22	104.6	0.295	13.8	0.365	15.5	3.94	185.1	0.159	7.5
PLSD 0.01	NS	21.4	NS	3.0	0.063	3.9	NS	38.3	NS	1.8
PLSD 0.05	NS	15.7	NS	2.2	0.047	2.9	NS	28.1	NS	1.3
PLSD 0.10	NS	13.0	NS	1.8	0.038	2.4	NS	23.3	NS	1.1
Prob. > F	-----	0.0000	-----	0.0000	0.0106	0.0000	-----	0.0000	0.3863	0.0000
CV %	7.0	10.2	6.2	10.8	9.6	12.6	4.9	10.3	7.6	12.0

----- = MSTAT does not print out a Prob. > F number when very high

Second cutting ADP, percent AV protein, percent D protein, NEL, ENE, ME, NEM, and NEG are presented in Table 14.

There were no differences between the varieties for any of these quality variables.

Table 14. Second cutting ADP, percent AV protein, percent D protein, NEL, ENE, ME, NEM, and NEG for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (Table sorted by ENE)

Variety	ADP	AV Protein (%)	D Protein (%)	NEL (mcal/lb)	ENE (mcal/lb)	ME (mcal/lb)	NEM (mcal/lb)	NEG (mcal/lb)
5 FA-293-86	0.220	15.8	10.6	0.683	56.4	0.968	0.580	0.320
8 Fawn	0.213	15.8	10.6	0.683	56.4	0.968	0.577	0.322
2 Syn W	0.235	15.5	10.5	0.678	56.0	0.963	0.575	0.315
6 Tandem	0.330	15.0	10.1	0.668	55.2	0.945	0.560	0.302
7 Johnstone	0.350	15.6	10.5	0.663	54.8	0.940	0.550	0.298
1 Forager	0.415	16.1	10.8	0.663	54.6	0.937	0.550	0.293
4 Martin	0.370	15.9	10.7	0.663	54.6	0.937	0.550	0.292
3 Mozark	0.400	15.1	10.1	0.650	53.7	0.922	0.532	0.280
Mean	0.317	15.6	10.5	0.668	55.2	0.947	0.559	0.303
PLSD 0.01	NS	NS	NS	NS	NS	NS	NS	NS
PLSD 0.05	NS	NS	NS	NS	NS	NS	NS	NS
PLSD 0.10	NS	NS	NS	NS	NS	NS	NS	NS
Prob. > F	0.1769	-----	-----	0.2787	0.2570	0.3184	0.2548	0.2811
CV %	40.6	7.8	7.0	3.0	2.9	3.1	5.1	8.6

----- = MSTAT does not print out a Prob. > F number when very high

Third cutting yield, percent DM, percent moisture, percent protein, percent ADF, percent NDF, percent TDN, percent DDM, percent DMI, and RFV are presented in Table 15.

‘Tandem’ was significantly lower yielding than all other entries; there were no differences between the other entries. There were no differences for moisture or dry matter. Five of the 8 entries had the same percent protein, statistically; while ‘FA-273’, ‘Syn W’, and ‘Martin’ had somewhat significantly lower percent protein compared to the other entries. All of the entries made “premium” quality class based on the USDA grass hay quality guidelines (table 4). All of the entries have equal digestibility; there were no differences between varieties for ADF, TDN, DDM, DMI, and RFV.

Table 15. Third Cutting yield, percent DM, percent moisture, percent protein, percent ADF, percent NDF, percent TDN, percent DDM, percent DMI, and RFV for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (Table sorted by yield)

Entry # / Variety	Yield DM (t/ac)	DM (%)	Moist. (%)	Protein (%)	ADF (%)	NDF (%)	TDN (%)	DDM (%)	DMI (%)	RFV
1 Forager	1.85	32.4	67.6	14.7	27.4	44.0	64.9	67.6	2.73	143
5 FA-273	1.82	32.6	67.4	13.2	28.8	45.8	63.2	66.5	2.62	135
2 Syn W	1.79	33.0	67.0	13.4	27.4	43.5	64.9	67.6	2.76	145
4 Martin	1.76	34.1	65.9	13.3	27.8	44.1	64.4	67.2	2.73	142
7 Johnstone	1.75	31.9	68.1	14.5	27.6	44.1	64.6	67.4	2.73	142
3 Mozark	1.73	32.0	68.0	14.2	27.6	44.5	64.6	67.4	2.70	141
8 Fawn	1.69	32.2	67.8	14.0	27.7	43.9	64.6	67.4	2.74	143
6 Tandem	1.14	33.3	66.7	14.5	28.2	43.5	64.0	66.9	2.77	143
Mean	1.69	32.7	67.3	14.0	27.8	44.2	64.4	67.2	2.72	142
PLSD 0.01	0.43	NS	NS	NS	NS	NS	NS	NS	NS	NS
PLSD 0.05	0.32	NS	NS	NS	NS	NS	NS	NS	NS	NS
PLSD 0.10	0.26	NS	NS	1.0	NS	NS	NS	NS	NS	NS
Prob. > F	0.0033	-----	-----	0.0839	0.3742	0.1296	0.3286	0.3384	0.1442	0.2509
CV %	12.7	5.4	2.6	6.1	3.3	2.5	1.6	1.0	2.5	3.5

----- = MSTAT does not print out a Prob. > F number when very high

Third cutting N use efficiency, extra N uptake (greater than fertilizer applied), pounds of uptake N to produce ton DM, 1 pound of uptake N produces pounds of DM, pounds of fertilizer N produces one ton of DM, 1 pound of fertilizer N produces pounds of DM, protein yield, TDN yield, and DDM yield are presented in Table 16.

Tandem had significantly lower N use efficiency, lower extra N uptake, than the other entries. There were no differences between the other 7 tall fescue varieties. ‘FA-273’, ‘Syn W’, and ‘Martin’ had significantly lower pounds of uptake N to produce a ton of dry matter. ‘Johnstone’, ‘Mozark’ and ‘Tandem’ had lower pounds of DM produced by a pound of uptake N, than the rest of the varieties. It took more lb of fertilizer N to produce a ton of DM for Tandem and produced less DM from a pound of Fertilizer N than the other entries, because of the lower yield potential. All of the varieties were over fertilized, though Tandem was significantly more so, than the other entries. ‘Tandem’ had significantly lower protein yield, ADF yield, TDN yield, and DDM yield, than the other 7 varieties, but there were no differences between the other varieties.

Table 16. Third cutting N use efficiency, extra N uptake (greater than fertilizer applied), pounds of uptake N to produce ton DM, 1 pound of uptake N produces pounds of DM, pounds of fertilizer N produces one ton of DM, 1 pound of fertilizer N produces pounds of DM, protein yield, TDN yield, and DDM yield for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (Table sorted by N use efficiency.)

Entry # / Variety	N Use Eff > Fert N (%)	Extra N Uptake (lb/ac)	lb of Uptake N = ton of DM	1 lb of Uptake N = lb of DM	lb. of Fert N = ton of DM	1 lb of Fert N = lb of DM	Protein Yield (lb/ac)	ADF Yield (lb/ac)	TDN Yield (lb/ac)	DDM Yield (lb/ac)
1 Forager	97.6	-2.2	47.1	42.6	49.2	41.2	549	2,689	2,402	2,502
7 Johnstone	90.2	-8.9	46.1	43.5	53.6	38.8	507	2,531	2,259	2,357
3 Mozark	87.3	-11.5	45.5	44.2	52.2	38.5	491	2,508	2,238	2,335
5 FA-273	85.2	-13.3	42.1	47.7	49.9	40.4	479	2,589	2,299	2,417
2 Syn W	85.1	-13.5	42.8	46.9	50.7	39.7	479	2,594	2,317	2,414
8 Fawn	84.1	-14.3	44.8	44.8	54.2	37.5	473	2,438	2,175	2,270
4 Martin	82.7	-15.6	42.4	47.4	51.4	39.0	465	2,531	2,256	2,357
6 Tandem	58.3	-37.6	46.5	43.3	81.3	25.3	328	1,634	1,455	1,523
Mean	83.8	-14.6	44.6	45.0	55.3	37.5	471	2,439	2,175	2,272
PLSD 0.01	NS	NS	NS	NS	17.6	9.6	NS	616	549	574
PLSD 0.05	18.4	16.6	NS	NS	12.9	7.0	104	452	403	421
PLSD 0.10	15.2	13.7	3.3	3.3	10.7	5.8	86	374	333	349
Prob. > F	0.0163	0.0163	0.0849	0.0777	0.0007	0.0031	0.0163	0.0026	0.0025	0.0027
CV %	14.9	-77.2	6.1	6.0	15.9	12.7	14.9	12.6	12.6	12.6

Third cutting percent N, N uptake, percent P, P uptake, percent Ca, Ca uptake, percent K, K uptake, percent Mg, and Mg uptake are presented in Table 17.

Percent N was significantly different between varieties, which of course is the same as percent protein. ‘Tandem’ had significantly less N uptake, P uptake, Ca Uptake, percent K, K uptake, Mg uptake, and greater percent Mg than the other entries; there were no differences between the other tall fescue entries, with the exception of a minor, yet significant difference for Ca uptake. There were differences between varieties for percentage calcium predicted.

Table 17. Third cutting percent N, N uptake, percent P, P uptake, percent Ca, Ca uptake, percent K, percent Mg, and Mg uptake for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (Table sorted by N uptake)

Entry # / Variety	N (%)	N Uptake (lb/ac)	P (%)	P Uptake (lb/ac)	Ca (%)	Ca Uptake (lb/ac)	K (%)	K Uptake (lb/ac)	Mg (%)	Mg Uptake (lb/ac)
1 Forager	2.35	87.8	0.303	11.3	0.633	21.4	3.43	127.3	0.157	5.9
7 Johnstone	2.32	81.1	0.308	10.8	0.595	18.9	3.44	120.5	0.155	5.5
3 Mozark	2.27	78.5	0.315	10.9	0.608	19.1	3.50	121.2	0.155	5.4
5 FA-273	2.11	76.7	0.298	10.9	0.558	18.5	3.37	123.1	0.150	5.5
2 Syn W	2.14	76.6	0.292	10.5	0.625	20.3	3.29	117.5	0.150	5.3
8 Fawn	2.24	75.7	0.292	9.9	0.612	18.7	3.51	118.5	0.155	5.2
4 Martin	2.13	74.4	0.295	10.4	0.627	20.0	3.31	116.1	0.155	5.5
6 Tandem	2.32	52.5	0.307	7.0	0.665	13.8	3.04	69.9	0.168	3.8
Mean	2.24	75.4	0.301	10.2	0.615	18.8	3.36	114.3	0.156	5.2
PLSD 0.01	NS	NS	NS	NS	0.063	4.6	0.28	32.3	NS	NS
PLSD 0.05	NS	16.6	NS	2.3	0.047	3.4	0.20	23.7	NS	1.0
PLSD 0.10	0.16	13.7	NS	1.9	0.038	2.8	0.17	19.6	*	0.9
Prob. > F	0.0839	0.0163	0.3486	0.0230	0.0002	0.0080	0.0021	0.0016	0.0989	0.0204
CV %	6.1	14.9	5.0	15.3	3.8	12.3	4.1	14.1	4.9	13.5

* error mean square was too small (<0.000) to run PLSD's.

Third cutting ADP, percent AV protein, percent D protein, NEL, ENE, ME, NEM, and NEG are presented in Table 18.

There were no differences between the varieties for any of these quality variables with the exception for percent AV protein and percent D protein.

Table 18. Third cutting ADP, percent AV protein, percent D protein, NEL, ENE, ME, NEM, and NEG for the 1991 tall fescue variety trial planted in 1987 at the COARC, Powell Butte, OR. (sorted by ENE)

Variety / Line	ADP	AV Protein (%)	D Protein (%)	NEL (mcal/lb)	ENE (mcal/lb)	ME (mcal/lb)	NEM (mcal/lb)	NEG (mcal/lb)
1 Forager	0.092	17.0	11.3	0.745	61.6	1.065	0.668	0.402
2 Syn W	0.075	15.5	10.5	0.745	61.6	1.065	0.668	0.402
3 Mozark	0.065	16.4	11.0	0.740	61.4	1.063	0.665	0.397
7 Johnstone	0.100	16.6	11.1	0.743	61.4	1.062	0.665	0.395
8 Fawn	0.095	16.2	10.9	0.743	61.3	1.060	0.665	0.395
4 Martin	0.033	15.4	10.4	0.740	61.1	1.055	0.663	0.392
6 Tandem	0.198	16.5	11.1	0.735	60.8	1.050	0.652	0.390
5 FA-273	0.093	15.1	10.3	0.728	60.1	1.035	0.642	0.378
Mean	0.094	16.1	10.8	0.740	61.2	1.057	0.661	0.394
PLSD 0.01	NS	NS	NS	NS	NS	NS	NS	NS
PLSD 0.05	NS	NS	NS	NS	NS	NS	NS	NS
PLSD 0.10	NS	1.1	0.6	NS	NS	NS	NS	NS
Prob. > F	0.2266	0.0875	0.0932	0.4477	0.3147	0.2990	0.2465	0.2975
CV %	83.0	5.8	4.9	1.6	1.5	1.7	2.2	3.6

Summary and Conclusions

A tall fescue variety trial was conducted during 1987-1992 at the Powell Butte research site of the Central Oregon Agricultural Research Center. This report provides yield and quality evaluation data and statistical analyses for the 8 tall fescue entries for the 1991 production season. Yield data for the entire trial have been previously reported in other publications. Stand longevity was good for all cultivars except Tandem. By the 4th year, Tandem had been fully replaced by volunteer bluegrass.

During the 1991 production year, there was a yield range of 0.88 ton/acre among the remaining 7 entries (after removal of Tandem). There were few significant differences among entries. Mozark was the top yielder (7.31 DM ton/acre) and Fawn was the lowest yielding cultivar (6.43 DM ton/acre), which was significantly different.

Quality analyses were performed by NIRS at the Klamath Experiment Station. This technique allows many quality parameters to be estimated simultaneously for use in ration formulation. No traditional chemistry analyses were performed. Significant differences among varieties for digestible yield and energy were found only for first cutting and totals. These differences followed the same ranking as for yield data. USDA grass hay quality guidelines placed all entries in the same classification; “good” for the first cutting and “premium” for cuttings 2 and 3.

On the basis of this 1 year analysis of yield and quality for this tall fescue variety trial, selection of varieties should be made primarily on the basis of yield potential. However, some consideration should be given to leaf smoothness and fineness (due to their affect on palatability and intake) and on protein and fiber measures (due to their affect on digestibility). Based on these considerations, it would be impossible to separate any of the top 3 yielding cultivars and top 5 cultivars for quality measures, since they were not significantly different (at $P = 0.05\%$ level). In fact, the lowest yielding cultivar yielded 87% of the top yielding cultivar and for quality evaluation, the lowest cultivar was 90.6% of the top cultivar.