



Grazing Preference of Tall Fescue as Affected by Leaf Softness and Endophyte Infection



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Introduction

- Some programs have bred for soft leaves in tall fescue – to improve palatability.
- In addition, there are increased number of non-infected/novel-endophyte types of tall fescue, but improved cattle preference has not documented.
- However, both soft-leaves and non-infected/novel endophytes may come at a cost to biotic/abiotic stress tolerance and yield.
- The objective was to document the effect of soft-leaves and endophytes on livestock preference of tall fescue.





Materials and Methods

PLANTS FOR THE WEST

- Plant materials: 40+ entries of tall fescue with orchardgrass, meadowbrome, and meadow fescue (Kentucky only) checks
 - Tall fescue entries included soft-leaved breeding lines and reported soft-leaved cultivars
 - Tall fescue entries included endophyte-free (EF), and novel (AR584 and AR542) and wild-type (WT) endophyte series (all in same grass genetic background)
- Locations: seeded at Logan, UT (2006), Lexington, KY (2007), Ardmore, OK (2007)
- Experimental design (follow Shewmaker et al. 1997):
 - 4 pastures separated by fence
 - RCB design with 2 or 3 reps of the seeded plots within each pasture
 - Pasture 1 is considered a conditioning pasture and not used in analysis
- Grazing:
 - Cattle allowed to graze 24 hours on pasture 1, then moved to pasture 2 through 4 sequentially for 24-h grazing period each
 - Grazed for two consecutive years; 4-grazing events/harvests in UT, 2-grazing events/harvests in KY, 1-grazing event/harvest in OK
 - Stocking rate adjusted to remove approximately 50% of forage in 24 hours

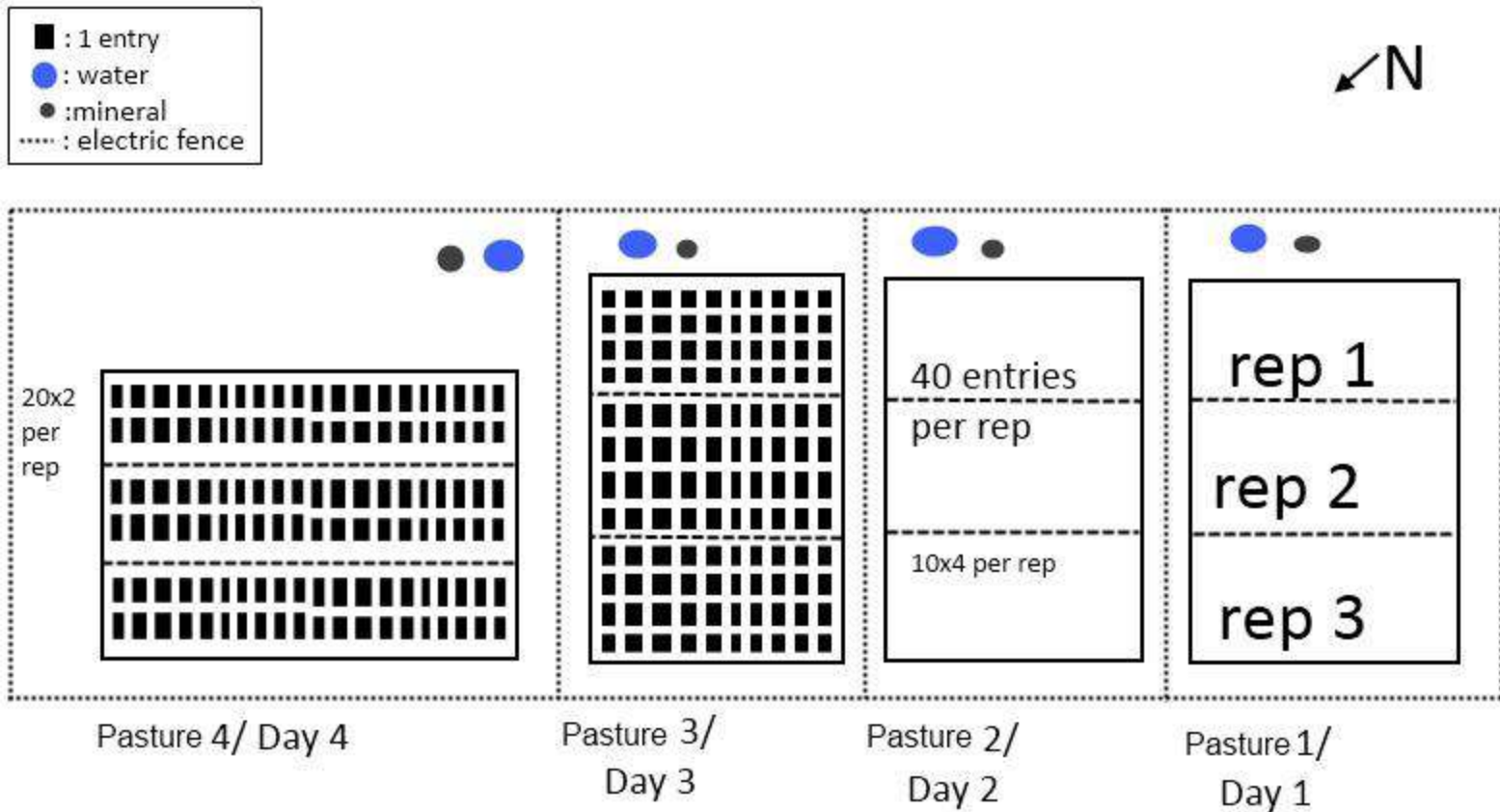


Materials and Methods Continued

- Data:
 - Pre-grazing forage yield = harvest one-half of seeded plot prior to grazing
 - Creates a visual “checker-board” pattern of plant materials within each pasture
 - Post-grazing forage residue = harvest the remaining forage of the other half of plot following grazing
 - Forage consumed = Pre-grazed forage – Post-grazed residue
 - Preference ratio =
 (forage of cultivar consumed/sum of all forage consumed) / (pre-grazing forage of cultivar/sum of all pre-grazing forage)
 - Utilization visual score, leaf softness (Utah only), forage nutritional quality (data not shown here)
 - For this presentation:
 - Forage data as the yearly total, Preference ratio as the yearly average – combined across years within the UT and KY location
 - No Oklahoma data shown



Materials and Methods



- A schematic representation of the area in Lexington, KY.



Materials and Methods





Materials and Methods





Results: Utah, Preference Ratio

Obs	ENTRY	Estimate	LSD, P=0.05
1	LatarOG	1.5107	A
2	CacheMB	1.3088	B
3	PDF_E-	1.1136	C
4	KYTF2	1.1012	CD
5	Jesup_MaxQ	1.0894	CDE
6	PDF_584	1.0843	CDEF
7	KY31_E-	1.0685	CDEFG
8	PDF_542	1.0576	CDEFGH
9	TF0203	1.0491	CDEFGH
10	97TF1_E+	1.0308	CDEFGH
11	TF0201	1.0205	CDEFGHI
12	Kentucky_31_E+	1.0132	CDEFGHIJ
13	Barianne	1.0066	CDEFGHIJ
14	KYFA9732	1.0014	CDEFGHIJK
15	TF0202	0.9965	CDEFGHIJK
16	Barolex	0.9907	CDEFGHIJK
17	PDF_HDMDC1_E+	0.9904	CDEFGHIJK
18	Jesup_E-	0.9885	CDEFGHIJK
19	Tuscannyll	0.9883	CDEFGHIJK
20	KYFA9821_584	0.9878	CDEFGHIJK
21	KYFA9304	0.9868	CDEFGHIJK
22	AGRFA_114	0.9865	CDEFGHIJK

23	Hoedown	0.9850	CDEFGHIJK
24	KYFA9821_542	0.9848	CDEFGHIJK
25	KY31_E+	0.9819	CDEFGHIJK
26	Kenhy	0.9810	CDEFGHIJK
27	Jesup_584	0.9751	CDEFGHIJK
28	AUTriumph	0.9735	CDEFGHIJK
29	KYFA9821_E-	0.9723	CDEFGHIJK
30	97TF1_E-	0.9691	CDEFGHIJK
31	KYFA9301_542	0.9665	CDEFGHIJK
32	PDF_HDMDC1_E-	0.9620	CDEFGHIJK
33	97TF1_542	0.9495	DEFGHIJK
34	97TF1_584	0.9396	EFGHIJK
35	Martin2	0.9387	EFGHIJK
36	KYFA9908	0.9353	EFGHIJK
37	Savory	0.9250	FGHIJK
38	Jesup_E+	0.9234	GHIJK
39	PDF_E+	0.9231	GHIJK
40	KYFA9301_584	0.8994	HIJK
41	TFsoft_HY_C3	0.8693	IJK
42	Seine	0.8610	IJK
43	KYFA9301_E-	0.8598	JK
44	Fawn	0.8445	K

12%
S.I.Trial
Average



Results: Kentucky, Preference Ratio

Obs	name	Estimate	LSD (P=0.05)
1	LatarOG	1.8088	A
2	KYFA9819MF	1.3536	B
3	BarturaMF	1.3422	BC
4	PDF_E+	1.2579	BCD
5	CacheMB	1.2433	BCDE
6	BarfestMF	1.1960	BCDEF
7	Barolex	1.1953	BCDEF
8	KY31_E+	1.1848	BCDEF
9	Jesup_MaxQ	1.1809	BCDEF
10	Bariane	1.1532	BCDEFG
11	KYFA0006	1.1324	BCDEFGH
12	PDF_542	1.1054	BCDEFGHIJ
13	TFsoft_HY_C3	1.0905	BCDEFGHI
14	KYFA9821_E-	1.0552	BCDEFGHIJK
15	KYFA9905	1.0492	BCDEFGHIJK
16	Seine	1.0489	BCDEFGHIJK
17	97TF1_E+	1.0254	BCDEFGHIJK
18	KY31_E-	1.0030	BCDEFGHIJK
19	KYFA9301_E-	1.0029	BCDEFGHIJK
20	KYFA9821_542	1.0011	BCDEFGHIJK

21	KYFA9304	0.9981	CDEFGHIJK
22	TuscanyII	0.9744	CDEFGHIJK
23	KYFA9611	0.9743	CDEFGHIJK
24	Fawn	0.9455	DEFGHIJK
25	KYFA9821_584	0.9422	DEFGHIJK
26	KYTF2	0.9408	DEFGHIJK
27	KYFA9913	0.9352	DEFGHIJK
28	Kenhy	0.9089	DEFGHIJK
29	97TF1_584	0.8944	DEFGHIJK
30	KYFP9801	0.8713	EFGHIJK
31	AUTriumph	0.8689	EFGHIJK
32	PDF_584	0.8165	FGHIJK
33	KYFA9301_584	0.7994	GHIJK
34	Stockman	0.7972	GHIJK
35	97TF1_E-	0.7902	HIJK
36	KYFA9908	0.7638	IJK
37	97TF1_542	0.7550	IJK
38	KYFA9732	0.7377	IJK
39	PDF_E-	0.7252	K
40	KYFA9301_542	0.7234	JK

12%
S.I.Trial
Average



Results: Utah, Preference Ratio and Leaf-softness

- Correlation between leaf-softness and preference statistically significant, but not biologically significant.

Pearson Correlation Coefficients Prob > r under H0: Rho=0 Number of Observations						
	TOTDMY	TOTCONS	TOTPERCONS	UTILAVE	PREFRATIO	LSOFT
TOTDMY	1.00000 528	0.56551 <.0001 527	-0.01104 0.8005 527	-0.20989 <.0001 528	-0.00981 0.8222 527	0.03511 0.4208 528
TOTCONS	0.56551 <.0001 527	1.00000 527	0.80681 <.0001 527	0.26888 <.0001 527	0.80759 <.0001 527	0.19090 <.0001 527
TOTPERCONS	-0.01104 0.8005 527	0.80681 <.0001 527	1.00000 527	0.48541 <.0001 527	0.99972 <.0001 527	0.22642 <.0001 527
UTILAVE	-0.20989 <.0001 528	0.26888 <.0001 527	0.48541 <.0001 527	1.00000 528	0.48535 <.0001 527	0.30978 <.0001 528
PREFRATIO	-0.00981 0.8222 527	0.80759 <.0001 527	0.99972 <.0001 527	0.48535 <.0001 527	1.00000 527	0.22427 <.0001 527
LSOFT	0.03511 0.4208 528	0.19090 <.0001 527	0.22642 <.0001 527	0.30978 <.0001 528	0.22427 <.0001 527	1.00000 528



Results: Utah, Preference Ratio and Endophyte Series

*TFPREF - UTAH- ENDO SERIES (COMPLETE)
PREFRATIO*

Effect=ENDOSTATUS Method=LSD(P<.05) Set=1

Obs	ENDOSTATUS	YR	Estimate	Standard Error	Letter Group
1	EF	-	1.0191	0.04166	A
2	542	-	1.0035	0.04740	A
3	584	-	0.9997	0.04124	A
4	WT	-	0.9591	0.04124	A

- Endophyte did not affect preference at Utah location.



Results: Kentucky, Preference Ratio and Endophyte series

TF Preference - Kentucky DATA - ENDOSERIES - YRS REPEATED
prefratio

Effect=ENDOSTATUS Method=LSD(P<.05) Set=1

Obs	ENDOSTATUS	yr	Estimate	Standard Error	Letter Group
1	WT	–	1.1524	0.1250	A
2	AR542	–	0.8768	0.1204	AB
3	AR584	–	0.8698	0.1211	AB
4	EF	–	0.7577	0.1171	B

- WT endophyte did increase preference at Kentucky.
- Probably due to infected-entries having better drought tolerance (e.g. higher survivorship, moisture, nutrition, etc) during the 2nd grazing event/harvest.



Conclusions

Grazing Preference of Tall Fescue - Leaf Softness and Endophyte Infection

1. Leaf softness did not affect grazing preference.
2. Endophyte infection might affect grazing preference when biotic/abiotic stress causes plant death.
3. Overall, there is very little variation in tall fescue for grazing preference.
4. Therefore, tall fescue breeding programs should focus on forage yield and nutritional quality.





However ... Grazing Trials are not always precise?





However ... Can we improve forage yield in tall fescue?

PLANTS FOR THE WEST

TF PREFERENCES – Utah - RCB - YR REPEATED, ALL ENTRIES
TOTDMY (kg/ha)

Effect=ENTRY Method=LSD(P<.05) Set=1

Obs	ENTRY	YR	Estimate	Standard Error	Letter Group
1	Fawn	_	22067	796.83	A
2	AUTriumph	_	21830	796.83	AB
3	Barianne	_	20925	796.83	ABC
4	Jesup_E+	_	20851	796.83	ABCD
5	KYFA9304	_	20520	796.83	ABCDE
6	Jesup_MaxQ	_	20390	796.83	ABCDEF
7	KY31_E-	_	20379	796.83	ABCDEF
8	KYFA9301_E-	_	20361	796.83	ABCDEF
9	PDF_E+	_	20199	796.83	ABCDEFG
10	PDF_HDMDC1_E-	_	20139	796.83	ABCDEFGH
11	TuscannyII	_	20119	796.83	ABCDEFGH
12	TF0203	_	20029	796.83	ABCDEFGHI
13	KYFA9821_584	_	20016	796.83	ABCDEFGHI
14	Kentucky_31_E+	_	19904	796.83	BCDEFGHI
15	PDF_584	_	19864	796.83	BCDEFGHI
16	Savory	_	19676	796.83	BCDEFGHI
17	PDF_HDMDC1_E+	_	19639	796.83	CDEFGHI
18	PDF_542	_	19628	796.83	CDEFGHIJ
19	Barolex	_	19568	796.83	CDEFGHIJ
20	PDF_E-	_	19514	796.83	CDEFGHIJ
21	TF0202	_	19470	796.83	CDEFGHIJ

Trial Average



22	Jesup_584	_	19447	796.83	CDEFGHIJ
23	KYFA9732	_	19436	796.83	CDEFGHIJ
24	Seine	_	19400	796.83	CDEFGHIJ
25	97TF1_584	_	19315	796.83	CDEFGHIJ
26	KYFA9908	_	19213	796.83	CDEFGHIJ
27	TF0201	_	19151	796.83	CDEFGHIJ
28	Kenhy	_	19116	796.83	CDEFGHIJ
29	KYFA9821_E-	_	19104	796.83	CDEFGHIJ
30	KY31_E+	_	19066	796.83	CDEFGHIJ
31	KYFA9821_542	_	18988	796.83	CDEFGHIJ
32	AGRFA_114	_	18930	796.83	CDEFGHIJ
33	TFsoft_HY_C3	_	18922	796.83	CDEFGHIJ
34	Jesup_E-	_	18921	796.83	CDEFGHIJ
35	97TF1_E-	_	18695	796.83	DEFGHIJ
36	97TF1_542	_	18637	796.83	EFGHIJ
37	KYFA9301_542	_	18534	796.83	EFGHIJ
38	Hoedown	_	18392	796.83	EFGHIJ
39	KYTF2	_	18365	796.83	EFGHIJ
40	Martin2	_	18277	796.83	FGHIJ
41	KYFA9301_584	_	18147	796.83	GHIJ
42	CacheMB	_	17995	796.83	HIJ
43	97TF1_E+	_	17934	796.83	IJ
44	LatarOG	_	17480	796.83	J



However ... Can we improve forage yield in tall fescue?

TF Preference - Kentucky DATA - YRS REPEATED
Pregrazing - TOTDMY (kg/ha)

Effect=name Method=LSD(P<.05) Set=1

Obs	name	yr	Estimate	Standard Error	Letter Group
1	CacheMB	_	588.90	42.7291	A
2	LatarOG	_	577.51	41.0809	AB
3	TFsoft_HY_C3	_	568.05	39.7540	ABC
4	Seine	_	559.29	39.7540	ABCD
5	Fawn	_	551.72	39.7540	ABCDE
6	KYFA9821_E-	_	550.74	39.7540	ABCDE
7	KYFA9908	_	550.31	41.0809	ABCDEF
8	Stockman	_	547.64	39.7540	ABCDEF
9	TuscanyII	_	544.33	41.0809	ABCDEF
10	AUTriumph	_	543.99	39.7540	ABCDEF
11	KYFA9905	_	537.58	39.7540	ABCDEF
12	KYFP9801	_	536.53	39.7540	ABCDEF
13	PDF_584	_	528.36	42.7272	ABCDEFG
14	KYFA9611	_	527.93	41.0809	ABCDEFG
15	97TF1_E-	_	527.29	39.7540	ABCDEFG
16	Jesup_MaxQ	_	523.78	39.7540	ABCDEFG
17	PDF_542	_	522.71	42.7291	ABCDEFG
18	Kenhy	_	522.55	39.7540	ABCDEFG
19	PDF_E-	_	521.17	39.7540	ABCDEFG
20	KYFA9821_542	_	520.34	41.0793	ABCDEFG
21	97TF1_584	_	520.00	39.7540	ABCDEFG

Trial
Average



No Significant difference

22	KY31_E-	_	516.59	39.7540	ABCDEFG
23	Barolex	_	516.50	39.7540	ABCDEFG
24	97TF1_E+	_	513.29	41.2359	ABCDEFG
25	KYFA9301_584	_	509.34	39.7540	ABCDEFG
26	KYFA9301_542	_	507.34	41.0818	ABCDEFG
27	97TF1_542	_	506.69	39.7540	ABCDEFG
28	Bartura	_	506.63	42.7249	ABCDEFG
29	KY31_E+	_	502.55	39.7540	BCDEFG
30	KYFA9301_E-	_	502.03	39.7540	BCDEFG
31	KYFA9913	_	501.08	39.7540	BCDEFG
32	Bariane	_	496.23	41.0818	BCDEFG
33	KYFA9819	_	495.12	39.7540	BCDEFG
34	KYFA9304	_	492.77	39.7540	CDEFG
35	PDF_E+	_	492.35	42.7249	BCDEFG
36	KYFA9732	_	489.25	41.0827	CDEFG
37	Barfest	_	479.72	39.7540	DEFG
38	KYFA9821_584	_	473.18	39.8793	EFG
39	KYTF2	_	466.87	41.0827	FG
40	KYFA0006	_	452.71	39.7540	G



Grazing Preference of Tall Fescue - Leaf Softness and Endophyte Infection

Thank you for your time. Questions?

