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PERFORMANCE OF TALL FESCUE VARIETIES

R. C. Buckner, P. B. Burrus, II, Nelson Gay, and Garry Lacefield

The objective of the tall fescue breeding program is the development of varieties characterized by superior nutritive value (including reduced contents of perloine and loline alkaloids and the fungal endophyte, Epichloe typhina), palatability, disease resistance, and adaptation through the utilization of intergeneric and interspecific hybrid derivatives of ryegrass and tall fescue species. Varieties previously released from the breeding program were Kentucky 31, Kenwell, and Kenhy. Johnstone tall fescue, developed cooperatively by the Kentucky Agricultural Experiment Station and USDA-ARS, was released March 1, 1982, as a new variety. Johnstone is characterized as having low levels of perloine alkaloid and the fungal endophyte, Epichloe typhina, and improved forage quality during summer. It is expected that seed of Johnstone will be available commercially during 1984 or 1985.

Tall fescue varieties are evaluated in pure stands seeded at the rate of 15 lbs/acre. The varieties are evaluated under two managements widely used in Kentucky as follows: (1) hay and pasture; and (2) seed and stockpiled forage.

Yields

Forage - While yield is an important characteristic of tall fescue, it is not considered to be a critical problem of the species. In the evaluation of varieties, the Kentucky 31 variety is used as the standard check as it is the major variety used in Kentucky and the central United States. New varieties are considered satisfactory for yield and adaptation when equal in performance to Kentucky 31.

Yields are determined by taking a hay harvest when the grass is in the boot stage of maturity. Aftermath growth is harvested each 4 to 6 weeks during the remainder of the growing season to simulate pasture conditions. Hay and pasture management includes fertilization with ammonium nitrate at the rate of 100 lb/acre in March, June and September. Forage dry matter yields are presented in Table 1.

Seed

Seed production management involves harvesting the varieties for seed in June, removing the forage in August, and permitting growth to accumulate until frost to simulate stockpiling forage for winter use. Grass in this management is fertilized with 200 lb/acre ammonium nitrate approximately September 1 and again December 1. Yields of clean seed/acre are presented in Table 2.

Forage Quality

Tall fescue is a well adapted, widely used pasture species occupying six million acres in Kentucky and 25-35 million acres in the South Central United States. Thus, it is an extremely well adapted cool-season species for this region. However, animal response from grazing tall fescue during summer is erratic, because of forage quality problems. Forage quality is directly related to performance of grazing animals. Criteria used to determine forage quality are digestibility, acceptability and intake.

The Kenhy variety was the first new tall fescue variety to be developed utilizing ryegrass-tall fescue. Kenhy is characterized by superior forage quality, disease resistance and yield and wide adaptation (Table 3).

Animal Performance

The ability of tall fescue to provide the nutrient requirements of animals for specific levels of performance is perhaps the best measure of forage quality. Many animal performance studies on tall fescue pastures, in pure and mixed seedings and in fescue-legume mixtures, have shown performance to be superior in some tests and inferior in others, when compared with other grasses.

Since the release of Kenhy tall fescue, anti-forage quality components have been found that decrease animal performance during periods of high summer temperatures.

The occurrence of poor performance of animals grazing tall fescue corresponds in time (July, Aug., and Sept.) to the greater accumulation of the perloine; and N-acetyl and N-formyl loline alkaloids; and the fungal endophyte, Epichloe typhina. Perloine inhibits digestibility in ruminants and the loline alkaloids and/or E. typhina reduce forage intake. Kenhy has perloine levels comparable to that of Kentucky 31. Seed may be obtained of Kenhy that is certified as having low levels of E. typhina and consequently, low levels of loline alkaloids.

A comparison of the performance of cattle grazing pure stands of Kentucky 31 and Kenhy tall fescue is presented in Tables 4 thru 6. The effect of the fungal endophyte, E. typhina, on animal performance is reflected in data presented in Table 6. This is the only test in which it was known whether or not the grass was infected with the fungus.

Table 1. Forage Dry Matter Yields of Tall Fescue Varieties Evaluated in Tests at Lexington During 1976-82.

Variety	Forage Dry Matter				
	Ton/A				
	1976-78	1979-80	1980-82	1981-82	1982
Kenhy	2.9	3.5	2.4	2.2	1.8
Ky. 31	2.6	3.4	2.4	2.2	1.7
MO. 96	2.5	3.5	2.1	2.4	1.7
K 5-27	-	3.3	-	-	-
K 5-30	-	3.5	-	-	-
Forager	-	-	-	2.2	1.6

Five separate forage dry matter yields tests are summarized above. In the first column, the 1976-78 figures give the year of harvest of a trial seeded in the fall of 1975. The other tests were seeded in subsequent years.

Table 2. Clean Seed Yields of Tall Fescue Varieties Evaluated in Tests at Lexington During 1976-82.

Variety	Seed Yield				
	Pounds/A				
	1976-78	1979-80	1980-82	1981-82	1982
Kenhy	318	552	369	312	445
Ky. 31	315	509	399	418	391
MO. 96	165	347	234	218	332
K 5-27	-	376	-	-	-
K 5-30	-	447	-	-	-
Forager	-	-	-	311	245

Five separate forage dry matter yields tests are summarized above. In the first column, the 1976-78 figures give the year of harvest of a trial seeded in the fall of 1975. The other tests were seeded in subsequent years.

Table 3.—Agronomic and Forage Quality Characteristics of Kenhy and Kentucky 31 Tall Fescue at Lexington (1970-75).

Characteristics	Variety	
	Kenhy	Kentucky 31
Leaf roll during drought (%)	53	65
Color ¹	1.2	4.8
Digestibility	66.4	63.5
Lignin(% of dry matter)	1.9	2.2
Palatability ² grazed by sheep (%)	67.3	17.3
Palatability ²	4.0	8.3

¹1 = green; 9 = brown. Figures are means of ratings during various seasons of the year.

²Free-choice cattle grazing trials: 1 = best grazed, 9 = ungrazed.

Table 4—Productivity of Cattle on Kenhy and Kentucky 31 Tall Fescue Varieties.

Location*	Years	Grazing Period		Average Daily Gain Pounds	
		Total Days	Seasons	Kenhy	Kentucky 31
Georgia	1974-75	212	Winter	0.8	0.6
Oklahoma	1974-75	134	Winter	0.3	-0.1
Missouri	1974-75-76	336	Summer	1.3	0.9
Illinois	1975	189	Summer	0.7	0.7
Virginia	1972-73-74	—	Summer	0.8	1.0
Arkansas	1980-81	266	Summer	1.1	0.8

*Data provided by Dr. R.S. Lowry, Dr. H.G. Williams, Dr. A.G. Matches, Dr. C.J. Kaiser, Dr. H.T. Bryant, and Dr. J.W. Spears, from the respective locations.

Table 5—Average Daily Gains of Steers at Princeton During 1977.*

Variety	Average Daily Gain Pounds			Average
	Apr. 1-June 14	July 7-Aug. 1	Sept. 26-Nov. 23	
Ky. 31	1.9	0.9	1.1	1.3
Kenhy	1.7	1.3	1.8	1.6

* Data provided by S. Oshidari, N. Gay, J. A. Boling and W. Muir. University of Kentucky Agric. Exp. Sta. Beef Cattle Research Report. Progress Rept. 234. 1978.

Table 6. Performance of yearling steers grazing Kentucky 31 and yearling heifers grazing Kenhy tall fescue at Western Kentucky Agricultural Experiment Station, Princeton, Ky.¹

Kentucky 31 ²			
Year	No. cattle	Avg. beginning wt.	ADG
1981	10	565	0.69
1982	8	629	<u>0.99</u>
		Two year average	0.82
Kenhy ³			
1981	16	595	1.40
1982	16	550	<u>1.34</u>
		Two year average	1.37

¹Cattle were on nitrogen fertilized grass throughout the grazing season.

²Kentucky 31 heavily infected with E. typhina.

³Kenhy has low-level infection of E. typhina.