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1987 Update of Agronomic Performance of Tall Fescue Varieties

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1987 UPDATE OF AGRONOMIC PERFORMANCE OF TALL FESCUE VARIETIES

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Tall fescue (Festuca arundinacea, Schreb.) is a well adapted, widely used pasture species occupying approximately 5.5 million acres in Kentucky and 35 million acres in the south central United States.

Commercial tall fescue varieties have been developed from plant materials of either northern European or Mediterranean origin. Varieties developed at the University of Kentucky — Kentucky 31, Kenmont, Kenwell, Kenhy, and Johnstone — trace to plant materials of northern European origin. The Kentucky varieties have later maturity dates and have greater resistance to certain foliar diseases during summer than varieties that are of Mediterranean origin (i.e., Alta, Fawn, Goar, and AU-Triumph) when grown under environmental conditions and management regimes prevailing in Kentucky. Varieties of Mediterranean origin have excellent early spring and late fall growth when foliar diseases are not a problem. Foliar diseases, however, may cause them to be of inferior quality and to make poor growth during the summer. Generally, in Kentucky, tall fescue is used for hay and for pasture in spring, summer and fall. Agronomic research data indicate that varieties of northern European origin are superior to varieties of Mediterranean origin for forage purposes in Kentucky.

Tall fescue varieties were evaluated in pure stands that were seeded in the late summer-early fall at 15-20 lbs/acre and irrigated to facilitate stand establishment. The varieties were evaluated under the following two management systems: (1) hay and pasture; and (2) fall-winter stockpiled forage in association with seed production.

FORAGE YIELD

While yield is an important characteristic of tall fescue it is not considered to be a critical problem of the species. In evaluation tests the Kentucky 31 is used as the standard check as it is the major variety used in

Kentucky and the central United States. New varieties are considered to be satisfactory for yield and adaptation when they equal or exceed the performance of Kentucky 31.

Hay yields were determined when the grass was in the boot stage of maturity. To simulate rotationally grazed pastures, aftermath growth was harvested every 4 to 6 weeks during the remainder of the growing season. Hay and pasture management included fertilization with 100 lb/A of ammonium nitrate (34 lbs/A nitrogen) in March, June and September on soils testing medium to high in phosphorus and potassium. Forage dry matter yields of hay, aftermath and total seasonal production of varieties evaluated at Lexington, Kentucky are presented in Table 1.

Forage dry matter yields and plant maturity at hay harvest of varieties evaluated at the Research and Education Center, Princeton, Kentucky are presented in Table 3.

SEED YIELD

Seed production management involves harvesting the varieties for seed in June, removing the forage in August and accumulating growth until frost to simulate stockpiling forage for winter grazing. Grass in this management system was fertilized with 200 lb/A of ammonium nitrate (68 lbs/A nitrogen) approximately September 1 and again December 1. Seed yield data, fall stand estimates and fall-winter stockpiled dry matter yields are presented in Table 2.

FORAGE QUALITY

The objective of the tall fescue breeding program at the University of Kentucky is to develop varieties with superior nutritive value (including reduced levels of perloline and loline alkaloids), minimal infestation of the fungal endophyte, (Acremonium coenophialum), higher palatability, improved disease resistance and wider adaptation through the derivation of intergeneric and interspecific hybrids of ryegrass and tall fescue species. Kentucky 31, Kenwell, and Kenhy were varieties released from this breeding program. Johnstone tall fescue, developed cooperatively by the Kentucky Agricultural Experiment Station and USDA-ARS, is the most recently released variety. This variety has low levels of perloline, is essentially free of the fungal endophyte, has improved forage quality during summer, and is superior for animal performance.

Animal performance data may be obtained by referring to Volume 19 No. 4 - 1986 Update of Agronomic and Animal Performance of Different Tall Fescue Varieites.

Kenhy was the first variety to be developed utilizing ryegrass-tall fescue hybrids. Kenhy is characterized by superior forage quality and yield, disease resistance and wide adaptation.

Plant variety protection has been approved specifying sale of Johnstone seed by variety name only as a class of certified seed. A seed certification

program has been approved, requiring seed of Johnstone to have low level (<5%) fungal endophyte infection. Johnstone has been released by USDA and University of Kentucky under an exclusive production and marketing arrangement to Kentucky for Progress Inc., Hardinsburg, Kentucky. It is anticipated that all Johnstone seed sold will be essentially endophyte free.

LOW ENDOPHYTE TALL FESCUE

Surveys conducted by the University of Kentucky College of Agriculture estimate that 97% of Kentucky's tall fescue fields contain an endophytic fungus (Acremonium coenophialum). Results show that 83% of the fields sampled contained over 50% endophytic infection.

Animal disorders associated with endophyte-infected tall fescue:

Summer syndrome is a term used to denote poor animal performance by cattle grazing tall fescue during the summer when cattle are subjected to high ambient temperature induced heat stress. One or more of the following symptoms may be expressed by animals suffering from this disorder: (1) reduced feed intake, (2) reduced weight gain, (3) reduced milk production, (4) rough hair coat, (5) rapid breathing, (6) increased body temperature, (7) increased water consumption, (8) more time spent in shade, (9) excessive salivation, (10) increased urine volume, (11) reduced prolactin level, (12) reduced reproductive performance, and (13) nervousness.

Other animal disorders associated with consumption of endophyte-infected tall fescue include reduced pregnancy rates, abortion, and agalatica in horses and, possibly, similar problems in sheep.

VARIETY SELECTION, ESTABLISHMENT AND MANAGEMENT OF LOW-ENDOPHYTE TALL FESCUE

Variety Selection

The following considerations are suggested when selecting a tall fescue variety to meet your needs:

(1) Does the seed bag have a certified blue tag that ensures genetic purity of the variety?

(2) Has the seed of the variety been tested (green tag) for the endophyte and the content/percentage listed on the tag?

(3) Is the variety adapted to Kentucky growing conditions?

(4) Has the variety been tested for agronomic and animal performance?

(5) Is the variety an improved variety, developed by the science of plant breeding and the unique characteristic(s) documented - (eg.) 'Johnstone' and 'Kenhy'?

(6) Does the cost of seed, compared with potential economic returns, warrant its use?

(7) Has the originating organization and or breeder(s) protected the variety (U.S. Plant Variety Protection Act) so it can only be sold as a class of certified seed?

Establishment

The decision to establish a new stand or to convert from an endophyte-infected stand of tall fescue should be thought through very carefully. Points which should be considered are listed below. Putting all these factors together to form an effective and economical plan requires a relatively high level of management.

(1) Are tall fescue pastures infected and, if so, what is the level of infection?

(2) Is animal performance poor?

(3) If pastures are endophyte-infected, existing stands must be destroyed as completely as possible before reseeding. This requires careful selection of an appropriate herbicide and the timely application with regard to rates and plant growth conditions at the time of application.

(4) Methods of seedbed preparation, conventional or no-till.

(5) Seeding rates

(6) Time of seeding (fall seeding is best)

(7) Soil acidity/fertility

(8) Post-seeding management (weed control)

(9) The spring introduction of legumes in established grass stands.

Pasture management

Animals given "free-choice" access to low endophyte tall fescue varieties may tend to overgraze to the point of stand depletion. Stands can be maintained by utilization of rotational grazing techniques whereby the animal units per acre are managed to maximize forage quality. Fewer acres are needed when using these techniques to maintain or increase the level of animal production.

SUMMARY

Through the science of plant breeding and genetics, tall fescue varieties have been developed and tested cooperatively by University of Kentucky and USDA-ARS scientists both for agronomic and animal performance. Superior tall fescue varieties were developed by combining the palatability and nutritional qualities of the ryegrasses with the excellent agronomic characteristics of tall fescue as a result of a hybridization program.

Selection and wise use of varieties characterized as having improved forage quality, reduced anti-quality factors, and superior animal performance, in conjunction with the use of legumes and improved pasture management techniques offer farmer-producers the opportunity to maximize their profit potential.

Table 1. Forage dry matter yields of tall fescue varieties evaluated at Lexington, Kentucky 1983 through 1986[+]

Variety and Seed Source	Infection Levels[++]	1983-84 Average Hay	1983-84 Average After/ math	1983-84 Average Total	1984-86 Average Hay	1984-86 Average After/ math	1984-86 Average Total	1985-86 Average Hay	1985-86 Average After/ math	1985-86 Average Total	1986 Average Hay	1986 Average After/ math	1986 Average Total[+++]
		Tons Acre/Year											
Johnstone Foundation	LE[++]	2.22	1.44	3.66	1.39	1.52	2.91	0.88	1.17	2.05	0.59	1.65	2.24
GI-320 Breeder	HE	2.26	1.44	3.70	---	---	---	---	---	---	---	---	---
Kenhy Certified	LE	---	---	---	---	---	---	0.91	1.38	2.28	0.56	1.67	2.23
Kenhy Foundation	LE	2.29	1.44	3.73	1.62	1.58	3.20	---	---	---	---	---	---
Kenhy Breeder	HE	---	---	---	1.63	1.23	2.86	0.81	1.35	2.16	---	---	---
Ky 31 Breeder	LE	2.02	1.56	3.59	---	---	---	0.96	1.19	2.15	---	---	---
Ky 31 INF	HE	2.07	1.45	3.53	---	---	---	0.99	1.19	2.18	0.69	2.00	2.70
Ky 31 (ALA.)	LE	---	---	---	---	---	---	0.95	1.09	2.03	---	---	---
MO. 96	ND	2.07	1.36	3.43	---	---	---	1.04	1.35	2.39	---	---	---
Forager	LE	1.69	1.47	3.17	1.35	1.37	2.72	0.87	1.37	2.24	0.64	2.07	2.71
AU-Triumph	LE	1.42	1.61	3.03	---	---	---	0.76	1.62	2.38	0.22	2.46	2.68
Festorina	LE	---	---	---	---	---	---	0.88	1.12	1.99	---	---	---
Stef	ND	---	---	---	---	---	---	0.52	1.45	1.97	---	---	---
Ondine	LE	---	---	---	---	---	---	0.75	1.54	2.29	---	---	---
Manade	LE	---	---	---	---	---	---	0.64	1.38	2.02	---	---	---
Clairine	LE	---	---	---	---	---	---	0.66	1.47	2.13	---	---	---
Lubrette	LE	---	---	---	---	---	---	0.60	1.34	1.93	---	---	---
Fawn	LE	---	---	---	---	---	---	0.85	1.27	2.13	0.55	2.06	2.62
Mozark	LE	---	---	---	---	---	---	---	---	---	0.49	2.40	2.89
Martin	LE	---	---	---	---	---	---	---	---	---	0.59	2.42	3.01
L.S.D. 05		0.26	0.15	0.32	0.15	0.11	0.19	0.12	0.12	0.20	0.12	0.28	0.32
C.V. (%)		13.0	10.1	9.10	12.5	8.7	8.0	14.3	9.1	9.4	12.7	8.6	7.6

[+]Four separate forage yield tests are summarized. In the first three numeric columns, the 1983-84 figures give the years of harvest of a trial seeded in fall 1982. Data in columns four through six, seven through nine and ten through twelve are from tests seeded during 1983 through 1985, respectively.

[++]LE indicates low levels of endophyte infection (<5%); HE indicates high levels of endophyte infection (>5%) and ND indicates endophyte levels are not known.

[+++]Abnormally warm late fall-early winter, followed by sudden extremely cold growing conditions in December, 1985 affected 1986 stands and dry matter yields.

The authors acknowledge the professional endeavors of Mr. William Lizer and Mr. George Tipton, technicians, University of Kentucky, Agronomy Department, in the collection of these data.

Table 2. Clean seed yields and fall stockpiled growth of tall fescue varieties evaluated in tests at Lexington from 1983 though 1986[+]

Variety and Seed Source	Infection Levels	1983-84 Average		1984-86 Average		1985-86 Average		1986 Average	
		Seed	Fall Forage Yield	Seed	Fall Forage Yield	Seed	Fall Forage Yield	Seed	Fall Forage Yield[+++]
		lbs/A/yr	tons/A/yr	lbs/A/yr	tons/A/yr	lbs/A/yr	tons/A/yr	lbs/A/yr	tons/A/yr
Johnstone Foundation	LE[++]	691	0.56	456	1.03	221	1.00	116	1.43
GI-320 Breeder	HE	636	0.57	—	—	—	—	—	—
Kenhy Certified	LE	—	—	—	—	187	1.00	168	1.38
Kenhy Foundation	LE	750	0.56	489	1.10	—	—	—	—
Kenhy Breeder	HE	—	—	—	—	188	1.11	—	—
Ky 31 Breeder	LE	658	0.55	504	1.08	213	0.96	—	—
Ky 31	HE	—	—	—	—	394	1.03	256	1.35
Ky 31 (ALA.)	LE	—	—	—	—	335	0.92	—	—
MO. 96	ND	—	—	—	—	237	0.95	—	—
Forager	LE	474	0.54	431	1.06	119	0.91	48	1.48
AU-Triumph	LE	342	0.66	—	—	90	1.14	19	1.48
Festorina	LE	499	0.55	—	—	310	1.04	—	—
Stef	ND	—	—	—	—	24	1.08	—	—
Ondine	LE	—	—	—	—	143	1.09	—	—
Manade	LE	—	—	—	—	75	1.08	—	—
Clairine	LE	—	—	—	—	58	1.16	—	—
Lubrette	LE	—	—	—	—	61	1.01	—	—
Fawn	LE	—	—	—	—	143	0.96	53	1.39
Mozark	LE	—	—	—	—	—	—	119	1.32
Martin	LE	—	—	—	—	—	—	92	1.48
L.S.D. 05		135	0.06	51	n.s.	42	0.12	45	n.s.
C.V. (%)		23.1	10.8	15.6	10.8	24.0	11.6	22.3	7.2

[+]Four separate tests are summarized. In the first two numeric columns, the 1983-84 figures give the years of harvest of a trial seeded in fall 1982. Data in columns three and four, five and six and seven through eight are from tests seeded during 1983 through 1985, respectively.

[++]LE indicates low levels of endophyte infection (<5%); HE indicates high levels of endophyte infection (>5%) and ND indicates endophyte levels are not known.

[+++]Abnormally warm late fall-early winter, followed by sudden extremely cold growing conditions in December, 1985 affected 1986 stands and dry matter yields.

The authors acknowledge the professional endeavors of Mr. William Lizer and Mr. George Tipton, technicians, University of Kentucky, Agronomy Department, in the collection of these data.

Table 3. Forage dry matter yields of tall fescue varieties evaluated at Princeton, Kentucky 1985 through 1986.

Variety	Endophyte evaluation levels[+]	1st Cut Hay	1985-86 Average Aftermath	Total	1985 - 1986 Plant maturity at 1st cut hay harvest[++]	
		- - tons/Acre/year - -				
Johnstone Foundation	LE	0.61	1.97	2.58	7.5	4.5
Kenhy Certified	LE	0.52	2.09	2.61	6.0	5.5
Kenhy Breeder	HE	0.66	2.16	2.81	7.0	3.0
Ky 31 Breeder	LE	0.68	2.17	2.85	7.0	6.0
Forager	LE	0.81	2.11	2.92	12.5	12.0
AU-Triumph	LE	0.82	2.29	3.11	12.5	13.0
Fawn	LE	0.92	2.09	3.01	13.0	13.0
Stef	ND	0.42	2.11	2.53	1.5	1.0
L.S.D. 05		0.13	0.20	0.26	1.7	1.3
C.V. (%)		18.6	9.4	9.4	13.7	12.8

[+] LE indicates low (<5%); HE indicates high (>5%) levels of endophyte infection and ND indicates endophyte levels not determined.

[++] Plant maturity: 1=vegetative; 3=early boot; 5=late boot; 7=early head; 9=fully headed (panicles fully emerged); 11=early bloom; 13=full bloom.

The authors acknowledge the professional endeavors of Mr. Tim Gray, technician, Research and Education Center, Princeton, Kentucky in the collection of these data.

Cross Reference Publications:

The following additional information regarding management and use of tall fescue may be obtained from the University of Kentucky County Extension Offices.

1. Special Report 1-86 - Johnstone Tall Fescue
2. AGR-60 Kenhy - A New Tall Fescue Variety
3. AGR-59 Tall Fescue
4. AGR-108 TAll Fescue in Kentucky
5. AGR-44 Season of the Year Affects Nutritional Value of Tall Fescue
6. AGR-119 Alternatives for Fungus Infected Tall Fescue
7. Volume 19 No. 4 - 1986 Update of Agronomic and Animal Performance of Different Tall Fescue Varieties
8. AGR-85 Efficient Pasture Systems
9. AGR-26 Renovating Grass Fields
10. AGR-45 The Effects of Weather on Hay Production
11. AGR-62 Quality Hay Production
12. AGR-61 Hay Feeding Systems
13. AGR-103 Fertilization of Cool-Season Grasses
14. ID-33 Renovating Grass Fields with a Renovation Seeder
15. ID-46 Hay Preservatives
16. OPTIONS-12 - Hay and Seeds
17. AGR-33 Growing Red Clover in Kentucky
18. AGR-24 Kenstar Red Clover
19. AGR-70 "Woodford" Bigflower Vetch - A New Winter-Annual Forage Legume
20. AGR-104 'Fergus' Birdsfoot Trefoil
21. ASC-56 Producing Slaughter Beef with Grain on Pasture
22. ASC-67 Forage-Related Cattle Disorders
23. PR 291 1985 Beef Cattle Research Report
24. PR 287 Kentucky Red Clover Variety Trials Through 1984

** PPA-30 Sampling for the Tall Fescue Endophyte in Pasture or Hay Stands

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