11-1984

Tall Fescue in Kentucky

Garry D. Lacefield
University of Kentucky, garry.lacefield@uky.edu

J. Kenneth Evans
University of Kentucky

AGR-108
TALL FESCUE IN KENTUCKY
ISSUED: 11-84
REVISED:
Garry Lacefield and J. Kenneth Evans, Extension Forage Specialists
Department of Agronomy

Tall fescue (*Festuca arundinacea* Schreb.), a long-lived grass with short underground stems, is presently grown on approximately 5.5 million acres in Kentucky and on approximately 35 million acres in the south central United States. It is a versatile plant used for livestock feed, lawns, turf and conservation purposes, and is adapted for a wide range of soil and climatic conditions.
Chemical analyses for forage quality indicate that tall fescue compares favorably to other transition zone grasses. Many livestock producers, however, have found animal response from grazing tall fescue to be erratic and often undesirable. Researchers at the University of Kentucky College of Agriculture have made and continue to make significant strides towards solving the forage quality problems of tall fescue.

Past

Discovery

In 1931, Dr. E.N. Fergus discovered Kentucky 31 tall fescue, as it was later named, growing on the W.M. Suiter farm in Menifee County in eastern Kentucky. Dr. Fergus was in Menifee County judging at a sorghum show when a local man approached him and asked if he was aware of a good grass that was growing in the county. Dr. Fergus was taken to the Suiter farm where he observed several fields of this "wonder grass." One large hillside, protected against erosion and with livestock grazing on it, was covered with the grass. Although the weather had been cold, the grass was still green.
Dr. Fergus obtained about a pound of seed from Mr. Suiter which he seeded on the University of Kentucky Experiment Station farm in 1932. The seed for the original planting on the farm presumably had come from a seedsman in Virginia, and a patch of the grass was likely growing on the farm when Mr. Suiter purchased it in 1887. Since it had been growing in Menifee County for many years, Dr. Fergus had no doubts about the plant's climatic adaptation.
Early seedings throughout the state showed the grass to have a long life and hardy persistence. It was also noted to be unusually deep-rooted for a cool-season grass. When recognized as a variety of tall fescue, it was named Kentucky 31 after the year in which it was discovered. From 1932 to 1939, seedings were made in outlying soil experimental fields and, in 1939, seed was distributed by W.C. Johnstone for trials by interested farmers. After testing, this grass was released in 1942 as the "Kentucky 31" variety. In 1945, it was included in the Kentucky seed certification program. Kentucky farmers readily accepted the new variety and seeded vast acreage with it.

Early Shortcomings

The new grass was not without its shortcomings, which became evident with general farm use. The first shortcoming observed was its relatively low palatability. In addition, cattle grazing on pure stands in fields grown for seed occasionally suffered from lameness or even sloughing off of tails, especially during fall and winter. It appeared that a toxic substance occasionally developed in the fescue which caused constriction of the blood vessels in the extremities of the animal. Dr. Lowell Bush and his associates at the University of Kentucky later found that an alkaloid (organic toxin) contained in tall fescue reduced the rate of cellulose digestion in the rumen. Researchers at the UK Agricultural Experiment Station attacked these problems through plant breeding efforts under the leadership of Dr. R.C. Buckner who is recognized nationally and internationally for his work on tall fescue. Dr. Buckner released the varieties Kenwell in 1965 and Kenhy in 1976. Johnstone, a low endophyte/low alkaloid variety, was released in 1982. Research in conjunction with Dr. Buckner's work was conducted by many

members of the Departments of Animal Sciences, Agronomy and Plant Pathology.

Present

Summer Syndrome

Summer syndrome is a term used to denote poor performance by cattle grazing tall fescue during the summer. It is characterized by the following symptoms: 1) reduced feed intake, 2) lower weight gain, 3) lower milk production, 4) rough hair coat, 5) rapid breathing, 6) increased body temperature, 7) increased water consumption, 8) more time spent in the shade, 9) excessive salivation, 10) greater urine volume, 11) reduced prolactin level, 12) possible reduced reproductive performance, and 13) nervousness. An endophytic fungus *Epichloe typhina* (=*Acremonium coenophialum*), known for several years to be in tall fescue, was found by Bacon and his co-workers in Georgia fescue pastures on which cattle showed the summer syndrome. Drs. Lowell Bush, James Boling and Roger Hemken and others in the University of Kentucky's Departments of Animal Sciences and Agronomy have shown this fungus to be associated with the occurrence of alkaloids in tall fescue.

In controlled experiments at the University of Kentucky, young cattle exhibited the summer syndrome malady when fed infected tall fescue seed and hay containing alkaloids. However, cattle fed non-infected tall fescue seed and hay without the alkaloids remained healthy. These feeding trials strongly suggest that fungus infection of the grass and the associated alkaloid levels are important to the summer syndrome malady.

Animal Response

University of Kentucky researchers have shown a drastic effect on forage intake, weight gain and milk production when a high level of this endophytic fungus is present in the animal diet. Studies conducted by Dr. Roger Hemken and colleagues have shown a 39 percent reduction in forage intake and a 37 percent reduction in milk production during the summer in lactating dairy cows. In addition, cows consuming fungus-infected fescue lost weight while animals consuming non-infected fescue gained weight.

Similar results have been shown in beef cattle grazing studies. University of Kentucky researchers showed average daily gains for animals fed fescue containing high levels of the fungus to be 0.81 pounds per day while animals fed fescue containing low levels of the fungus gained 1.37 pounds per day. Similar responses have been found in other states. Auburn University researchers showed beef production per acre was increased 18.5 pounds and average daily gains were increased by 0.83 pounds per day on fungus-free compared to fungus-infected fescue. More recent studies by Dr. James Boling at the University of Kentucky showed a 0.55 pound per day increase in ADG for animals grazing low endophyte Kentucky 31 compared to infected Ky 31. The same study showed a 0.97 pound per day increase in ADG for animals grazing Johnstone as compared to infected Ky 31. Additional studies have shown increased daily gains and intake, and lower body temperatures of steers consuming fungus-free seed or fungus-free hay.

Growth of the Fungus

The endophytic fungus grows between the plant cells, overwintering in the perennial parts of the plant. In the spring, fungus growth closely parallels tiller growth of fescue. The infected flower panicles produce infected seed. The primary method of transmitting the fungus is through infected seed.

Spread of the Fungus

A statewide survey was conducted in 1981 of tall fescue samples collected from 200 fields, representing 42 of the 120 Kentucky counties. Results showed 97 percent of the fields to be infected with the endophyte. The amount of fungal infection in individual fields was not determined and additional studies are being conducted to determine this.

Preliminary data indicate that the spread of the fungus in fescue fields occurs slowly. Stem samples

collected in 1981 from two adjacent fields established in 1974 indicated limited movement of the fungus across the border from a fungus-infected field into the field that had been free of the fungus. Future research will emphasize the effects of mowing and grazing on the spread of the fungus in tall fescue.

Future

Research at the University of Kentucky, along with research from other states, has convincingly demonstrated that the endophytic fungus is creating quality problems in tall fescue. An interdisciplinary team of University of Kentucky researchers is presently seeking additional answers to the remaining questions concerning fescue quality. Advancements have been made in breeding and selection of fungus-free plants. Release of the Johnstone variety and selection within currently available varieties will provide seed with low fungus levels for new plantings.

Certification

A seed certification program has been implemented by the Kentucky Seed Improvement Association which will provide labeling and tagging of seed with low fungus content. Any variety eligible for seed certification can be certified for fungus level. Standards allow 2 percent fungus in Foundation Seed, 3 percent in Registered and 5 percent or less in Certified Seed. The University of Kentucky Department of Regulatory Services is conducting tests on seed for the certification program. At present, no laboratories are available in Kentucky for testing of plant material for producers.

Low Fungus Varieties

All Johnstone seed to be sold will need to be certified and contain acceptable low levels of the fungus. The Johnstone variety is in the process of initial seed multiplication and certified seed should be available for planting by September 1985. Limited amounts of certified Kenhy seed are also presently available which have been tested and labeled for fungus content.

Fungus Control

Treating field plants for the fungus with systemic fungicides has not been successful to date. Research studies are continuing in Kentucky and other states to screen additional chemicals for this purpose. Chemical seed treatment has met with limited success, but additional research is needed. Researchers have been able to obtain fungus-free fescue plants by heat treatments of infected seed, chemical treatment of seed, aging seed and by harvesting seed from fungus-free plants.

Preliminary data suggest the possibility of destroying fungus-infected fescue stands and replacing them with fungus-free stands using herbicides and no-till techniques. University of Kentucky researchers have begun long-term studies to determine the best methods of renovation.

Dilution

Sufficient data exist to show that the negative effects on animal performance created by the fungus and alkaloids can be diluted substantially by the presence of legumes in the animal diet. Grazing studies conducted by Dr. Nelson Gay and associates over a 2-year period at the West Kentucky Research and Education Center at Princeton revealed a benefit of legumes in fungus-free fescue also. Cattle grazing fungus-free Kenhy gained 1.37 pounds per day while cattle grazing fungus-free Kenhy that had been renovated with red clover gained 1.64 pounds per day.

The Tall Fescue Research Program at the University of Kentucky has resulted in major breakthroughs. We are possibly near discoveries which can answer some of the questions relating to fescue quality and perhaps provide solutions to some of the problems. These recent discoveries could equal or surpass in importance the discovery and release of Kentucky 31 tall fescue.

Acknowledgements

Appreciation is extended to the following University of Kentucky research personnel for supplying information for this publication: James Boling, R.C. Buckner, Paul Burrus, Lowell Bush, Nelson Gay,

Roger Hemken, James A. Jackson, Mark Johnson and Malcolm Siegel.