The MaxQ® Advantage

News and Information on Jesup **MaxQ®** *and Texoma* **MaxQ II®** *Tall Fescue*

New Tall Fescue Varieties Solve Fescue Toxicity Problems

"Eliminates animal production problems while offering plant persistence of toxic endophyte varieties."

Tall fescue is the most widely used livestock forage in the eastern half of the U.S. While tall fescue has many desirable forage traits, it can cause a number of livestock health problems. This is because most of the fescue in the U.S. contains a fungal endophyte that produces alkaloids which are toxic to many species of livestock. Fescue toxicity problems noted in cattle include long hair coats, intolerance to heat and cold, poor performance and reduced pregnancy rates (See Table 1). On horse farms, pregnant mares grazing toxic fescue pastures have serious reproduction problems that include prolonged gestation, dystocia, agalactia and abortions. Losses to livestock producers from fescue toxicosis is estimated to be $1 billion annually.

To eliminate toxicity problems, scientists released a number of tall fescue varieties that were "fungus-free". They quickly discovered the fungal endophyte dwelling within the fescue plant served a key purpose by giving it added tolerance to drought, insect pests and grazing pressure as well as improved utilization of nitrogen fertilizer. Plants containing the endophyte also exhibited increased seedling vigor and enhanced early growth potential. Fungus-free varieties did indeed eliminate livestock health and production issues, but without the endophyte could not survive field conditions long term.

Table 1
Effects of Fescue Toxicity in Cattle

- Calving rate reduced up to 37%
- Abortion during early pregnancy
- Calf deaths up to 20% after birth
- Longer breed-back time
- Grazing time reduced 20-90%
- Forage intake reduced 40%
- Milk production reduced 37-60%
- Weaning weights of calves reduced 14%

Source: Ball, Hoveland, Lacefield, Schmidt, Young

In 1997, scientists in New Zealand discovered strains of non-toxic endophytes that led to the development of a revolutionary new endophyte-infected fescue variety – **Jesup MaxQ®**. Developed cooperatively by former University of Georgia plant breeder Joe Bouton and scientists in New Zealand, MaxQ eliminates all health and production problems associated with fescue toxicosis while offering the same plant persistence and hardiness found in toxic varieties.

Cattle suffering from fescue toxicity spend excessive time in shade and water attempting to stay cool.

In 2011, a new tall fescue variety containing a second generation novel endophyte was released by the Noble Foundation in Ardmore, Oklahoma in cooperation with Grasslanz Technology, NZ and Pennington Seed. The Texoma variety was selected and developed from a population of tall fescue that had persisted for over 30 years on a Noble Foundation research farm. MaxQ II, a new non-toxic endophyte, was introduced into Texoma plants to create the Texoma **MaxQ II®** tall fescue variety. Texoma MaxQ II has excellent adaptability across the traditional fescue belt and has proven to be better suited than traditional fescue varieties for the Central and south-central U.S. east of the I-35 corridor.

Prior to their release to Pennington Seed for marketing, both Jesup MaxQ and Texoma MaxQ II underwent extensive research at leading universities throughout the U.S. to determine plant persistence and hardiness as well as livestock health and performance (See Table 2).

Table 2 - *Per acre gains of stocker cattle grazing toxic versus non-toxic endophyte-infected tall fescue pastures [3] (2007-2011) University of Ark. - Batesville, AR

TF Variety	Gain (lbs/A)	Adv. Vs. Ky 31
[1] Texoma MaxQ II	538	+259 lbs
[1] Jesup Max Q	499	+220 lbs
[2] KY 31	279	---

(1)Non-toxic endophyte-infected
(2)Toxic endophyte-infected
(3)Pastures fertilized with 60 lbs N/ac in the fall and spring
*Annual average over 4 yrs.

MaxQ® & MaxQ II® Don't Co$t - They Pay

While dozens of studies across the U.S. have documented the cattle performance benefits of grazing non-toxic novel endophyte tall fescue pastures versus toxic Kentucky 31(KY 31) fescue pastures, producers are still reluctant to adopt this breakthrough technology on their cattle farms. The most common reason given is the high cost of pasture establishment or conversion to novel endophyte tall fescue and the uncertainty of getting a positive return on their investment. But, a recent study conducted at the University of Arkansas in cooperation with the Noble Foundation dispels any uncertainty about the positive economic value of such pasture establishment or renovation.

Table 1- Per acre establishment costs, total stocker gain and net return by grazing system (2007 – 2011) University of Ark. – Batesville, AR

System	Gain(lbs/A)	*Est. Cost ($/A)	**Net Return ($/A)
Texoma (N)	538	47	169
Jesup (N)	499	47	122
KY 31 (N)	279	28	(-63)
Texoma (C)	457	53	195
Jesup (C)	438	53	176
KY 31 (C)	258	33	22

***Prorated @7.5% interest**
****Calculated assuming a value of stocker gain of $1.21/cwt for fall grazing period and $88/cwt for spring grazing period.**

Using the commercially available novel endophyte tall fescue varieties Texoma MaxQ II and Jesup MaxQ and toxic endophyte KY 31, the study compared establishment and annual production costs along with returns of six different grazing systems for stocker steers. These included (1) Texoma + clover and no N fertilizer, (2) Texoma alone with N, (3) KY 31 + clover and no N; (4) KY 31 alone with N, (5) Jesup + clover and no N and (6) Jesup alone with N. The non-clover paddocks received 60 lbs/A N in the fall and again in the spring.

Annual amortorized establishment costs (at 7.5% interest) were $47/acre for both Texoma Max II and Jesup MaxQ compared to $28/acre for KY 31. Annual stocker cattle gains per acre in the nitrogen fertilized systems over the 4-year study averaged 538 lbs/A for Texoma, 499 lbs/A for Jesup and 279 lbs/A for KY 31. Annual net returns for these systems were $169/A for Texoma, $122/A for Jesup and (-$63)/A for KY 31. (See Table 1)

The addition of clover (with no N fertilizer) to each system resulted in a slight reduction in gain per acre, but improved per acre profits by $26 for Texoma, $54 for Jesup and by $85 (from minus $63 to a plus $22/A) for KY 31 versus the nitrogen fertilized systems.

University of Georgia Extension Forage Agronomist Dennis Hancock says this research addresses the oft asked question "Is MaxQ worth it?" *"Economic analyses have consistently found it to be so, but this study confirms that,"* states Hancock. *"Plus, it answers questions about whether one is just as well off "diluting" the toxins with clover."* The forage expert adds, *"The truth is, even as little as 20-30% of the diet (perhaps less) coming from high alkaloid, endophyte-infected tall fescue may cause fescue toxicosis symptoms AND reduce animal performance. Clover adds quality, but it really doesn't "dilute" the toxin as was previously believed."* Dr. Hancock states matter-of-factly, *"Fescue toxicity is a major economic drain. Not only does novel endophyte fescue pay in the long-run, it also pays in the near-term."*

Results from this comprehensive study once again illustrate the positive economic value of incorporating advanced technology forage varieties like Texoma MaxQ II and/or Jesup MaxQ into the grazing system.

(Note: Information for this article came from "Study reveals legume – fescue mixture economics" by Jon Biermacher, Mohua Haque & Paul Beck – Noble Foundation Ag News and Views – November 2013.)

What the experts say...

"The scientists who have contributed to our current understanding of the tall fescue endophyte deserve great credit. Several strategies for minimizing losses to endophyte toxins have been developed, with the crowning achievement being novel endophyte tall fescues. This technology provides, in the form of a widely adapted perennial grass, a tool for sharply increasing production, profit, and sustainability of livestock farms over a wide geographical area, thus helping to feed the world."

Dr. Don Ball
Retired Extension Forage Agronomist
& Professor Emeritus – Auburn University

"Fescue toxicity is a major economic drain. Not only does novel endophyte fescue pay in the long-run, it also pays in the near-term."

Dr. Dennis Hancock
Extension Forage Agronomist - University of GA

Double Stocker Gains & Increase Profits with Non-Toxic Fescue

Stockering beef calves on forage is a popular method farmers use to add value prior to marketing and/or gain before placing cattle in the feedlot. While this can be accomplished with a variety of forage systems, research at the University of Arkansas strongly suggests the most economical system is one utilizing a novel (non-toxic) endophyte-infected variety of tall fescue such as Jesup MaxQ® or Texoma MaxQ II®.

When compared to toxic fescue varieties such as KY 31, novel endophyte-infected tall fescue offers the same high forage yields and stand persistence, but contains no toxins that retard growth of growing livestock. As a result, stocker gains are significantly improved, often doubling those of stockers grazing toxic fescue. (See Table 1.)

The Arkansas study also illustrated the advantage a fescue based forage system has for stockering programs over an annual small grain system by providing more total grazing days. As shown in Table 2, the number of grazing days for fescue was 35% greater (+26 days) than small grains in the fall and early winter and double (+57 days) in the spring. This led to similar gains per acre with both systems in the fall, but twice the gain per acre in the spring with the fescue.

In terms of economics, the improved gains and longer grazing periods combined to give novel endophyte-infected tall fescue a decided economic advantage. (See Table 3.) Because fescue is a perennial forage, prorated establishment costs are considerably cheaper than planting annual forages every year. Also, there is a greater exposure to risk with annuals as they depend heavily on favorable fall weather to become established. As illustrated in Table 2, an established fescue pasture allows fall grazing to begin much earlier. These factors further add to the attractiveness of novel infected-endophyte tall fescue as a premier forage for stocker cattle.

Table 1
Effects of Forage on Steer Performance
Batesville, Arkansas • Spring 2004

	Novel Endophyte Fescue	Toxic KY 31 Fescue
Grazing Dates	March 17 to July 8	March 17 to July 8
ADG lbs	2.03	1.00

University of Arkansas Livestock and Forestry Branch Station

Table 2
Grazing Days - Fescue vs. Small Grains
Batesville, Arkansas

	Fall 2003		Spring 2004	
	Novel Endophyte Fescue	Wheat/ Wintergrazer 70	Novel Endophyte Fescue	Wheat/ Wintergrazer 70
Grazing Dates	Sept. 16 - Dec. 23	Nov. 11 - Jan. 23	March 17 - July 8	March 17 - May 12
Grazing Days	**98**	72	**113**	56
Total Gain (lbs/A)	**252**	256	**575**	261

University of Arkansas Livestock & Forestry Branch Station

Table 3
Effects of Forage on Stocker Profits
Batesville, Arkansas • 2003-2005

	Novel Endophyte Fescue	Toxic KY 31 Fescue	Wheat/ Wintergrazer 70
	Profit ($/A)		
2003 - 2004	**147.61**	5.08	1.44

University of Arkansas Livestock & Forestry Branch Station

Toxic Fescue Robs Genetic Potential

When it comes to choosing breeding bulls and replacement seedstock, top cattle producers want to find the best genetics available. This usually means devoting a great amount of time to studying, searching, traveling and most likely spending extra money to obtain cattle that will enhance the productivity of the operation. All too often, the same producer who devotes so much time, energy and money investing in top genetics will then place these superior cattle on poor quality or toxic pastures where their genetic potential cannot be captured.

Toxic fescue can prevent cattle producers from capturing all the genetic performance potential in their cow herds.

Nowhere is this more evident than with cattle being maintained on toxic fescue pastures. A study was initiated at the Northwest Georgia Branch Experiment Station in Calhoun, GA to compare performance of cows and calves maintained on non-toxic and toxic endophyte-infected fescue pastures. In the study, cow/calf pairs were split into two even numbered groups. In early April, one group was placed on a toxic fescue pasture and the second group on a non-toxic **Jesup MaxQ®** fescue pasture. Both groups remained on their respective pastures through calf weaning time in late August.

MaxQ vs. Toxic Fescue
Cow-Calf Performance
Calhoun, GA

MaxQ® Advantage
Steers: +62 lbs./head
Heifers: +44 lbs./head

Three year summary; 44 steers and 52 heifers/group
Watson, et al., 2004

Over a three-year period, cows maintained on non-toxic MaxQ pastures weaned steer calves that averaged 62 lbs./head/year more and heifer calves that averaged 44 lbs./head/year more than calves from cows grazing toxic fescue pastures. The genetics of the two groups were essentially the same. The only difference was the quality of the forage!

While improving animal genetics is important, this study strongly emphasizes it is equally or more important to invest some dollars in pasture forage improvement. If a certain bull could deliver an extra 40 lbs. on every calf weaned, a producer would no doubt be willing to invest thousands of dollars to obtain his genetics.

It makes little sense to invest heavily in improved animal genetics if the pasture forage system doesn't allow those genetics to express themselves. Cattle experts will agree - a key component of any cattle management system is providing adequate amounts of high quality, non-toxic pasture forage. Producers wanting to capture the full genetic potential of their cattle will wisely invest some time and money into providing and maintaining productive, high quality pastures.

Here's what cattlemen are saying about the MaxQ® Advantage...

"We have 174 acres of novel endophyte fescue on our farm. All but 12 acres is Pennington's Jesup MaxQ. We have another herd on a nearby rented farm that has toxic KY 31 fescue on it. This year, the cows on the MaxQ pastures have body condition scores of 7 plus compared to maybe a score of 5 for the cows on the rented farm. I have weaning weight records going back some 8 years that show the difference between MaxQ and KY 31. In 2013, adjusted weaning weights for the steer calves raised on the MaxQ pastures averaged 717 lbs. versus 616 lbs. for steers raised on the rented farm. Heifer calves on MaxQ pastures averaged 643 lbs. compared to 588 lbs. for the heifers reared on KY 31 pastures."

Joe Davis
Westminster, SC

"MaxQ has given me a cool season forage that I do not need to plant every year! The toxic fungus is not in MaxQ like in KY 31 so we get the gains we are hoping for on a perennial plant. I had 103 head of dry wintered steers that I placed on 70 acres of MaxQ on March 19, 2007, weighing 782 lbs. They were pulled off of the MaxQ on May 17, 2007, weighing 973 lbs! That is a gain of 190 lbs., which averages out to 3.18 lbs. of gain per day! I grazed all winter with cows and then pulled them off and placed the steers in. This shows that MaxQ is working."

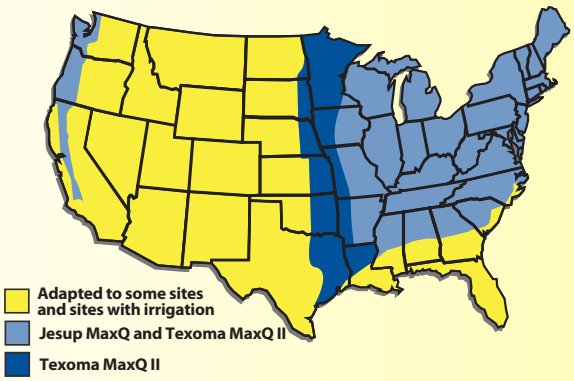
Billy Neher
Ashdown, AR

Jesup MaxQ® and Texoma MaxQ II® Tall Fescue Technical Information

Festuca arundinacea shreb

TYPE: Cool season perennial grass

WHERE TO PLANT:



ENDOPHYTES: Endophytes (fungi) are important to the tall fescue plant. The fungus is only transmitted through infected seed. There is no fungal transmission through the air or in pollen. The fungus enables the plant to be more tolerant of heat and drought stress and enhances tolerance to some insects and diseases. However, the fungus in most fescue varieties produces toxins that are harmful to livestock. The MaxQ® and MaxQ II® endophytes provide all the benefits to the plant without producing any harmful animal toxins. Other benefits of the endophyte to plants include enhanced seedling vigor, less seedling root rot, increased tillering, greater tolerance to grazing, more efficient use of nitrogen, higher phosphorus uptake, improved competitiveness and a longer growing season compared to fungus-free tall fescue.

ADAPTATION: **Jesup MaxQ®**- Grows well where KY 31 tall fescue is grown. **Texoma MaxQ II®**- Grows well where KY 31 tall fescue is grown and better than KY 31 in the south central U.S. Suitable for some sites west of the I-35 corridor and under irrigation. Jesup MaxQ and Texoma MaxQ II are best adapted to moisture retentive, fertile, clay or clay loam soils. They are tolerant to soil acidity and poor drainage, but perform best on well drained soils having good water holding capacity and a pH of 6.0-6.5. Relatively tolerant to drought. Not suited to drought prone, low fertility sandy soils.

USES: Jesup MaxQ® and Texoma MaxQ II® enhanced tall fescue varieties provide excellent permanent pasture for all classes of grazing livestock including cattle, sheep and horses. (Both varieties are university tested safe for pregnant mares.) With adequate soil moisture, they provide high quality, abundant forage throughout the fall months into spring and early summer. Highest productivity is during September-December and March-June. When cut in the early boot stage of maturity, both varieties produce high quality hay. They are excellent for fall stockpiling and managed grazing during the winter months.

NUTRITION: With proper soil fertility and good management, tall fescue can produce crude protein levels of 15-16% or more with a total digestible nutrient content of 60% or higher. However, environmental conditions and management practices will determine individual results.

***PLANTING:** For best results and benefits, all toxic tall fescue should be killed before establishing Jesup MaxQ® and Texoma MaxQ II®. If the field has a history of volunteer cheatgrass (Bromus tectorum), annual ryegrass (Lolium multiflorum) or rescue grass (Bromus catharticus), do not allow these plants to produce seed in the spring prior to fall establishment of MaxQ and MaxQ II. Prepare the ground well ahead of planting to allow volunteer weeds and grasses to emerge. Apply a non-selective and non-residual herbicide such as glyphosate just prior to seeding to kill all weeds. A firm seedbed is important for good stand establishment. Seed can be drilled into a prepared, firm seedbed, no-tilled into killed sod with a no-till drill or surface broadcast on a prepared seed bed and packed in with a culti-packer. Establishing MaxQ and MaxQ II with a companion crop is **not** recommended. Place seed at a depth of ¼" to ½". Planting too deep will result in poor stand emergence.

SEEDING RATE: 15 lbs/acre in clean-tilled prepared seedbed or 20 lbs/acre sod-seeded or broadcast.

PLANTING DATES: South Central U.S. - Oct. 1 to Nov. 15; Southeast - Sept. 15 to Nov. 1; Mid-South, Midwest and Northeastern states - Aug. 15 to Oct. 1 or spring planted in March and April.

***MANAGEMENT:** Apply lime and fertilizer per soil test recommendation. Do not graze or cut seedling stand until 6"- 8" tall. Use only light rotational grazing in the first year and do not graze or cut closer than 3". To prevent hoof pugging damage, do not graze when soil is excessively wet and soft. During periods of heat and drought stress, rotate grazing cattle more frequently.

*** For more details, see MaxQ® and MaxQ II® planting guides in the Forage Knowledge Center on the Pennington website www.pennington.com.**

MaxQ®
A Non-Toxic Endophyte to Enhance Tall Fescues

Jesup MaxQ® and Texoma MaxQ II® feature advanced technology that combines a non-toxic endophyte with a proven variety of tall fescue. Both varieties offer the plant persistence of toxic fescue varieties like KY 31 but with no detrimental effects on animal performance and health. MaxQ and MaxQ II are university proven to be safe for all classes of grazing animals including pregnant mares. They are widely adapted throughout the traditional fescue belt of the U.S. (See adaptation map.)

TEXOMA MaxQ II®
A Non-Toxic Endophyte to Enhance Tall Fescues

Studies Show MaxQ® & MaxQ II® Safe for Brood Mares

Fescue toxicity in brood mares is widely known and documented. Detrimental effects include prolonged gestation, foaling difficulty, weak or dead foals, thickened placenta, agalactia and reduced conception. With the release of Pennington Seed's **Jesup MaxQ®** and **Texoma MaxQ II®** non-toxic, novel endophyte-infected tall fescue, horse owners now have two safe and persistent varieties from which to choose. In studies at Mississippi State University, no breeding or foaling problems were observed with brood mares grazing MaxQ. (See tables 1 & 2.) This led the researchers to conclude "there is minimal or no health risk to pregnant mares grazing non-toxic endophyte-infected tall fescue." Subsequent studies have proven Texoma MaxQ II to be equally safe for horses.

Table 1

Foaling Results
Mississippi State University

Year	MaxQ®	Toxic Fescue*
2000	100% NP**	40% NP 20% Abort 60% Retained Placenta 80% No Milk
2001	100% NP	33% NP 33% Retained Placenta 83% No Milk

*Mares treated with Equidone
**NP=No Problems
P. Ryan, B. Rude, et.al. - MSU

Table 2

Early Embryonic Death in Mares Grazing Toxic & Non-Toxic Fescue

	Toxic Fescue	MaxQ®
Mare #	8	8
1st Exposure - Breeding Success	4	6
Pregnancies lost by day 120	3	0
Pregnancies past day 120	62.5%	100%

D.L. Christiansen, R. Hopper, et.al. - MSU & UGA

Why Wait - Put the MaxQ® & MaxQ II® Advantage to work on Your Farm Today!

Desired Trait	MaxQ® & MaxQ II®	Toxic Fescue	Fungus-Free Fescue
Stand Persistence	**Excellent!**	Excellent	Poor
Grazing Tolerance	**Excellent!**	Excellent	Poor
Drought Tolerance	**Excellent!**	Excellent	Poor
Cattle Performance	**Excellent!**	Fair	Excellent
Equine Performance	**Excellent!**	Poor*	Excellent
Animal grazing preference	**Excellent!**	Fair	Excellent
Hay production	**Excellent!**	Excellent	Excellent

*Not recommended for pregnant mares