DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA2139

General Traits of Forage Grasses Grown in Arkansas

John Jennings
Professor - Extension
Forage Specialist

Several traits of 35 forage grasses are briefly summarized in this publication.

The values given are estimates of the major traits of these grasses grown under Arkansas conditions. These traits may vary considerably due to extremes in management or environmental conditions.

Seeding Rate

Factors including seed quality, planting date, seedbed condition and method of seeding influence seeding rate. The seed of most forage crops are small. Therefore, cloddy seedbeds may result in much of the planted seed trickling down between clods to a depth too deep for seedlings to emerge, or may result in poor seed-to-soil contact.

It is usually more efficient to spend more time preparing a good seedbed than to increase the seeding rate to compensate for poor seedbed preparation. Rolling the seedbed prior to broadcasting small seed is often a good practice.

When a drill is used to plant forage crops, the seeding rate may be reduced from that recommended for broadcast planting because a larger percentage of the planted seed is placed at a more uniform depth for germination and emergence.

Date of Planting

Planting dates listed in this publication are a broad range for the entire state. Specific planting dates for a local area may be obtained from your county Extension agent.

Planting dates are given as broad ranges because they are based on average weather conditions. Later or earlier than average killing frosts, abnormal rainfall and milder or harder winters or summers are not predictable, so planting date recommendations may vary by season and locality.

There are two general planting seasons for forage crops. Warm-season forages like bermudagrass and dallisgrass are spring planted. Cool-season grasses like tall fescue and orchardgrass are preferably planted in the autumn. But there are exceptions to this rule. Bahiagrass, a warm-season grass, may be planted after November 1 and until the end of May. Tall fescue may be planted either in the autumn or the spring.

Forage crops may be planted earlier or later than the recommended planting dates. However, when this is done, there is a greater chance for stand failure due to frost or drought damage to young seedlings that have not had time to become well established. Older seedlings are likely to be more drought and cold tolerant.

Forage Persistence

The lifespan of a forage stand is determined not only by the genetics of the species but also by such factors as harvest frequency, pests and weather.

Grazing and fertility management also influence stand persistence. Forage species persist from crowns, roots and seeds. Annual forages die each year and must persist in the stand from seed production. Some forages persist better under low

fertility because of low competitiveness. Grazing tolerance, pest resistance, cold tolerance and drought tolerance are factors that improve stand persistence.

Bunch Grasses Versus Sod Formers

Sod-forming grasses such as bermudagrass, bluegrass and bromegrass produce below-ground rhizomes that allow the plant to spread by "creeping" underground. They make excellent soil stabilizers for abating erosion. Bunch grasses such as orchardgrass, big bluestem and switchgrass do not spread extensively by rhizomes. Instead, individual plants grow in clumps. Growing clover in mixtures with bunch grasses is easier than with sod-forming grasses.

Grazing Tolerant Varieties and Development

All grasses will tolerate close grazing better if an extended rest period of several weeks follows a short-duration grazing period. Repeated removal of leaves too soon after the previous grazing can be very detrimental to plant health. If repeated often enough, it can weaken or kill plants in the stand. Grasses whose regrowth arises primarily from nodes set close to the ground tolerate close grazing best. Some new varieties have been tested under heavy grazing pressure to improve stand persistence.

Survives Low Fertility

Any grass will produce better and remain healthier if soil fertility is adequate. Both yield and stand longevity are favored by good soil fertility. Tall fescue is an example of a forage species that performs better on fertile soils but tolerates low fertility. Its persistence under harsh conditions has made it a favorite for use on erodible, infertile soil. Native prairie grasses including big bluestem, little bluestem and indiangrass may survive better under low fertility because they do not compete well with forages like fescue under high fertility conditions.

Tolerance of Poor Drainage

Roots of most commonly grown forage crops require oxygen in the soil pore spaces for proper nutrient uptake. Standing water tends to harm forage growth in two ways. First, it excludes oxygen from the root zone, and second, it encourages root rot organisms to grow. Reed canarygrass and dallisgrass are examples of forages whose roots tolerate wet, poorly drained soils. Bermudagrass and alfalfa are forages that need well-drained soils. Within the alfalfa species, however, are phytophthora root rot-resistant varieties that are more tolerant of wetter soils. Also with the bermudagrass species, Alicia seems to be more tolerant of wetter soils than other hybrids.

Nitrate Accumulation

Plants tend to accumulate more nitrate than normal when they are growing under drought stress, in shade and when soils have been heavily treated with either commercial nitrogen fertilizer or animal waste. However, some species accumulate nitrates more readily than others due to their genetic makeup rather than the environmental conditions. These nitrate "accumulator" species are designated in the following tables.

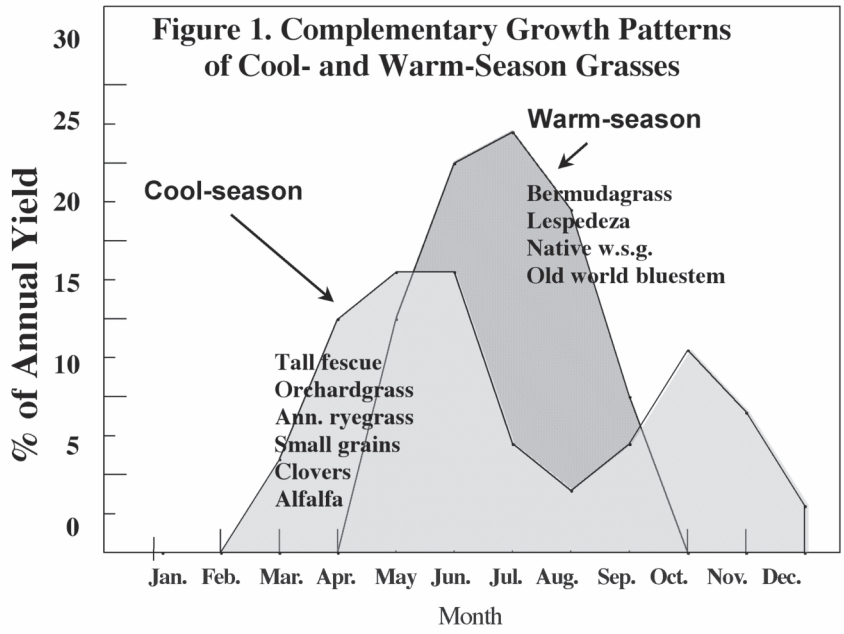
Germination Time

When germination times are given for different forage species, they refer to the time needed for seed to germinate under optimum temperature and moisture conditions. Therefore, the actual germination times for seed planted in the field may be entirely different from those shown in this publication because of soil moisture and temperature differences.

Generally, unhulled seed germinate slower than hulled seed. Also, scarified seed germinate faster than non-scarified seed.

Seasonal Production

Most forages can be categorized as cool-season or warm-season, meaning that the peak growing season occurs during cool or warm times of the year (Figure 1). Full-season grazing requires a combination of cool- and warm-season forages because no single forage grows throughout the year. Effective pasture management includes a combination of cool-



and warm-season forages at a percentage that matches the livestock enterprise.

The values shown in Table 1 are estimates of the percentage of the total annual yield that is normally produced during spring, summer, fall and winter by each commonly grown forage species or mixture. These estimates are intended to serve as a guide for planning 300 days of pasture with a 65-day period for feeding hay. Spring, summer and fall are set as 100 days and winter is 65 days for purposes of this publication. Seasonal forage yield can be determined by multiplying the estimated total forage yield per acre by the percent yield occurring during a particular season. Total seasonal yield for the farm can be estimated by determining seasonal yield for all pastures. Actual growth distribution may vary with local conditions.

Table 1. Seasonal Yield Distribution of Common Forages and Forage Mixtures

	Approximate Forage Yield Distribution* % of Total Annual Yield			
Cool-Season Grasses	**Spring**	**Summer**	**Fall**	**Winter**
Tall fescue	65	10	25	0
Fescue – S. AR	75	5	20	0
Stockpiled fescue**	60	10	0	30
Orchardgrass	65	20	15	0
Annual ryegrass	85	0	10	5
Small grains – N. AR	85	0	10	5
Small grains – S. AR	75	0	10	15
Small grains/ryegrass – S. AR	70	0	10	20
Cool-Season Grass (C.S.G.)/Legume Mixtures	**Spring**	**Summer**	**Fall**	**Winter**
C.S.G./clover	55	20	25	0
C.S.G./lespedeza	40	40	20	0
C.S.G./alfalfa	50	30	20	0
Warm-Season Grasses	**Spring**	**Summer**	**Fall**	**Winter**
Bahiagrass	25	70	5	0
Bermudagrass	20	70	10	0
Stockpiled bermuda	20	60	20	0
Crabgrass	5	90	5	0
Dallisgrass	15	75	10	0
Native W.S.G.***	20	75	5	0
Old World bluestems	20	60	20	0
Warm-Season Grass Mixtures	**Spring**	**Summer**	**Fall**	**Winter**
Bermuda/annual clovers	35	60	5	0
Bermuda/vetch	40	55	5	0
Bermuda/ryegrass	40	50	10	0
Bermuda/small grains – N. AR	35	40	20	5
Bermuda/small grains – S. AR	30	40	20	10
Bermuda/fescue	40	40	20	0
Bermuda/stockpiled fescue – S. AR	30	40	0	30
Bermuda/stockpiled fescue – N. AR	40	30	0	30

* Growing season is split into three 100-day periods with a 65-day winter period. Spring = 100 days from March 1 - June 8; Summer = June 9 - September 16; Fall = September 17 - December 25; Winter = December 26 - February 28.

** Fall growth is normally grazed during winter period.

*** Fall growth is left to maintain stand vigor – grazing is not recommended during this period.

Table 2. Warm-Season Perennial Grasses Described

Forage Species Trait		Bahiagrass	Hybrid Bermudagrass	Common Bermudagrass	Big Bluestem	Old World Bluestem	Dallisgrass	Eastern Gamagrass	Indiangrass	Johnsongrass	Switchgrass	Buffalograss	Weeping Lovegrass
Seeding rate PLS [j] (lb/A)	Drilled	12	20-40[a]	4[bh]	5-10	2-3	12	8-10	6-10	10-15	5-6	5	2
	Broadcast	15-18		6-8[ch]	5-10	3-5	15-18	10	10	20-30	5-6		
Date to plant (month)		11-5	3-6	3-6	4-5	4-6	5-6	4-5	4-5	4-5	4-5	4-5	3-4
Germination time (days)		21		21	28		21	10-90[e]	21	35	28	28	14
Seed per lb (1000)		150		1300-1800[i]	150	880	340	5-7	170	130	220-370	330	1500
Lifespan A = Annual P = perennial		P	P	P	P	P	P	P	P	P	P	P	P
Bunch (B) or sod forming (S)		S	S	S	B	B	B	B	B	S	B	S	B
Spread by: S=seed R=rhizome St=stolons		S-R	R-St	S-R-St	S	S	S	S-R	S	R-S	R-S	S-St	S
Height at maturity (ft)		1-1.7	1.3-1.7	1-1.5	3-6	2-4	1-2	3-8	3-6	3-6	3-7	1/4-3/4	2-3
Estimated yield potential (T/A)		5.2	7.9	5.8	4.5	7.3	4.5	6	4.2	4.5	4.6		
Tolerates close grazing often		yes	no	yes	no	yes	yes	no	no	no	no	yes	no
Major use: H=hay P=pasture S=silage		P	P-H	P-H	P-H	P-H	P	P-H	P-H	H	P-H	P	P
Survives low soil fertility		yes	no	yes	yes	yes	no	yes	yes	yes	yes	yes	yes
Soil texture preferred		sand and sandy loam	sandy loam	sandy loam to clay loam	loam to clay loam	loam to silt loam	clay and loam	loam to clay loam	loam to clay	sand to clay	loam to clay loam		
Tolerates poor soil drainage		yes	no	yes[d]	yes	no	yes	yes	yes	yes	yes		
Degree of drought tolerance: P=poor G=good E=excellent		E	E	E	E	G	G	G	G	G	G	E	G
Production season (month)		4-10	5-10	5-10	6-8	4-10	4-10	5-8	5-9	5-9	5-8	6-9	4-10
Nitrate accumulator							yes			yes			
Portion of Arkansas where best adapted: N=northern S=southern A=entire state W=western		S 1/2	A	A	A	N 1/2	A	A	A	A	A	W	W
Special traits			Needs deep soil.				Has ergot on heads. Tolerates poor drainage.		Slow seedling growth.	Watch for prussic acid.	Tolerates poor drainage.	Not adapted.	Very poor forage when mature.

[a] Bushels of sprigs/A.
[b] Hull removed.
[c] 4 lbs if hulls are removed, 6 lbs if hulls are attached.
[d] Better than hybrids.
[e] Untreated seed takes months; treated seed 10+ days.
[f] Green weight.
[g] Verify rate with seed company.
[h] Same seeding rate for lime-coated seed.
[i] One-half the number of seed/lb for lime-coated seed.
[j] lbs of pure live seed.

Table 3. Warm-Season Annual Grasses Described

Forage Species Trait		Browntop Millet	Crabgrass	Foxtail Millet	Pearl Millet	Silage Sorghum	Sudangrass and Sorghum-Sudan	Corn
Seeding rate PLS[c] (lb/A)	Drilled	15-20	2-4	15-20	15	4-6[b]	20-35[b]	10-20[b]
	Broadcast	25-30	4-6	20-30	25-30	15-20[b]	30-35[b]	
Date to plant (month)		5-8	3-5	4-6	4-6	5-6	5-6	4-5
Germination time (days)		14	14-21	10	7	10	10	8
Seed per lb (1000)		140		220	85	28	55	
Lifespan: A=annual P=perennial		A	A	A	A	A	A	A
Bunch (B) or sod forming (S)		B	S	B	B	B	B	
Spread by: S=seed R=rhizome St=stolons		S	S, ST	S	S	S	S	S
Height at maturity (feet)		2-3	2-4	3-4	3-8	4-15	4-8	8-10
Estimated yield potential (T/A)		3.0	4.3	5	6.3	20.0[a]	4-6	22[a]
Tolerates close grazing often		no	yes	no	no	no	no	no
Major use: H=hay P=pasture S=silage		P-H	P-H	H	P-H	S	P-H-S	S
Survives low soil fertility		yes	yes	yes	no	no	no	no
Soil texture “preferred”		sandy loam to clay loam	loam to clay loam	well drained	sandy loam to clay loam	sandy loam to silt loam	sandy loam to silt loam	sandy loam to clay loam
Tolerates poor soil drainage			yes	no	no	no	no	no
Degree of drought tolerance: P=poor G=good E=excellent		G	G	G	G	G	E	P
Production season (month no.)		6-9	5-9	5-9	6-8	7-8	6-9	5-9
Nitrate accumulator					yes	yes	yes	yes
Most likely portion of Arkansas where best adapted: N=northern S=southern A=entire state W=western		A	A	A	A	A	A	A
Special traits		Needs only 60+ days for a crop	Watch for nitrate	Can harvest in 65 days	Cut for hay at 36" ht.	Watch for prussic acid.	Watch for prussic acid. Cut hay at 36".	

[a]Green weight

[b]Verify rate with seed company

[c]lbs of pure live seed

Table 4. Cool-Season Perennial Grasses Described

Forage Species Trait	Kentucky Bluegrass	Orchardgrass	Reed Canarygrass	Tall Fescue	Timothy	Redtop	Wheatgrass	Wildrye	Smooth Bromegrass
Preferred date of planting (month)	9-10	9-10	9-10	9-10	9-10	8-9	8-9	8-9	9-10
Alternate date of planting	2-3	3		3					2-3
Seeding rate (lb/A)	10-15	10-12[a] 12-15[b]	5-8	15-20[a] 20-25[b]	6-10	10-12	4-6[a] 12-20[b]	10-12	15-20
Germination time (days)	14	12	21	7	10	10	14	21	14
Seed per lb (1000)	2200	590	550	227	1230	5100	110-230	120	137
Lifespan: A = annual P = perennial	P	P	P	P	P	P	P	P	P
Bunch (B) or sod forming (S)	S	B	S	B	B	B		B	S
Spread by: S=seed R=rhizome St=stolons	R-S	S	R-S	S-R	S	S	S	S	S-R
Height at maturity (feet)	1-3	2-3	2-6	2-4	2-4	1.5-2.5	3	3	2-3
Estimated yield potential (T/A)	3	4	4.5	4.6	2-4	2-4	3	3	3.8
Tolerates close grazing often	yes	no	no	yes[d]	no	yes	no	no	no
Major use: H=hay P=pasture S=silage	P	P-H	P-H	P-H	H	P-H		P	P-H
Survives low soil fertility	no	no	no	yes	yes	yes	no	yes	no
Survives poor soil drainage	no	no	yes	yes	no	yes	no	no	no
Degree of drought tolerance: P = poor G = good E = excellent	P	P	G	G	P	P	E	G	P
Production season (Fall)	9-11	9-11	9-10	9-11	9-11				9-10
Production season (Spring)	3-6	3-6	3-6	4-6	4-6	4-6	4-6	3-6	4-6
Most likely portion of Arkansas where best adapted: N=northern S=southern A=entire state W=western	N 1/4	N 1/2	N 1/4	N 3/4	N 1/4	N 1/4	W	N, W	N 1/2
Special traits	Use only in mixtures.	Less tolerant of poor drainage and drought than fescue. Is shade tolerant. Nemtatode damage.	Good choice in wet soils.		Tolerates acid soil; prefers clay or loam. Can accumulate nitrates.	Only one hay cutting annually.	Tolerates harsh conditions.		Tolerates saline soils. Slow establishment.

[a]drilled [b]broadcast [c]sod-seeded [d]endophyte-free is less tolerant

Table 5. Cool-Season Annual Grasses Described

Forage Species Trait	Matua Rescuegrass (also called Prairie Grass)	Annual Ryegrass	Wheat	Winter Oats	Spring Oats	Rye	Triticale
Preferred date of planting	9	9-10	9-10	9-10	2-3	9-10	9-10
Alternate date of planting	3	2-3	2-3	2-3	8-9		
Seeding rate (lb/A)	20-30	15-20[ac]	90-120	90-120	90-120	90-120	90-120
Germination time (days)	35	14	7	10	7	7	7
Seed per lb (1000)	50-70	227	12-20	13	13	18	15
Lifespan:	A	A	A	A	A	A	A
Bunch (B) or sod forming (S)	B	B	B	B	B	B	B
Spread by:	S	S	S	S	S	S	S
Height at maturity (feet)	2-4	2-3	2-4	2-4	2-4	2-4	2-4
Estimated yield potential (T/A)	4	4.5	3.4	3.6	2.5	4	3.4
Tolerates close grazing often	no	yes	no	no	no	no	no
Major use: H=hay P=pasture S=silage	P-H	P-H	P-H-S	P-H-S	P-H-S	P-H-S	H-S
Survives low soil fertility	no	yes	no	no	no	no	no
Survives poor soil drainage	yes	yes	no	no	no	yes	yes
Degree of drought tolerance: P=poor G=good E=excellent	P	P	P	P	P	P	P
Production season (Fall)	10-12	11-12	11-12	11-12		11-12	11-12
Production season (Spring)	3-6	2-5	2-4	2-4	3-5	2-3	2-4
Most likely portion of Arkansas where best adapted: N=northern S=southern A=entire state W=western	A	A	A	A	N 1/2	A	A

[a]drilled [b]broadcast [c]sod-seeded

Acknowledgment is given to Dr. B. J. Hankins, former Extension agronomist - forages, the original author of this publication.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

DR. JOHN JENNINGS is a professor - Extension forage specialist with the University of Arkansas System Division of Agriculture, Department of Animal Science, Little Rock.

FSA2139-PD-12-2017RV