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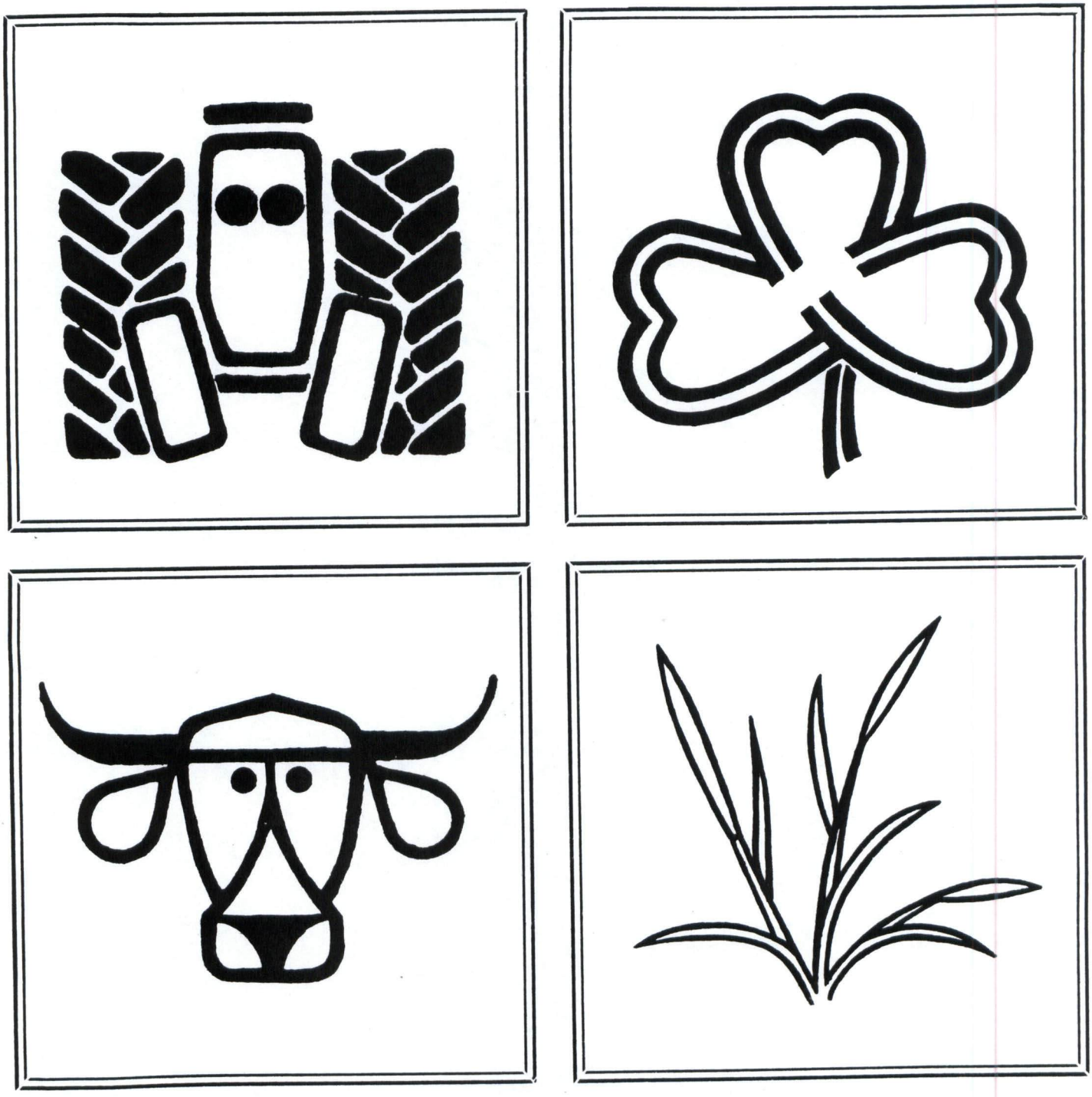

Forage Research in Texas

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Production of Forage Sorghums under Various Management Options at Stephenville

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Summary

Twelve cultivars of Sorghum bicolor (L.) Moench were seeded in one test, and four cultivars were seeded in three additional tests to determine differences due to cultivars, irrigation, planting date, maturity, and regrowth. Yields ranged from 0.93 to 8.25 tons per acre depending upon cultivar and stage of growth.

Highest production at the boot stage was 5.97 tons per acre from the forage sorghum cultivar 'FS-25a+' while 'SX-17+', a sudan sorghum hybrid, produced 5.13 tons. SX-17+ produced more than all other cultivars at the soft dough stage. Planting April 28 resulted in slightly higher yields than planting June 3 for three of the four cultivars tested, but all cultivars planted April 28 required eight days longer to reach boot stage. Regrowth contributed approximately one-half of the total production when first and second cuttings were made at boot stage. 'Atlas' and 'FS-4' reached soft dough stage appreciably sooner than other forage sorghum types. 'Trudan 8' reached boot stage 3-17 days earlier than other sudan sorghum types. Plant height varied with cultivar and growth stage. Adequate rainfall nullified irrigation.

Introduction

Sorghums grown for forage are used for hay, silage, and pasture. Many cultivars of both forage sorghum and sudan sorghum types are available to the producer. Forage sorghum types include tall, high sugar, high yielding cultivars such as Atlas and hybrids resulting from crosses with these cultivars and sorghums grown for grain. The resulting plant generally has good grain production, but is taller, and produces greater plant weight. These types are generally cut for silage or green chop when the seed is at the soft dough stage to optimize digestibility and yield. Sudan sorghum types are generally used for hay or pasture and include sudangrass cultivars and hybrids resulting from crosses of sudangrass with other sorghums, or other sudangrasses. The cross between sorghums used for grain and sudangrass is very common (1). Knowledge of yield and quality potential of sorghums grown for forage under various management options is essential to the producer.

The purposes of this study were: (1) to determine the effect of planting date and irrigation on the growth characteristics, growth

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potential, and forage quality of selected cultivars (2) to determine yields of forage sorghum and small grains in rotation (3) to determine the maturity stage for harvesting optimum yield and quality (4) to determine the contribution of a second harvest to total yield under dryland conditions. This paper reports yields, regrowth yields, and plant height at four growth stages, and the number of days required to reach each growth stage.

Procedure

Plots were established near Stephenville on Windthorst fine sandy loam in 1982 in four separate tests designated A, B, C, and D. Twelve cultivars of S. bicolor were included in test A. These included the cultivars 'Hoti', 'FS-25a+', 'FS-1a+', 'NK 300', 'Red Top Kandy', 'Kow Kandy', 'TE Haygrazer II', 'SX-17+', 'Atlas', 'FS-4', 'Trudan 8', and 'Sweet Sudan'. The latter four cultivars were selected for tests B, C, and D. Tests A and B were designed to be irrigated while tests C and D were to be dryland. Tests A and C were seeded April 28; tests B and D were seeded June 3. Plots in test C were split after the first harvest. Regrowth was harvested from half of the plot, and the other half was destroyed by plowing. Tests B and D were split in September and one-half was seeded to 'Grazer Blend' triticale while the other half was fallowed. Each test had four replications in a randomized, complete-block design.

Fertilizer was broadcast April 8 on test area A and C at the rate of 148-48-48 and incorporated by disking. Test areas B and D were similarly treated June 2 following removal of the triticale. Weighed amounts of seed were hand metered through a funnel placed in the seed spout of a field crop planter having disk openers. The seeding rate was one seed per row-inch. Plots forty feet long had three rows spaced at 36 inches.

Tests A and B were designed for irrigation by a solid-set sprinkler system but received only a single irrigation of two acre-inches when half the cultivars were 3-8 days past flowering and half were at soft dough. Sprinkler heads were mounted on seven feet tall riser pipe, and tops of adjacent plants were tied back to prevent interference with the water stream. Plant height approaching 8.3 feet (measured to the base of the panicle) precluded irrigation with standard sprinkler systems. Cultivars in test A had received 13.14-18.65 inches of rainfall when cut before booting, 14.33-18.65 inches by boot stage, 16.79-19.01 by anthesis, and 18.65-19.77 inches by the soft dough stage. Rainfall for May and June was approximately twice the average for the period 1942-1979 and nullified the effects of two inches of irrigation on tests A and B. Therefore, data from test B is not reported. July rainfall was slightly above the average for the same period.

Plants were cut three inches above ground level from four feet of the center row at each harvest. Each cultivar in test A was harvested when it reached the pre-boot, boot, anthesis, and soft-dough maturity stage. Cultivars in the other tests were

harvested at the boot stage. The pre-boot stage consisted of approximately 1% of the plants in boot stage.

Plant height was measured to the top of the crop canopy at pre-boot, to the base of the flag leaf (at the top of the boot) at booting, and to the base of the panicle at anthesis and soft dough, the stage at which the seed no longer contains liquid. Weight of harvested plants was determined, and subsamples were weighed and subsequently dried at 70C to determine dry matter per acre. Weights were recorded when additional drying caused insignificant weight loss. Subsamples were retained for determination of protein content and *in vitro* dry matter digestibility although these data are not reported.

Results and Discussion

Yields ranged from 0.93 to 8.25 tons dry matter per acre (Table 1). Mean dry matter production of forage sorghum types exceeded production of the sudan sorghum types at all growth stages. However, yields of SX-17+ were comparable to those of the forage sorghum types and highest among the sudan sorghum types at all growth stages. FS-1a+ produced more forage than any other sorghum type at the pre-boot stage, but FS-25a+ produced more at the other growth stages.

Planting on April 28 resulted in slightly higher yields for Trudan 8, Sweet Sudan, and FS-4, but Atlas yields were slightly higher for the June 3 planting (Table 2). All cultivars required an average of eight days longer to reach boot stage when planted April 28 rather than June 3. Sweet Sudan and Trudan 8 reached boot stage about five days earlier than Atlas and FS-4 regardless of planting date.

First harvest yields of most cultivars were slightly higher than regrowth yields when cuttings were made at booting, but yields of Atlas were slightly higher at second boot (Table 3). Total yields of all cultivars were almost doubled by obtaining the second cutting. Since rainfall between cuttings was only 11% above the 39 year average, regrowth should normally contribute about one-half to the total production. Trudan 8 and Sweet Sudan each required 39 days to reach boot stage on the regrowth (ratoon). FS-4 required 45 days while Atlas again reached boot stage 53 days after the first cutting.

Number of days from planting to each of four maturity stages varied within the two types (Table 4). Atlas and FS-4 required appreciably less time to reach the soft dough stage than the other forage sorghum cultivars. Within the sudan sorghum types Trudan 8 reached boot stage earliest at 54 days while SX-17+ required 71 days.

Plant height varied within each type (Table 5). Sweet Sudan was 5.0 feet at the boot stage while SX-17+ was 7.6 feet. NK-300 was the shortest of the forage sorghum types at soft dough while Red Top

Kandy was the tallest at 7.9 feet. SX-17+ was the tallest cultivar at all growth stages.

Literature Cited

1. Personal Communication. Fred R. Miller, Soil and Crop Sciences Department, Texas A&M University, College Station, Texas 77843.

Table 1. Forage Yields of Sorghums Grown for Forage and Harvested at Four Growth Stages in 1982 [1/].

Forage Sorghum Types	Seed Source	Tons Dry Matter Per Acre - Test A*			
		Pre-Boot	Boot	Anthesis	Soft Dough
FS-25a+	DeKalb-Pfizer	4.38	5.97	6.84	8.17
FS-1a+	DeKalb-Pfizer	5.02	4.75	5.05	7.42
NK-300	Northrup King Co.	3.03	4.48	5.26	6.40
Red Top Kandy	R. C. Young	4.51	4.05	6.47	7.54
Hoti	R. C. Young	1.96	3.70	5.24	7.42
Atlas	Warner Seed	2.58	2.70	4.07	5.24
FS-4	DeKalb-Pfizer	2.10	2.61	4.10	5.42
Mean		3.37	4.04	5.29	6.52
Sudan Sorghum Types					
SX-17+	DeKalb-Pfizer	3.21	5.13	5.07	8.25
Kow Kandy	R. C. Young	2.39	2.57	3.14	4.98
T E Haygrazer II	Taylor-Evans	2.04	2.19	3.08	5.07
Trudan 8	Northrup King Co.	1.76	1.78	2.94	3.66
Sweet Sudan	R. C. Young	0.93	1.34	1.98	2.94
Mean		2.07	2.60	3.24	4.98

[1/] Only Hoti, FS-1a+, FS-25a+, SX-17+, NK-300, and Red Top Kandy received two inches of irrigation more than four days preceding harvest at soft dough. Irrigation effect was nullified by rainfall.

* Mean of four replications

Table 2. Effect of Planting Date on Dry Matter Production and Number of Days to Boot Stage of Sorghums Grown for Forage.

Forage Sorghum Types	Test C - Planted April 28 [1]		Test D - Planted June 3 [2]	
	Dry Matter (tons per acre)	Days to Boot	Dry Matter (tons per acre)	Days to Boot
Atlas	2.36	66	2.75	59
FS-4	2.24	62	2.06	53
Mean	2.30	64	2.41	56
Sudan Sorghum Types				
Trudan 8	1.75	55	1.46	46
Sweet Sudan	1.76	62	1.32	55
Mean	1.75	59	1.39	51

[1] Atlas, FS-4, and Sweet Sudan received 16.79 inches of rainfall; Trudan 8 received 14.33 inches.

[2] All cultivars received 9.1-9.8 inches of rainfall.

Table 3. First Cut and Regrowth Yields and Dates of Cutting of Sorghums Grown for Forage Under Dryland Conditions in 1982.

Cultivar	Harvest Dates		Tons Dry Matter Per Acre [1]		
	First Cut*	Regrowth 2**	First Cut 1*	Regrowth 2**	Total
FS-4	June 28	August 12	2.24	1.89	4.13
Atlas	July 2	August 24	2.36	2.47	4.83
Sweet Sudan	June 28	August 6	1.76	1.44	3.20
Trudan 8	June 21	July 30	1.75	1.34	3.09

* Planted April 28 and cut at booting. Trudan 8 received 14.33 inches rainfall while other cultivars received 16.79 inches.

** Planted April 28 and cut at booting. Trudan 8 received 4.70 inches rainfall. Atlas, FS-4, and Sweet Sudan received 3.00, 3.00, and 2.60 inches, respectively.

[1] Mean of four replications

Table 4. Number of Days From Planting to Harvest at Four Growth Stages of Sorghums Grown for Forage 1/

Forage Sorghum Types	Number of Days			
	Pre-Boot	Boot	Anthesis	Soft Dough
FS-25a+	79	83	90	111
FS-1a+	75	79	90	106
NK-300	65	75	79	110
Red Top Kandy	75	78	86	104
Hoti	65	82	89	104
Atlas	61	63	72	89
FS-4	55	61	69	84
Sudan Sorghum Types				
SX-17+	65	71	78	96
Kow Kandy	51	57	65	84
T E Haygrazer II	51	57	65	84
Trudan 8	51	54	62	79
Sweet Sudan	55	58	65	89

1/ Test A - planted April 28

Table 5. Plant Height of Sorghum Grown for Forage at Four Maturity Stages.

Forage Sorghum Types	Plant Height in Feet 1/			
	Pre-Boot	Boot	Anthesis	Soft Dough
Red Top Kandy	6.9	7.2	7.9	7.9
FS-25a+	6.3	6.3	6.9	7.4
Hoti	5.1	6.5	7.1	7.3
Atlas	5.6	6.0	7.3	7.1
FS-4	5.0	6.0	7.0	6.7
FS-1a+	6.2	5.6	6.1	6.4
NK-300	5.2	4.9	5.4	5.5
Sudan Sorghum Types				
SX-17+	7.2	7.6	8.4	8.5
Kow Kandy	4.9	6.0	7.1	7.1
T E Haygrazer II	4.9	6.0	7.1	7.2
Trudan 8	4.3	5.3	6.4	6.8
Sweet Sudan	4.7	5.0	6.1	6.4

1/ Mean of four replications. Height was measured to the top of the plant canopy at pre-boot, to the base of the flag leaf at booting, and to the base of the panicle at anthesis and soft dough.