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Management Effects on Irrigated and Dryland
Forage Sorghum Cultivars at Stephenville in 1981

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SUMMARY

Twelve cultivars of the Sorghum genus were seeded to determine differences due to cultivars, irrigation, planting date, maturity, and regrowth. Dry matter yields of single-cut irrigated forage sorghums ranged from 1.08 to 6.14 tons per acre. Yields of most forage sorghum types were significantly greater than the sudan types at boot stage. Cultivar 'FS-25a+' produced significantly more forage than 'Atlas' at soft-dough. Yields of sudan types were not significantly different at the boot stage. May 22 was a significantly better planting date than April 9 although Atlas yields were higher for the earlier planting. Irrigation hastened booting by 5-9 days for cultivars seeded April 9. Cultivars planted dryland May 22 generally reached boot stage 21 days sooner than those planted April 9. Second cutting yields of 'FS-1a', 'Sweet Sudan', and 'Trudan 8' were as large as the first under dryland conditions. Two harvests of dryland cultivars produced more dry matter than a single harvest of irrigated cultivars cut at booting. Regrowth rate of Trudan 8 was fastest while FS-1a was slowest.

Introduction

Forage sorghums are used for hay, silage, and grazing by beef and dairy animals. Many cultivars of both sorghum and sudan types are available from commercial sources. Since the genetic base among types is narrow, performance of selected cultivars within each type is reasonably representative of those available. Knowledge of yield and quality potential of forage sorghums 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 potential and forage quality of selected cultivars (2) to determine yields of forage sorghum and small grains in double-crop rotation (3) to determine the maturity stage for harvesting optimum yield and quality (4) to determine the effect of a second harvest on yield under dryland conditions. This paper reports the results of the first year of a two year study.

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Materials and Methods

Plots were established on Windthorst fine sandy loam in 1981 in four separate tests designated A, B, C, and D. Twelve cultivars of the *Sorghum* genus were included in test A. These included the cultivars 'Hoti', 'FS-25 a+', 'FS-4', 'NK 300', 'Red Top Kandy', 'Kow Kandy', 'TE Haygrazer II', 'SX-17', 'Atlas', 'FS-1a', 'Trudan 8', and 'Sweet Sudan'. The latter four cultivars were selected for tests B, C, and D. Tests A and B were irrigated while tests C and D were dryland. Tests A and C were seeded April 9; tests B and D were seeded May 22. Plots in test C were split after the first harvest. Regrowth was harvested from one split-plot, and the other was destroyed by plowing. Test B and D were split in September and one-half was seeded to 'Grazer Elend' triticale while the other half was fallowed. Each test had four replications in a randomized, complete-block design.

Fertilizer was broadcast on the area March 27 at the rate of 148-48-48 and incorporated by disking. A cone-type seeder unit mounted on a field crop planter was used to place one seed per row-inch. Plots forty feet long had three rows spaced 36 inches apart.

Tests A and B were designed for irrigation by a solid-set sprinkler system but received only three separate one-acre-inch applications primarily to aid seedling emergence. Rainfall received by cultivars in test A ranged from 7.91 - 10.73 inches by boot stage, 9.47 - 10.73 inches by anthesis, and 10.73 inches by the soft-dough stage. Cultivars in test B had received 8.07 inches by boot stage. Plant height prevented irrigation when it might have been beneficial.

Plants were cut at a height of three inches from four feet of the center row at each harvest. Each cultivar in test A was harvested when it reached the boot, anthesis, and soft-dough maturity stages. Cultivars in the other tests were harvested at the boot stage. Weight of harvested plants was determined, and subsamples were weighed and subsequently dried at 70C to determine dry matter per acre. Subsamples were retained for determination of protein content and *in vitro* dry matter digestibility.

Results and Discussion

Irrigated forage sorghum yields ranged from 1.08 to 6.14 tons dry matter per acre depending upon cultivar and growth stage at harvest (Table 1). Yields from a single harvest of the forage sorghum types (except for FS-1a) were significantly greater than those of the sudan types at the boot stage. Yields of FS-25a+, Hoti, and Red Top Kandy were significantly greater than the sudan types and other forage sorghums at anthesis. Cultivars of the sudan types were not significantly different at the boot stage, but at the soft-dough stage other sudan types produced significantly greater yields than Sweet Sudan. FS-25a+ produced significantly greater yield than Atlas, NK 300, and FS-1a at soft-dough, while FS-1a produced significantly less than other forage sorghum types at the boot and soft-dough stages.

Trudan 8, FS-1a, and dryland Sweet Sudan produced higher yields when seeded May 22, while Atlas and irrigated Sweet Sudan yields were higher when seeded April 9 (Table 2). Lack of response to irrigation was probably due to cool soil temperatures following the April planting and to adequate rainfall following the May planting. The forage sorghum types produced more forage than the sudan types under both irrigated and dryland conditions.

Irrigation hastened booting by 5 - 9 days for the cultivars seeded April 9 (Table 3). Failure of irrigation to hasten booting of the May planting was due to adequate rainfall. Atlas, Trudan 8, and Sweet Sudan planted dryland on May 22 reached boot stage 21 days sooner than when planted April 9. However, the calendar date at booting was later for the May planting.

Dry matter production of FS-1a, Sweet Sudan, and Trudan 8 at the second cutting equaled or exceeded production at the first cutting under dryland conditions (Table 4). Yield of Atlas was substantially less at the second cutting, but total yield was slightly higher than the others. Yields at booting from two harvests of dryland FS-1a, Atlas, Sweet Sudan, and Trudan 8 were greater than those from a single harvest of these cultivars under irrigation (Tables 1,4). Trudan 8 had the fastest regrowth since it produced 2.67 tons/acre in the 32 days following the first cutting. FS-1a required 53 days to produce 2.23 tons per acre when it again reached boot stage.

Table 1. Forage Yields of Irrigated Sorghum Cultivars Harvested at Three Growth Stages at Stephenville, Texas in 1981.

Forage Sorghum Types	Seed Source	Tons Dry Matter Per Acre**		
		Boot	Anthesis	Soft-Dough
FS-25a+	DeKalb AgResearch	4.44	5.77	6.14
Hoti	R. C. Young	3.99	5.35	5.91
FS-4	DeKalb AgResearch	3.52	4.07	4.98
Red Top Kandy	R. C. Young	3.47	6.09	5.90
Atlas	Warner Seed	3.00	4.19	5.17
NK 300	Northrup, King & Co.	2.79	3.62	5.05
FS-1a	DeKalb AgResearch	1.13	2.99	4.03
Mean		3.19	4.58	5.32
<u>Sudan Types</u>				
Kow Kandy	R. C. Young	1.58	3.32	4.37
Sweet Sudan	R. C. Young	1.56	2.50	2.97
TE Haygrazer II	Taylor-Evans	1.39	3.10	4.94
SX-17	DeKalb AgResearch	1.39	3.19	4.77
Trudan 8	Northrup, King & Co.	1.08	3.32	4.43
Mean		1.40	3.09	4.30
L.S.D. (0.05)*		0.68	0.80	0.94

*Difference between two yields within a growth stage must exceed the L.S.D. value for that growth stage for the two yields to be significantly different with a 5% chance of error.

** Mean of four replications

Table 2. Effect of Irrigation and Planting Date on Dry Matter Production of Forage Sorghum Cultivars Harvested at Booting. Stephenville, Texas, 1981.

Forage Sorghum Types	Planted April 9		Planted May 22		Mean
	Irrigated ^{1/}	Dryland ^{2/}	Irrigated ^{1/}	Dryland ^{3/}	
----- Tons Per Acre ^{4/} -----					
Atlas	3.00	3.37	2.75	2.75	2.97a*
FS-1a	1.13	2.00	4.19	4.36	2.92a
<u>Sudan Types</u>					
Trudan 8	1.08	1.31	2.40	2.39	1.81b
Sweet Sudan	1.56	1.46	1.39	1.58	1.50c

Mean - May Planting 2.73a*

Mean - Dryland 2.41a

Mean - April Planting 1.86b

Mean - Irrigated 2.19b

^{1/} Three inches of water applied

^{2/} 'Atlas', 'FS-1a' and 'Sweet Sudan' received 9.47 inches rainfall; 'Trudan 8' received 8.34 inches.

^{3/} Received 8.07 inches rainfall.

* Means followed by the same letter are not significantly different at the 0.05 level

^{4/} Mean of four replications

Forage Sorghum Types		Harvest Dates	
Irrigated	Dryland	June 19	July 15
Atlas	3.00	2.75	2.75
FS-1a	1.13	4.19	4.36
Trudan 8	1.08	1.31	2.40
Sweet Sudan	1.56	1.46	1.39

Planted April 9 and cut at booting. 'Trudan 8' received 8.34 inches rainfall while other cultivars received 9.47 inches.

Planted May 22 and cut at booting. 'Trudan 8' received 8.07 inches rainfall, and other cultivars received 9.47 inches between booting and harvest.

Mean of four replications

Table 3. Effect of Irrigation and Planting Date on Number of days to Booting of Forage Sorghums Grown at Stephenville, Texas in 1981.*

Cultivar	Planted April 9		Planted May 22	
	Irrigated	Dryland	Irrigated	Dryland
Atlas	75	80	59	59
FS-1a	61	70	68	67
Trudan 8	61	66	45	45
Sweet Sudan	70	75	52	54

* See footnotes of Table 2 for irrigation and rainfall information

Table 4. Seasonal Distribution of Dry Matter Production of Forage Sorghum Cultivars Grown Under Dryland Conditions at Stephenville, Texas, 1981.

Cultivar	Harvest Dates		Tons Dry Matter Per Acre ^{1/}		
	Cutting 1*	Cutting 2**	Cutting 1*	Cutting 2**	Total
FS-1a	June 19	Aug. 12	2.00	2.23	4.23
Atlas	June 29	Aug. 12	3.37	1.31	4.68
Sweet Sudan	June 24	Aug. 12	1.46	1.36	2.82
Trudan 8	June 15	July 17	1.31	2.67	3.98

* Planted April 9 and cut at booting. 'Trudan 8' received 8.34 inches rainfall while other cultivars received 9.47 inches.

** Planted April 9 and cut at booting. 'Trudan 8' received 2.43 inches rainfall, and other cultivars received 1.33 inches between harvests.

^{1/} Mean of four replications