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Agronomic performance and silage quality traits of forage sorghum hybrids in 1994

Abstract

The 1994 growing season was characterized by near normal rainfall and temperatures. Both whole-plant DM and grain yields were excellent for all hybrids. The middle-season Pioneer 947 hybrid had the highest grain yield. The two dual-purpose hybrids had the highest whole-plant DM yields, and the male sterile (Golden Harvest H-1) and the grain sorghum (DeKalb 42Y) had the lowest. Strong winds in the first week in September caused substantial lodging in three of the four tall middle- and late-season hybrids (DeKalb FS-5 and Golden Harvest H-2 and H-68). Two of the short height, dual purpose hybrids (Northrup King 300 and Golden Harvest H-45) were not affected. The 10 sorghum hybrids differed significantly in the three important silage quality traits - whole-plant DM, crude protein, and acid detergent fiber.

Keywords

Cattlemen's Day, 1995; Kansas Agricultural Experiment Station contribution; no. 95-357-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 727; Beef; Forage sorghum; Hybrid; Silage; Yield

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**AGRONOMIC PERFORMANCE AND SILAGE QUALITY
TRAITS OF FORAGE SORGHUM HYBRIDS IN 1994**

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L. Pfaff, and K. K. Bolsen*

Summary

The 1994 growing season was characterized by near normal rainfall and temperatures. Both whole-plant DM and grain yields were excellent for all hybrids. The middle-season Pioneer 947 hybrid had the highest grain yield. The two dual-purpose hybrids had the highest whole-plant DM yields, and the male sterile (Golden Harvest H-1) and the grain sorghum (DeKalb 42Y) had the lowest. Strong winds in the first week in September caused substantial lodging in three of the four tall middle- and late-season hybrids (DeKalb FS-5 and Golden Harvest H-2 and H-68). Two of the short height, dual-purpose hybrids (Northrup King 300 and Golden Harvest H-45) were not affected. The 10 sorghum hybrids differed significantly in the three important silage quality traits -- whole-plant DM, crude protein, and acid detergent fiber.

(Key Words: Forage Sorghum, Hybrid, Silage, Yield.)

Introduction

In Kansas, 80,000 acres of sorghum were harvested for silage in 1992, producing nearly 1,300,000 tons with a value of over \$21 million.

Growing season and hybrid have a tremendous effect on agronomic and silage quality traits, as shown in earlier studies (KAES Report of Progress 678, page 13). Our objective was to continue documenting the effects of hybrid and growing season on the agronomic performance and silage quality traits of a wide variety of forage sorghums.

Experimental Procedures

Nine forage sorghum hybrids and one grain sorghum were selected to represent a range of phenotypic characteristics and season lengths. All were grown under dryland conditions near the Kansas State University campus. The forage and grain sorghum plots were planted on May 26, 1994, and each hybrid was assigned randomly to three replications. The 6-row plots were in a Reading silt loam soil. Anhydrous ammonia was applied at 100 lb of nitrogen per acre, Furadan 1.5 G was applied in the furrows at planting, and Ramrod-atrazine was applied the day after planting as a preemergent herbicide. Rows were 30 ft long with a 30-inch spacing, and plots were thinned to uniform stands of 34,800 plants per acre. Because our earlier work (KAES Report of Progress 623, page 65) showed that harvesting at the late-dough stage of kernel maturity maximizes silage yield, all hybrids were harvested at that stage. The two outside rows in each plot were protective borders. Whole-plant DM yield was measured by harvesting the 2nd and 3rd rows with a one-row precision chopper. All heads in the 4th and 5th rows were hand clipped and dried for grain yield determination. A sample of whole-plant material from each plot was analyzed for DM, crude protein (CP), and acid detergent fiber (ADF).

Results and Discussion

Agronomic performance of the 10 hybrids is presented in Table 1. Days to half bloom for the nine forage sorghums ranged from 61 for Golden Harvest EX-218 to 88 for Golden Harvest H-68. Plant heights were near normal. The two late-season forage sorghums (Golden Harvest H-2 and H-68) and DeKalb FS-5 were the tallest, whereas the three dual-purpose

hybrids (Northrup King 300, Golden Harvest H-45, and EX-218) were the shortest among the forage sorghums. As expected, the grain sorghum (DeKalb 42Y) was the shortest overall. Eight of the nine forage sorghums contained at least 32% whole-plant DM. This is essential, because hybrids with less than 30% DM are preserved less efficiently as silage and can produce large amounts of effluent during initial fermentation. Whole-plant DM yield was highest for two of the dual-purpose forage sorghums (Northrup King 300 and Golden Harvest H-45), whereas the male sterile (Golden Harvest H-1) and the grain sorghum had the lowest silage yields. Grain yields were excellent for all hybrids and ranged from 97.5 to 146.3 bu per acre. High wind during the first week in September caused severe lodging in three of the four tall middle- and late-season hybrids (DeKalb FS-5, Golden Harvest H-2, and H-68). The earlier hybrids had already been harvested, and two of the dual-purpose hybrids were not affected by the strong winds.

As expected, the grain sorghum had the highest CP (8.5%) and the lowest ADF (30.7%). Among the forage sorghums, CP values ranged from 6.5 to 8.4%, and ADF from 33.0 to 40.2%. No significant correlations occurred between the three silage quality traits (whole-plant DM, CP, and ADF) and days to half bloom, plant height, or whole-plant DM and grain yields.

Selecting a silage hybrid that has acceptable yield and nutritive value traits is an important management decision. Forage sorghums can be grown under a wide range of moisture and temperature environments, have drought tolerance, and have the ability to recover from drought and still produce satisfactory yields with relatively low inputs. Results from earlier studies have indicated that several forage sorghum hybrids compared favorably to corn and grain sorghum hybrids for both agronomic and nutritive value silage traits (KAES Reports of Progress 539, pages 167 and 172; 568, page 12; and 678, page 16). Most importantly, choose silage hybrids that fit the cropping and cattle-feeding programs of your operation.

Table 1. Agronomic Performance and Quality Traits of Nine Forage Sorghum Hybrids and the Grain Sorghum

Hybrid ¹	Days to Half Bloom ²	Plant Height, inches ³	Harvest Date	Days from 1/2 Bloom to Harvest	Whole-Plant ⁴			DM Yield, tons/acre	Grain Yield, bu/acre ⁵
					DM, %	CP, %	ADF, %		
Grain sorghum									
DeKalb 42Y	62	44(0)	8-25	32	33.6	8.5	30.7	5.6	119.3
NK 300	79	89(0)	9-13	34	35.8	7.6	33.4	8.9	128.4
DeKalb FS-5	66	99(85)	9-06	39	32.3	6.5	32.8	8.1	97.6
Pioneer 947	68	92(0)	9-06	38	38.1	7.8	35.6	8.0	146.3
Golden Harvest									
H-1	---	91(0)	8-25	---	26.2	6.9	35.3	5.5	---
H-2	84	97(90)	9-15	31	33.6	6.5	40.1	8.1	116.5
H-45	79	78(0)	9-09	30	34.7	7.4	34.2	8.5	114.4
H-68	88	99(100)	9-15	27	34.3	6.7	35.2	8.3	97.8
EX-217	81	84(0)	9-06	25	33.5	7.5	36.5	8.1	97.5
EX-218	61	77(0)	8-22	30	32.9	8.4	33.0	6.4	115.1
Mean ⁶	76	89.5(31)	9-02	32	33.5	7.25	35.1	7.75	114.2
LSD (P<.05) ⁷	1.7	13.7(39.2)	---	1.7	5.7	.9	4.1	1.8	14.7

¹NK is Northrup King and EX is experimental. ²Golden Harvest H-1 is a male sterile. Paper bags were placed over the emerging heads to prevent grain development in the two harvested rows. ³Percent lodging on the day of harvest is shown in parentheses. ⁴Crude protein (CP) and acid detergent fiber (ADF) are expressed on a DM basis. ⁵Adjusted to 14.5% moisture. ⁶Mean values include only the nine forage sorghum hybrids. ⁷The LSD (least significant difference) is valid only within a column.