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RESEARCH ARTICLE

Assessment of Two Forage Sorghum-Sudan Grass Hybrids[#]

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ABSTRACT

This trial was conducted for two consecutive Kharif seasons of 2011 and 2012 to compare two interspecific hybrids of sorghum and Sudan grass, namely Mabrook and Panar 888 with two local checks Abu Sabein and Abu Sabein Kambal. Cultivars were sown in a randomized complete block design with four replicates. Data were collected on plant height, number of leaves per plant, leaf area, stem diameter, number of days to 50 % flowering, plant density, fresh weight, and dry weight. Plant height, leaf area, number of leaves per plant, plant density, fresh weight, and dry weight showed highly significant differences ($P = 0.01$) among the four cultivars while stem diameter showed significant differences ($P = 0.05$). Number of days to 50% flowering showed insignificant differences among the four cultivars. Mabrook exceeded all the other cultivars in plant height, fresh weight, and dry weight. Mabrook and Abu Sabein Kambal exceeded the others in leaf number, leaf area, and plant density.

Key words: Abu Sabein Kambal, Abu Sabein, Mabrook, Panar 888

INTRODUCTION

The effort on sorghum breeding in the Sudan has been directed toward the development of high-yielding types suitable for mechanical harvesting.[1,2] Due to the increasing demand for animal products and the establishment of dairy farms and animal fattening centers, some efforts were deviated toward the production of forage sorghum varieties.

The animal wealth in the Sudan depends mainly on natural pastures and the animal owners adopt nomadic system. In the Sudan, the irrigated forages constitute only 4% of the total available forage and they were concentrated in north and central Sudan.[3]

Forage crops of the genus *Sorghum* were classified into three categories: The forage sorghum (*Sorghum bicolor* L. Moench), the forage of Sudan grass (*Sorghum sudanensis* L.), and the sorghum Sudan grass hybrids. The forage sorghum included dual-purpose cultivars that can be used for grains and forage production, for example, Mugud Hemaisy, Abu Sabein Kambal, and Abu Sabein Aliab.[4]

Sudan grass, the cultivar Garawia, constitutes most of the grass forage in the Sudan.[5] It was proved that Garawia had better nutritive value fast regrowth after the first cut than Abu Sabein due to larger number of leaves per plant and slender stem.[6] I was also found that Sudan grass more productive in the second cut, less affected by soil salinity, more resistant to stem borer and one of the best pollinator sorghum cultivars for production of F_1 hybrids.,[7]

There were many sorghum-Sudan grass hybrids approved in the Sudan. These included Pioneer 988 and Pioneer 877 which were sorghum-Sudan grass interspecific hybrids from Pioneer International Seed Company[8] than Jumbo which was released by the Agricultural Research Corporation, Wad Medani, Sudan.[9] Panar 888 was a sorghum-Sudan grass hybrid from Pacific Seed Company.[6] Sorghum-Sudan grass hybrids were reported to be more responsive to recurrent cutting compared to Abu Sabein (El Hamada

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et al., 2003). Furthermore, the hybrids were more productive during winter months than Abu Sabein and Gadam El Hamam.[6]

The hybrids were found to be more responsive to recurrent cutting and can grow more better than Abu Sabein during the winter months.[10]

The objectives of this study were to compare the growth and yield components of two introduced forage interspecific hybrids with two local checks, Abu Sabein local and Abu Sabein Kambal.

MATERIALS AND METHODS

A trial was conducted in the experimental farm of the Faculty of Agriculture and Neutral Resources, University of Bakht Al Ruda, Ed Dueim, Sudan, for two successive Kharif seasons 2011 and 2012. The planted material consisted of four forage grasses, namely Abu Sabein and Abu Sabein Kambal (*S. bicolor* L. Moench), Panar 888, and Mabrouk. The last two were sorghum-Sudan grass (*Sorghum sudanense*) interspecific hybrids. Seeds were supplied by Shambat Research Station.

Treatments were arranged in a randomized complete block design with four replicates. Land was prepared by deep plowing, harrowing, leveling, and ridging. The experimental area was divided into 16 plots, each plot with five ridges of 5 m long and 0.75 m apart. Seeds were planted in channels at the side of the ridge at seed rate of 20 kg/Feddan according to Ishag (1989). Weeding was done manually at 2 weeks after sowing. Nitrogen fertilizer was applied as urea (urea = 46% nitrogen) at the rate of 80 kg/Feddan. Irrigation water was applied at intervals of 10–15 days. The trial received seven irrigations during the growing period and the area received few rain showers.

A sample of 10 plants randomly selected from the central ridges of each plot and tagged for data collection. Plant height was recorded from the tagged plants using a metric ruler from the lowest node above the soil surface to the top of the plant. The stem diameter was measured from the sampled or the tagged plants using a Vernea. The number of days to 50% flowering was recorded for each plot when about half of the plants of each plot started to shed pollens. Number of leaves per plant was counted for each tagged plant and the average of the 10 plants was calculated. Leaf area was obtained by multiplying the length by the maximum width for the fourth leaf by the factor 0.77.

Analysis of variance for randomized complete block design was applied according to Gomez and Gomez[11] and the least significant difference was used to compare the means.

RESULTS

Means for the different characters of the two seasons are presented in Table 1. Analysis of variance showed that there were significant differences among the four cultivars in plant height, number of leaves per plant, leaf area, plant density green matter yield, and dry matter yield, at ($P = 0.01$) level of significance. Stem diameter showed significant differences among the cultivars at ($P = 0.05$) the level of significance. Number of days to 50% flowering showed no significant differences among the four cultivars [Table 2].

In plant height, Mabrouk exceeded significantly all the other three cultivars while Abu Sabein Kambal exceeded significantly both Abu Sabein Local and Panar 888.

Panar 888 was exceeded significantly by the other three cultivars in number of leaves per plant and stem diameter, while these three cultivars showed no significant differences among them.

Results also showed that Mabrouk exceeded significantly Abu Sabein Local and Panar 888 and

Table 1: Mean of the different characters, the average of two seasons 2011 and 2012

Genotype	Plant height	Leaf number	Stem diameter	Leaf area	Days to 50% flowering	Plant density	Fresh weight	Dry weight
Mabrouk	218.5^{a}	10.6^{a}	0.9^{a}	235.1^{a}	65.4^{a}	170.6^{a}	51.5^{a}	13.1^{a}
Abu Sabein	183.5^{b}	9.9^{a}	0.8^{a}	231.8^{ab}	69.9^{a}	161.8^{a}	41.8^{b}	10.0^{b}
Abu Sabein Kambal	174.3^{c}	9.6^{a}	0.8^{a}	210.9^{b}	64.5^{a}	141.3^{b}	37.8^{bc}	8.1^{bc}
Panar 888	173.5^{c}	7.8^{b}	0.6^{b}	170.8^{c}	63.4^{a}	136.8^{b}	33.0^{c}	8.1^{bc}
Mean	187.3	9.4	0.8	212.2	64.5	152.6	41.0	10.0
C.V.	5.3	16.4	17.6	10.4	4.9	10.2	12.7	18.6
LSD	78.9	1.9	0.02	39.4	8.0	19.2	5.9	2.8
S.E.	9.9	0.5	0.1	22.1	3.2	15.5	5.2	1.9

Means currying the same numbers are insignificantly different

Table 2: Means of the different characters for the four cultivars, the average of two seasons 2011 and 2012

Source of variation	Degrees of freedom	Plant height	Leaf number	Stem diameter	Leaf area	Days to 50% flowering	Plant density	Fresh weight	Dry weight
Block	3	31.76	3.03	2.02	272.04	17.20	439.28	61.20	3.20
Genotype	3	3652.81**	11.72**	0.08**	7006.22**	32.78	2103.12**	494.30**	38.78**
Season	1	4023.05**	13.78*	0.03	30830.17**	457.53**	2476.50	4.50	0.03
Genotype/Season	3	235.23	1.04	0.07	2435.66**	27.45	1018.20	11.50	1.95
Error	21	98.60	2.34	0.02	488.17	9.95	240.02	27.30	3.49
$F_{calculated}$		37.05	5.09	4.0	14.4	1.35	8.8	18.11	11.11
F_{Table} (5%)		2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
F_{Table} (1%)		3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80

**Highly significant differences, *Significant differences

Abu Sabein Kambal exceeded significantly, also, Panar 888 in leaf area.

DISCUSSION

The results were obtained wide range of variation among the four forage cultivars in the characters studied. The highly significant differences in plant height among the four cultivars found in this study agreed with results obtained by Cruz *et al*. and Khair.[3,12]

The highly significant variation in number of leaves per plant observed in this study among the four cultivars agreed with the results obtained by Poehlman.[13] Stem diameter showed highly significant variation among the four cultivars confirmed the results found by Bushara,[14] but the plants were higher than the plant obtained in this study.

According to Khair (1995), drought has adverse effect on leaf area and accordingly in forage yield. Mohamed (1910) reported that forage yield was dependent on plant height, number of leaves per plant, and leaf area.

The significant variation in number of days to 50% flowering observed in this work confirmed the results obtained.[15]

REFERENCES

1. Tahir WM. Sorghum improvement for mechanization in the central rain land of the Sudan. Emp J Exp Agric 1964; 32:211-8.
2. Walton PD. Plant breeding in the central Rainland of the Sudan. Emp J Exp Agric 1959;27:79-85.
3. Khair MA. Principles of Forage Crops Production. Training and Publication Administration. Sudan: Agricultural Research Corporation; 1999.
4. Kambal AE. Naming abu sabein sorghums. J Agric Sci 2003;11:449-52.
5. Mohammed MI. Breeding for Forage Sorghum (*Sorghum bicolor* L. Moench) in the Sudan Using Local Stocks as Males and Introduced Stocks as Females. Ph.D. Thesis, Faculty of Agriculture, University of K, Sudan; 2005.
6. Khair MA, Babiker EA, Ibrahim BA, Mohammed BA. Speed Feed and Jumbo, New Sorghum × Sudan Grass Hybrids for Irrigated Areas in the Central Sudan. A Paper Submitted to the Variety Release Committee. Wad-Medani, Sudan: Agricultural Research Corporation; 1995.
7. Emundus LK, Zummo N. Sorghum Diseases in United States and their Control. Agriculture Hand Book 468. Washington, D.C: U.S. Department of Agriculture; 1975. p. 46.
8. Ishag HM. Pioneer 988 Forage Sorghum for Irrigated Gezira. A Report Submitted to the Variety Release Committee. ARC, Wad Medani, Sudan; 1989.
9. Nour AM, Khair MA, Mohammed BA. Performance of Forage Sorghum Hybrids under Sudan Conditions. A Paper Submitted to the Variety Release Committee. Wad Medani, Sudan: Agricultural Research Corporation; 1998.
10. El Ahmadi AB, Khair MA, Mohammed MI. Comparative Performance of Safed Moti, a Grain Sorghum × Sudan Grass Hybrid from India. A Paper Submitted to the Variety Release Committee. ARC. Wad Medani. Sudan; 2003.
11. Gomez KA, Gomez AA. Statistical Procedures for Agricultural Research. New York: John Wiley and Sons; 1984. p. 680.
12. Cruz R, Garcia M, Ayala JR. Evaluation and selection of forage sorghum varieties, morphology cal and productive traits. Cuban J Agric Sci 1995;29:233-8.
13. Poehlman JM. Breeding Field Crops. 3rd ed. New York: Van Nostrand Reinhold Co Ltd.; 1987. p. 508-55.
14. Bushara MA. Tester Analysis for Hetrosis and Combining Ability in some Genotypes of Grain Sorghum (*Sorghum bicolor* L. Moensch) MSc Thesis, Faculty of Agriculture, University of Khartoum; 1999.
15. Quinby JR. Sorghum Improvement and the Genetics of Growth College Station. College Station, TX: Texas A and M University Press; 1974. p. 108.