

Pioneer 877F A new forage hybrid of *Sorghum bicolor* and Sudan grass, *Sorghum sudanensis*.

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SUMMARY

Sorghum bicolor / Sudan grass hybrid, viz pioneer 877F, was compared with *Sorghum bicolor* cv. Abu Sabeen and *Sorghum bicolor* / Sudan grass hybrid, pioneer 988 regarding forage yield and quality. No significant differences were found in the total yield or crude protein (cp%) of the different genotypes. Pioneer hybrids invariably out yielded Abu Sabeen in the second cut. Some agronomic aspects, which are in favour of Pioneer 877F, are discussed.

INTRODUCTION

Since its inception in 1914, the breeding programme of sorghum in the Sudan has been directed towards grain production. Despite the fact that animal wealth in the Sudan is as or even bigger than other agricultural activities, no breeding programmes for forage varieties of sorghum were initiated. This attitude has resulted in the prevalence of a single variety of forage sorghum, i.e Abu Sabeen, in the country.

Abu Sabeen is an early flowering crop and its forage yield was reported to be higher than some other introduced varieties of forage sorghum (Kambal, 1972). A major shortcoming of Abu Sabeen, however, is its poor growth after cutting. Henceforth, a sorghum/sudan grass hybrid i.e pioneer 988 which yielded better than Abu Sabeen in the second cut, was released (Ishag, 1989). Pioneer 988 in turn has some shortcomings which are encountered in its seed production. Fortunately, another hybrid, i.e pioneer 877F, was made available by Pioneer Company.

The objective of the experiments reported here is to compare the dry matter yield and crude protein of Pioneer 877F with that of Abu Sabeen, Pioneer 855F and pioneer 988.

MATERIALS AND METHODS

Four experiments were conducted in the Gezira Research Farm, Wad Medani, Sudan. The standard land preparation procedure was followed i.e disc ploughing, disc harrowing, levelling and then ridging to 60 cm apart. Seeds were drilled on top of the ridge at the rate of 48 kg/ha. Urea was applied at sowing at the rate of 188 kg/ha (2N). Irrigation was applied every two weeks. Subplots were kept weed free by hand weeding when needed.

The treatments comprised four genotypes namely, *Sorghum bicolor* cv. Abu Sabeen and three sorghum/sudan grass hybrids (pioneer 988, pioneer 877F and pioneer 855F). The design of each

experiment was a completely randomized block with five replications. Further specifications for each experiment are given below.

Experiment 1:-

This experiment was conducted in 1986. The subplot size was 9.0 M², and the genotypes included Abu Sabeen and the three pioneer hybrids. Three cuts were taken and the fresh weights of the forage were recorded in the field. ***Experiment 2:-***

This was conducted in 1990. The sowing date was July, 7, and the genotypes included Abu Sabeen, pioneer 988 and pioneer 877F. Two cuts were taken, and the fresh weight was measured in the field. A sub-sample of known fresh weight was oven dried at 70-80 °C for 48 hours for the determinations of the dry matter percentage.

Experiment 3:-

This was sown on August 4, 1991. The genotypes included Abu Sabeen, pioneer 988 and pioneer 877F. Two harvests were taken from each genotype, and forage yields were handled as in experiment 2.

Experiment 4:-

This was sown on August 6, 1991. The treatment comprised two genotypes, namely, Abu Sabeen and Pioneer 877F, and four cutting stages i.e. boot, 50% heading, 100% heading and grain filling stages. Two cuts were taken from each genotype, and the forage yields were handled as in experiment 2. Only the yield of each genotype (average across all cutting stages) are presented in this paper.

Nitrogen percentage was measured by Micro kjeldahl method and crude protein percentage was calculated as N% X 6.25. The crude protein yield was measured as CP% X Dry matter.

RESULTS

Dry matter:-

In 1986, comparison of Pioneer 877F with other Pioneer hybrids (Table 1) revealed no significant differences in forage yield. Similarly no significant differences in dry matter (DM) yield were found between Pioneer 877F and each of Abu Sabeen and Pioneer 988 during 1990 and 1991 (experiments 2 and 3) in the first cut or in the total yields (Tables 2 and 3). However, both Pioneer hybrids (Pioneer 988 and 877F) out yielded Abu Sabeen in the second cut (Tables 2 and 3). Moreover, the DM yield of Pioneer 877F in the second cut of 1991 (experiment 4) was significantly higher than that of Abu Sabeen (Table 4). The DM yield of Abu Sabeen and Pioneer hybrids in the second cut (% total DM) were, respectively, 13% and 18% in 1990 (experiment 2) and 18% and 23% in 1991 (experiment 3) (Tables 2 and 3). In experiment 4, the DM yield of Pioneer 877F was 21% compared to 16% for Abu Sabecii (Table 4).

Crude protein:-

The data on crude protein (CP) of the different plant tissues as well as in the over all dry matter in experiment 3 and 4 are shown in Table 5 and 6, respectively. No significant differences were found among the genotypes whether in the different plant tissues or in the overall plant tissues in experiment 4 except that the overall CP% of Abu Sabeen was higher than that of Pioneer 877F ($p < 0.05$) (Table 6).

Table 1: Fresh yield of pioneer hybrids (t/ha) in 1986 (experiment 1).

Table 2: Dry matter yield (t/ha) of Abu Sabeen and two sorghum/sudan grass hybrids in 1990 (experiment 2).

Genotype	1st cut	2d cut	Total
Abu Sabeen	8.75	1.33(13.2)	10.08
Pioneer 988	8.26	1.80(17.9)	10.06
Pioneer 877F	7.41	1.70(18.7)	9.11
S.E. t	0.431	0.149	0.496

Figures between brackets are the second cut as % of the total yield.

Table 3: Dry matter yield (t/ha) of Abu Sabeen and two sorghum/sudan grass hybrids in 1991 (experiment 3).

Genotype	1st cut	2nd cut	Total
Abu Sabeen	6.83	1.49(17.9)	8.32
Pioneer 988	7.50	2.30(23.3)	9.88
Pioneer 877F	7.37	2.14(22.5)	9.51
S.E. t	0.565	0.219	0.698

Figures between brackets are the second cut as % of the total yield.

Table 4: Dry matter yield (t/ha) of Abu Sabeen and Pioneer 877F yield. (mean across all cutting stages) in 1991 (experiment 4).

Genotype	1st cut	2nd cut	Total
Abu Sabeen	7.44	1.39(15.7)	8.83
Pioneer 877F	7.78	2.12(21.4)	9.90
S.E.	0.337	0.144	0.376

Figures between brackets are the second cut as % of the total yield.

DISCUSSION

The overall CP% reported in this study compares closely with that of pearl millet, tift Sudan grass and dried stalks of maize (Skerman and Riveros, 1990) and with that reported for the straw of some mature temperate legumes (Thomson, 1987). As the differences between the genotypes in the CP% are limited or lacking, the best criterion to differentiate between the genotypes is their ability to produce dry matter.

The dry matter yields of the different genotype in this study are consistent with earlier reports on Abu Sabeen and Pioneer 988 (Ishag, 1989) and with some selections of Abu Sabeen (Kambal, 1972). The consistently higher yield of the hybrids in the second cut of this study are in agreement with earlier reports on Pioneer 988 (Ishag, 1989). This superiority of the hybrids in

the second cut, compared to Abu Sabeen suggests that these hybrids are much suited for multiple cutting systems. Abu Sabeen, in contrast, is better suited for single cutting system.

Despite the similar yielding ability of Pioneer 877F and Pioneer 988, there are few agronomic advantages which are in favour of Pioneer 877F. According to Dr. Devy Mohan (Pioneer company; personal communication), the number of days to 50% flowering in the female parents of 877F and 988 and the male parent were 78-82, 75-82 and 80-85, respectively. The nicking problem which is usually encountered between the female parent of Pioneer 988 and the male parent is therefore lacking in the case of Pioneer 877F. In addition, the seed yield of the female parent of Pioneer 877F was 28% more than that of Pioneer 988 in the Sudan and about 50% in the U.S.A. The weight

Table 5: Crude protein (%DM) of Abu Sabeen and Sorghum/sudan grass hybrids (experiment 3).

Genotype		1st cut			2nd cut		
Stem	Leaf	Overall	Stem	Leaf	Overall		
Abu Sabeen			4.15	10.29	6.32	4.74	9.74
Pioneer 988			4.14	10.14	6.18	4.53	9.68
Pioneer 877	F		4.14	10.16	6.28	4.50	9.48
Mean			4.14	10.20	6.23	4.50	9.63

of the 1000 seeds in Pioneer 877F is 25 g whereas that of Pioneer 988 is 31 g. This means that one kilogramme of Pioneer 877F would contain 40,000 seeds compared to 32,359 seeds in the case of Pioneer 899. Hence lower seed rates would be needed in the case of Pioneer 877F.

In conclusion, no significant differences were found among the different genotypes regarding the total yield. The sorghum / sudan grass hybrids are better than Abu Sabeen in the second cut. Some agronomic advantage in the female parent of Pioneer 877F are in favour of Pioneer 877F compared to Pioneer 988.

Table 6: Crude protein (%DM) and crude protein yield (t/ha) of Abu Sabeen and Pioneer 877F (in the first cut of experiment 4).

Genotype	Stem CP%	Leaf CP%	Overall CP%	Total CP yield
Abu Sabeen	3.62	9.26	5.7	0.414
Pioneer 877F	3.98	8.98	5.4	0.418
S.E. t	0.057	0.126	0.088	0.016

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