

The effect of planting date on the dry matter production of annual forage sorghum hybrids and hybrid millet cultivars.

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Introduction

The use of forage sorghum hybrids (*Sorghum bicolor* (L.) Moench x *Sorghum sudanense*) (Viaene and Abawi 1998) and hybrid millets (*Pennisetum glaucum*) as summer and autumn pasture have become very popular during recent years. This is because forage sorghums hybrids and hybrid millets have low water requirement, high dry matter (DM) productions and rapid growth over a short season (Renato et al. 2001; Butler et al. 2003). Unfortunately no information is available on when to establish

these pastures and if some cultivars can be planted earlier than others. It is important during establishment to choose the most effective planting date to ensure optimal growth. The wrong planting date could lead to insufficient germination and uneven growth.

The aim of the study was to determine the effect of planting dates of different cultivars on the DM production of forage sorghum hybrids (*Sorghum bicolor* (L.) Moench x *Sorghum sudanense*) and hybrid millets (*Pennisetum glaucum*).

Table 1: The types of forage sorghum hybrids and hybrid millets and cultivars evaluated.

Type of sorghum	Cultivar
Conventional:	
Late	Jumbo Pac 8288
Early	Greengrazer Super King
BMR	Revolution BMR Kow Kandy BMR
Sweet	Hunnigreen Beta Grazer
Hybrid millet (<i>Pennisetum</i>)	Hy Pearl Millet Nutrifeed

Material and methods

An experiment using four different planting dates was conducted at Outeniqua Experimental farm with forage sorghum hybrids and hybrid millet cultivars. The farm is situated near George in the Western Cape (altitude of 210 m, 33° 58' 38" S and 22° 25' 16" E,) (Botha, 2003) with an annual rainfall of 730 mm (Anonymous 1990).

Ten cultivars were selected according to previous sorghum trial results (Gerber et al. 2006). The cultivars were planted at four different planting dates. The planting dates were 22 September 2006, 20 October 2006, 21 November 2006 and 20 December 2006. Table 1 indicates the different types of forage sorghums hybrids and hybrid millet cultivars that were selected.

The cultivars were planted on an Estcourt type of soil. Sixteen paddocks sized 138 m² each was each divided into 10 blocks. The size of these blocks was 11.5 m². Soils were sprayed with glyphosate (2 L/ha) 2 weeks before planting. Soils were tilled with a disc harrow (1.5m) followed by a kongskilde. Seeds were broadcasted on plots and then rolled with a land roller (2.33m width, 30 rollers, Cambridge type). The seeding rate of forage sorghums hybrids and hybrid millets were 30kg/ha and 15kg/ha respectively. Irrigation was scheduled according to a tensiometer reading. Irrigation commenced at a tensiometer reading of -25 Kpa and terminated at -10 Kpa (Botha 2003). Fertilizer was applied to raise the soil potassium (K) level to 80mg/kg,

phosphorous (P) to 35mg/kg and pH (KCl) level to 5.5. Nitrogen (N) and K was applied before planting at a rate of 50kg LAN/ha and 150kg KCl/ha respectively. Four weeks after emergence a top dressing of 200kg/ha of 4:3:4 (33) was applied and after each cutting 200kg/ha LAN. and 90kg/ha KCl were given.

Plants were harvested when 60% of plots reached a height of 1 meter. It was cut down with an Agria 5400 cutter (1.27m width) to a height of 100 mm. Sorghums were separated from weeds to determine plot weight. Samples of approximately 300g were taken from each plot to be weighed and dried for 72 hours at 60° C, this was used to determine DM production (kg DM/ha), growth rate (kg DM/ha/day) and DM content (%).

The experimental design was a split-plot with 4 main plot treatments (planting dates) and 10 split plot treatments (cultivars). To select the treatments, which performed the best, a monthly average was calculated for each variable. An appropriate analysis of variance was conducted. Student 's LSD (least significant difference) at a 5% significance level was used to compare the treatment means (Ott 1998) The assumption of normality of the residuals was tested by a Shapiro Wilk test before the analysis of variance could be called reliable and valid. The "LSTATS" module of SAS program version 8.2 was used to analyze the data (SAS 1999).

Result and Discussion

Table 2 indicates the total DM pro-

Table 2: The DM production (kg DM/ha) of frequently cut forage sorghum hybrids and hybrid millet cultivars planted during September 2006

Cultivar	Cutting date					Total DM production
	11 Dec	8 Jan	6 Feb	12 Mar	25 Apr	
Betta Grazer	440 ^a	1615 ^a	1854 ^a	1054 ^{ab}	1446 ^a	6409^a
Hy Pearl Millet*	67 ^e	453 ^{cd}	940 ^{cd}	608 ^{cd}	644 ^{cd}	2712^{cd}
Nutrifeed*	117 ^{cde}	803 ^{bc}	1681 ^{ab}	1168 ^a	1373 ^a	5142^{ab}
Pac 8288	265 ^{bc}	1204 ^b	1767 ^a	1171 ^a	1175 ^{ab}	5582^{ab}
Greengrazer	281 ^b	1143 ^b	1609 ^{ab}	837 ^{abc}	973 ^{bc}	4843^{ab}
Super King	228 ^{bcd}	1007 ^b	1155 ^{bc}	790 ^{bc}	896 ^{bc}	4076^{bc}
Revolution BMR	46 ^e	382 ^d	322 ^e	180 ^e	151 ^e	1080^e
Kow Kandy	12 ^e	226 ^d	74 ^e	23 ^e	35 ^e	369^e
Hunnigreen	78 ^e	502 ^{cd}	371 ^{de}	134 ^e	162 ^e	1247^{de}
Jumbo	83 ^{de}	531 ^{cd}	580 ^{cde}	351 ^{de}	327 ^{de}	1872^{de}
LSD (0.05)	148.2	402.5	586.9	345.8	347.5	1618.5

Figures with letters in common do not differ significantly ($P>0.05$)

*Hybrid millet

Table 3: The DM production (kg DM/ha) of frequently cut forage sorghum hybrids and hybrid millet cultivars planted during October 2006

Cultivar	Cutting date					Total DM production
	19 Dec	18 Jan	16 Feb	27 Mar	14 May	
Betta Grazer	711 ^a	1357 ^a	1330 ^a	2128 ^a	604 ^b	6131^a
Hy Pearl Millet*	206 ^d	725 ^d	667 ^{de}	1145 ^c	401 ^{bcd}	3145^{de}
Nutrifeed*	379 ^{cd}	995 ^c	1243 ^{ab}	1909 ^{ab}	1279 ^a	5805^a
Pac 8288	694 ^a	1257 ^{ab}	1498 ^a	2044 ^a	559 ^{bc}	6052^a
Greengrazer	462 ^{bc}	1037 ^{bc}	919 ^{bcd}	1525 ^{bc}	404 ^{bcd}	4346^{bc}
Super King	631 ^{ab}	1031 ^{bc}	1124 ^{abc}	1796 ^{ab}	544 ^{bc}	5125^{ab}
Revolution BMR	303 ^{cd}	747 ^d	480 ^{ef}	636 ^d	194 ^{de}	2359^e
Kow Kandy	198 ^d	400 ^e	114 ^f	135 ^e	42 ^e	888^f
Hunnigreen	250 ^{cd}	575 ^{de}	523 ^e	546 ^d	195 ^{de}	2090^e
Jumbo	446 ^{bc}	1031 ^{bc}	758 ^{cde}	1133 ^c	343 ^{cd}	3710^{cd}
LSD (0.05)	226.8	243.1	380.1	401.8	256.6	1109

Figures with letters in common do not differ significantly ($P>0.05$)

*Hybrid millet

Table 4: The DM production (kg DM/ha) of frequently cut forage sorghum hybrids and hybrid millet cultivars planted during November 2006

Cultivar	Cutting date					Total DM production
	1 st cutting 11 Jan	2 nd cutting 8 Feb	3 rd cutting 15 Mar	4 th cutting 4 May	5 th cutting	
Betta Grazer	1314 ^{abc}	775 ^b	1032 ^a	1172 ^{bc}	-	4293 ^{bc}
Hy Pearl Millet*	1456 ^{ab}	1543 ^a	751 ^{bc}	1095 ^{bc}	-	4845 ^b
Nutrifeed*	1597 ^a	1712 ^a	795 ^{ab}	1809 ^a	-	5913 ^a
Pac 8288	930 ^{cd}	831 ^b	1009 ^{ab}	1264 ^b	-	4034 ^{bc}
Greengrazer	1031 ^{bcd}	653 ^{bc}	484 ^d	654 ^{de}	-	2822 ^d
Super King	958 ^{cd}	770 ^b	779 ^{abc}	1031 ^{bcd}	-	3538 ^{cd}
Revolution BMR	357 ^e	374 ^c	217 ^e	326 ^{ef}	-	1274 ^e
Kow Kandy	257 ^e	398 ^c	50 ^e	74 ^f	-	780 ^e
Hunnigreen	264 ^e	385 ^c	194 ^e	400 ^{ef}	-	1244 ^e
Jumbo	647 ^{de}	621 ^{bc}	528 ^{cd}	804 ^{cd}	-	2599 ^d
LSD (0.05)	459.0	371.1	259.8	383.9		1055.2

Figures with letters in common do not differ significantly ($P>0.05$)

*Hybrid millet

Table 5: The DM production (kg DM/ha) of frequently cut forage sorghum hybrids and hybrid millet cultivars planted during December 2006

Cultivar	Cutting date					Total DM production
	1 st cutting 1 Feb	2 nd cutting 28 Feb	3 rd cutting 17 Apr	4 th cutting	5 th cutting	
Betta Grazer	1397 ^a	924 ^b	1536 ^{ab}	-	-	3856 ^{abc}
Hy Pearl Millet*	1051 ^{ab}	1579 ^a	1583 ^a	-	-	4213 ^{ab}
Nutrifeed*	1188 ^{ab}	1686 ^a	1700 ^a	-	-	4574 ^a
Pac 8288	954 ^b	957 ^b	1325 ^{ab}	-	-	3236 ^{bc}
Greengrazer	1219 ^{ab}	818 ^b	804 ^{cd}	-	-	2841 ^c
Super King	961 ^b	875 ^b	1050 ^{bc}	-	-	2886 ^c
Revolution BMR	229 ^c	290 ^c	284 ^e	-	-	802 ^d
Kow Kandy	160 ^c	148 ^c	71 ^e	-	-	379 ^d
Hunnigreen	296 ^c	319 ^c	199 ^e	-	-	814 ^d
Jumbo	273 ^c	394 ^c	376 ^{de}	-	-	1044 ^d
LSD (0.05)	412.0	367.7	494.8			1067.8

Figures with letters in common do not differ significantly ($P>0.05$)

*Hybrid millet

duction (kg DM/ha) of frequently cut forage sorghum hybrids and hybrid millet cultivars planted during September 2006.

Betta Grazer produced the highest amount of DM during the first two cuttings. During the third and fourth cutting Betta grazer, Nutrifeed, Pac 8288 and Greengrazer produced similar amounts of DM. This resulted in Betta Grazer, Nutrifeed, Pac 8288 and Greengrazer to produce the highest total amount of DM per hectare (kg/ha).

Table 3 shows the total DM production (kg DM/ha) of frequently cut

forage sorghum hybrids and hybrid millet cultivars planted during October 2006.

Betta Grazer, Nutrifeed, Pac 8288 and Super King had high DM productions throughout the majority of the first four cuttings. Nutrifeed produced the highest amount of DM during the fifth cutting. This resulted in Betta Grazer, Nutrifeed and Pac 8288 to produce a higher amount of DM/ha than most of the cultivars and only Super King could produce a similar amount of total DM/ha.

Table 4 indicates the total DM production (kg DM/ha) of frequently

Table 6: The total DM production (kg DM/ha) of frequently cut forage sorghum hybrids and hybrid millet cultivars planted on 4 different planting dates.

Cultivars	22 September	20 October	21 November	20 December
Betta Grazer	6409 ^{xx}	6131 ^x	4293	3856
Hy Pearl Millet*	2712	3145	4845	4213
Nutrifeed*	5142	5805 ^x	5913 ^x	4574
Pac 8288	5582 ^x	6052 ^x	4034	3236
Greengrazer	4843	4346	2822	2841
Super King	4076	5125	3538	2886
Revolution BMR	1080	2359	1274	802
Kow Kandy	369	888	780	379
Hunnigreen	1247	2090	1244	814
Jumbo	1872	3710	2599	1044
¹ LSD (0.05)	1618.5	1109.0	1055.2	1067.8
² LSD (0.05)	1193.0			

¹LSD within planting date

²LSD over planting dates

^{xx}Highest value (P<0.05) LSD = 1193.0

^xDiffer not from highest value (P>0.05) LSD = 1193.0

Hybrid millet*

cut forage sorghum hybrids and hybrid millet cultivars planted during November 2006.

During the first cutting Nutrifeed had a higher DM production than most of the cultivars and only Betta Grazer and Hy Pearl Millet had a similar DM production. The fact that Nutrifeed had a higher DM production during each cutting than most of the other cultivars and only similar to that of Betta Grazer during the third cutting, resulted in Nutrifeed to produce the highest total amount of DM per hectare.

Table 5 shows the total DM production (kg DM/ha) of frequently cut forage sorghum hybrids and hybrid millet cultivars planted during December 2006.

Hy Pearl Millet and Nutrifeed produced similar amounts of DM during each of the three cuttings followed the December planting date. The similarity of DM produced by Betta Grazer compared to that of Hy Pearl Millet and Nutrifeed during the first and third cut resulted in these three cultivars to produce a higher total amount of DM per hectare than most of the cultivars.

Table 6 shows the total DM production (kg DM/ha) of frequently cut forage sorghum hybrids and hybrid millet cultivars planted on 4 different planting dates.

Insert Table 6

Betta Grazer planted during September produced a higher amount of total DM than most of the other cultivars. Only Pac 8288 planted during September or October, Nutrifeed planted during Octo-

ber or November and Betta Grazer planted during October could produce a similar amount of DM than Betta Grazer planted during September.

Conclusion

Cultivar had a significant influence on DM production. Betta Grazer, Nutrifeed, Pac 8288, Greengrazer, Hy Pearl Millet and Super King were the most prominent cultivars and produced a higher total DM production than most of the other cultivars if compared to planting date and the frequency of cutting. Betta Grazer, Nutrifeed and Pac 8288 are recommended for the September and October planting date, Nutrifeed for the November planting date and Nutrifeed, Hy Pearl Millet and Betta Grazer for the December planting date.

Acknowledgement

We would like to thank the Plant Production team at Outeniqua Experimental farm, as well as Mardè Booyse and Dalena Robertson for their help and support.

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