Effects of cutting and sowing date on biomass production and nitrogen content of forage sorghum

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Abstract

Management practices to improve forage sorghum production (biomass) and quality (e.g. nitrogen (N) content), include the timing of sowing and harvesting. In southeast Queensland, forage sorghum produced higher biomass under single cut than multicut irrespective of sowing date, when cut 50 days after sowing, then at 35 day intervals. Late sowing beyond mid-November decreased biomass in both single cut and multicut, but the regrowth biomass was reduced more than the single cut biomass. In contrast with biomass production, green leaf and stem N concentration and the total N content was higher in multicut in early sowing, but the total N content was similar in late sowing. It was concluded that single cut produced higher biomass in all conditions, and that regrowth was affected more than single cut due to sub-optimal solar radiation and thermal conditions.

Key Words

Forage sorghum, cutting, sowing time, water stress, biomass, nitrogen.

Introduction

Forage sorghum (*Sorghum bicolor* (L) Moench) is a popular summer annual forage and widely grown in southeast Queensland and northeast New South Wales to provide fodder for stock between late spring and autumn. The crop may be cut only once (single cut) or several times (multicut) during the growing season (1). Forage sorghum has high dry matter production, drought tolerance and the ability to regrow after grazing or cutting. Despite of its high potentiality as a fodder crop, little work has been done on the effects of cutting on dry matter production and N uptake of forage sorghum as influenced by sowing date. This paper reports on the results of a field experiment which examined the effects of sowing date on biomass and N uptake of single cut (primary growth) and multicut (regrowth) forage sorghum.

Materials and Methods

A field experiment was conducted at The University of Queensland Farm, Redland Bay during the 1999/00-summer season. There were four sowing dates (October 6 (S1), November 15 (S2), December 31 (S3) and February 17 (S4)) and two cutting managements, single cut (cut only once at the end of the experiment, 120 days after sowing (DAS)) and multicut (cut at 50, 85 and 120 DAS). The cultivar was Agfeed and plants were spaced at 50 cm x 10 cm. The experiment was irrigated regularly to avoid moisture stress. The tissue was analysed for N only for S2 and S4.

Results and discussion

Sowing date had a pronounced effect on biomass accumulation under single cut (Figure 1a). At the first harvest, 50 DAS, biomass was significantly higher in S3 compared with the other sowings and it was lowest in S1. This was due to the high temperature and high solar radiation early in the season in S3 which hastened crop growth (Table 1). This was slower in the earlier sowings due to low temperature during the early crop growth. The lower biomass in S4 was due to lower incident solar radiation. Myers et al. (1989) also reported rapid crop growth in grain sorghum in December sowing compared with October or March sowings. At the second harvest, 85 DAS, the biomass was significantly lower in S4 compared with other three sowing dates. This was due to lower incident solar radiation. At maturity, biomass was similarly high in S1 and S2. A delay in sowing reduced biomass by 29% in S3 and by 58% in S4, respectively. Higher biomass in S1 and S2 at maturity compared to S3 and S4 was due to more favourable thermal and radiative conditions with early sowing as found by Muchow (1989) with maize and pearl millet.

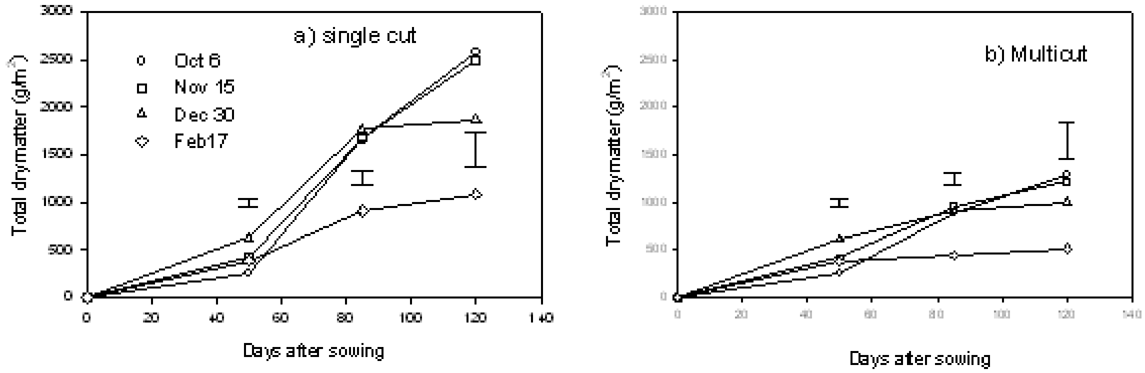

Figure 1. Changes in total biomass with time in a) single cut and b) multicut forage sorghum in four sowing dates.

Biomass was greatly reduced in the multicut situation compared with a single cut (Figure 1). As with the single cut, a delay in sowing to S3 increased early biomass production but later growth was reduced. This was especially evident with a further delay in sowing to S4. By the end of the season, the greatest biomass occurred with early sowing. (Figure 1b). Although a delay in sowing date reduced the biomass in both single cut and multicut, the regrowth was affected more with delay in sowing date. The cumulative biomass reduction due to a delay in sowing compared with S1 was 23% and 60% in S3 and S4, respectively. Biomass produced after the first harvest (regrowth biomass) was 81%, 65%, 38% and 25% of the total biomass in S1, S2, S3 and S4, respectively.

In contrast to biomass yield, green leaf and stem N% was higher in multicut than single cut irrespective of sowing date (3.35 vs 2.31 and 2.13 vs 0.31 for green leaf and stem, respectively, in earlier sowing), but the total N content was higher in multicut only in earlier sowing (28 g/m^2 vs 22 g/m^2).

Table 1. Mean temperature (?C) and incident solar radiation ($MJ/m^2/day$) during the growing season

	Emergence–50 DAS	50-85 DAS	85-120 DAS
S1			
Temperature	20.9	21.6	23.5
Radiation	22.9	23.7	24.3
S2			
Temperature	21.8	23.8	23.5
Radiation	23.6	24.4	19.0
S3			
Temperature	23.6	23.6	22.2
Radiation	23.3	19.9	15.2

S4			
Temperature	23.6	21.4	16.5
Radiation	18.6	12.4	11.8

References

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