Potential of tropical forages for the Tasmanian dairy industry

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Abstract

The southern dairy regions of Australia are heavily reliant on pasture growth throughout the year to maintain long lactation lengths in dairy cows. However, seasonal growth patterns and poor production of pasture during long dry summers limit milk production. As a result there has been an increased focus on the use of summer forage species to better utilise available irrigation water. A preliminary field study was undertaken in northwestern Tasmania examining potential dry mater production of tropical forage species. Eight tropical forages: Japanese millet (*Echinochloa utilis cv. Shirohie and cv. Japanese*), white panicum (*E. frumentacea cv. Siberian*), sorghum x sudan hybrid (*Sorghum sudanese cv. Pacific BMR, cv. Sweet Jumbo, cv. Pac F8386, cv. Bettagraze*) and hybrid pennisetum millet (*Pennisetum glaucum cv. Nutrifeed*) were sown at six planting dates between 1st December 2005 and 8th January 2006. There was discernible variation in yield between species and between cultivars within species. Sorghum x sudan hybrid *cv. Bettagraze* displayed the greatest yield potential, yielding 16 t DM/ha over 14 weeks from a single harvest. The highest level of cold tolerance and regrowth potential was displayed by Japanese millet *cv. Shirohie*, while white panicum *cv. Siberian* was found to be susceptible to low temperatures, resulting in slow seedling establishment and low yields.

Introduction

Dairy farming in the southern regions of Australia is predominantly reliant on all year temperate pasture production. The seasonal growth patterns of these pastures affected by hot and dry summers limit milk production in these regions. Irrigation has historically been used to reduce the inter and intra seasonal variation of pasture growth. Increased competition for water between the dairy industry, other primary industries and urban users has led to a larger focus on the dairy industry to become a more efficient user of water. One approach to address this has been the increased use of tropical forages in temperate areas, as these crops have higher water use efficiencies than temperate forages (Rawnsley *et al.* 2005). Unfortunately the use of tropical forages in the southern dairy regions is not wide-spread due to a lack of understanding of the agronomic requirements of these species. There is a need to identify the tropical forage cultivars that are most adapted to cool temperate areas so that further research and extension can be targeted towards these species.

Materials and methods

A field study was established in north western Tasmania at Elliott Research and Demonstration Station

(41.08S; 145.77E) to investigate the yield potential of eight tropical forages: Japanese millet (*Echinochloa utilis cv. Shirohie and cv. Japanese*), white panicum (*E. frumentacea cv. Siberian*), sorghum x sudan hybrid (*Sorghum sudanese cv. Pacific BMR, cv. Sweet Jumbo, cv. Pac F8386, cv. Bettagraze*) and hybrid pennisetum millet (*Pennisetum glaucum cv. Nutrifeed*). Each of these forages was sown into 5 by 5m plots at six planting dates between 1st December 2005 and 8th January 2006. The treatments were not replicated. The first two plantings of the sorghum x sudan hybrid cultivars received two defoliations while the later plantings only received one. The Japanese millet cultivars received 3 or 4 harvests, hybrid pennisetum millet and white panicum cultivars were harvested 2 or 3 times depending on planing date. Harvests were undertaken when the average sward height of Japanese millet, sorghum x sudan hybrid and hybrid pennisetum millet species were, 40 to 50cm, 70 to 90cm and 40 to 50cm, respectively. Dry matter (DM) yield and sward structure measurements were undertaken at each harvest. Final assessment was carried out on the 28th March 2006 using two 1m^2 quadrats. Cattle were then introduced to assess grazing preference.

Results

Sorghum x sudan hybrid *cv. Bettagraze* was the highest yielding of the cultivars investigated, with an average yield across the planting dates of 12 t DM/ha (Figure 1). Sorghum x sudan *cv. Pacific BMR*, *cv. Pac F8386* and *cv. Sweet Jumbo* yielded 9.2, 9.5 and 7.8 t DM/ha respectively. Hybrid pennisetum millet *cv. Nutrifeed* yielded 7 t DM/ha and plots of white panicum *cv. Siberian* yielded 5 t DM/ha of which only 2.9 t DM/ha was the target species. For all other cultivars the target species contributed greater than 80% of the yield. The average yield and components of yield for each cultivar are presented in Figure 1.

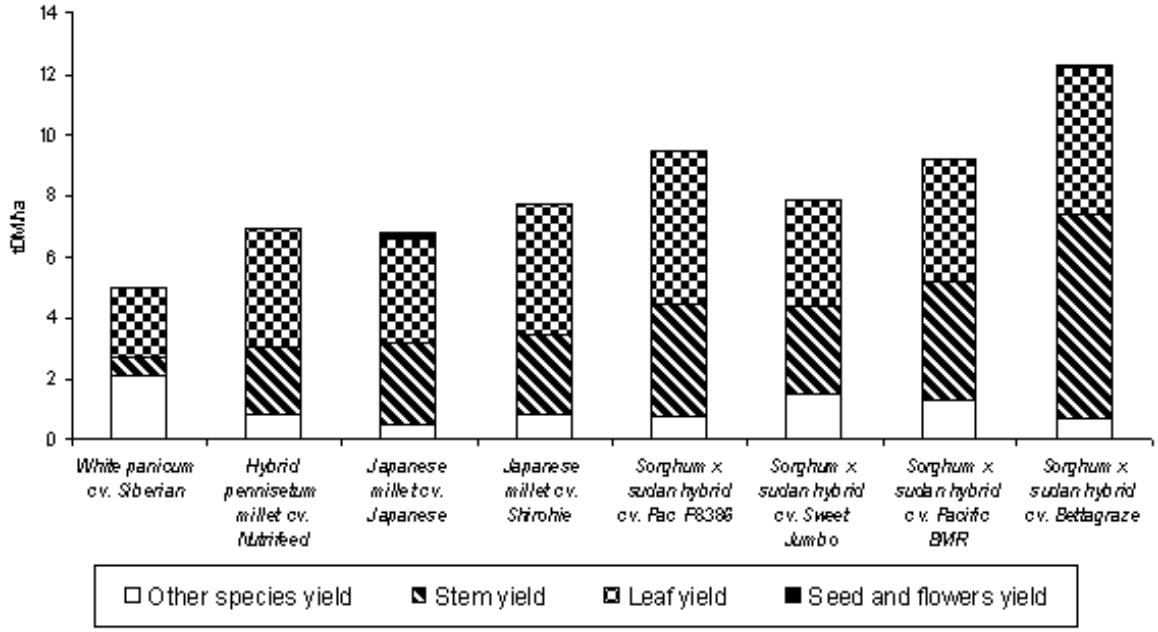

Figure 1. The yield and components of yield for each cultivar examined averaged across six planting dates.

Japanese millet *cv. Shirohie* displayed higher levels of regrowth and ratooning than *cv. Japanese*. Defoliation of the sorghum x sudan hybrids appeared to reduce their yield potential as those plantings that underwent only one defoliation had a discernibly higher yield than plantings which underwent two defoliations. At maturity *cv. Shirohie* had a higher leaf to stem ratio than *cv. Japanese*. Of the sorghum x sudan hybrid cultivars, *cv. Pacific BMR and cv. Pac F8386* had higher leaf to stem ratios than *cv. Sweet Jumbo* and *cv. Bettagraze*. Hybrid pennisetum millet *cv. Nutrifeed* had a higher leaf to stem ratio than white panicum or sorghum x sudan hybrid cultivars.

Cattle preferred those species with a higher proportion of leaf. Grazing preference assessment showed that white panicum, hybrid pennisetum millet and both Japanese millet cultivars were preferred over the sorghum x sudan hybrid cultivars.

Conclusions

For cold tolerance and rotational utilisation, Japanese millet *cv. Shirohie* displayed the greatest potential due to its high level of regrowth and ratooning following defoliation. Sorghum x sudan hybrid cultivars although showing the greatest yield potential appeared more suitable as a bulk forage crop. White panicum *cv. Siberian* had low level of production and poor competitiveness and it was concluded that this species is not suited to temperate dairy regions.

Japanese millet and hybrid pennisetum millet have been identified as two species having potential to be used as summer forage for the Tasmanian dairy industry. Further work is underway to establish best management practices for these species in a cool temperate environment.

References

Rawnsley RP, Donaghy DJ, Christie KM, and Chamberlain PL (2005). Yield and water use efficiency of seven summer forages. Proceedings of the 46th annual conference of the Grassland Society of Southern Australia, Ballarat. p118.