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Potential of Australian bermudagrasses (*Cynodon* spp.) for pasture in subtropical Australia

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Introduction

In Australia, little work has been carried out on the improvement of tropical or subtropical pastures in recent years. There seems to be an increasing demand for pastures that can withstand heavy grazing, while producing high yields of high quality forage in the humid subtropical regions of Australia. Most graziers, who live in these areas, have small acreages, which they graze intensively. *Cynodon* spp. represent a potential source of grasses with these attributes. This study will evaluate the pasture potential of a large number of bermudagrass (*Cynodon* spp.) ecotypes collected from across Australia.

Materials and Methods

The studies were conducted on a highly fertile vertisol at the University of Queensland, Gatton Research Station (27.54° S, 152.34° E), Queensland, Australia. Included were 850 *Cynodon* ecotypes collected from 5 climatic zones across Australia and 70 *Cynodon* turf cultivars assembled from Australia and USA. The 920 genotypes were split into 2 groups based on collection time. Experiment 1 included 440 entries and was planted on August 20, 2008. Experiment 2 included 480 entries and was planted on April 20, 2009. For each grass a 2 m x 2 m plot was established from a single plug. Each experiment was arranged as an augmented Latin square (ALS) design and included a single replication of each ecotype with 5 repeated check entries (Legend, Wintergreen, CT-2, 81-1, 40-1), replicated 5 times and Latinized throughout the field. Experiment 1 was harvested on March 25, 2010 and experiment 2 on April 29, 2010. Using a standard lawn mower with cutting height set to 5 cm, a middle strip 45 cm wide and 1 m long was cut from each quadrant after the front and rear of the plot had been trimmed to remove 'edge' effects. The grass was collected, weighed fresh and sub-sampled to determine moisture content, for calculating dry matter (DM) yield per unit area. In vitro dry matter digestibility (IVDMD) (Minson and McLeod 1972) was determined for the top 20 and bottom 5 ecotypes on the basis of yield from each experiment. Seed set of the grasses was determined from X-ray images taken of flower heads using a Faxitron-X-Ray machine.

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Results

Average DM yields for experiments 1 and 2 were 8.9 and 7.7 t/ha, respectively, with a large range (1–23 t/ha) for each experiment (Figure 1). Average values for IVDMD of the top 20 ecotypes in experiments 1 and 2 were 47% and 48%, respectively, and for the bottom 5 ecotypes were 51% and 47%, respectively. Most ecotypes (520 of the 920) were completely sterile, and there was a large range in seed set per head (1−150 seeds/head) for the remaining ecotypes (see Plate 1). On average the highest-yielding ecotypes were collected from warm environments (Table 1).

Discussion

These preliminary yield data suggest there is great potential within the assembled Australian *Cynodon* germplasm to identify forages with agronomic potential for the humid subtropics. The top 20 ecotypes on the basis of yield from both experimental areas produced 14−23 t/ha, similar to biomass production of other tropical forage grasses grown in Queensland; for example, blue couch (*Digitaria didactyla*) 7−11 t/ha, pangola grass (*D. eriantha*) 10−20 t/ha, creeping bluegrass (*Bothriochloa insculpta*) 10−15 t/ha and bahiagrass (*Paspalum notatum*) 8−20 t/ha (Cook et al. 2005).

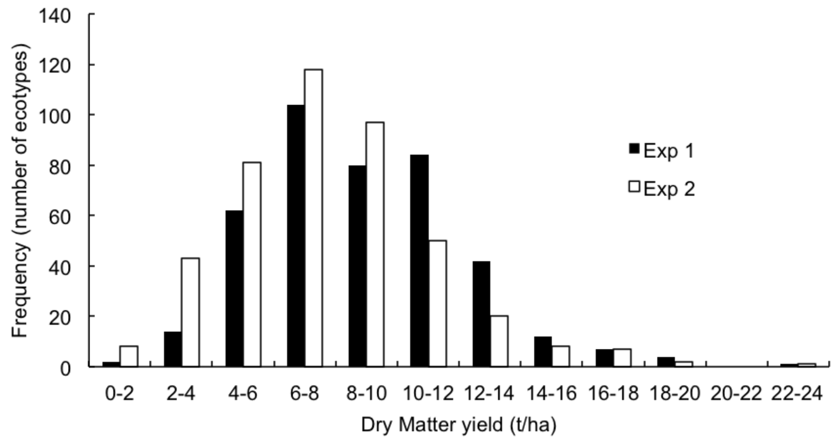

Figure 1. Frequency distribution: Dry matter production of *Cynodon* ecotypes evaluated in 2 field experiments at Gatton, Queensland.

Table 1. Average dry matter production of *Cynodon* ecotypes grouped by climatic zone of collection site.

Climatic zone	Experiment 1 DM (t/ha)	Experiment 2 DM (t/ha)
Tropical	9.09	7.81
Subtropical	8.61	7.90
Semi-arid	9.05	7.91
Mediterranean	−	7.63
Temperate	7.88	7.38
Mean	8.91	7.73

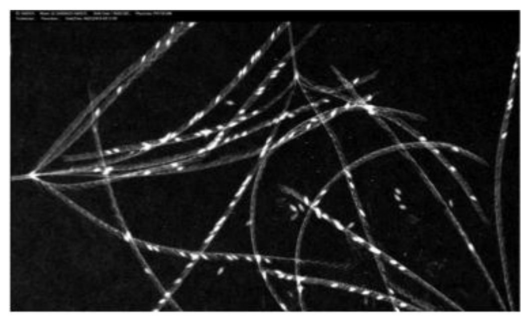

Plate 1. X-ray image of *Cynodon* inflorescences showing seed set.

In addition, the biomass production observed in this study compares well with commercial production for *Cynodon* forage cultivars in USA with USDA releases Tifton 68 and Coastal Bermuda producing 12 and 14 t/ha, respectively (Burton 2003). The IVDMD values of about 48% compare favorably with those of forages like pangola grass (45−70%), bahiagrass (48−70%) and commercial *Cynodon* forages from the USA (40−60%) (Hill et al. 1993; Cook et al. 2005). It should be noted that the biomass and digestibility levels reported here for Australian *Cynodon* ecotypes represent underestimates, since the swards were uncut for 12−19 months and would have reached a ‘closed’ canopy stage well before the harvest date.

The development of seeded types should also be possible, since some high-yielding grasses also had high seed set. The *Cynodon* ecotypes of this study were tested in a subtropical environment and not surprisingly, on average, the highest-yielding grasses were collected from tropical, subtropical or semi-arid climatic zones with the lowest-yielding ecotypes from the temperate zone.

Conclusion

There is potential to select among Australian *Cynodon* ecotypes, particularly among germplasm from warmer zones, material with high yields, digestibility and seed set, for cultivar development in humid subtropical regions.

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