Effects of different cutting stages on forage yield and quality of nilegrass and pangola grass[1]

F.H. Hsu[2], Shyh-Rong Chang[3] and K.Y. Hong[4]

[1]Contribution paper no. 1224 from Livestock Research Institute, Council of Agriculture, Executive Yuan, Taiwan.
[2]Livestock Research Institute, COA, Hsinhua, Tainan, Taiwan. Email: fhhsu@mail.tlri.gov.tw
[3]Livestock Research Irstitute, COA, Hsinhua, Tainan, Taiwan. Email: srchang@mail.tlri.gov.tw
[4]Livestock Research Institute, COA, Hsinhua, Tainan, Taiwan. Email: kyhong@mail.tlri.gov.tw

Abstract

The objectives of this study were to determine the effects of different cutting stages on forage yield and quality of nilegrass (*Acroceras macrum*) and pangola grass (*Digitaria decumbens*). Four cutting stages, 4, 6, 8 and 10 weeks, were used. Both fresh and dry weights of nilegrass and pangola grass increased with later cutting stages in the first 3 years. However, the forage yields of the two species cut at 10 weeks were lower than those cut at 8 weeks in the 4th year. Nilegrass produced significantly higher forage yield than did pangola grass for all cutting stages except at 6 weeks in the 4th year. The crude protein contents of both nilegrass and pangola grass decreased with lengthening cutting intervals, while those of neutral detergent fiber and acid detergent fiber increased with longer cutting intervals. No significant difference was observed for the contents of water soluble carbohydrate (WSC) of nilegrass among cutting stages. However, those of pangola grass increased as growth stages advanced. Pangola grass had a higher content of WSC than did nilegrass for all the cutting stages. It is suggested that nilegrass be cut between 6 and 8 weeks to produce higher forage yield and quality.

Media summary

Nilegrass produced higher forage yield than did pangola grass. Higher forage yield and quality of nilegrass can be obtained when harvested at 6-8 week intervals.

Key words

Acroceras macrum, Digitaria decumbens, cutting interval, forage quality, yield.

Introduction

Nilegrass (*Acroceras macrum*) is a perennial C_3 forage grass with a similar growth habit to the C_4 pangola grass (*Digitaria decumbens*) which is a commonly used grass in Taiwan. Nilegrass is well adapted to conditions in Taiwan and a new cultivar, Nilegrass Taishi No.1 (NLT1), was selected and released in 2000 (Shaug *et al.*, 2002), based on its high forage yield and quality. However, little information is available about the management of this cultivar, particularly for optimizing forage yield and quality. The objectives of this experiment were to determine and compare the effects of different cutting stages on forage yield and quality of nilegrass and pangola grass.

Methods

The effect of 4 cutting frequencies on the forage yield and quality of Nilegrass NLT1 and pangola grass A254 was determined in a split-plot design experiment with 4 replicates. Grasses were the main plot, with 4, 6, 8 and 10 week cutting frequencies as the subplots. The experiment was conducted over 4 years (1998-2002) at Hsinhua, Tainan (120^{0}19'E, 23^{0}03'N) on alluvial soils, with irrigation at 4-8 week intervals, depending upon seasonal conditions. Plots received fertilizer at an annual rate of 400 kg/ha N, 144 kg/ha P_2O_5, and 150 kg/ha K_2O. N fertilizer was split into equal dressings after each harvest, while P_2O_5 and one half of K_2O were used as base dressing. Fresh and dry matter yields were determined by harvesting all the grasses

for each 4 x 5 m subplot. Plant height was measured from ground level for 10 plants per harvest/plot. Samples were taken to separate leaf and stem (including the leaf sheath) to determine leaf/stem ratio (LSR). Subsamples of harvested material were oven dried at 80℃for 48 hours to determine dry matter percent (DM%), with ground samples used to determine N, P, K, acid detergent fiber (ADF), neutral detergent fiber (NDF) and water soluble carbohydrate (WSC).

Results

Agronomic traits: Plant heights and DM% of both nilegrass and pangola grass increased with longer cutting intervals, while LSR decreased as growth stage advanced (Table 1). Pangola grass had higher LSR and DM% and lower plant heights than nilegrass at respective cutting stages.

Forage quality: The crude protein (CP) contents of both nilegrass and pangola grass decreased significantly with lengthening cutting intervals. This result is consistent with that reported by Shaug et al. (1999), i.e. that forage quality was better at 42 days regrowth than at 56 days. A difference in CP contents between these species was only apparent at the 6 week cutting interval. The NDF, ADF and WSC measures all increased with lengthening cutting intervals. NDF and ADF measures were similar for nilegrass and pangola grass, but the WSC content of pangola grass was significantly higher than for nilegrass. P and K contents were generally similar for the two grasses, except for higher P contents of pangola grass cut at 8 and 10 weeks (Table 2).

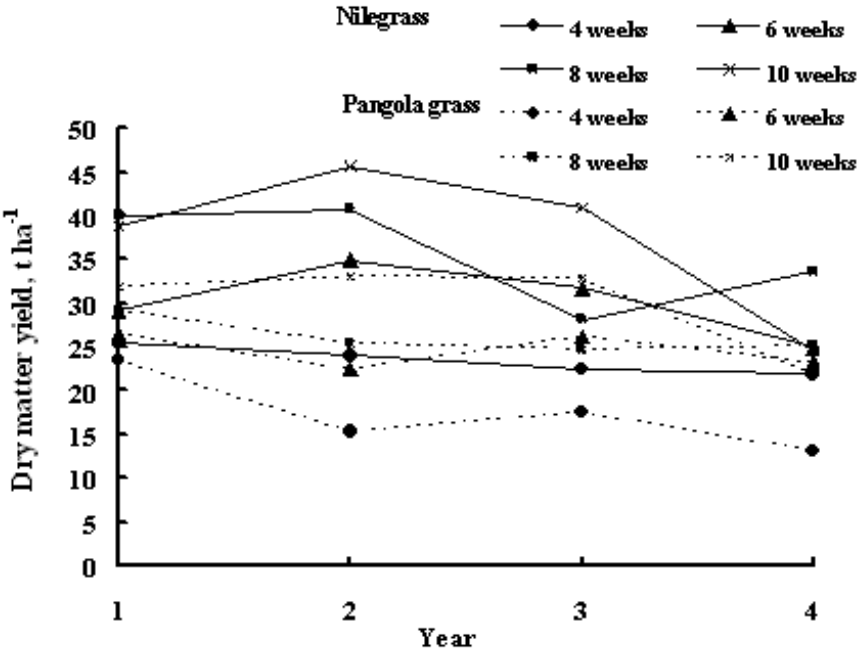

Figure 1. Effects of different cutting stages on dry matter yields of nilegrass and pangola grass in different growth years.

Table 1. Effects of different cutting stages on the agronomic traits of nilegrass (NL) and pangola grass (PG).

Week	Plant height (cm)	Leaf/stem ratio	Dry matter (%)

	NL	PG	NL	PG	NL	PG
4	52.3^{dA}	35.0^{cB}	0.87^{aA}	0.99^{aA}	19.5^{cB}	22.1^{dA}
6	72.9^{cA}	49.0^{bB}	0.45^{bA}	0.58^{bA}	21.8^{bB}	24.2^{cA}
8	102.2^{bA}	58.7^{aB}	0.27^{cB}	0.43^{bcA}	22.0^{abB}	25.4^{bA}
10	112.8^{aA}	61.2^{aB}	0.27^{cA}	0.30^{cA}	22.9^{aB}	27.1^{aA}

Means with the same small letters within the same trait in the same column are not significantly different at 5% level.
Means with the same capital letters within the same trait in the same column are not significantly different at 5% level.

Table 2. Effects of different cutting stages on the chemical components of nilegrass (NL) and pangola grass (PG).[?]

Week	CP[≠]		P		K		NDF		ADF		WSC	
	NL	PG	NL	PG	NL	PG	NL	PG	NL	PG	NL	PG
4	11.5^{aA}	10.4^{aA}	1.03^{aA}	1.06^{aA}	2.04^{aA}	2.02^{aA}	61.3^{cA}	65.4^{aA}	38.0^{bA}	39.5^{bA}	2.08^{aB}	2.72^{dA}
6	9.6^{bA}	8.5^{bB}	1.36^{aA}	1.06^{aA}	1.73^{bA}	1.60^{bA}	64.1^{bA}	65.8^{aA}	40.2^{aA}	40.7^{aA}	4.04^{aA}	3.69^{cA}
8	8.0^{cA}	7.4^{cA}	0.92^{aB}	1.06^{aA}	2.03^{aA}	2.10^{aA}	68.5^{aA}	67.7^{aA}	41.3^{aA}	40.7^{aA}	2.74^{aB}	4.85^{bA}
10	6.7^{dA}	6.0^{dA}	0.94^{aB}	1.04^{aA}	1.52^{bA}	1.70^{bA}	67.2^{aA}	66.5^{aA}	41.9^{aA}	39.4^{bA}	3.58^{aB}	6.45^{aA}

[?]Data shown were averaged values (%) of 13 analyses sampled from different dates.
[≠]CP: Crude protein, P: Phosphorus, K: Potassium, NDF: Neutral detergent fiber, ADF: Acid detergent fiber, WSC: Water soluble carbohydrate.
Means with the same small letters within the same item in the same column are not significantly different at 5% level.
Means with the same capital letters within the same item in the same row are not significantly different at 5% level.

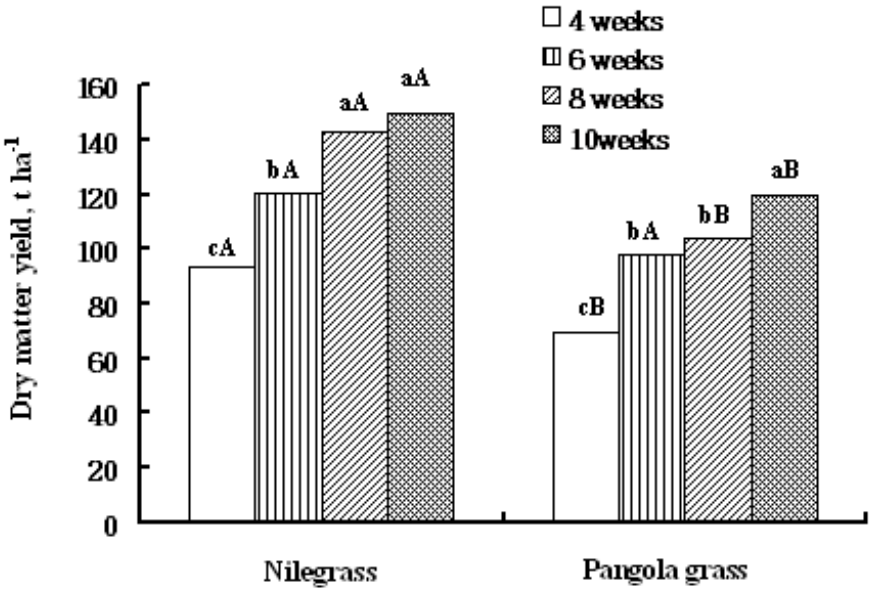

Figure 2. Effects of different cutting stages on total dry matter yields of nilegrass and pangola grass for 4 years. Means with the same small letters in the same species are not significantly different at 5% level. Means with the same capital letters in the same cutting stage are not significantly different at 5% level.

Yield: The yield of the two species increased with lengthening cutting intervals in the first 3 years. However, in the 4th year the yields at 10 weeks were lower than those at 8 weeks for both species (Fig.1). For each cutting frequency, the total dry matter yield of nilegrass over the four years was higher than that of pangola grass (not significant at 6 weeks) (Fig. 2). These results are similar to those reported by Shaug *et al*. (1999) who found that the yield of nilegrass was higher when cut at 56 days than at 42 days.

Conclusion

The results showed that nilegrass generally produced higher forage yield than pangola grass at a range of cutting frequencies. Forage quality was generally similar. Consequently, nilegrass NLT1 has the potential to replace pangola grass in Taiwan as a forage species.

References

Shaug SP, Lo KD and Lin JB (1999). Effects of cutting stages on forage yield and quality of nliegrass. J. Taiwan Livestock Res. 32, 219-226.

Shaug SP, Lin JB, Jin WW, Chen W, Chen YY, Chang SC and Yan SF (2002). Breeding of Nilegrass Taishi No. 1. J. Taiwan Livestock Res. 35, 91-100.