

# Intake and Digestibility of Some Forages for Shaded Environments

D.A. Kaligis\* and S. Mamonto\*

## Abstract

A series of pen feeding trials was carried out with goats at Manado, North Sulawesi, Indonesia. Six and 12-week-old regrowth of *Panicum maximum* cv. Riversdale, *Setaria sphacelata* cv. Splenda, *Paspalum wettsteinii*, *Paspalum dilatatum*, *Paspalum conjugatum* (local), *Axonopus compressus* (local), *Calopogonium mucunoides* and *Arachis pintoii* cv. Amarillo were fed fresh to goats and their morphology, intake and digestibility were measured.

Leaf percentage was highest in the 6-week-old regrowth of *P. wettsteinii*. The lowest leaf proportion was recorded for *S. sphacelata* in both the 6- and 12-week-old regrowth. Digestibility was highest in *A. compressus* (> 70%), followed by *A. pintoii*, *C. mucunoides* and the 6-week-old regrowth of *S. sphacelata*. Voluntary intake was highest in *A. pintoii*, followed by *A. compressus* and *C. mucunoides*. The lowest intake was recorded for *S. sphacelata*.

A number of species has been reported to be suitable for growing under plantation crops. Shelton et al. (1987) and Rika et al., Kaligis and Sumolang, Ng (these Proceedings) report the continuing evaluation of new germplasm for shaded environments. Selection criteria include factors such as persistence under cutting or grazing and high yield in shade. However, the value of these plants as feed for ruminants also needs to be determined. Species must be acceptable to animals, have a high nutritive value, and should be non-toxic.

This experiment was conducted to study the nutritive value in terms of digestibility and voluntary intake of promising grasses and legumes which were identified in a concurrently-run evaluation of forages for coconut plantations in North Sulawesi.

## Materials and Methods

A series of pen feeding trials were carried out with goats at Manado, North Sulawesi, Indonesia, between 1988 and 1990. The climate in Manado is wet tropical with a well distributed, average annual rainfall of 2770 mm and average mean monthly maxima and minima temperatures of 33.5/21.5°C and 29.0/21.9°C for summer and winter respectively.

Plots of promising forages were established under a stand of old coconuts with a light transmission of 75% PAR. The forages planted included the grasses

*Panic-urn maximum* cv. Riversdale, *Setaria sphacelata* cv. Splenda, *Paspalum wettsteinii*, *Paspalum dilatatum*, *Paspalum conjugatum* (local) and *Axonopus compressus* (local), and the legumes *Calopogonium mucunoides* and *Arachis pintoii* cv. Amarillo.

Plots were cut to a height of 5-20 cm (depending on growth habit) at 6 and 12 weeks prior to feeding period to obtain material of 'young' and 'old' regrowth. Each feed was fed *ad libitum* (10-20% above intake) and fresh to four goats housed in individual pens. As eight goats (same sex, age and approximate weight) were available for the trial, two feeds were simultaneously processed. It was assumed that there was very little difference between feeding periods since the climate is uniform. Goats were drenched regularly to control parasites, and water and salt were available at all times.

Each feed was fed for 3-4 weeks and feed intake and amount of refusals and faeces were recorded for the last seven days each feeding period. At the time of this workshop, the trial had not been completed and therefore some data sets are not complete.

## Results and Discussion

The morphological characteristics of the 6- and 12-week-old regrowth are presented in Table 1. *Setaria sphacelata* had the lowest proportion of leaf of all species; the highest proportion was recorded for *P. wettsteinii* in the 6-week-old regrowth. There was a large difference in the proportion of leaf between the 6- and the 12-week-old material of this latter species, while there was little difference in other species. The

---

\*Faculty of Animal Husbandry, University of Sam Ratulangi, North Sulawesi, Indonesia

proportion of stem usually increases with increasing age of forage plants (Whiteman 1980). A high proportion of dead material was present in the 12-week-old regrowth of *P. dilatatum* and *A. compressus*, which indicates that this regrowth period was too long for maximum yield. With the exception of *C. mucunoides*, none of the species had a large proportion of flowers or inflorescences. The small amount of flowering and seed production may be related to the close proximity to the equator.

The dry matter digestibility of the various feeds, aged 6 and 12 weeks, is presented in Table 2. *Axonopus compressus* had the highest digestibility of all species despite the regrowth period of 12 weeks and the large proportion of dead material in the feed. The relatively high nutritive value of *A. compressus* has been reported previously (Samarakoon et al. 1990). The second-highest digestibility was recorded for the 6-week-old regrowth of *S. sphacelata* and this was followed by *A. pintoii* and *C. mucunoides*. The 12-week-old material of *P. maximum* had the lowest digestibility of all species. In all three cases, where data for both the 6- and 12-week-old material were available, the digestibility of the younger material was higher than that of the older material. This effect of age of regrowth on digestibility of forages is widely reported (Whiteman 1980).

The voluntary intake of the legumes and especially that of *A. pintoii* was higher than the intake of the grasses (Table 2). The exception was *A. compressus*. The higher intake of legumes, compared to grasses, despite similar digestibility, has been previously

reported (Thornton and Minson 1973). The intake of the 12-week-old regrowth of *S. sphacelata* was particularly low and much lower than that of 6-week-old regrowth. This occurred despite the similar proportion of leaf in the 6- and 12-week-old regrowth of this grass.

**Table 2.** Dry matter digestibility (%) and voluntary intake (g/day) of 6- and 12-week-old regrowth of various forages, fed fresh to goats.

Species	Age of regrowth (weeks)	Dry matter digestibility (%)	Intake (g/day)
<i>Panicum maximum</i>	6	51.7	311
	12	43.7	321
<i>Setaria sphacelata</i>	6	68.2	282
	12	52.2	185
<i>Paspalum wettsteinii</i>	6	57.3	359
	12	50.8 <sup>1</sup>	309
<i>Paspalum dilatatum</i>	6	-	-
	12	61.7	299
<i>Paspalum conjugatum</i>	6	-	-
	12	49.7	264
<i>Axonopus compressus</i>	6	-	-
	12	74.9	383
<i>Calogogonium mucunoides</i>	6	65.5	381
	12	-	-
<i>Arachis pintoii</i>	6	67.5	417
	12	-	-

<sup>1</sup> The feeding trials had not been completed at the time of the workshop

**Table 1.** Morphological characteristics of 6- and 12-week-old regrowth of various cut forages prior to feeding to goats for nutritive value determinations.

Species	Age of regrowth (weeks)	% in Dry Matter			Dead material
		Leaf	Stem	Inflorescence	
<i>Panicum maximum</i>	6	53	45	1	2
	12	52	44	1	4
<i>Setaria sphacelata</i>	6	33	63	0	3
	12	33	64	0	3
<i>Paspalum wettsteinii</i>	6	63	31	0	6
	12	43 <sup>1</sup>	45	2	10
<i>Paspalum dilatatum</i>	6	-	-	-	-
	12	41	25	0	34
<i>Paspalum conjugatum</i>	6	-	-	-	-
	12	41	37	3	19
<i>Axonopus compressus</i>	6	-	-	-	-
	12	43	17	3	37
<i>Calogogonium mucunoides</i>	6	44	45	12	0
	12	-	-	-	-
<i>Arachis pintoii</i>	6	45	47	0	8
	12	-	-	-	-

<sup>1</sup> The feeding trials had not been completed at the time of the workshop.

## Conclusions

Of the legumes, *A. pintoi* had both a high digestibility and a high voluntary intake. Among the grasses, *Axonopus compressus* had a particularly high digestibility and voluntary intake. Of the introduced grasses, *S. sphacelata* had a high digestibility in the young regrowth but low intake, especially in the 12-week-old regrowth.

## Acknowledgments

This work was carried out as part of an ACIAR-funded collaborative research program entitled 'Improvement of Forage Productivity in Plantation Crops', between Sam Ratulangi University, North Sulawesi, Indonesia and The University of Queensland, Australia.

## References

- Samarakoon, S.P., Wilson, J.R. and Shelton, H.M. 1990. Growth, morphology and nutritive quality of shaded *Stenotaphrum secundatum*, *Axonopus compressus* and *Pennisetum clandestinum*. *Journal of Agricultural Science, Cambridge*, 114, 161-169.
- Shelton, H.M., Humphreys, L.R. and Batello, Caterina. 1987. Pastures in the plantations of Asia and the Pacific: Performance and prospect. *Tropical Grasslands*, 21, 159-168.
- Thornton, R.F. and Minson, D.J. 1973. The relationship between apparent retention time in the rumen, voluntary intake, and apparent digestibility of legume and grass diets in sheep. *Australian Journal of Agricultural Research*, 24, 889-898.
- Whiteman, P.C. 1980. *Tropical Pasture Science*. Oxford, Oxford University Press, 392p.