INTAKE AND PARTIAL DIGESTIBILITY OF *PANICUM MAXIMUM* (CV. GATTON) AT THREE STAGES OF MATURITY DURING SUMMER

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ABSTRACT
The objective of this study was to determine the influence of stage of maturity on the intake and digestibility of *P. maximum* (cv. Gatton) during the active growing season. Low DM content at the young and medium growth stages (24.9 and 25.2%) did not hamper DOMI (48.8 and 44.1 g/kg $W^{0.75}$/d) respectively. The N concentration of the three stages were well within the limit required for optimal rumen microbial production (1.8 - 2.0%). The high NDF value of the adult stage (59.5%) resulted in a significantly lower IVDOM value (62.3%) but the IVDOM values of all stages were on the higher side (average 66.4%) of the spectrum for C4-grasses. Significantly higher NH_3-N and VFA levels in the rumen fluid were obtained for the young and medium growth stages and the same trend was observed for DOMI and N-intake. The higher DOMI resulted in a higher digesta flow rate in the abomasum and ileum. The lower DOMI of the adult stage was most probably due to the taller growing sward. Differences in the proportionally OM disappearance in the stomach didn't differ (average 0.63) but was higher in the small intestine for the younger growth stages. The very high proportional disappearance of non-NH_3-N in the small intestine, indicates that ± 30% OM which disappeared in the small intestine, must have consisted primarily of protein matter. The fact that about 70% of N intake was apparently digested in the small intestine, may be the function of a lower soluble N content.

KEYWORDS
P. maximum, sheep, intake, digestibility, digesta flow

INTRODUCTION
Native rangeland in the drier, summer rainfall areas of South Africa may limit animal production. This results because of high cell wall content, poor digestibility and consequently suboptimal intake (Minson and McLeod, 1970), typical of native subtropical grasses. Several improved dry land pastures have proved to be persistent and to increase carrying capacity substantially both during active growth and as foggages. Less is known about their nutritive value and how it relates to intake and partial digestion.

The objective of this study was to compare three different growth stages of *P. maximum* (cv. Gatton), adapted to dry conditions in terms of the above defined nutritive value for sheep. Comparisons were done in the peak growing season.

METHODS
The study was conducted at the Experimental Farm at Hatfield, larger Pretoria, of the University of Pretoria. The area has an exclusively summer rainfall of 650 mm per annum, dry late autumn and winter and has an altitude of 1370 m. Summer temperatures are 12½C (min.) to 30½C (max.). Panicum (*Panicum maximum* cv. Gatton) was established under dry land conditions in paddocks of 0.04; 0.08 and 0.16 ha which were randomly distributed over the experimental area. The pasture was fertilized with 112 kg N (LAN equivalent) once during October just as the rainy season starts. Measurements started in early December.

The three stages of maturity comprised of an early stage (21 day regrowth = young), a medium stage (42 day regrowth = medium) and an adult stage (84 day regrowth = adult). Four Merino type wethers per growth stage were fitted with oesophageal cannulae and an additional four with rumen, abomasal and ileal cannulae. Intake of pasture was determined by the ratio of faeces voided in collection bags and the indigestibility of oesophageal samples calculated from the *in vitro* technique (Tilley and Terry, 1963). *In vitro* values were converted to expected *in vivo* digestibility of organic matter (OM) according to Engels *et al*. (1981). Partial digestion of OM and disappearance of non-ammonia-N in the small intestine were determined by digesta flow measurement, using Yb-acetate and Cr-EDTA as particulate and fluid markers, respectively (Siddons *et al*., 1985) and reconstitution according to Faichney (1980). Markers were continuously infused by peristaltic pump fitted to the back of sheep (Corbett *et al*., 1976).

Experimental animals were adapted to their allotted pasture over 14 days. Marker infusion started at day nine of adaptation with a primer dose. Digesta samples from the rumen, abomasum and ileum were collected at regular intervals for four days and pooled (Faichney, 1980). Oesophageal extrusa was collected on days one and five of the experimental period and faeces voided for the relevant five days. Aliquots of all samples were frozen in plastic bags and stored until analyzed. All samples were analyzed according to standard laboratory procedures.

Tukey's studentized range test for factorial designs was used to test for differences between the growth stages.

RESULTS AND DISCUSSION
The quality of oesophageal selected material and certain ruminal parameters are shown in Table 1.

The lower DM content of the young and medium growth stages were expected, but didn't seem to hamper intake because of a too high water content, judging according to the digestible organic matter intake (DOMI) values (Table 2. The N (nitrogen) content does not differ significantly between the maturity stages and even the N content of the young stage is well within the limit set by Satter & Slyter (1974) whom suggested that if the N-content of a grass should rise above 2.5% N on a DM-basis, too much N will be lost through NH_3-N (ammonia-N), which will cause a drop in microbial protein production. The higher NDF-content of the adult growth stage was most probably responsible for the significantly lower *in vitro* digestible organic matter (IVDOM) value of that grass, although by all standards it was still fairly high for a tropical grass. The rumen ammonia-N values corresponded well with the N intakes given in Table 2, and the higher values of the young and medium growth stages repeat itself in significantly higher volatile fatty acids (VFA) production.

Both DOMI and N intake didn't differ between the two younger growth stages (Table 2), but were significantly higher than the adult stage. The higher DOMI was followed by higher digesta flows in both the abomasum and ileum. The lower DOMI of the adult stage could be the result of a few factors of which quality could have played a role (higher NDF-value) but certainly also because of the exceptionally tall sward which is known to hamper intake of sheep (Allden and Whittaker, 1970).

No real differences were found in the proportionally OM disappearance in the stomach, but larger differences were present in the small intestine, showing that more OM was proportionally digested in the young and medium growth stages compared to the adult stage. The proportional disappearance in the rumen corresponds well with the rapport by Ulyatt & Macrae (1974) for ryegrass and clover and that of Van Niekerk *et al*. (1989) for *Anthephora pubescens* and *P. maximum* foggages.

The very high proportional disappearance of non-NH_3-N in the small intestine indicates that approximately 30% OM that disappeared in the small intestine, must have consisted primarily of protein matter. The fact that about 70% of N intake was apparently digested in the small intestine, appears to be at the higher scale of possibilities, but corresponded well with the results of Meissner *et al*. (1991) for Panicum, Anthephora, Rhodes and Smutsfinger grass evaluated during the summer. Those higher values may be the function of soluble-N content. Both the dry land conditions and low level of N fertilization used in the present study would suggest that soluble-N levels could have been low, and therefore N disappearance in the small intestine as a percentage of N intake, is expected to be high.

CONCLUSION

It was concluded that the potential of all three growth stages of Panicum as a dryland pasture to supplement degraded rangeland, should be satisfactory during the active growing season to sustain relatively high levels of sheep production. The best quality, as was expected, was obtained by the younger growth stage and the adult stage hamper DOMI, most probably due to a tall growing sward.

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Table 1
The quality of selected material and certain ruminal parameters of sheep grazed Panicum at three stages of maturity during summer (DM-basis)

Parameters	Young	Medium	Adult	SE_m*
DM (%)	24.9^{c}	25.2^{b}	40.2^{a}	0.1
Oesophageal fistulae:				
N (%) 2.0^{a}	1.8^{b}	1.8^{b}	0.03	
NDF (%)	51.9^{c}	55.6^{b}	59.5^{a}	0.2
IVDOM (%)	70.3^{a}	66.5^{b}	62.3^{c}	0.6
Ruminal:				
NH_3-N (mg/100 ml)	18.6^{a}	16.3^{b}	8.9^{c}	0.6
VFA (mmol/100 ml)	18.7^{a}	18.4^{a}	13.7^{b}	0.6

*SE_m = Standard error of the mean.
^{a,b,c} = means in a row follow by a different letter, differ (P-0.05).

Table 2
Intake, digesta flow and digestibility of Panicum at three stages of maturity during summer

Parameters	Young	Medium	Adult	SE_m
DOMI (g/kg $W^{0.75}$/d)	48.8^{a}	44.1^{a}	26.7^{b}	1.9
N-in (g/d)	27.3^{a}	26.9^{a}	16.9^{b}	1.4
Digesta flow (l/d):				
At abomasum	30.6^{ab}	37.3^{a}	23.7^{b}	3.0
At ileum	8.7^{a}	7.9^{ab}	6.2^{b}	0.7
Proportional OM disappearance:				
In stomach	0.64	0.59	0.66	0.05
In small intestine	0.31^{a}	0.35^{a}	0.26^{b}	0.04
In large intestine	0.05	0.06	0.08	0.01
Non-NH_3-N disappearance:				
In small intestine (g/d)	19.4^{a}	19.3^{a}	11.9^{b}	0.9
Proportion of N intake	0.71	0.72	0.70	0.02