Variety, harvest date after planting and fraction of Napier grass influence *in vitro* gas production

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Message: Plant fraction and harvest date after planting influence in vitro digestibility of Napier grass

Introduction and Objective: The nutrient composition and digestibility of tropical forages is influenced by stage of harvesting, species, soil fertility and climate (Minson, 1990). Differences have been reported in the digestibility and nutrient composition of different fractions (leaf, stem and whole) of grass with age. The objective of this study was to investigate the effect of variety (V), harvest date (HD) and plant fraction (PF) on *In vitro* gas production of Napier grass cultivated and harvested at 60, 90 and 120 days after planting in the humid forest zone of Ghana

Materials and Methods: A 4×3×2 factorial in a completely randomized design was used for the gas production studies. The main factors were the varieties [4]; (Local, 16798, 16786 and 16840), harvesting days [3]; (60, 90 and 120 days) and plant fraction [2]; (leaf and stem) with 5 replicates. The in vitro gas study was carried out using the ANKOM Gas Production system version 3. The ANKOM[RF] Gas production equipment was used because of its automated nature (Ankom technology, 2008). The system is made up of a module (bottle and lid), antennae, incubator or water bath and a computer. The substrate is put into the bottle, buffered rumen fluid is added and flushed with carbon dioxide for 30 seconds after which the bottle is closed with the lid. The lid contains a sensor which sends gas produced from each substrate to the computer through an RF communication system. The antennae is put in the incubator and connected to the computer. The bottle with the lid is put in an incubator with the temperature set to 39 degrees Celsius. The time interval for the gas recording is set on the computer using the software provided by the manufacturer. The gas is vented through a vent valve on the side of the lid to ensure the module does not explode as a result of accumulated gas. The Mixed MODEL from SAS was used to analyse for variation in the various Phases for the varieties, harvest date and plant fraction. Gas production figures are in psi. The curves generated from the data collected all showed a similar multi-phasic shape. Three different phases in the curves within the 48 hour digestion period were selected and used for the results analysis.
Phase I covered the period from 0.0-7.0 hours.
Phase II covered the period from 8.0-24.0 hours.
Phase III covered the period from 25.0-48.0 hours.

RESULTS AND DISCUSSION

Table 1 shows the treatment effects on total gas and rate of gas production.

Treatments		Phase I (LS Means)		Phase II (LS Means)		Phase III (LS Means)	
		accumulated gas production (psi)	Rate of gas production (per hour)	accumulated gas production (psi)	Rate of gas production (per hour)	accumulated gas production (psi)	Rate of gas production (per hour)
Variety (V)	Local	2.35	0.56	5.23	0.15	8.07[a]	0.16[a]
	16840	2.49	0.59	5.57	0.17	8.71[a]	0.17[a]
	16786	2.51	0.60	5.57	0.16	8.60[a]	0.17[a]
	16798	2.61	0.60	5.50	0.15	9.20[b]	0.20[b]
Harvest date (HD)	60	2.32	0.55[a]	5.21	0.17[a]	9.21[a]	0.21[a]
	90	2.55	0.60[b]	5.58	0.15[b]	8.44[b]	0.16[b]
	120	2.59	0.61[b]	5.61	0.15[b]	8.29[b]	0.15[b]
Fraction (PF)	Leaf	2.32[a]	0.55[a]	5.17[a]	0.15[a]	8.46	0.20[a]
	Stem	2.59[b]	0.62[b]	5.77[b]	0.17[b]	8.29	0.15[b]
V X HD				*		*	
V X PF						*	
PF X HD		***		***			

Means with different superscript in the same column within the same row heading are significantly different (P<0.05).
**significant at 0.05, **significant at 0.01, ***significant at 0.001*

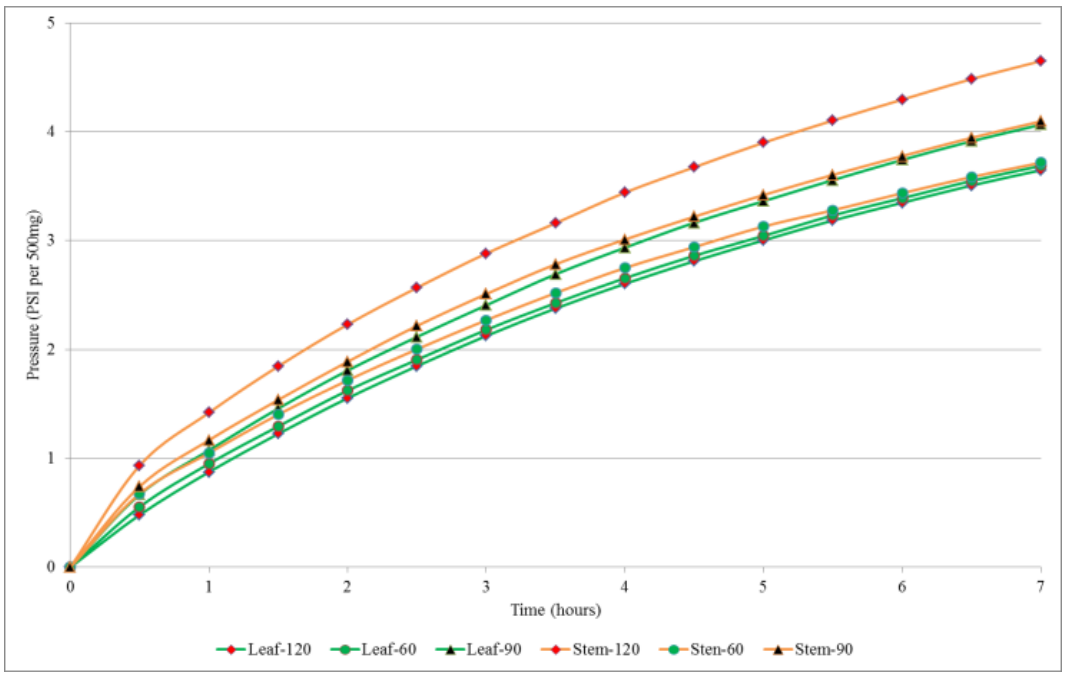

Figure 1 Accumulated *in vitro* gas production for two PF and three HD in Phase I

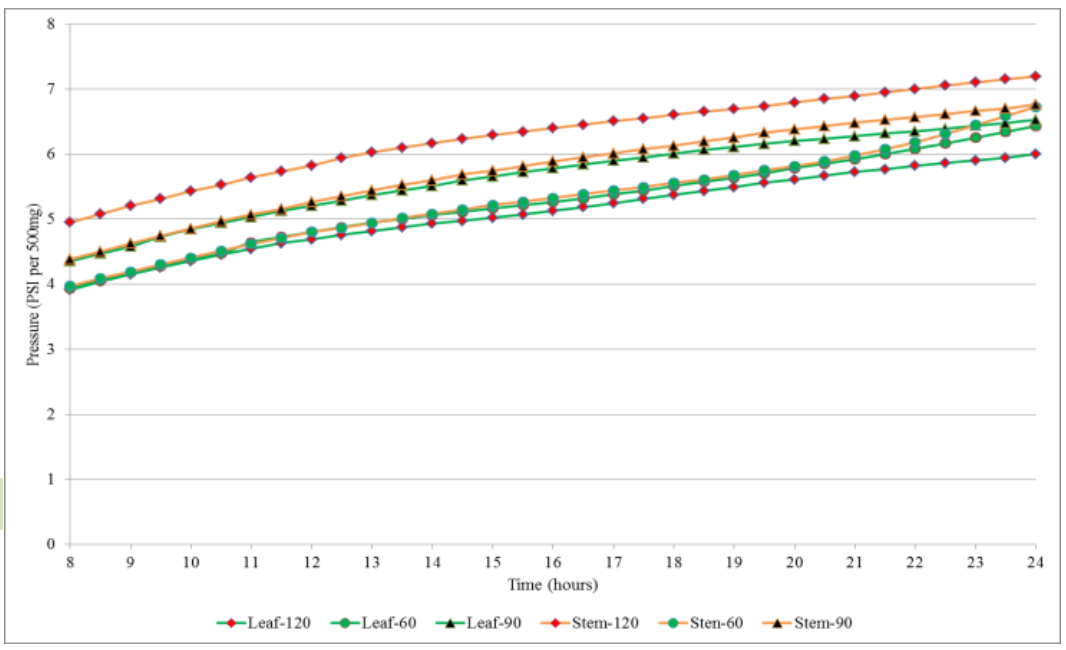

Figure 2 Accumulated *in vitro* gas production for two PF and three HD in Phase II

Effect of V, HD and PF on gas and rate of gas production

From table 1 and figures 1 and 2, it can be seen that the stem fraction and the harvest at 120days were producing more gas compared to the leaf fraction and harvest at 60days in phases I and II (0-24hrs). In phase III, however, the leaf fractions and the harvest at 60 were producing more gas. These findings agree with the report of Tolera and Sundstøl (1999) and Tang *et al.* (2008) who both reported higher gas production for stem compared to leaf fractions. Leaf fraction and early harvest plants may contain high amount of soluble carbohydrates. These soluble carbohydrates have the tendency to lower rumen pH which could lead to the death of cellulolytic microbes. Mertens and Loften (1980) also reported that starch prolongs the lag time for fibre digestion. Leaves of grasses contain more soluble CHO than structural CHO (cellulose and hemicellulose) compared to the stem. High Soluble CHO results in lower pH and could affect cellulolytic microbes.

CONCLUSION: *Potential digestibility varied among the varieties in the three different phases. The differences observed were due to the effect of the harvest dates and plant fraction. From the results it will be appropriate to feed Napier grass especially variety 16789 to ruminant however it should be harvested at 90 days so as to benefit from both higher yields and digestibility. It is also recommended that both leaves and stems should be used in case the plants are harvested before or at 60 days for silage.*

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