Biomass yield, nutritional composition and silage fermentation characteristics of Panicum and Cenchrus grasses in the savanna agro-ecological zone of Ghana.

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Introduction

Successful silage production can help overcome seasonal fluctuations in feed quality and improve livestock production efficiency in tropical regions. Fodder yield and nutritional value are crucial when selecting forage varieties suitable for silage. This study investigated two *Megathyrsus maximus* (formerly *Panicum mamximum*) cultivars (Mombasa and Massai) and a local Napier grass (*Cenchrus purpureus,* formerly *Pennisetum purpureum*) focusing on their biomass yield, nutritional quality, and silage fermentation characteristics.

Materials and Methods

Two Panicum (*Megathyrsus maximus*) cultivars (Mombasa and Massai) were cultivated at a seed rate of 7 kg/ha as against a local Napier grass (*Cenchrus purpureus*) in an experimental farm of the University for Development Studies in Tamale, Ghana. The grasses were fertilized with NPK 23-10-5 at 60 kg/ha. At 6 weeks of regrowth, the grasses were harvested at a stubble height of 5 cm. The grass was chopped to a 1.5-2.0 cm length and silage was prepared into mini plastic silos (600 ml). The fermentation characteristics of the silages were determined after 90 days of ensiling (Fig.1)

Fig. 1. Silage preparation of grasses.

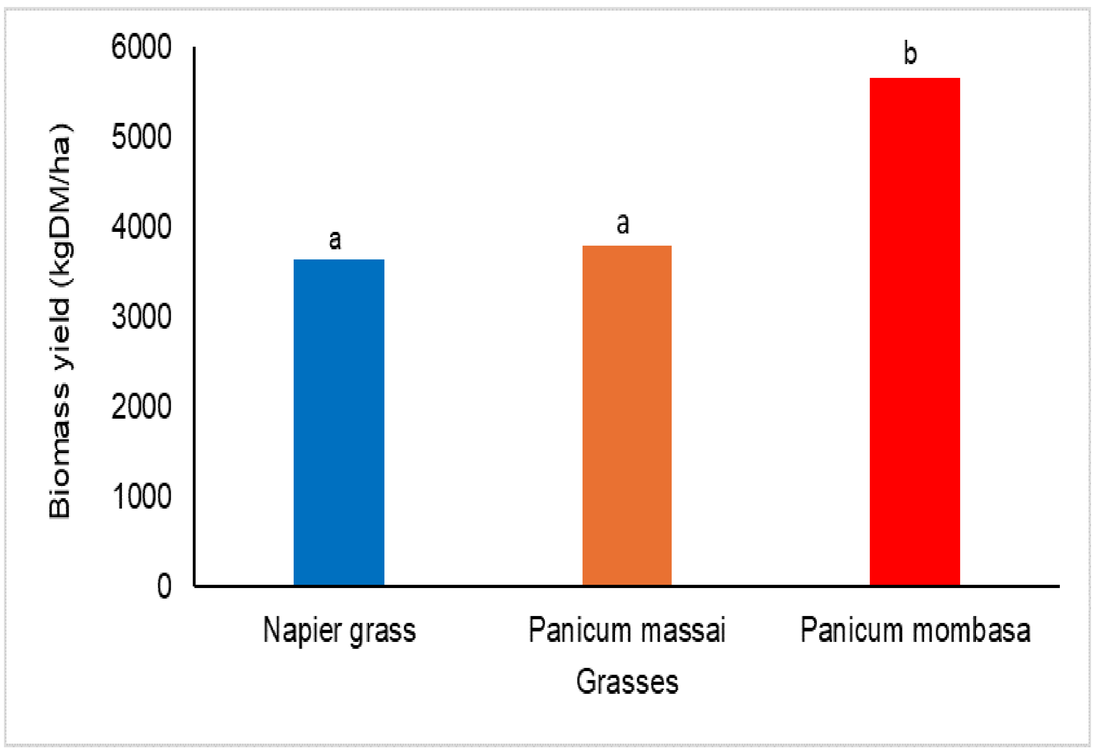

Fig. 2.. Biomass yield of grasses at one harvest (kgDM/ha).

Table 1. Chemical composition of grasses before and after ensiling (%).

Grasses	Treatments	Parameters (%)					
		CP	NDF	ADF	Mg	P	Ca
Napier grass	Fresh	9.5	74.2	38.4	0.32	0.19	0.36
	Ensiled	8.3	65.6	38.9	0.50	0.20	0.4
Panicum massai	Fresh	11.9	70.8	40.2	0.44	0.25	0.60
	Ensiled	13.0	56.4	38.5	0.54	0.30	0.73
Panicum mombasa	Fresh	11.7	72.8	40.0	0.53	0.22	0.53
	Ensiled	10.6	60.2	37.1	0.43	0.30	0.63
	Grasses	0.964	2.239	0.978	0.072	0.030	0.054
Seds	Treatments	0.787	1.828	0.790	0.059	0.024	0.044
	Grasses*treatments	1.363	3.167	1.369	0.102	0.042	0.077
	Grasses	0.010	0.049	0.642	0.357	0.052	0.001
P-values	Treatments	0.628	0.001	0.116	0.445	0.340	0.060
	Grasses*treatments	0.435	0.438	0.241	0.244	0.666	0.643

Table 2. The DM, pH and microbial count of grasses before and after ensiling.

Grasses	Treatments	Parameters					
		DM (%)	pH	Aerobic bacteria (cfu/g FM)	Coliform bacteria (cfu/g FM)	Lactic acid bacteria (cfu/g FM)	Yeast (cfu/g FM)
Napier grass	Fresh	20.0	5.9	4.5	5.3	4.6	4.3
	Ensiled	18.0	4.7	3.0	0.0	5.1	4.9
Panicum massai	Fresh	21.0	5.8	5.6	6.0	3.7	5.6
	Ensiled	21.1	4.5	4.9	0.0	2.9	3.2
Panicum mombasa	Fresh	16.6	6.2	5.8	5.4	4.0	5.4
	Ensiled	18.4	5.0	3.4	0.0	4.5	4.8
	Grasses	0.235	0.109	0.000	0.042	0.001	0.000
Seds	Treatments	0.192	0.089	0.000	0.000	0.000	0.000
	Grasses*treatments	0.333	0.154	0.000	0.000	0.001	0.000
	Grasses	0.351	0.003	0.001	0.001	0.001	0.001
P-values	Treatments	0.120	0.001	0.001	0.000	0.001	0.001
	Grasses*treatments	0.215	0.635	0.001	0.000	0.001	0.001

Results and Discussion

Biomass yield of Mombasa at regrowth was significantly higher than Maasai and purpureus (P=0.026) with values of 5652.0, 3800.0 and 3647.0 kg DM/ha/harvest, respectively (Fig. 2). The crude protein (CP) of the two Panicum cultivars was similar (Massai [11.9%] vs Mombasa [11.6] %) and higher than that of Napier grass (9.4%) (Table 1).The ensiling process decreased the CP content in Napier (8.3%) and Mombasa (10.5%) but increased in Massai (13.0). The neutral detergent fibre and acid detergent fibre contents were significant for cultivars and ensiling. The mineral composition (Mg and P) did not differ by cultivar and ensiling except in Ca, where the Massai and Mombasa were higher than Napier (Table 1). There were no major changes in total digestible nutrients before or after ensiling. The dominant aerobic bacteria and coliform bacteria before ensiling were significantly reduced after ensiling (P<0.05), whereas lactic acid bacteria became dominant (Table 2). The pH value decreased, lactic acid content increased, improving the fermentation quality (Table 2). The high biomass yield, CP content and Ca in panicum cultivars may be due to their genetic modification. Hybrid cultivars are genetically engineered to be more drought-resistant, high yielding and very nutritious compared to local grasses. The increment and decrement in CP after ensiling may be due to difference in forage type. Low pH and high lactic acid bacteria count after ensiling is an indication of high-quality silage that may improve animal performance. This study confirms that *Megathyrus maximus* Mombasa has excellent production characteristics. Its biomass yield and nutritional content are superior to Napier grass. As a silage, this grass can significantly help alleviate feed shortages and enhance livestock production, especially during periods of feed scarcity in the tropics.