Chemical Composition and Fermentation Profile of Perennial Peanut and Marandu Grass Mixed Silages

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Introduction

Perennial peanut has high quality, evidenced by the improvement of animal production in grazing, due to good contents of crude protein and digestibility, which makes it one of the best alternatives for low cost feeding (Paganella and Valls 2002). Grass ensilage associated with legumes is considered an alternative to meet the protein demand of cattle in the livestock. However, due to limited information on the techniques of grass ensilage with tropical legumes, this research aimed to evaluate the chemical composition and the fermentation profile of perennial peanut and Marandu mixed grass silages, treated or not with bacterial inoculant.

Methods

The experiment was conducted at the Department of Animal Science, Federal University of Viçosa, Viçosa, Minas Gerais. A factorial arrangement (5 x 2) in a completely randomized design was used, with three replicates. Marandu grass silages (*Brachiaria brizantha* cv. Marandu) with increasing levels of perennial peanut (*Arachis pintoi* cv. Belmonte) were evaluated, in the proportions 0, 25, 50, 75 and 100%, with and without bacterial inoculant. The Marandu grass was harvested at 60 days regrowth and the perennial peanut with approximately 10% flowering. The material was chopped in a stationary forage harvester and divided into two portions, submitted or not to treatment with the bacterial inoculant SilAll, Altech of Brazil. After treatments, the forage was ensiled in 20 L buckets, with snap-on lids, equipped with Bunsen valve. The experimental silos were opened 60 days after ensiling. Samples of fresh forage and of silages (25 g) were homogenized in 225 mL of a sterile solution for 1 minute in a blender. The pH of this aqueous extract was recorded immediately in a pH meter. Samples of the aqueous extract were successively diluted and analyzed for lactic acid bacteria and fungi and yeasts, using a selective culture medium (Kung Jr. 1996). Analysis of organic acids was also performed in the aqueous extract. Identification of lactic, acetic, butyric and propionic acid was performed using a C18 column (reversed phase), Bio-Rad Laboratories. Analyses of dry matter (DM), crude protein (CP), acid detergent insoluble nitrogen (ADIN), neutral detergent fiber corrected for ash and protein (NDFap) and lignin were performed according to techniques described by AOAC (2005). Data were subjected to analysis of variance and regression, according to the levels of perennial peanut, and to the F-test, at 5% significance.

Results

Dry matter, CP, and NDFap contents, and LAB, enterobacteria, and fungi + yeasts populations found for Marandu grass and perennial peanut before ensiling were 26.2 and 21.0%; 5.14 and 17.9%; 72.9 and 37.5%; 5.9 and 5.76 log cfu/g; 6.26 and 8.01 log cfu/g; 5.76 and 6.85 log cfu/g, respectively. The dry matter contents decreased linearly with increasing levels of perennial peanut in the mixtures (Table 1). This is due to the lower DM content of perennial peanut compared to Marandu grass at the time of ensiling. Crude protein contents of the silages increased linearly (5.4 to 16%) due to the high crude protein content of the legume. The interaction between perennial peanut level x inoculant had an effect on the NDFap contents that increased linearly with increasing levels of perennial peanut in silages. The ADIN and lignin contents also increased linearly with levels of perennial peanut. The inoculant provided the lowest average contents of ADIN (26.0 vs 27.9%) and lignin (4.08 vs 4.48%). The pH of the silages, with and without inoculant, increased linearly with the levels of peanut. This result was expected, since legume silages have higher pH than grass silages. There were no linear and quadratic effects on ammonia contents. There was a quadratic effect of perennial peanut levels on lactic acid bacteria population of silages. In the absence of inoculant, fungi and yeast populations increased linearly with increasing levels of peanut. However, in inoculated silages, this variable had a quadractic effect. There was effect of the peanut level x inoculant interaction on the organic acid content of the silages. A linear and quadratic effect of peanut level on the acetic and lactic acids contents, respectively, in the absence of inoculant was observed. The lactic and propionic acid contents of the inoculated silages increased linearly and the acetic acid had a quadratic effect with increasing of perennial peanut levels. The silages evaluated can be considered of good

Table 1. Chemical composition, fermentation profile and microorganism populations in Marandu grass silages with increasing proportions of perennial peanut (0, 25, 50, 75 and 100%)

Measurements	Peanut proportion (%)					Inoculant		Level of significance				
	0	25	50	75	100	without	with	P	I	PxI	L	Q
DM	26.7	25.9	24.3	22.6	20.7	24.0	24.1	***	ns	ns	***	ns
CP	5.72	7.91	10.4	13.3	16.3	10.7	10.7	***	ns	ns	***	ns
NDFap	64.5	57.1	49.2	48.5	39.2	54.7	48.8	***	***	***	***	ns
ADIN	17.2	22.0	26.6	31.5	37.5	27.9a	26.0b	***	***	ns	***	ns
LIG	2.76	3.58	4.69	5.11	5.75	4.48a	4.08b	***	***	ns	***	ns
pH	4.22	4.35	4.49	4.62	4.73	4.44	4.51	***	***	*	***	ns
NH_3-N/TN	8.99	9.74	10.3	13.8	8.43	9.36	9.28	*	ns	ns	ns	ns
LAB	7.64	7.75	7.73	7.69	7.40	7.64	7.64	*	ns	ns	*	***
FUN + YEAST	2.82	3.25	3.44	3.72	3.76	3.42	3.37	***	ns	*	***	*
LAC	1.55	1.80	2.29	2.37	2.57	2.49	1.74	***	***	***	***	*
ACET	1.27	1.45	1.37	1.69	2.08	1.57	1.58	***	ns	***	***	***
PROP	0.43	0.50	0.52	0.56	0.63	0.48	0.58	***	***	***	***	ns
BUT	0.07	0.07	0.08	0.07	0.08	0.08	0.08	***	ns	***	ns	ns

P = perennial peanut proportion; I = inoculant; P × I = interaction between perennial peanut proportion and inoculant; L = linear effect; Q = quadratic effect; DM: dry matter; CP: crude protein; NDFap: neutral detergent fiber corrected for ash and protein; ADIN: acid detergent insoluble nitrogen; LIG: lignin; NH3-N/TN: ammonia nitrogen/total N; LAB: lactic acid bacteria; FUN + YEAST: fungi and yeast; LAT: lactic acid; ACET: acetic acid; PROP: propionic acid; BUT: butyric acid. *(P<0.05); ***(P<0.01); ns = not significant.

quality, according to criteria suggested by Mahanna (1994).

Conclusion

The addition of perennial peanut to Marandu grass at the time of ensiling increased crude protein content and reduced fiber content, and provided adequate fermentation profile of silages.

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