EVOLUTION OF THE NUTRITIONAL QUALITY DURING BIG BALE ENSILAGE OF TEMPERATE MULTISPECIES PASTURES

L.M. Gutiérrez and E.M. Viviani Rossi
FCA, UNMdP/E.E.A. Balcarce INTA. Unidad Integrada

ABSTRACT
The objective of this work was to assess the evolution of the nutritive quality of big bales composed of multispecifies pastures (*Phalaris acuática, Festuca arundinacea, Lolium perenne* and *Medicago sativa*). Ten big bales were analysed after 90 and 120 days for the following: dry matter (%DM); crude protein (CP, %DM); pH; neutral detergent fibre (NDF, %DM); digestibility in vitro of DM (IVDMD, %DM); ammonia nitrogen (NH3-N/%TN); soluble protein (SP, %NT) and non structural carbohydrates (WSC, %DM).The results were analyzed through variance of the means and significant differences ($p<0.05$) were found in percentages of DM (32.9% and 27.8%); CP (12.1% and 8.6%); pH (4.6 and 6.7); IVDMD (61.1% and 53.2%); N-NH3/TN (11.8% and 36.0%); SP (8.6% and 12.6%) and no differences were found in NDF (60.2% and 61.6%) and WSC (2.8% and 1.9%) ($p>0.05$).

KEYWORDS
Big bale silage, temperate pasture, nutrition quality, fermentation

INTRODUCTION
Forage kept as bale silage has good nutritive value provided it is made from a forage of good quality and is not stored for more than six months (Andrieu et al., 1981). In periods longer than 6 months losses in nutritional quality were observed (Viviani Rossi et al., 1995), because contact of the silage with air alters its fermentation parameters (pH and ammonia-N).

As quality of baled silage depends upon the properties of the plastic material used (Gaillard and Berner, 1988) as well as on its intrinsic characteristics, the necessity for an assessment of its quality during the conservation period arose.

MATERIALS AND METHODS
A pasture of phalaris (*Phalaris acuatica L.*) 73.8%, tall fescue (*Festuca arundinacea* Scheb.) 14.6%, ryegrass perennial (*Lolium perenne*) and lucerne (*Medicago sativa*) 2.4% was established at the Experimental Station in Balcarce, Argentina (37° 45' 9" S and 5°17' 47" W). It was harvested on November 23, 1993 and the bales were made immediately without wilting the forage before baling it. The characteristics of the forage before baling were: dry matter (DM) 32.6%, digestibility in vitro of DM (IVDMD) 60.5%, crude protein (CP) 12.3%, neutral detergent fibre (NDF) 65.4%.

Weather conditions at the moment of baling were: photoperiod (h): 15.4 h, relative heliophony: 46 %, temperature: 13.9 ºC, relative humidity: 84%. A 30 micron white polythene, 500 mm in width was used and Gaillard's technical recommendations were followed: 50% stretching, 50% overlapping of the strips and 4 film layers.

The experimental bales (10) were sampled twice: 90 (**P1**) and 210 (**P2**) days after baling with a pneumatic drill (500 rpm), at 3 different depths and in all its faces: a) from the external layers up to 20 cm. b) 20 cm to center c) center.

A homogeneous 300 g sample for each treatment was analysed and the following laboratory tests were applied: 1) Digestibility in vitro of DM (IVDMD): Tilley and Terry; 2) Crude protein (CP): Kjeldahl method; 3) Acidity (pH): Digital pHmeter Cole Parmer; 4) Neutral detergent fibre (NDF): Goering and Van Soest; 5) Ammonia nitrogen/ total nitrogen (NH3-N/ %TN): Technicon autoanalyzer 6) Soluble protein (SP): Kjeldahl method 7) Non structural carbohydrates (WSC): Antrona method.

Analysis of variance were statistically analyzed using SAS, 1989.

RESULTS AND DISCUSSION
Results in Table 1 show: Dry matter (DM) decreased significantly ($P<0.05$) with time because water soluble carbohydrates are lost. Crude protein (CP) decreases significantly due to plant protein denaturalization caused by the microorganisms thriving in high moisture conditions. This produced a fermentation with deamination and oxido-reductions generating ammonium (McDonald et al., 1991). A probable increase in clostridial bacteria also may have affected proteins of the ensiled forage producing deamination processes (Woods et al., 1981).

Acidity (pH) values increased with later samplings, causing unsuitable fermentation of the stored forage whose quality is lowered ($p<0.05$). The percentages of neutral detergent fibre (NDF) are constant through time ($p>0.05$). Digestibility in vitro of DM (IVDMD) diminishes significantly in the second sampling probably due to fermentative alterations in silage ($p<0.05$). A significant increase in the value of ammonia nitrogen/total nitrogen (NH3-N/ TN) was observed in late samplings and this value, together with Soluble protein (SP) values would indicate a hydrolysis of true proteins ($p>0.05$). A non-significant reduction in Non structural carbohydrates (WSC) value was found in the different sampling periods ($p>0.05$).Time affected nutritive quality of silage in the parameters related to proteins, but changes related to digestibility were not affected (Haig, 1990). Airtightness of the plastic material was not affected up to 210 days after wrapping, so little aerobic spoilage was observed.

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Table 1
Qualitative evaluation of baled hay in two periods after baling (**P1** vs **P2**).

	DM (%)	CP (%DM)	pH	NDF (%DM)	IVDMD (%DM)	NH3-N (%TN)	SP (%TN)	WSC (%DM)
P_1	32.9[a]	12.1[a]	4.6[a]	60.2[a]	61.1[a]	11.8[a]	8.6[a]	2.8[a]
P_2	27.8[b]	8.6[b]	6.7[b]	61.6[a]	53.2[b]	36.0[b]	12.6[b]	1.9[a]

(*) Means of treatment followed by the same letter do not differ ($p<0.05$).