Meta-analysis of sorghum silages produced in experiments in Brazil: Types of silo

K.C. Welter[1,2], J.P.Velho[3], D.R.M. Alessio[4], T.R. Backes[1], J. Rossetto[1,5], A. Faccenda[1]

[1]Federal University of Santa Maria, undergraduate student in Animal Science, Palmeira das Missões, Rio Grande do Sul, Brazil. [2]PIBIC/CNPq/UFSM Scholarship student. [3]Federal University of Santa Maria, Department of Animal Science and Biological Sciences, Palmeira das Missões, Rio Grande do Sul, Brazil. Email: velhojp@ufsm.br [4]Santa Catarina State University, Graduate Education Program in Animal Science, Lages, Santa Catarina, Brazil. CAPES Scholarship student. [5]FAPERGS Scholarship student.

Introduction The hybrid tendency, its maturity stage, the chop length and the additives inclusion, for example, are factors that can interfere on the nutritional value of sorghum silages in an isolate, antagonist and/or in a synergic way. Considering the amplitude of the possible interactions between the factors mentioned above, several researchers have been conducting experiments that evaluate, simultaneously, multiple treatments to hybrids, which precludes the possibility of using field silos in these conditions. Then, laboratory silos are generally used to simulate field conditions. However, the silo size, its covering and its sealing may influence silage quality. So, through a meta-analytical comparison, we aimed to answer if laboratory silos represent the field silos conditions concerning the chemical composition of sorghum silage produced in Brazil.

Materials and Methods To compose the database (DB), we have looked for public domain scientific papers published between January, 1989 and December, 2010, covering the last 22 years of researches about sorghum silage in Brazil. The database was built of 82 works with 604 treatments, which totalized 797 silos. The list of selected papers can be requested for the authors of this paper. In this meta-analytical study, there were selected experiments which presented parameters relating to the chemical composition of sorghum silage (SS), concerning the type of silo, classified as: field silo (FIE) and laboratory silo (LAB). The database was composed by 312 treatments from 58 studies, totalizing 786 silos. The development of this work was based on methodologies idealized by Normand (1999) and Lovatto et al. (2007). Statistical analyses were performed through mixed models according to Littell et al. (2006), considering the work as a random effect and the types of silos as a fixed effect.

Results and Discussion There was no difference ($P>0.05$) between silo types on analyzed parameters (Table 1). It is important to mention that all silos studied in this work are from scientific papers developed in Brazil. In other words, probably, the field silos were made and managed according to the silage and ensiling premises. Furthermore, in both laboratory silos and field silos there was not aerobic instability that could severely influence the silage nutritional value in rural properties. Thus, it is essential to conduct experiments that compare the research conditions to the real field condition. In a great part of Brazilian rural properties that use silage at the production system, the producers are quite concerned at the ensiling moment, but they are not much concerned about silo management during the silage feedout which can cause biological and economic losses. In this study, the neutral detergent fiber (NDF) content was 57.71% for laboratory silos and 60.65% for field silos, showing that even under experimental conditions, these percentages are pretty high, requiring changes to preserve high energy feed. According to Van Soest (1994), there is a high negative correlation between the content of NDF and ruminant's dry matter intake. So, silage with similar levels as those ones we have mentioned

above may limit animals' voluntary feed intake which have standard genetic compatible with the forage and also with the production cost of semi or totally confined systems.

Conclusions The laboratory silos are used to simulate the silage process in real conditions.

References

Littell, R. C., Milliken, G. A., Stroup, W. W., Wolfinger, R. D. and Schabenberger, O. 2006. SAS® for mixed models. Second Edition, SAS Institute Inc., Cary, NC, USA.

Lovatto, P. A., Lehnen, C. R., Andretta, I., Carvalho, A. D. and Hauschild, L. 2007. Meta-análise em pesquisas científicas - enfoque em metodologias. R. Bras. Zootec. 36 (Supl.)285-294.

Normand, S. T. 1999. Tutorial in biostatistics meta-analysis: formulating, evaluating, combining, and reporting. Statistics in Medicine, 18:321-359.

Van Soest, P.J. 1994. Nutritional ecology of the ruminant**.** Ithaca: Cornell University Press.

Table 1. Chemical composition of Brazilian sorghum silages, according to silo type

Parameter	Number of silos according to the type				P=
	n	LAB	N	FIE	
DM (%)	177	32.81	89	29.91	0.2963
CP (%DM)	197	7.69	94	6.72	0.1401
N-NH_3 (%TN)	146	7.13	27	6.05	0.6333
NDIN (%TN)	12	13.85	28	20.21	0.4979
ADIN (%TN)	41	6.99	32	11.61	0.2596
Soluble carbohydrates (%DM)	78	1.73	6	1.80	0.9841
NDF (%DM)	186	57.71	77	60.65	0.1388
ADF (%DM)	186	34.21	73	36.85	0.1733
Hemicellulose (%DM)	148	22.83	26	19.35	0.1151
Cellulose (%DM)	148	27.71	17	28.39	0.8290
ADL (%DM)	164	5.14	49	6.32	0.0611
EE (%DM)	17	3.04	57	2.33	0.1594
Lactic acid (%DM)	90	8.74	14	9.26	0.8669
pH	155	3.83	31	3.96	0.1382

LAB= Laboratory; FIE= field