Moisture control, inoculant and particle size in tropical grass silages

[illegible], L.G. Nussio, D.R.S. Loures, L.J. Mari, J.L. Ribeiro, P. Schmidt, M. Zopollatto, M.C. Junqueira and [illegible]

Department of Animal Science, University of São Paulo, ESALQ, Av. Pádua Dias 11, Piracicaba, SP, 13418-900, Brazil. Email: nussio@esalq.usp.br

Keywords: grass silage, *Panicum maximum*, silo losses, moisture, wilting

Introduction Decreased fermentation and spoilage losses with improved aerobic stability during feed out can be accomplished by several strategies, such as wilting, addition of microbial additives and moisture absorbents. Particle size reduction may increase bulk density and improve the fermentation. The objective of this trial was to evaluate the effects of particle size, moisture content and a microbial additive on chemical-physical parameters and losses in silages made from Tanzania grass.

Material and methods The trial was carried out during the summer on a 90 d vegetative regrowth cut of Tanzania grass (*Panicum maximum*) which was harvested and ensiled with the following treatments: T1 - fresh forage, large particle size, no microbial additive; T2 - fresh forage, small particle size, no microbial additive; T3 - wilted forage, large particle size, no microbial additive; T4 - fresh forage, large particle size, no microbial additive + ground pearl millet grain (GM); T5 - fresh forage, small particle size, microbial additive (Ecosyl®, UK). Pressed bag silos (40t each) with 2.7m diameter were packed under pressure (80pounds/inches^2) and opened after 90 d storage. A core sample (30x30x30cm) was taken weekly for analysis. Spoilage losses were measured daily as a % of the silage unloading rate. Chemical analyses were carried out according to AOAC (1980), mean particle size following Lammers *et al.* (1996) and porosity according to Williams (1994).Repeated measurements were taken in a complete randomised design during eight weeks and analysed using a mixed procedure (SAS, 1996).

Results Wilting and pearl millet grain addition increased the dry matter (DM) content (Table 1). The small particle size in the forage did not increase wet or DM silage bulk densities (Table 2), even though the addition of pearl millet grain showed a trend for higher DM density-DMD (156 kg/m^3) compared to the other treatments. Forage wilting tended to lower the wet density of the silage (460 kg/m^3), but DM density was not affected due to the compensatory effect of the higher DM content. Reducing the particle size in the forage (T2 and T5) did not reduce the porosity, in contrast to the expected results. This may have arisen because fewer and larger pores with longer forage were compensated by many smaller pores. The wilted forage (T3) showed higher losses when compared to the addition of pearl millet (29% vs 18%). Particle size reduction did not change the spoilage losses ($P=0.60$) but the addition of bacterial inoculant showed a trend ($P=0.09$) for increased losses.

Table 1 Chemical parameters of tropical grass silages

Parameters	T1	T2	T3	T4	T5
DM, %	24.8	24.0	27.7	28.5	24.0
CP, % DM	9.2	10.2	9.6	11.0	8.5
NDF, % DM	67.8	69.4	69.0	49.8	69.3
ADF, % DM	45.0	45.4	46.4	33.7	45.4
ASH, % DM	10.9	10.5	11.2	8.3	10.8
WSC, % DM	1.8	1.8	2.4	1.4	1.2
$N-NH_3$, % total N	8.2	5.8	4.6	2.4	10.1
pH	4.9	4.9	4.8	4.8	4.7

Table 2 Physical parameters of tropical grass silages

Parameters	T1	T2	T3	T4	T5
Mean particle size, cm	2.4	2.2	3.4	2.2	2.0
Sieve retention, %	47.4	53.1	67.4	54.0	36.9
Bulk density, kg/m^3	535^a	523^a	460^b	505^{ab}	487^{ab}
DMD, kg/m^3	142^{ab}	131^b	135^{ab}	156^a	122^b
Porosity, %	45^b	52^a	50^{ab}	48^{ab}	55^a
Spoilage losses, %	17^{ab}	14^b	29^a	18^{ab}	23^{ab}

^{a,b}($P<0.05$)

Conclusions High spoilage losses suggested that wilting may not be a suitable strategy for ensiling tropical grasses when harvested with larger particles and stored in pressed bag silos. The bacterial inoculant also increased spoilage losses during feed out.

Acknowledgement Financial support provided by FAPESP, SP (Brazil)

References

AOAC (1980). Official Methods of Analysis.13th .ed. Washington, 1015 pp.

Lammers, B.P., D.R. buckmaster & A.j. Heinrichs. (1996). A simple method for the analysis of particle sizes of forage and total mixed rations. *Journal of Dairy Science*, 79, 922-928

Williams, A.G.(1994). The permeability and porosity of grass silage as affected by dry matter. *Journal of Agricultural Engineering Science*, 59, 133-140.