DRY MATTER LOSSES IN TANZÂNIA GRASS (*Panicum maximum, Jacq, cv. Tanzânia*) SILAGE

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Abstract

A spring cut of Tanzânia grass (*Panicum maximum, Schum,* cv. Tanzânia) was harvested (20% DM), in a 60-day regrowth sward. Laboratory silos (20 L) were filled with chopped forage. Nine treatments, in a 3 x 3 factorial arrangement with four replication each. Treatments consisted on the addition of 3 levels of dehydrated and pellet citrus pulp (CP) (0, 5 and 10%- fresh basis) combined with 3 particle sizes (Larger (1), medium (2) and smaller (3)). After 60 days silos were opened, effluent and gas yield was calculated. Reduction in particle size lowered gas losses in silage. Major benefit on preventing gas losses from more finely cut forage (sizes 2 and 3) was observed when higher CP levels were added. Gas losses were maximum when 1.2% and 4.6% of CP were added in forage particle sizes 1 and 2, respectively. For size 3, a linear trend was observed. The lowest silage effluent yields for both, particle sizes 1 (1,81 g/ 100 g DM) and 2 (2,67 g/100 g DM), were when CP addition was up to 7,89% and

7,50%, respectively. When the higher CP level was added (10%) no differences in effluent yield were detected among particle sizes.

Keywords: Tropical grass, silage, effluent, losses, additives, particle size

Introduction

Low soluble carbohydrates levels associated with high moisture may be harmful to the forage ensilage process. Under those conditions, an increase on dry matter losses may due to secondary fermentation. Carbohydrates suppliers and/or water absorbent substrates are interesting to enhance the conservation process and silage quality (Vilela, 1998).

A reduction on silage particle size may have a beneficial effect on fermentation quality, improving bulk density and an additional specific surface area available to microorganism attack. On the other hand it may increase effluent yield as result of a higher water activity and release of cellular content.

This study was conducted to evaluate the effect of particle size and citrus pulp addition on dry matter losses due to effluent and gas yield on tropical grass silage.

Material and Methods

A spring cut of Tanzânia grass (*Panicum maximum, Schum,* cv. Tanzânia) was harvested (20% DM), in a 60-day regrowth sward during 1999. Laboratory silos, which consisted of 20 L plastic buckets with Bunsen valves device, were filled with chopped forage. Nine treatments, from a 3 x 3 factorial arrangement, were assigned in a completely

randomized experimental design with four replication each. Treatments consisted on the addition of 3 levels of dehydrated and pellet citrus pulp (CP) (0, 5 and 10%- fresh basis) combined with 3 particle sizes.

To obtain the targeted particle sizes, forage was chopped through a stationary machine once, twice or even three times. Particle sizes were measured by using sequential sieves “Penn State Particle Size Separator” (Lammers, 1996). Larger forage particles (1) showed 51% of the DM retained on the upper sieve (1,81 cm) and 15% on the lower sieve (0,79 cm). For the medium (2) and smaller particle sizes forages (3) 39% and 18% of DM, were retained on the upper sieve while 14% and 13% of DM were recovered at the lower sieve, respectively.

Dry sand (1.5 kg) was placed in an uniform layer on the bottom of the bucket, followed by to thin mesh plastic screen and two fold layers of cheese cloth, to filter liquid flow and measure effluent yield, indirectly. Effluent yield was calculated as difference between the sand weight before and after ensiling. Gas yield was estimated as difference in silo weight between the first and 60^{th} day after sealing.

All treatments were submitted to a constant loading pressure (2 t/m^2) applied by a hydraulic press, simulating the effect of a medium size tractor.

After 60 days fermentation period, silos were opened and silage samples were placed in a 55^oC oven during 72 hours to obtain DM determination.

Losses traits were statistically analyzed by analysis of variance, and means were submitted to Least square comparisons of GLM procedure -SAS

(1988). Regression analyzes were used to verify trends between particle sizes or citrus pulp levels and silage losses.

Results and Discussion

Reduction in particle size lowered gas losses in silage (Table 1) and improved fermentation, resulting in lower silage pH values (data not presented). Silage bulk density and air tightness (data not presented) might explain the origin of an enhanced conservation process (McDonald, 1991).

Major benefit on preventing gases losses from more finely cut forage (sizes 2 and 3) was observed when higher CP levels were added. However, by reducing particle size partially, from size 1 to 2, forage alone showed a better fermentation, with a lowered gas yield.

Gas yield predicting equations are described below, for particle sizes 1 and 2:

Size1: Gas Yield = 19,54 – 0,10(%CP) – 0,06(%CP)^2; r^2 = 0,71

Size2: Gas Yield = 14,97 + 0,92(%CP) – 0,10(%CP)^2; r^2 = 0,56

Gases losses were maximum when 1.2% and 4.6% of CP were added in forage particle sizes 1 and 2, respectively.

For size 3, a linear trend was observed, as follows:

Size3: Gas Yield = 13,74 – 0,50(%CP); r^2 = 0,64

Better silage pH, (not presented) and a surplus on carbohydrate supply may be driven by CP addition. The absorbent effect of CP led to a reduced effluent yield. Similar results were reported (Peres, 1997) with the addition of citrus pulp up to 5 to 10% in elephant grass (*Pennisetum purpureum* Schum.) silage.

The lowest silage effluent yields for both, particle sizes 1 (1,81 g/ 100 g DM) and 2 (2,67 g/100 g DM), were noticed when CP addition was up to 7,89% and 7,50%, respectively. When the higher CP level was added (10%) no differences in effluent yield were detected among particle sizes. However, larger particles (sizes 1 and 2) showed lower water activity resulting from less mechanically damaged cells. As consequence, when 5% CP was added, effluent yield reached (7,56 g/100 g DM) for finest particles, while it was only 3,73 and 4,01 g/100 g DM, respectively, for sizes 1 and 2. Against most of the current literature, exclusive forage silage had an increased effluent yield with coarse particles, which might be explained by an effluent runoff on smaller particles, resulting in sand saturation and probable effluent underestimation.

Gas and effluent losses may be reduced by either adopting finely chopped forage or CP addition up to 7 to 8%. Manipulation of particle size and silage moisture might offset opposite negative effects.

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Table 1 - Effects of particle size and citrus pulp addition on gases losses (% DM) from Tanzânia grass (*Panicum maximum* cv. Tanzânia) ensilage.

Particle size	Citrus pulp addition , (%)		
	0	5	10
1	19,54[a]	18,54[a]	14,53[a]
2	14,97[b]	17,09[a]	14,22[a]
3	13,61[b]	11,52[b]	8,65[b]

* Means in columns followed by unlike superscripts differ (P<0,05) LSmeans.

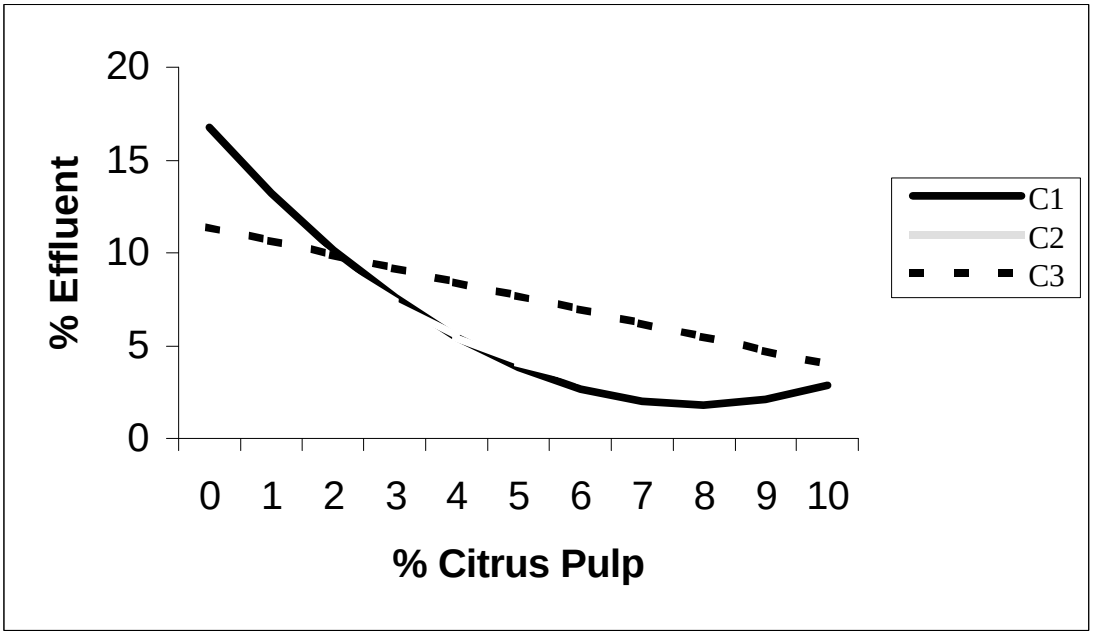

Figure 1 - Effects of citrus pulp addition on silage effluent yield.