Silage quality and losses due to ensiling of Napier grass, Columbus grass and maize stover under small holder conditions in Kenya

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Introduction

On behalf of the National Dairy Development Project, several ensiling experiments were conducted at the National Animal Husbandry Research Centre (NAHRC) at Naivasha, Kenya, in the period 1983-1989. The aim of the experiments was to develop methods and techniques suitable for smallholders for the ensiling of Napier grass, Columbus grass and maize stover to overcome feed shortages during the dry season.

Materials and methods

The following six series of ensilage experiments were conducted:

Series A: 2 silages of chopped, wilted Napier grass with or without addition of molasses, ensiled in an number of netted nylon bags and placed inside a larger silage clamp

Series B: 6 pits of wet long or chopped Napier grass with addition of 3.5% or 6% or without molasses

Series C: 4 pits of wet long or chopped Napier grass with addition of 3.5% molasses or MUM (molasses/urea mixture)

Series D: 6 pits of wet long or chopped Napier grass with addition of 3% molasses

Series E: 4 pits of wet long or chopped Columbus grass with addition of 3% molasses

Series F: 3 pits of chopped maize stover or maize stover mixed with lablab, without additive.

Silages were made in small earthen pits in quantities varying from 1000 to 2000 kg fresh material, thus more or less representing conditions for small-scale farmers. Sides and top of the pit were covered with 2 m wide polyethylene plastic sheets covered with a layer of about 50 cm of sand on top and sides

Results

Percentage non-edible silage (mouldy and rotten silage) varied from 0 to 2.5%, indicating that sealing with polyethylene sheet and soil cover was good. Levels of butyric acid and contents of ammonia nitrogen often were below 0.3% and 12 respectively for silages of wilted Napier grass and wet chopped Columbus grass with the addition of molasses and for silage of maize stover. These fermentation characteristics indicate good silage quality. Smell was good as well. For some wet Napier grass silage and for silages made with addition of MUM of unchopped Columbus grass, results were less good.

Long, unchopped Napier grass wilted for one or two days to about 30% dry mater and with the addition of molasses and with proper compaction, often resulted in good silage as well.

Dry matter losses due to ensiling of Napier grass averaged 15.2 ± 4.2%. Losses were lower for silages made of grass wilted for one or two days and higher for silages made of wet unchopped

grass and grass with the addition of MUM. For wet Columbus grass, there was also a clear positive effect of chopping. Average dry matter losses for ensiled maize stover were 8.1%.

Losses of crude protein averaged 16.9%, but variation was large, partly due to sampling errors. Losses were lower for wilted silages and much higher for silages with the addition of MUM.

In vitro organic matter digestibility decreased due to ensiling and was more than 10 units lower in case of poor quality silages. For well-preserved silages, the decrease in digestibility was often limited to 5 units or less. Losses of digestible organic matter for Napier silages averaged 28.5±7.9%. Losses were lower for wilted silages and much higher for wet silages of series D and silages made with the addition of MUM.

Results show that under smallholders' conditions, good silage can be made. Poor quality silages of poorly digestible Napier grass however, will not meet maintenance requirements of animals.

Conclusions and practical recommendations

1. Under small farmer's conditions, good silage can be made, provided that air-tight sealing with plastic polyethylene sheets is applied, with at least a cover of 50 cm of soil on top and sides of the pit, and with good drainage of rain water. Ensiling and covering has to be completed within one day.

2. As shown by good fermentation characteristics and smell, wilting one or two days to reach a dry matter content of 30% often results in good silage, especially when molasses is added. Wilting to a dry matter content of more than 30%, or wilting of old stemmy material is not recommended, because of the higher weather risks and difficulties with compaction.

3. Dry matter losses due to ensiling of wilted or wet, chopped Napier grass with the addition of molasses could be limited to 15%.

4. Dry matter losses of silages made of wilted, un-chopped long Napier grass are probably slightly higher than from chopped Napier grass. Provided proper compaction, addition of molasses, air-tight sealing and covering with at least 50 cm soil, making silage of long, wilted Napier grass may be a good alternative for smallholder conditions.

5. Although it is not very clear from the limited experience provided by these experiments, addition of 3% molasses to wet and long wilted Napier grass will probably be sufficient to obtain good quality silage, especially when hand-mixed through chopped silage. To increase chances for good quality silages addition rates of up to 6% are suggested when molasses is applied in the silage pit on layers of grass. For chopped, wilted Napier grass and for chopped Columbus grass, addition of molasses can be lower.

6. MUM as an alternative additive for molasses does not produce good silages.

7. Silages of chopped Columbus grass with molasses and chopped maize stover without molasses made good silage. Dry matter losses appeared to be lower compared to Napier grass.

8. Because of a higher risk for leaching, dilution of molasses with water in order to ease application should not exceed a 1-to-1 ratio. A relatively small quantity of molasses should be used at the bottom layers of the pit, and more to be added to the middle and top layers.

9. Losses of crude protein and digestible organic matter were not accurately measured in these experiments, because of the limited number of samples and because of sampling errors.

Based on good quality silages in these experiments, losses are about 15% and 25% for crude protein and digestible organic matter respectively.

10. Poor silages of overgrown Napier grass will at best supply sufficient energy for maintenance. Feeding overgrown Napier grass as standing hay, or mulching might be a better alternative then. Proper storage and utilisation of crop residues like maize stover and preserving feeds like sweet potato vines, fodder beets, cassava or fodder trees may prove better in those situations.