Fermentation Quality and Aerobic Stability of Maize Stover and Banana Pseudostem Mixed Silages in Ethiopia

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Introduction

Feed harvesting and conservation practice in Ethiopia are not very efficient to ensure year round feed security (Dunière et al., 2013). The conservation of hay and crop residues are mostly practiced in an open space, where the sunlight and rainfall might cause leaching of nutrients (Tegegne et al., 2013).

Such inefficient practices have resulted in:

- A feed shortage ranging from 4 to 6 months
- Decrease of animal performance
- Increased free grazing and degradation (Luiz et al., 2019).

However, the crop byproducts of the banana and maize are underutilized by farmers in the southern region of Ethiopia:

- Banana pseudostem (BPS) is left in the field
- Dry maize stover (Dms) is conserved after lignification for selective grazing

Therefore, better conservation of such crop byproducts via ensiling is expected to lead to more efficient use of the available nutrients and improved animal performance, while reducing free grazing and land degradation.

The objective of this study was: to evaluate the physicochemical and microbial quality of maize stover and BPS mixed silages conserved in microsilos.

Fig. 1. Traditional feed conservation

Fig. 2. Cattle feeding on maize stover

Materials and methods

As indicated in Fig. 3, the crop byproducts were chopped (in 2-4 cm) separately and mixed into six treatments (w/w). Table 1 below shows the different levels of BPS mixed with fresh or dry maize stover and molasses. The mixed treatments were ensiled in triplicates of microsilos (Fig. 4) for 0, 7, 14, 30, 60 and 90 days of sampling. Subsequently, the microbiological quality was determined by performing plate counts and the pH was analysed by homogenizing 10 gm of sample in 90 ml of peptone physiological salt solution.

Table 1. Treatment layout

Treatments	BPS (%)	Fms (%)	Dms (%)	Molasses (%)
1	80	-	20	-
2	70	-	30	-
3	40	60	-	-
4	20	80	-	-
5	95	-	-	5
6	-	100	-	-

BPS = Banana pseudostem, Fms = Fresh maize stover, Dms = Dry maize stover

Fig. 3. Mixing of BPS with maize stover

Fig. 4. Microsilos

Results

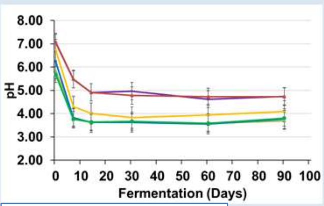

Fig. 4. pH Value

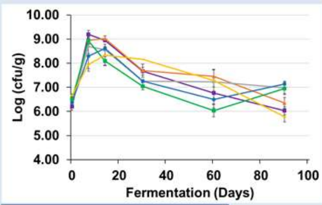

Fig. 6. Lactic acid bacteria

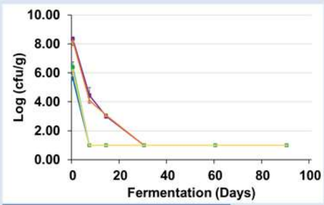

Fig. 7. Enterobacteriaceae

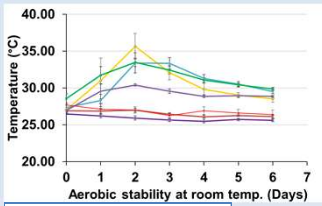

Fig. 5. Aerobic stability on day 90

20% Dms — 30% Dms — 60% Fms — 80% Fms — 95% BPS — 100% Fms — Room temp.

Discussion and Conclusion

There was a significant ($p = 0.001$) reduction in pH for all treatments. However, for 20% Dms and 30% Dms, the pH failed to drop below 4.5 throughout the entire fermentation. The lactic acid bacteria reached a maximum level while the Enterobacteriaceae counts decreased below the detection limit (2 log g/cfu) in the first 14 days. Although in all treatments the *Clostridium* spore counts (data not shown) were above the maximum level of 2 log g/cfu (McEniry et al., 2006), this was not accompanied by a higher pH, except in 20% Dms and 30% Dms.

The aerobic stability was higher in 20% Dms and 30% Dms, while the well fermented (pH < 4.5) byproducts (60% Fms, 80% Fms, 95% BPS and 100% Fms) showed a lower aerobic stability after 90 days of fermentation. The study suggests that mixed silages may improve the fermentation quality, but not always the aerobic stability of the byproducts.

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