Evaluating the Nutritional Value of Sweetpotato Vines for Animal Feed

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Abstract

Sweetpotato, *Ipomoea batatas* L. (Lam.), is a highly nutritive crop grown in many developing countries. Sweetpotato is advantageous because of its rusticity, low maintenance and high adaptability to extreme conditions such as droughts and flooding. Sweetpotato roots can be used for human food and vines for livestock feed. Indeed, the fresh vine yield often exceeds the root yield on a per hectare basis. However, the valuable potential of the vines as animal feed is often overlooked. The objective of this research was to evaluate the nutritional value of ensiled sweetpotato vines. Ensiling preserves vine quality by storing the vines under anaerobic conditions and stimulating acid fermentation. Fresh and ensiled vine characteristics, including dry matter, fermentative capacity, crude protein (CP), neutral/acid detergent fiber (NDF/ADF) and lignin, were assessed for different sweetpotato cultivars. The effect of the wilting period on the fermentation process was also evaluated. When compared to the same cultivars of fresh vines, the ensiling process preserved the average CP and NDF concentrations. Ensiled sweetpotato vines can be a highly nutritious, low-cost alternative to grain-based feeds to support livestock in less productive periods of the year when pastures are not available.

Introduction

Sweetpotato vines represent nearly two-thirds of the overall crop on a fresh matter basis and they are often wasted during the harvest. The potential for sweetpotato vines to be ensiled and used for animal feed is promising. Silage is produced in anaerobic conditions through a fermentative process in which bacteria produce lactic acid by utilizing substrates such as soluble sugars and organic acids. The ensiling process involves cutting the forage, compacting the material and storing it in a silo, and maintaining anaerobic conditions to promote fermentation. If this process is conducted properly, the nutritive value of the silage will be similar to the green forage.

Objectives

- Determine nutritional value of ensiled sweetpotato vines as compared to fresh vines
- Evaluate suitability of using sweetpotato vines from an industrial variety of sweetpotato (CX-1) for silage production

Figure 1. Shredded CX-1 Sweetpotato Vines (Immediately Following Harvest)

Figure 2. Ensiled CX-1 Sweetpotato Vines (After Three Months)

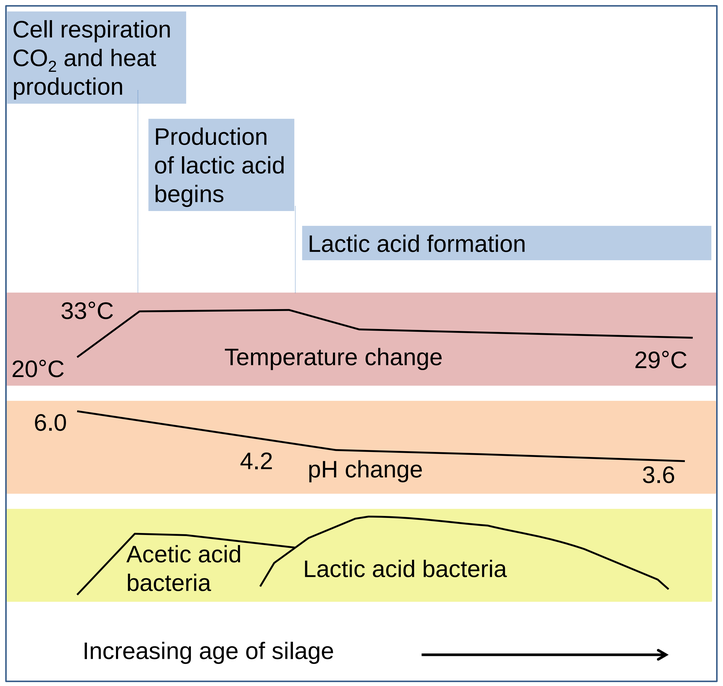

Figure 3. Biochemistry of the Ensiling Process

Results

Table 1. Nutritional Value of Sweetpotato Vines as Silage Compared to Fresh Material (Dornas, 2012)

Genotypes	DM	CP	NDF
	(%)	(%DM)	(%DM)
Silage			
BD-08	26.8	12.7	45.0
BD-23	25.4	12.8	44.8
BD-25	27.4	12.1	43.3
BD-31TO	20.4	12.9	42.4
BD-43	24.0	12.8	44.1
AVERAGE	24.8	12.6	43.9
Fresh Vines			
BD-08	19.6	11.9	33.4
BD-23	19.4	11.6	36.3
BD-25	20.5	11.0	35.3
BD-31TO	16.4	11.3	37.7
BD-43	18.6	12.4	33.8
AVERAGE	18.9	11.6	35.3

- Notes: DM – Dry Matter, CP – Crude Protein, and NDF – Neutral Detergent Fiber

Discussion

Dry matter (DM) is an important parameter that contributes toward the fermentative capacity of the vines. Fresh vines should undergo a wilting (or natural drying) process to elevate the DM content to 25% for optimal silage production (McDonald, 1981). Further dehumidification and leaching occurs during the fermentation process and thus ensiled vines have higher DM than fresh vines. Crude protein (CP) represents the nitrogen content of the feed, which is necessary for bacteria proliferation responsible for the fermentative processes that occur in the rumen. For optimal digestibility, a minimum CP of 7%DM is required (Van Soest, 1994). The average CP of the ensiled vines (12.6%DM) is much higher than that of grass hay (3.8%DM) (Mergesa, 2013). Neutral detergent fiber (NDF) should be between 25 and 60% to supply ample nutrients without discouraging voluntary intake of the feed (Van Soest, 1994). Both CP and NDF are preserved through the ensiling process of sweetpotato vines.

Conclusions

- Both fresh and ensiled sweepotato vines have optimal nutritional value (as measured by CP and NDF) to be used as animal feed.
- The nutritional value is preserved during the ensiling process for all five genotypes evaluated. Similar results are expected from the CX-1 genotype.
- Silage made from sweetpotato vines is a high-protein feed than can be used for livestock during non-productive periods of the year.

Future Work

- The nutritional value of the CX-1 sweetpotato vines (both fresh and ensiled) will be analyzed to determine whether the vines from this genotype are comparable to those sited in the existing literature.
- Advantages/disadvantages of using the ensiled CX-1 vines as animal feed versus as a feedstock for anaerobic digestion will be evaluated.

References

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