Seeking Super Silage

SASHA Sweetpotato Action for Security and Health in Africa

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The optimal combination found for making silage with good levels of protein and digestibility was 50:30:20 of Napier grass, sweetpotato vines, and sweetpotato roots, respectively.

Sampling of silage samples for nutrient analysis (credit A. Kiragu)

What is the problem?

Sweetpotato silage is a product from the preservation of vines and roots in a succulent condition in a silo. Well-made sweetpotato silage is a wholesome and nutritious feed for all classes of cattle, goats and pigs. The silage is prepared through fermenting vines (SPV) and storage roots (of non-commercial value) which are chopped and preserved in the absence of air. The material can be stored with minimal spoilage for a considerable amount of time.

The high protein content and digestibility of SPV/Roots silage makes it an excellent complement to common fodders at the farm level. At farm level, the silage can be prepared using a combination of the grasses (e.g. Napier) and calcium with only vines or only roots or both. The use of a fermentation substrate like molasses improves the process of fermentation and nutrient content. Use of SPV/Root silage significantly increases milk yield by 15-20% as well as meat production. However, use of sweetpotato silage in Sub-Saharan Africa is low due to lack of dissemination of the technology. It's best to use sweetpotato silage during the dry season as it helps to maintain both milk and meat production.

Findings show that the adoption of silage technologies is still low in Kenya (EADD, 2010). This may be due to lack of access to the new technology and economics. Succulent forages like sweetpotato vines are a challenge, as their moisture content could accumulate as effluent during ensiling and rot the silage. During SASHA Phase 1, the animal feeding component developed an improved silage tubing for use with sweetpotato. This tubing has a drainage pipe that mitigates the risk of rotting when using succulent forage like sweetpotato. The aim of this trial was test use of plastic containers with the improved drainage system in making SPV/Roots silage in combination with other fodders. It was anticipated that reduction of the risk of high losses during ensilage would greatly enhance adoption of the silage making technology.

What did we want to achieve?

This trial aimed to determine ways of making high quality silage not only suitable for small quantities of fodder but also that reduces spoilage compared to pure sweetpotato silage. The broad objective of The trial was to test the innovative drainage system, using a combination of vines and roots, Napier grass and sweetpotato and sweet potato vines and maize stover.

The objective of the study was to:

1) determine the appropriate combination of sweet potato vines and roots as silage;
2) determine the appropriate level of Napier grass combination with sweetpotato vines as silage;
3) determine the appropriate level of sweetpotato and maize stover combination (haylage);

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4) determine the scenarios of sweetpotato use (fresh and silage) in combination with local feeds.

The choice of combinations were based on Napier grass being the most popular grass used by farmers and maize stover the dominant crop residue on farms. The design was based on the model response surface located in the tools section of the LIFESIM software model. The analysis used the rotatable central composite design to evaluate and define a suitable mixture of sweetpotato vines and roots together, as well as with other grasses available on a Kenyan farm.

A total of 125 mini-silo buckets, each with 20 kg capacity, prepared with the modified drainage system were used for ensiling the different combinations. 1% of diluted molasses was included in all the silage combinations.

Where did we work?

The trial was conducted in 2013 at Nairobi University, Department of Animal Production where the silos were opened sixty days after ensiling. Upon opening the silos, samples were collected, oven dried and analysed for protein content and digestibility at the International Livestock Research Institute (ILRI) quality laboratory in Addis Ababa, Ethiopia.

What did we achieve?

The trial was successfully concluded and data analyzed. Key findings from the trial are:

A. For Silage made of Sweetpotato Vine: Storage Root Combinations

- The best combination was 75:25 for sweetpotato vines and storage roots, respectively, with an estimated crude protein content of 14.75% with and 82% digestibility.
- Further increments in vine content (>75 %) tended to increase protein content, but addition of roots (>25) tended to decrease the protein and digestibility and overall dry matter content, which is not desirable for silage making.

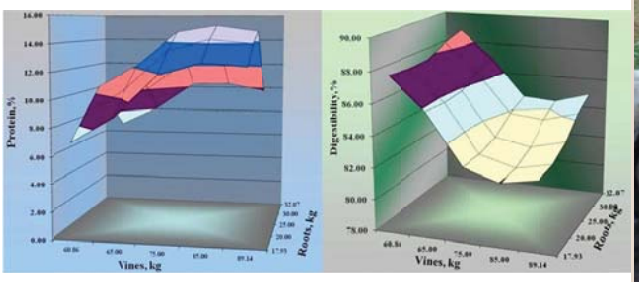

Fig. 1. The response surface curves for protein content and dry matter digestibility for combination of vines and roots.

B. For Silage made of Napier: Vines: Roots (protein content and dry matter digestibility, with roots proportion fixed at 20%)

- The combination of 50:30 for sweetpotato vines and Napier grass resulted in an estimated crude protein content of 9.70% with 80% dry matter digestibility.
- Increments in vines tend to increase crude protein contention, but the addition of Napier grass decreases the protein and digestibility.
- The optimal point found was the combination of 50:30:20 for Napier grass, sweetpotato vines and roots, respectively (Fig. 2)

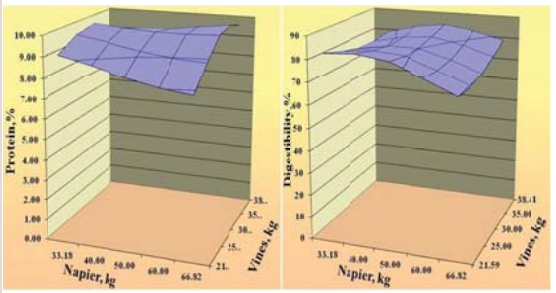

Fig. 2. Response surfaces curves for protein and digestibility for combinations of vines, roots and Napier grass

Smelling silage to test if its ready (credit C. Gachuiri)

Compacted sweetpotato silage that can be stored for period between 4-8 months (credit S. Agili)

Key Partners

- International Potato Center (CIP)-SSA
- University of Nairobi, Department of Animal Production (Kenya)
- University of Nairobi, Kenya
- East African Dairy Development project (EADD):
  - Heifer International
  - International Livestock Research Institute (ILRI)
  - World Agroforestry Centre (ICRAF),
  - Technoserve (TNS)
  - African Breeding Services (ABS)
  - World Agroforestry Centre (ICRAF)
- Farmers Choice Ltd, Kenya
- Egerton University, Njoro, Kenya
- Kenya Agricultural Research Institute (KARI)
- Ministry of Agriculture-Kenya

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