

Research on the Assessment and Quality Control of Maize Silage, Produced and used in the Research-Development Station for Cattle Breeding Dancu, Iași

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Abstract

The objective of this research was to observe the quality of the corn silage obtained within SCDCB Dancu, Iași at 2, 4, 6 and 8 months after silage process. The maize was sown at a distance between rows of 70 cm, its fertilization being carried out according to the soil characteristics, using 150 kg / ha NPK (16-16-16). 110-120 days after sowing, when the plants have shown the optimal stage of harvesting. In conducting this study, in order to determine the quality of corn silage, the NIR Analyzer, type Perten DA 7200 was used. The dry matter had a slight upward trend, the observed values being between 37.22% and 37.34%. The crude protein showed small variations between analyzes, the observed values being between 6.6 and 6.7%. In the present study, the values recorded for NDF ranged between 47.25 and 48.10% and the level of ADF showed values between 19.05 and 19.30%, the variations from one analysis to another being insignificant. Regarding ash, the minimum value obtained was 5.4% in the first analysis and 5.5% in the last analysis. Based on the results obtained, it can be concluded that the analyzed corn silage has optimal qualities for its use in animal feed.

Keywords: Corn silage, Parameters, Quality.

1. Introduction

Corn silage has been used as an alternative in forage preservation to increase animal productivity and performance and is now increasingly used in Romania [1]. By quality control is meant a whole system of activities performed to prevent, due to the conditions of the production process, a certain product from deviating from the performances expected by the beneficiary.

However, every year an attempt is made to identify the hybrid with the best productive potential and the right nutritional quality for silage, with an optimal ratio between stems and leaves and high digestibility, as there is a high correlation between the nutritional value of a crop and its capacity of his silage.

Quality control means a whole system of activities performed to prevent, due to the conditions of the production process, a certain product from deviating from the performances expected by the beneficiary [2]. Inspection procedures are varied, from visual or dimensional, to measurements with standardized or special test equipment. Preserving corn by silage is an anaerobic fermentation process, which transforms

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soluble carbohydrates in the plant into organic acids through microbial activity [3,1]. The quality of the silo depends on the efficiency of this process and the conditions that determine it, such as the degree of compaction, humidity, temperature, the presence of oxygen, the concentration of soluble carbohydrates and the productive characteristics of the plant silage [4]. Thus, the objective of this study was to evaluate the quality of the corn silage produced within the S.C.D.C.B. Dancu, Iași, at different periods of time since silage.

2. Materials and methods

To carry out this study, the activities took place at the Research-Development Station for Cattle Breeding Dancu, Iasi between August 2019 and Mai 2019. Corn for silage was obtained by on good quality soil, from an unirected area. In this study we determined the chemical composition of the corn silo, at 2, 4, 6 and 8 months after silage process. In order to determine the quality of the corn silo, we used the NIR Analyzer, Perten type DA 7200, from the Cattle Nutrition Laboratory of SCDCB Dancu, Iași. It allows fast and high accuracy analysis of corn silage. First a lamp illuminates the sample to be analyzed with white light, so that part of the light is absorbed and another part is reflected. Then the reflected light strikes a stationary network which separates it

according to the wavelength. Thus, each wavelength is measured using a detector. These detectors are very sensitive, with a frequency of 100 measurements per second.



Figure 1. NIR Analyzer (Perten DA 7200)

It allows fast and high accuracy analysis of corn silage. The analysis is performed in a time of 6 seconds, it is not necessary to prepare the sample and the results are displayed independently.

3. Results and discussion

Maize (*Zea mays*), a common fodder crop worldwide, is commonly used as a silage due to its productive characteristics.

Table 1. Values obtained for the chemical composition of maize silage

Forage	DM%	M%	CP%	NDF%	ADF%	Ash%
Corn silage analyzed 2 months after silage process	37.22	62.78	6.65	47.90	19.30	5.40
Corn silage analyzed 4 months after silage process	37.30	62.70	6.70	48.10	19.20	5.45
Corn silage analyzed 6 months after silage process	37.35	62.65	6.60	47.50	19.05	5.45
Corn silage analyzed 8 months after silage process	37.34	62.66	6.60	47.25	19.10	5.50

¹DM = dry matter

²M = moisture

³CP = crude protein

⁴NDF = neutral detergent fiber

⁵ADF = acid detergent fiber

The silo sample studied showed a content of 37.22% dry mater (DM), 2 months after silage, 37.30% DM at 4 months, 37.35% DM at 6

months, and 37.34% DM at 8 months after silage, respectively. The recorded values fall within the

range indicated by Pinto et al. (2010) as ideal to ensure adequate fermentation of corn silage.

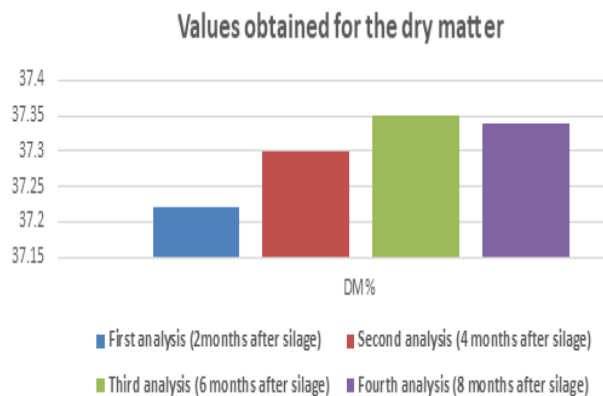


Figure 2. Values obtained (DM %)

A lower or higher DM content can lead to poor silage quality [6]. The low DM content due to early harvest causes silage with a low DM level, which can be voluminous, thus reducing the ingestibility and performance of the animals [7].

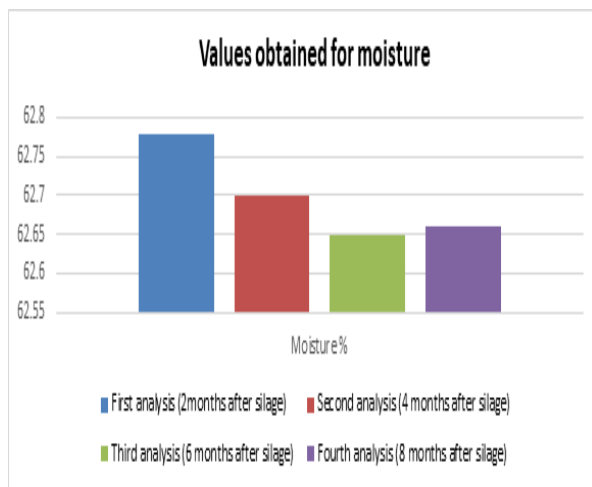


Figure 3. Values obtained (Moisture %)

The proportion of water is inversely proportional to the percentage of dry matter. Depending on its level, fermentative changes may occur.

The crude protein (CP) content of maize silage decreased significantly over time, leading to nutrient losses, including noncellulose saccharides [8, 9]. Aerobic bacteria, present in the contents of plants, consume nutrients such as plant proteins and sugars; these processes are important factors that contribute to the reduction of intestinal absorption [10, 11].

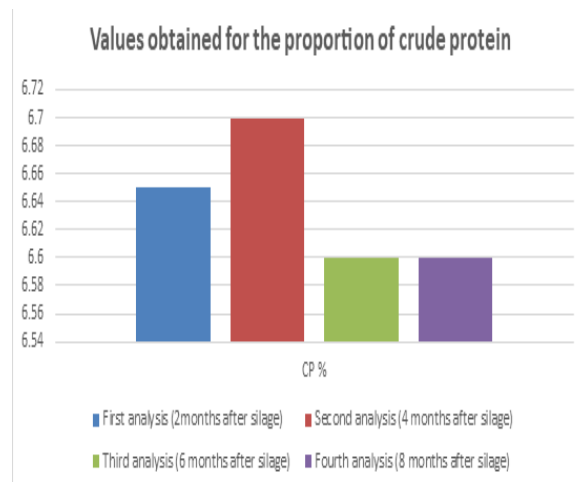


Figure 4. Values obtained (CP %)

Regarding the crude protein, it showed small variations between analyzes, the observed values being between 6.6 and 6.7%. Previous studies have reported that in the case of fresh corn silage containing a relatively large number of CPs, that the resulting silage fermented correctly, with minimal nutrient loss and improved in vitro digestibility [12, 13].

A meta-analysis by Kilic (2010) of data from 92 studies concluded that changes in NDF levels in rations and digestibility were the most important factors that determined the digestibility of the organic matter in dairy cows.

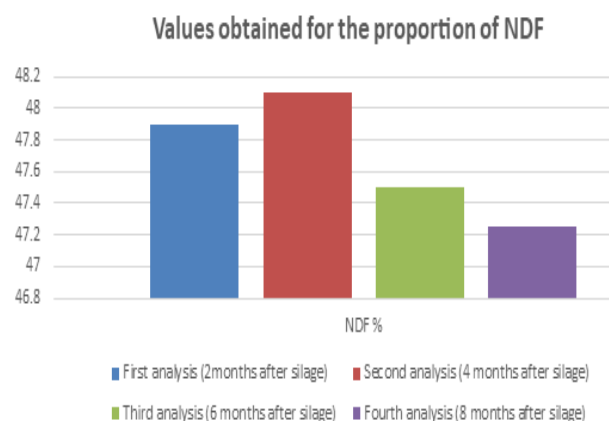


Figure 5. Values obtained (NDF %)

In this research, NDF values ranged from 47.25 to 48.1%.

In the present research, the level of ADF presented values between 19.05 and 19.30%, the variations from one analysis to another being reduced.

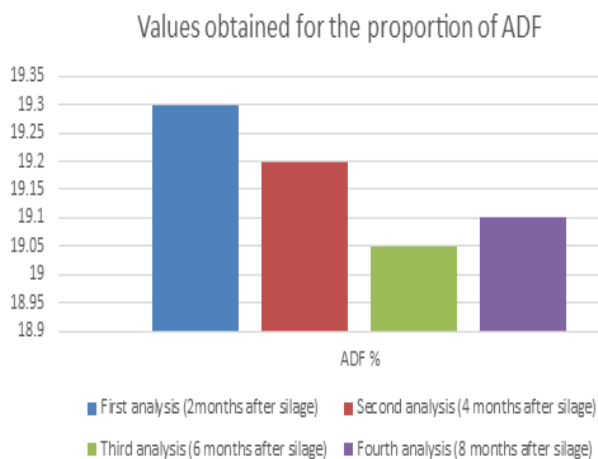


Figure 6. Values obtained (ADF %)

ADF refers to the cell wall portion of feed, consisting of lignin and cellulose. Value is important because it relates to an animal's ability to digest feed; a higher ADF suggests a decrease in digestibility [15].

Ash is simply the total mineral content of a feed ration. Crude ash shows slight variations from one analysis to another, with a slight increase in values over time.

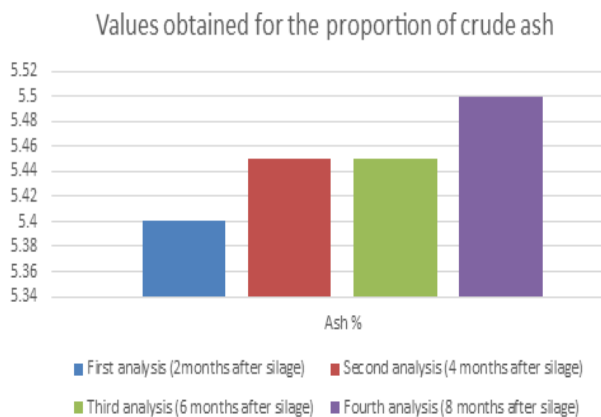


Figure 6. Values obtained (Ash %)

The minimum value obtained was 5.4% in the case of the first analysis and 5.5% in the last analysis, 8 months after the silage of the corn silo. The ash content considered normal in maize silage is about 5.0% of the DM, but there have been cases where the content can reach up to 10.0% ash [11].

Conclusions

Corn silage is the most important source of food for dairy cows currently exploited in our country.

As for the dry matter, it had a slight upward trend, with the observed values being between 37.22% and 37.34%.

In the case of crude protein, it showed small variations between analyzes, the observed values being between 6.6 and 6.7%.

In the present study, the values recorded for NDF ranged between 47.25 and 48.10% of the dry matter. The level of the ADF showed values between 19.05 and 19.30%, the variations from one analysis to another being insignificant.

Regarding raw ash, the minimum value obtained was 5.4% in the first analysis and 5.5% in the last analysis.

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