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Evaluating Effect of Material of Construction of Silo on Silaging

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Abstract

In this study Biomass Silaging was examined under the effect of construction material of silo. The hypothesis of the study was material of construction of silo affects the quality of silage. There are two factors each with two levels were used. Total of Four treatments were used in this study. The first factor in the study was biomass combination ratio with two levels; 10% Maize + 90% Mott grass (Y) and 90% Maize + 10% Mott grass (Z). The second factor was material of construction of silo has two levels; sealed galvanized Aluminum (A) and sealed high-density Plastic (P). In the way, the four treatments in the study were; YA, YP, ZA, ZP. The experimental design showed that material of construction of silo and Biomass combination ratio had significant effect on the Silage. The highest *In vitro* digestible nutrients (28 % Dry Matter, 16% Protein, 33% Fibers and 10% Ash) were found in the treatment having combination of 90% Maize and 10% Mott grass with the plastic silo (ZP). The treatments containing 10% Maize and 90% Mott grass showed lowest *In vitro* digestible nutrients.

Keywords: Aluminum; Material of construction; Mott grass; Plastic; Silo.

Abbreviations

Y	:	10% Maize + 90% Mott grass
Z	:	90% Maize + 10% Mott grass
A	:	galvanized Aluminum
P	:	Plastic
pH	:	Power of Hydrogen
YA	:	10% Maize + 90% Mott grass in galvanized Aluminum silo
YP	:	10% Maize + 90% Mott grass in Plastic silo
ZA	:	90% Maize + 10% Mott grass in galvanized Aluminum silo
ZP	:	90% Maize + 10% Mott grass in Plastic silo
m	:	Meter
J/m^2	:	Joule per square meter

Introduction

Better management and long-standing strategy are the backbone of Dairy farm feeding transition. Every ruminant requires better feed for production of milk, flesh and be healthy [1,2]. Approximately all the dairy researchers try their best to achieve better feed for the dairy cattle [3] discussed affect of mycotoxin on the Dry Matter and *In vitro* digestibility in the combination of berseem and straw of wheat. Through many years, a lot of experiments were conducted to obtain best quality silage with high *In vitro* digestible nutrients with advantage of low cost and short-term planning. An experiment should be conducted in order to select a better silo and combination of fodders.

Maize is reflected as the unsurpassed forage as well as for silage due to high protein content. When the moisture content of maize reaches to suitable level, it should be harvested [4]. Mott grass has enough nutrients and Dry Matter which make it suitable for silage [5]. In Mott grass, there was low fermentable content of carbohydrates with high final value of pH. Mott grass can be mixed with any fodder having sufficient amount of carbohydrates, for making silage [6]. Adding maize with Mott grass enhances silage by aerobic fermentation of sugar molecules producing high amount of lactic acid which decline its pH [7]. During silaging anaerobic and aerobic bacteria are responsible for the fermentation. Buffering capacity of silage depends on Dry Matter contents in the plant, number of microorganisms and amount of glucose which led to better quality of silage [8,9] stated that better silage can be obtained by using fodder having high Dry Matter than the lowest one. Mott grass is better for silage preparation because its Dry Matter content is high and it can be mixed with any crop having high moisture content for silaging. George (1994) stated that silage can be prepared in the silo or in the form of pile or by using plastic covering but every type of silo has its own advantages and disadvantages. Therefore, the purpose of this study was to investigate the effect of material of construction of silo and combination ratio of biomass on silaging.

Materials and Methods

Study Spot

The study was carried out in the Department of Agricultural Mechanization, the University of Agriculture Peshawar Pakistan. The study period was 60 days and each replication were repeated after each 20 days.

Development of Silo and Analyzing Silage

Two types of containers were used in the development of silo, one made of galvanized Aluminum and the second was made of Plastic. The silo volume was 0.05 m^3 and completely sealed. In this silo anaerobic and aerobic digestion took place. The biomass was loaded in the silo through its upper lid. The silage was tested with association of Faculties of Animal Health and Animal Nutrition Sciences, The University of Agriculture Peshawar, Pakistan. The insulation was made of polythene having insulation value of 0.3 J/m^2 with a thickness of 0.0127m.

Experimental Design and Experimental Layout

Completely Randomized Design (CRD) was used to find the result of Biomass combination ratio and material of construction of Silo on Silage. Biomass combination ratio was the first factor having two levels; 10% Maize + 90% Mott grass (Y) and 90% Maize + 10% Mott grass (Z). The second factor was material of construction of Silo with two levels; galvanized Aluminum (A) and Plastic (P). The treatments with their layout were;

Levels of Biomass combination:

- Y= 10% Maize + 90% Mott grass.
- Z= 90% Maize + 10% Mott grass.

Levels of construction of material of Silo:

- A= galvanized Aluminum.
- P= Plastic.

Total of four treatments were;

- YA
- YP
- ZA
- ZP

1.1. *In vitro* Digestibility

The *In vitro* digestibility of Silage was tested through the methods discussed by [10] with the association of Department of Animal Nutrition, Faculty of Animal Science the University of Agriculture Peshawar Pakistan.

Statistical Analysis

Completely Randomized Design was used to analyze the treatments having highest digestibility in four treatments and three replications. The treatment means were calculated and compared by means of Least Significant Difference test at 5% level of probability [11].

Results and Discussion

The Maize and Mott grass in this study was chopped in fresh condition. The study showed that *In vitro* digestibility was significantly affected by the material of construction of silo and biomass combination ratio. Maize is considered as the preeminent forage as

well as for silage due to high protein content. Harvesting of maize started when its moisture content is at suitable level [4]. In Mott grass, there was low fermentable content of carbohydrates with high final value of pH. Mott grass can be mixed with any fodder having sufficient amount of carbohydrates, for making silage [6]. Adding maize with Mott grass enhances silage by aerobic fermentation of sugar molecules producing high amount of lactic acid which decline its pH [7]. In this study different proportion of Mott grass and Maize were used in different type of silo, according to mode of construction, for making silage.

Protein and Silage Digestibility content were influenced by changing material of construction of Silo. Highest Protein losses were arising in the treatments having Maize and Mott grass in galvanized Aluminum silo. [8]. discussed that increasing temperature cause increase in number of thermophilic bacteria. These bacteria reduce the silage pH which result loss of nutrients. Protein may be changed into Ammonia Nitrate if microbes and its enzymes exist extensively.

Different researchers [12-14] described that the declining of silage fibers occurred due to proteolysis and fibrolysis. These enzymes need pH of 5-6 but below 5 they can't perform any activity [15]. Acidic silage has more Dry Matter, Protein and Fiber contents than alkaline silage. [9] stated that acid hydrolyzing of fibers content and lignin contents occur if long life fermentation develops [14-16] stated that the silo of maize fodder in Wisconsin was organized on August 18th and the data logger was taken back on December 23rd. The silage temperature arises to 36°C but slowly decreased after few days. The silage temperature recorded for the period of three months was 32°C. Silaging depends on the environmental condition, type of silo and fodder. The results of silaging were also accord with the research of [1,2].

Conclusion

The study of effect of material of construction of silo and type of biomass combination on silaging showed significant difference among the treatments. The result found from the study showed that combination of 90% Maize and 10% Mott grass with plastic silo give highest yield of *In vitro* digestible contents (28 % Dry Matter, 16% Protein, 33% Fibers and 10% Ash). The lowest *In vitro* digestible contents were found in the treatments having 10% Maize and 90% Mott grass (Figure 1-4).

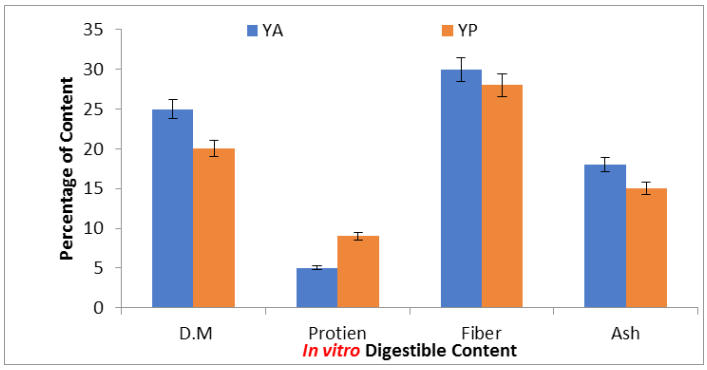

Figure 1: *In vitro* digestible contents from the treatments of "10% Maize + 90% Mott grass".

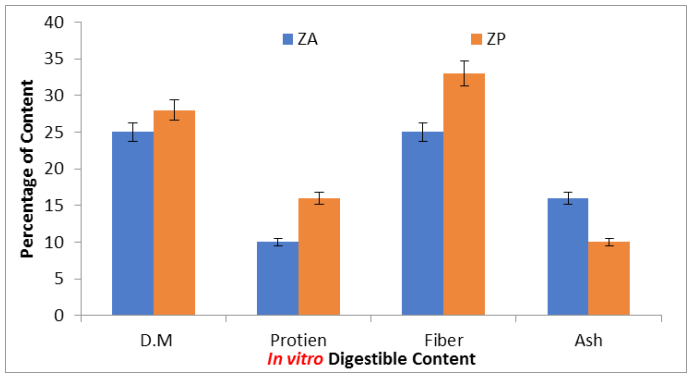

Figure 2: *In vitro* digestible contents from the treatments of "90% Maize + 10% Mott grass".

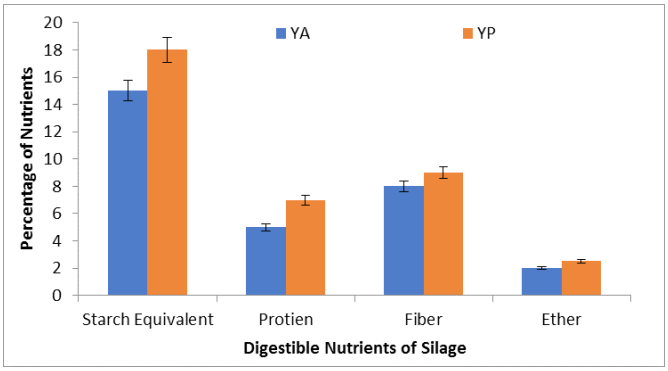

Figure 3: Digestible Nutrients of silage from the treatments of "10% Maize + 90% Mott grass".

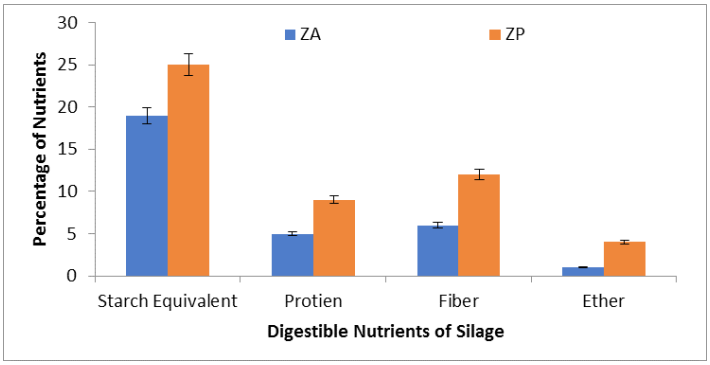

Figure 4: Digestible Nutrients of silage from the treatments of "90% Maize + 10% Mott grass".

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