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Nutritional evaluation of savoy grass *(Panicum máximum)* varieties, mombaza, tanzania and zuri, 35 days after harvest

Evaluación nutricional del pasto saboya (*Panicum máximum*) variedades, mombaza, tanzania y zuri, a los 35 días de cosecha

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Abstract: This study was framed within the research line of the Faculty of Agricultural Sciences entitled: production, management and sustainable development of agricultural, livestock and forestry products with an ecosystem approach. In addition, it was aligned with the sub-line of the Animal Husbandry career: local, regional and national integrated livestock development and management. The genera Panicum máximum varieties such as Mombaza, Tanzania and Zuri have been introduced in different regions of the country with success and failure because they have been established in regions with totally different climate, soil and topography characteristics, which generates low productivities. The objective of this work was to study the bromatological performance of three cultivars of Panicum maxima varieties (Mombaza, Tanzania and Zuri). A completely randomized repeated block design with subplots was used, with three treatments and three replications. The cut was made 35 days after harvest to determine crude protein, crude fiber and dry matter. The following results were obtained. The proximal bromatological analysis showed that the highest percentage of protein was obtained by zuri grass (13.44) CP. In the fiber ratio, the one that stood out best was Mombaza grass, which reached (35.20) FC. And the one that obtained the best dry matter percentage was the Zuri variety with (19.95) DM. In the protein-carbohydrate ratio, the Zuri grass achieved the highest yield of CP with 13.44%, while the Mombaza grass in crude fiber with 31.02%.

Key words: grasses, forages, protein, bromatological composition, Panicum maximum, mombaza, tanzania, zuri.

Resumen: Este estudio se enmarcó dentro de la línea de investigación de la facultad de Ciencias Agropecuarias titulada: producción, manejo y desarrollo sustentable de los productos agrícolas, pecuarios y forestales con enfoque de ecosistema. Además, se alineó con la sub línea de la carrera de Zootecnia: desarrollo y manejo pecuario integral local, regional y nacional. Los géneros Panicum máximum variedades como Mombaza, Tanzania y Zuri se han introducido en diferentes regiones del país con éxito y fracaso debido a que se han establecido en regiones con características de clima, suelo y topografía totalmente distintas, lo cual genera bajas productividades. El objetivo de este trabajo fue estudiar el comportamiento bromatológico de tres cultivares de Panicum máximum variedades (Mombaza, Tanzania y Zuri). Se realizó un diseño en bloque repetidos completamente azar con subparcelas, con tres tratamientos y tres repeticiones, el corte se lo realizo a los 35 días de cosecha, para determinar proteína cruda, fibra cruda y materia seca. Donde fueron obtenidos los siguientes resultados. El análisis bromatológico proximal demostró que el mayor porcentaje de proteína lo obtiene el pasto zuri (13,44) PC. En la relación de fibra la que mejor se destaco fue el pasto Mombaza que alcanza (35,20) FC. Y la que mejor porcentaje de materia seca obtiene es la variedad Zuri con (19,95) MS. Relación proteína – carbohidrato, el pasto Zuri alcanzo el mayor rendimiento de PC con el 13,44%, mientras que el pasto Mombaza en fibra cruda con 31,02%.

Palabras claves: Gramíneas, forrajes, proteína, composición bromatológica, Panicum maximum, mombaza, tanzania, zuri.

Introduction

Pastures and forage in Ecuador are an important sector in its economy, since they occupy most of the country's usable land area between natural and cultivated pastures, in addition to the fact that the environmental conditions are favorable for producing pasture all year round, with no harsh winters as in Europe, nor the extreme droughts of Africa where the climate forces the confinement of livestock. (León, Bonifaz, & Francisco, 2018)..

Arellano (2022) indicated that, in order to increase the productive efficiency of pastures, it is necessary to face several challenges such as: adapting forage species to different environmental conditions,

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improving grazing production systems, improving knowledge about the productive potential of pastures, about limiting conditions, and highlighting the importance of irrigation systems in the management of grazing systems. (Anchundia Torres, 2021).

Livestock productivity depends on four fundamental factors such as the adequate management, which is the type of pasture and animal load; then the physical and nutritional characteristics of the soil (texture, structure, real density, depth, pH, percentage of organic matter and nutrients); the climate (precipitation, relative humidity and temperature) and finally the feed, which is nothing more than the type of feed in sufficient quantities and of good quality (Arellano, 2022). (Arellano, 2022).

Panicum has demonstrated that it is able to adapt to extreme conditions, it represents a very hardy grass that supports extensive grazing; however, it does not maintain a balance of production throughout the year.

With the introduction of varieties such as Mombaza, Tanzania and Zuri, breeding expectations are generated; however, it is necessary to study this genus and from the results obtained, incorporate appropriate technologies for its optimization. (Macias, Vargas, Solorzano, Mendoza, & Intriago, 2019)..

The low productivity of soils in the Ecuadorian tropics limits forage production, which makes it difficult to meet the nutritional needs of grazing and cutting animals. The constant search for promising forage species that contribute to meeting the nutritional needs of livestock during the dry season should be a priority, taking into account the agro-ecological conditions of the country. Other limiting factors of low forage productivity are: low fertility, soil acidity, poor drainage, lack of planning for pasture improvement. This affects the adaptability and persistence of the species. Another problem that affects the development of livestock in the country is the lack of knowledge on the part of the farmer of ecotypes and forage species that improve productivity and yield. (Arellano, 2022).

The fundamental basis of all agricultural production is the feeding of our animals and even more important is to provide very good quality food taking into account that the feed is palatable and nutritious in order to obtain the greatest benefits from it; Mombaza, Tanzania and Zuri grass currently show very good characteristics for cattle feeding, highlighting its good adaptability to various conditions of the tropics

and great capacity of animal load, they are able to achieve a high production of dry matter, Mombaza (53 t / y) Tanzania (19 to 20 t / y) Zuri (21 t / y).

The purpose of the research is justified by providing information on the nutritional characteristics of Mombaza, Tanzania and Zuri grasses.

Materials and methods

The research was conducted at the Faculty of Agricultural Sciences, School of Animal Husbandry, Technical University "Luis Vargas Torres" of Esmeraldas, Mutile Campus, located at km 18, San Mateo parish, Esmeraldas canton, Ecuador, with an average annual temperature of 28 ºC and an altitude of 26 m.a.s.l. latitude: 0.974063 / longitude: -79.653489.

Characteristics of the experimental units.

Table 1. *Test dimensions*

TOTAL TEST AREA	376 m^2
TOTAL AREA PER PLOT	120 m^2 (15*8 m)
DISTANCE BETWEEN SUBPLOTS	1 m
EXPERIMENTAL UNIT AREA	40 m^2 (8*5 m)

Source: author

A completely randomized design with three treatments and three replications was applied, where the treatments were the varieties and the replications were the subdivisions of the plots.

Variables

Independent variables

- Grass varieties: Mombaza, Tanzania and Zuri.

Dependent variables

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- Chemical composition: percentage of protein, fiber, dry matter, protein-carbohydrate ratio.

Trial management

The experimental area was inspected, where the experimental units were established, then a weed control was carried out. The pasture plots were established on the indicated dates, complying with the 1 m spacing. The pastures were cut after 35 days, taking samples of green matter, which were sent to the laboratory for bromatological analysis.

3. Result

Of the percentage of crude protein:

The nutritive value of the grasses and forages is based on their protein content. At 35 days after harvest, the grass that obtained the highest protein yield, with an average of 13.44% in Zuri grass, followed by Mombaza grass with 9.98% in crude protein and finally Tanzania grass with an average of 9.02% protein.

Table 2. *Proximal bromatological evaluation in the three varieties of Panicum, cut 35 days.*

Protein	**percentage**		
Base	bromatological composition		
	Mombaza	Tanzania	Zuri
Dry	%	%	%
	9,98	9,02	13,44

Source: Agrolab

The results of Anchundia J. (2021), showed that Zuri grass, reached an average of 11.2% crude protein without fertilizer, a value LOWER than that of the present research, which obtained 13.44%, values that are within those obtained by Embrapa (2014) with a crude protein content of 11 to 15%, respectively.

Fierro J. (2018) showed that Mombaza grass is a forage species of high nutritional value and high digestibility, where it reached a protein

content at 9.1% at 35 days, value LOWER than that of this research that obtained an average of 9, 98%, this is due to the difference of nutrients available in the soil, which in different climatic conditions may vary. Likewise, Ortega A, et al, (2015) showed that the Tanzania grass, reached 10.68%, of protein value SIMILAR to the present research with 9.02% PC.

In an investigation conducted at 30 days after the cut-off date by (Andadre, Vivas, Parraga, & Mendoza, 2020)the protein content was 16.79% in the Tanzania grass, HIGHER than in this research with 9.02% at 35 days.

At 70 days, Carrillo A, (2015) A,) through his research indicated that Monbaza grass reported an average of 4.3% protein content, a value LOWER than the present research where 9.98% was obtained at 35 days of harvest.

Crude fiber

With respect to the crude fiber content of the Panicum grasses, at 35 days of regrowth, the one with the highest content was Mombaza grass with 35.20% of crude fiber, followed by Tanzania with 34.00% and the last one was Zuri with 33.70% of crude fiber.

Table 3. *Percentage of fiber*

Of the percentage of crude fiber			
Base	bromatological composition		
	Mombaza	Tanzania	Zuri
Dry	%	%	%
	35,2	34	33,7

Source: Agrolab

Pilco (2017) In his research on the agronomic behavior and nutritional value of Panicum varieties indicates that the highest level of fiber is obtained by Mombaza grass with 41.80% at 25 days HIGHER than this

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research with 35.20% at 35days, likewise he mentions that Panicum Tanzania reaches values of 32.50% crude fiber, values LOWER reported by this research with 35.20%.

On the other hand, Mosquera B. A., (2022) presents a table showing the results of the bromatological analysis component of Panicum BRS Zuri where the amount of crude fiber obtained is 38.62% at 45 days of harvest HIGHER than that of the present research which reaches 33.50% at 35 days of harvest.

In a research conducted at 45 days by Conrado C., (2015) using organic fertilizers, the level of crude fiber reached by Mombaza grass is 25.70% LOWER than that of this research, which obtained an average of 35.20% at 35 days, significant results.

Erazo (2014) indicates that based on his research conducted on the bromatological composition of Panicum maximum Tanzania using slaughterhouse residues the level of fiber that reached at 45 days of cutting was 30.71%, being LOWER than that obtained in this research without using any type of fertilizer with 34.00% at 35 days of harvest.

Dry matter

Table 4 . *Percentage of dry matter*

Of the percentage of DM			
Base	bromatological composition		
	Mombaza	Tanzania	Zuri
Dry	%	%	%
	17,41	15,7	19,95

Source: Agrolab

Cedeño A. et al. (2021) indicated through their research that for the dry matter yield of the Tanzania cultivar variety at 30 days, they obtained 22.93% and for Mombaza 24.00%, results SIMILAR to those reported in this research, which indicate values of 15.2% for the Tanzania variety and 17.7% for Mombaza at 35 days of harvest.

Heredia J., et al. (2022), showed that Mombaza grass reported an average dry matter of 17.6% at 30 days of harvest, results SIMILAR to those of this research, which reached values of 17.7% at 35 days of cutting.

In an investigation by Chávez G, et al. (2021) showed that Zuri grass reached a dry matter content of 33.22% using 4 seeding densities, a result SUPERIOR to that of this investigation with 19.95% at 35 days of cutting.

Protein - Carbohydrate ratio

With respect to the crude protein content of Panicum maxima; without fertilizer, at 35 days after harvest, the highest content was Zuri grass with 13.44% CP, while Panicum Mombaza obtained the best crude fiber content of 35.2%.

Table 5 *protein-carbohydrate ratio*

Base	**protein-carbohydrate ratio**					
	Mombaza		Tanzania		Zuri	
Dry	PC % PC	FC	PC % PC	FC	PC % PC	FC
	9,98	32,2	9,02	34	13,44	33,7

Source: Agrolab

In a research conducted by Santillan J., (2017) reports that the crude protein content of Mombaza grass is 7.16% LOWER than those reported by this research that reaches values of 9.98% at 35 days of harvest, while crude fiber obtained results of 43.54% HIGHER than those presented this research with percentages of 35.2%. Likewise, it mentions that the crude protein of the Tanzania grass obtained 5.58%, which is LESS than the result obtained in this research with 9.02%, while the crude fiber mentioned that it contains 32.09% SIMILAR to those of this research with 34.00% at 35 days of cutting.

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Pilco L. (2017) evidenced that Mombaza grass at 50 days reached a crude protein content whose value was 16.62% HIGHER than those of this research, on the other hand, the value of crude fiber that reached was 42.22% value HIGHER than that of this research that reached 35.2% at 35 days of cutting.

On the other hand, Mosquera B.(2022) showed that Zuri grass had a CP content of 11.02% LOWER than that of the present study with 13.44%; on the other hand, crude fiber reached 38.62%, a value HIGHER than that of this study with 33.07%.

Cornejo S. et al. (2019) mention that, the results obtained in their research where through a bromatological analysis of the Tanzania grass at the age of 30 days evidenced the percentage in crude protein of 12.84% SIMILAR to this research with 9.02% at 35 days, likewise the crude fiber reached an average 31.32% result SIMILAR to this research with 34.00%.

4. Conclusions

According to the results obtained in the bromatological analyses, the following conclusions were reached.

The proximal bromatological analysis concluded that the highest percentage of crude protein was obtained by the Zuri grass with 13.44%, and the highest presence of dry matter was also obtained by the Zuri grass with 19.95%.

The crude fiber content of Mombaza grass was higher than that of the other Panicum varieties.

Under the conditions in which this work was carried out and based on the results obtained, it can be concluded that the high variability in crude protein and crude fiber content among the varieties of Panicum máximum studied, indicates a variety of responses in the results of bromatological analysis. In which the Panicum máximum genotype that stood out for its higher crude protein content was the Zuri grass with 13.44%, and the Mombaza grass also stood out for its high crude fiber content, which was 35.2%.

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