

Digestibility Studies on Venezuela Grass (*Paspalum fasciculatum*) and Plantain Pseudostalks (*Musa paradisiaca*)

J. A. Arroyo and L. Rivera Brenes¹

INTRODUCTION

The data reported in this paper are the results of digestion trials performed on Venezuela grass (*Paspalum fasciculatum*) and plantain pseudostalks (*Musa paradisiaca*). Digestion trials and palatability tests were conducted concurrently with these two forages. Palatability results were reported separately (4).²

Venezuela grass was introduced into Puerto Rico from Venezuela some years ago. It is known there as "chiguirera" grass (3). Observations made at this Station indicated that it was not well accepted by cattle (5). This was later confirmed when it was compared to Merker grass (a strain of Napier grass) in several palatability trials (4).

Plantain pseudostalks are sometimes used as forage for cattle here in Puerto Rico and in Central and South America. They are very palatable to cattle (4). However, the stalks are very high in moisture content and are recommended only as emergency feed during prolonged dry periods when other roughages are very scarce.

In Puerto Rico thousands of tons of plantain and banana pseudostalks are thrown away during the harvest of these fruits. Since plantain stalks seem to be so palatable to dairy cows it was considered advisable to determine their feeding value.

This study reports the work performed to evaluate the feeding value of plantain pseudostalks and Venezuela grass. The digestible protein and digestible energy were the criteria used, as recommended by Swift (6).

PROCEDURE

The experiment consisted of one trial of each of the two roughages with a 7-day prefeeding period and a 5-day collection period. Two groups of four cows each were used. In each group a given forage constituted the sole feed.

The Venezuela grass was fertilized with 400 pounds of ammonium sulfate per acre and was cut between 40 and 60 days of age. The grass was cut daily at the field and chopped in a silage chopper prior to feeding.

¹ Research Assistant in Chemistry, and Head, respectively, Animal Husbandry Department, Agricultural Experiment Station, University of Puerto Rico, Río Piedras, P. R.

² Italic numbers in parentheses refer to Literature Cited p. 106.

The plantain pseudostalks fed were cut at the Corozal Substation farm when around 1 year old. They were brought in quantities sufficient to supply the requirement of this feed for 3 days. They were chopped into small pieces about 1 inch long with a machete.

The animals were fed three or four times during the day. The roughage given and refused was carefully weighed daily for each cow. All feces were carefully collected in a pail and weighed for each 24-hour period for 5 consecutive days. Cows were weighed every morning around 7:00 a. m. during the 5-day collection period.

During the collection period a 25-gm. sample of fecal material was collected twice daily, in the morning and in the afternoon. The samples were accumulated in the same jar to a total of 250 gm. throughout the collection period. A 500-gm. sample of roughage material was collected once a day for 5 days. Fecal and roughage samples were air-dried at room temperatures for 5 days for dry-matter determinations.

The dried samples were ground in a Wiley mill and placed in glass bottles. Crude protein determinations were made according to A.O.A.C. Official Methods (1). Calorimetric determinations were made according to the Parr oxygen-bomb combustion methods (2). A total of 14 roughage samples and 8 fecal samples was analyzed.

RESULTS AND DISCUSSION

Dry-matter, crude-protein, and gross-energy determinations for Venezuela grass, plantain pseudostalks, and fecal samples from both roughages are given in table 1.

Plantain pseudostalks were very much lower in dry-matter and crude-protein content than Venezuela grass. The two roughages were more or less equal as to gross-energy values.

The fecal samples from the plantain group were lower in dry-matter content. Both fecal samples had higher dry-matter values than the roughage samples.

The fecal samples had higher protein values than the roughage ingested. The higher values obtained for dry matter and crude protein in the feces can be explained in part by the high water content of the roughages fed.

Values for green-roughage and dry-matter consumption, and for fecal and dry-matter elimination are given in table 2. There was a marked difference in green-roughage consumption and a small difference in dry-matter intake which can be attributed to the differences in moisture content and palatability between the two roughages studied. The high moisture content of the plantain pseudostalks and the poor palatability of the Venezuela grass may be the reason for the low dry-matter intake.

Digestible-energy and digestible-protein values for Venezuela grass and

plantain pseudostalks are given in table 3. Two of the cows on Venezuela grass had a negative nitrogen balance and were eliminated in the calculation of the digestion coefficient for protein. These two cows did not eat

TABLE 1.—*Dry matter, crude protein, and gross energy for Venezuela grass and plantain pseudostalks, and fecal samples (dry basis), averages for 4 cows per group*

Forage	Roughages					Feces						
	Samples		Dry matter	Crude protein	Gross energy		Samples		Dry matter	Crude protein	Gross energy	
	Number	Per-cent	Per-cent	Cals./gm.	Therms	Number	Per-cent	Per-cent	Cals./gm.	Therms		
Venezuela grass	7	17.68	6.41	3.62	1.642	4	21.30	8.96	3.62	1.642		
Plantain pseudostalks	7	5.64	4.64	3.44	1.560	4	12.65	12.71	3.94	1.784		

TABLE 2.—*Green roughage and dry matter consumed, and feces and dry matter eliminated per day, averages for 4 cows per group on Venezuela grass or plantain pseudostalks*

Forage	Cows	Average roughage consumption per day	Average dry-matter consumption per day	Average fecal elimination per day	Average dry-matter elimination per day
	Number	Pounds	Pounds	Pounds	Pounds
Venezuela grass	4	23.11	4.10	10.10	2.06
Plantain pseudostalks	4	117.97	6.72	13.38	1.66

TABLE 3.—*Digestible-energy and digestible-protein values for Venezuela grass and plantain pseudostalks, averages for 4 cows per group*

Forage	Cows	Digestible energy	Energy ¹		Digestible protein	Digestible coefficient
	Number	Cals./lb. D.M.	Therms	Percent	Percent	Percent
Venezuela grass	4	3,339.85	3.34	49.76	2.97	46.28
Plantain pseudostalks	4	7,523.18	7.52	71.76	1.53	32.93

¹ The digestible-energy values of plantain pseudostalks are higher than those of Venezuela grass.

enough of this grass. This confirms the fact that Venezuela grass is not palatable enough to the animals.

The protein in Venezuela grass seemed to be more digestible than that in the plantain pseudostalks. The Venezuela grass contained 6.41 percent of crude protein of which 46.28 percent was digestible, while the plantain pseudostalks contained 4.64 percent of protein, of which 32.93 percent was

digestible. Therefore, the percentage of digestible protein in Venezuela grass and plantain pseudostalks was 2.97 and 1.53, respectively.

SUMMARY

A study was undertaken to determine the digestibility of Venezuela grass (*Paspalum fasciculatum*) and plantain pseudostalks (*Musa paradisiaca*). Two groups of four cows were fed separately with the two roughages.

It was found that plantain pseudostalks were lower in dry matter, crude protein, and gross energy than Venezuela grass.

Based on feed consumption and dry-matter intake, plantain pseudostalks were more palatable than Venezuela grass.

The protein digestibility of Venezuela grass was higher than that of plantain pseudostalks. The reverse held for the energy digestibility.

RESUMEN

Se llevó a cabo un estudio para determinar la digestibilidad de la yerba Venezuela (*Paspalum fasciculatum*) y la de los pseudo-tallos del plátano (*Musa paradisiaca*). Dos grupos de 4 vacas cada uno fueron alimentados separadamente con estos dos forrajes.

Se encontró que el contenido de los pseudo-tallos del plátano es bajo en materia seca, proteína cruda y en valores de energía, al compararse con el contenido de la yerba Venezuela.

Los pseudo-tallos del plátano fueron más apetecibles para el ganado que la yerba Venezuela, según fué comprobado por el consumo diario de ambos forrajes y por la cantidad de materia seca ingerida de cada uno.

La digestibilidad de la proteína de la yerba Venezuela fué mayor que la de los pseudo-tallos del plátano. En cuanto a la energía digerible fué todo lo contrario, esto es, mayor para los pseudo-tallos del plátano y menor para la yerba Venezuela.

LITERATURE CITED

1. Association of Official Agricultural Chemists, Methods of Analysis, 8th ed., Washington, D. C., 1955.
2. Oxygen Bomb Calorimetry and Oxygen Bomb Combustion Methods, Parr Instrument Co., Moline, Ill., Manual No. 120, 1948.
3. Ramia, M., Pasto de los Llanos de Barinos, *Bol. de la Soc. Venezolana de Ciencias Nat.* 17(87) 300, 1957.
4. Rivera Brenes, L., Herencia, J., Arroyo, J. A., and Cabrera, J. I., Palatability Trials on Merker grass (*Pennisetum purpureum*), Venezuela grass (*Paspalum fasciculatum*) and plantain pseudostalks (*Musa paradisiaca*), *J. Agr. Univ. P. R.* 43(4) 249-54, 1959.
5. Rivera Brenes, L., Progress Report to the Director Agr. Exp. Sta. Univ. P. R., 1955; (unpublished).
6. Swift, R. W., The Nutritive Evaluation of Forages, Bull. 615, Pa. State Univ., Univ. Park, Pa., January 1957.