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Nutritional Values Indicators of Tropical Arborescent Legume Foliage for Ruminants and Pigs

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ABSTRACT

Nutritional value indicators of *Albisia lebbeck*, *Calliandra surinamensis*, *Erythrina variegata*, *Gliricidia sepium*, and *Leucaena leucocephala* for ruminant and swine feeding were determined. Chemical test, *in vitro* gas production technique, and movable nylon bag technique were applied. Raw protein concentrations ranged between 12,7 % and 23,1 %. Significant differences concerning *in vitro* gas production among species and food digestibility in swines were detected. A diet based on *E. variegata* foliage was better accepted by swines. *E. variegata*, *L. leucocephala*, and *G. sepium* showed the highest nutritional value for ruminants, while *E. variegata*, *L. leucocephala*, and *A. lebbeck* exhibited the highest digestibility values for swines.

Key Words: *digestibility, nutritional value, ruminants, swines*

INTRODUCTION

The use of local protein resources is important to achieve a more sustainable animal production, especially when the hunger that strikes part of the population of the planet has not been satisfied and some of the foods for human consumption are being used on farm animals. Many of the local resources must be assessed for efficient use in animal nutrition (Pedraza *et al*., 2011).

Some nutritional value indicators of foliage meal for ruminants and pigs from five arborescent legumes are dealt with in this paper.

MATERIALS AND METHODS

Leave, petioles and stem samples from arborescent legumes (*Albizia lebbeck*, *Calliandra surinamensis*, *Erythrina variegata*, *Gliricidia sepium and Leucaena leucocephala)* were chosen at random during the dry season. The stems were less than 5 mm long. All the species had 90-day reshoots and were growing in the vicinity of the Taburete Farm, in the municipality of Camagüey, Cuba (21°, 23' NL y 78°,51' WL). For the meal, the samples were dried at 65 °C, for 48 h, until they reached constant weight, using an oven with air forced circulation, then they were ground in a crush grind mill, and sieved through a 1 mm net.

The ash and gross protein analysis (PB) were carried out according to AOAC recommendations in 1995. The neutral fiber detergent analysis (NDF) was determined by the Van Soest and Robertson (1985) method.

The determination of *in vitro* gas production was set up following the principles of Menke *et al*. (1979), with 100 ml glass syringes (FORTUNA®, Häberle Labortechnik, Germany) modified for fresh bovine feces inoculations. They were dissolved in a mineral medium buffer (1 + 3) as described by Martínez (2005). Measurements were made at 24; 48 and 72 h of incubation.

Total digestibility in pigs was determined by the portable chemical analysis with bags, according to recommendations by Pedraza *et al*. (2011). Bags of 2 x 2 cm made of parachute fabric, with approximately twenty-five holes/mm^2 and a capacity of 300 mg of samples, were used. Three Yorkland reproducing sows were included in the study. They were separate and were fed with concentrates. The animals were forced to swallow five bags of forage at two different times. Then the bags were recovered, washed, dried and weighed; digestibility was determined by weight difference.

A test cafe was made by triplicate to measure acceptability. The same foliage was collected twelve months after the first experiment. Ten prefattening pigs (20-25 kg) were used. Two replicas with Duroc pigs were made in a three-week interval, on a private farm. The third replica was made on a state-owned farm with Yorkland pigs. In each experiment, six piles were made per species and consumption was measured after an hour.

Normality analysis was performed to every variable; the peaks in pig digestibility were disregarded by Dixon criterion, and simple variance

assessments were performed. The mean differences were determined by the Tukey test.

RESULTS AND DISCUSSION

Table 1 shows the ash, PB and NFD contents in the meals. Some differences were observed between the species as to, ash higher in *E. variegata*, and PB with higher values in *A. lebbeck* and *L. leucocephala*, which do not differ between them.

The NFD contents are higher *L. leucocephala* y *E. variegata*, whereas *A. lebbeck* has the lowest values. It is well-known that the chemical composition of forages may vary mainly due to the climate, soil, the topography and plant age. Also, leave position on the stems and the level of fertilization are important. Several researches done on arborescent plants have proven so (Galindo *et al.*, 2005 and Ly *et al.*, 2008).

Fig. 1 shows the *in vitro* gas production from legume foliage meals, with the highest values expressed in *E. variegate* and *G. sepium*, shortly followed by *L. leucocephala; whereas C. surinamensis* had the lowest gas production values in all incubation times. The relation between feed digestibility and metabolizing energy concentration with gas production is well known (Menke *et al*., 1979).

Total digestibility, measured by portable chemical analysis with bags, indicates that *E. variegata, A. lebbeck* and *L. leucocephala* meals have the highest values, whereas *C. surinamensis* had the lowest (Table 2).

The results from the test cafe are shown in Fig. 2. The most commonly consumed species was *Erythrina variegata, and* the least commonly consumed were *Albizia lebbeck* and *Gliricidia sepium*. Feed acceptance is an important criterion related to consumption (Ly *et al.*, 2008).

CONCLUSIONS

E. variegata, L. leucocephala and G. sepium foliage meals have the best nutritional value for ruminants; whereas *E. variegata, L. leucocephala* and *A. lebbeck* foliage have the best digestibility in pigs. *C. surinamensis* foliage meal had the highest nutritional value.

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Table 1. Chemical composition indicators of foliage meals

Species	Ashes	PB	FND
Albizia lebbeck	7.3[b]	21.8[a]	36.4[d]
Calliandra surinamensis	7.6[b]	12.7[c]	47.6[c]
Erythrina variegata	14.1[a]	12.9[c]	59.7[a]
Gliricidia sepium	8.0[b]	19.2[b]	55.9[b]
Leucaena leucocephala	7.7[b]	23.1[a]	61.1[a]
Typical error	0.69	1.19	2.47
Significance	***	***	***

*** P < 0.001

Different letters in the columns indicate significant differences

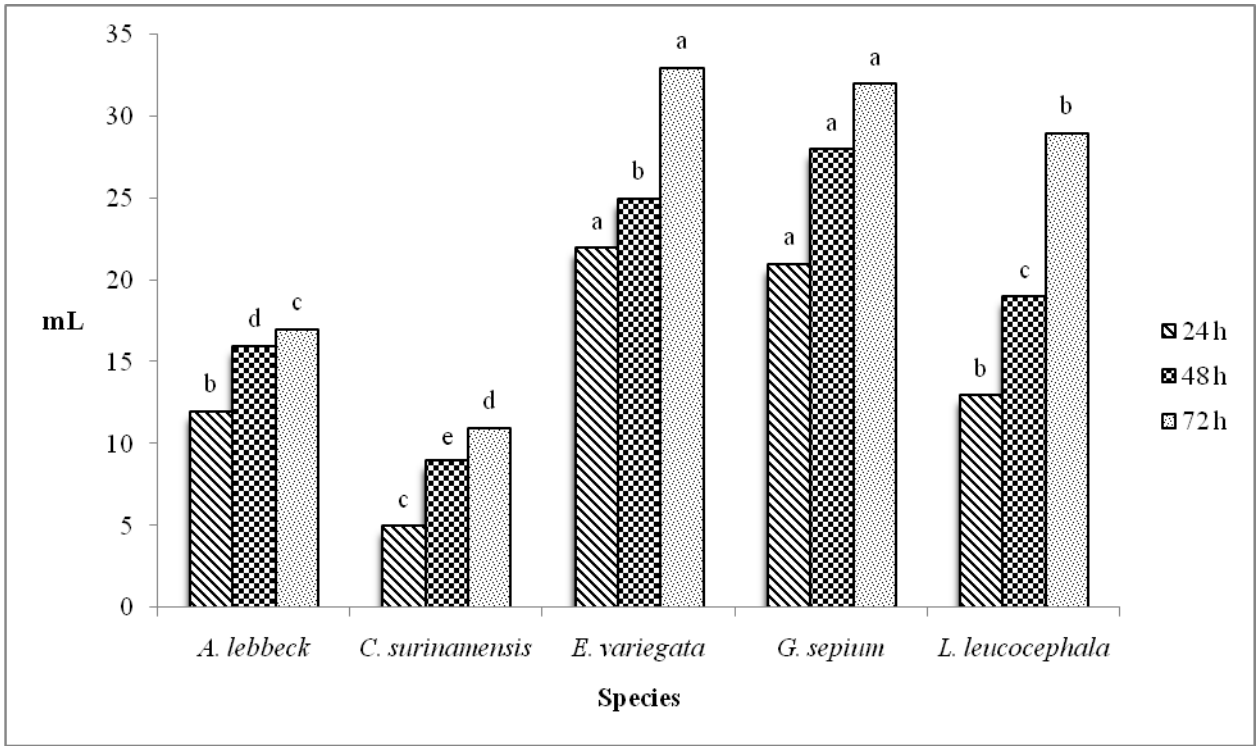


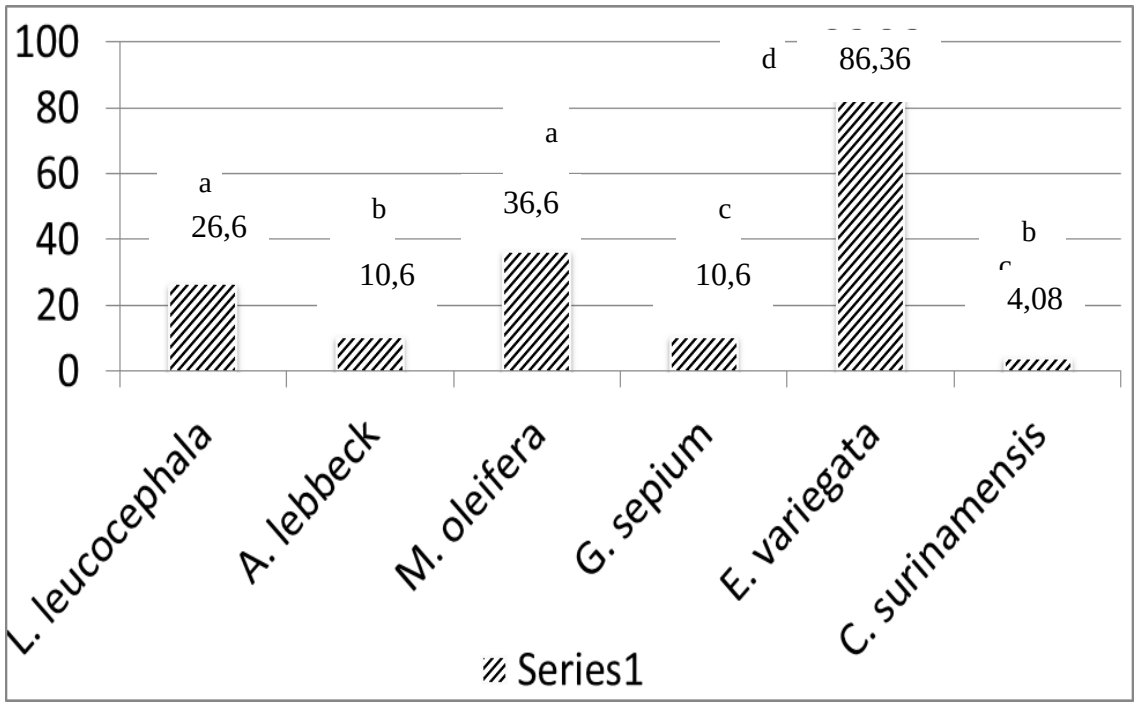
Fig. 1. *In vitro* gas production from meals at different incubation times (different letters at each time indicate significant differences P < 0.05)

Table 2. Total digestibility of foliage meals in pigs

Species	Digestibility
Leucaena leucocephala	63.6[b]
Gliricidia sepium	46.9[c]
Erythrina variegata	74.3[a]
Albizia lebbeck	64.3[b]
Calliandra surinamensis	46.4[c]
Typical error	2.79
Significance	***

*** P < 0.001

Different letters indicate significant differences



*** P < 0.001

Fig. 2. Foliage acceptability according to the test cafe (intake percent in 1 h)