

# Effect of a Protein-Energy Supplement of Low Consumption with Coconut Pulp Expeller (*Acrocomia aculeata*) of Beef Cattle at Pasture

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## Abstract

The purpose of this study is to evaluate the effect of a low consumption protein-energy supplement that incorporates 15% of coconut pulp expeller in bovine animals. These pasture fattening cattle were checked on daily weight gain, supplement consumption and efficiency of pasture use. This study was carried out in a livestock establishment in the Department of Concepción, Paraguay. A total of 108 animals were selected; castrated male bovines,  $342 \pm 30.2$  of body weight (BW), age average 28 months, Nelore breed distributed in 2 treatments (T1 and T2): T1 = 42 animals; control group (pasture + conventional mineral salt) and T2 = 66 animals; treatment group with a protein-energy supplement (pasture + protein-energy supplement with minerals). In both treatments, the animals grazed on pasture of *Brachiaria brizantha* cv. Marandú and *Panicum maximum* cv. Tanzania used a system of pasture rotation of 1 - 3 days of occupation and 35 - 40 days of rest. The average daily weight gain (DG) was 0.82 and 0.83 kg/day ( $p > 0.05$ ), the supplement consumption was 0.1 and 0.28 kg/day per animal and the % disappearance of the biomass of 18 and 23% for T1 and T2, respectively. In conclusion, there was no evident effect on DG of protein-energy supplementation.

## Keywords

Supplementation, Protein-Energy, Mineral, Bovine, Fattening

## 1. Introduction

Beef cattle production constitutes one of the most important sectors of Para-

guayan economy and occupies 39% of the land in the country. In this sense, production on extensive grazing systems is predominant, which is carried out on native and cultivated pastures, fundamentally on the first one [1].

Cattle raising versus cultivation compete for the use of the land; it caused the first to look for more efficiency in the whole productive cycle, mainly in the cattle fattening stage [2].

For cattle termination in the extensive system of production, the order of priorities based on existing limitations must be taken into consideration, especially when the quality of fodder offers is limited, due to the fact that they experience accelerated growth and therefore, greater changes in their chemical composition as the summer season advances, at a time that it may coincide with a rotating system when the animals arrive to consume them, a situation when the pastures have a high level of neutral detergent fiber (NDF), detergent acid (ADF) and lignin. On the other hand, during the dry season, the quality of the pasture is essentially low, with a high fiber content and meager in nitrogen [3] [4] [5].

This is why in beef cattle production one must look for alternatives in supplements which allows for ruminal function to have a harmonious balance [6] which lead to alternatives such as low consumption energy-protein supplements which generally have, as main ingredients, corn and soybeans that may present limitations of high acquisition prices of these raw materials.

An alternative raw material for ruminant feed could be Coconut Pulp Expeller (*Acrocomia aculeata*), even though up till date, there is very little information in the literature for its use, it could partially substitute traditional energy sources such as corn, taking into account its chemical composition with an oil residual of 15% [5], especially in fattening bovines and with a more competitive price. Paraguay is a country noted for having an abundant natural production of *Acrocomia aculeata*, besides being one of the few countries where it is industrially processed [7]. Due to these motives, in this study it was posed as a main objective to evaluate the effect of a protein-energy supplement of low consumption incorporating 15% of coconut pulp expeller over daily weight gain, supplement feed and pasture use efficiency.

## 2. Material & Methods

### *Animals and Feeding*

The study was carried out in a cattle raising establishment that fattens bovines on cultivated pasture located in the Department of Concepción, Paraguay (23° 19'45.6"S 57° 10'43.8"O). 108 bovines, castrated males of Nelore breed, with an average weight at the start of the study of  $342 \pm 30.2$  kg and 28 months of average age in the fattening stage. They were divided in two groups (Treatments: T). T consisted in two different types of supplements; T1 (control): grass + conventional mineral salt (n = 42 bovines) and T2: grass + protein-energy supplement of low consumption with 15% inclusion of Coconut Pulp Expeller (n = 66 bovines), that were formulated based on recommendations [8] (See **Table 1**).

**Table 1.** Chemical concentration (for each kg of product) of conventional mineral salt (T1) and of protein-energy supplement plus minerals with 15% coconut pulp expeller (T2).

Components (unit)	T1 Concentration	T2 Concentration
Calcium (g)	140	32
Phosphorus (g)	60	20
Sodium (g)	140	90
Magnesium (g)	15	6
Sulphur (g)	20	15
Zinc (mg)	3000	1000
Manganese (mg)	2000	500
Copper (mg)	1000	500
Cobalt (mg)	90	30
Iodine (mg)	90	30
Selenium (mg)	20	7
Crude Protein (g)	NC	350
Total Digestible Nutrients (g)	NC	350
Metabolizable Energy (Kcal)	NC	1.500

NC: does not contain.

The bovines grazed during 68 days (February to April 2019) on cultivated pastures of *Brachiria brizantha* cv. Marandú y *Panicum maximum* cv. Tanzania in a rotating system with grazing periods of 1 to 3 days and rest from 35 to 40 days (according to the paddock and grass production) (See **Table 2** Chemical Composition of sample grass).

#### Measurements

Supplements were offered in feeders (30 cm linear per animal), both those offered as well as those that refused were weighed daily. Animals were weighed on a mechanical scale at the beginning and at the end of the study period (68 days), samples of the grass offered were taken one day before the entry and on the same day of exit of the animals from their respective paddocks with the technique of square throw (1 × 1 meter) proposed [9].

A daily weight gain (DG in kg/day) for each animal, and by group daily intake of the supplement per animal by treatment (DI in kg/day) were estimated; initial offer of biomass fodder refused post-grazing was measured for each treatment (in kg/ha.) whereas the missing biomass fodder after grazing was measured in percentage (%).

#### Chemical Analysis

Grass samples offered were ground in a hammer mill going through a sieve of 1 mm in diameter and dried in a forced ventilation heater at 105°C during 48 hours, whereas PB was determined following the Kjendahl method using a Quimis Digestor & Destilator model Q327E26B [10]. ADF and NDF were analyzed according to [11].

**Table 2.** Chemical composition of sample grass (%).

Chemical Composition <sup>1</sup>	Values (%)
CP	5.2
ADF	71.6
NDF	39.6

<sup>1</sup>CP: Crude Protein, ADF: Acid Detergent Fiber, NDF: Neutral Detergent Fiber.

### *Statistics Analysis*

Results of daily weight gain were compared statistically by the Student T method using the statistics package Statistx 9.0, with an alfa error level of 0.05. Offer and refusal of biomass fodder, as well as the percentage of missing biomass fodder, both of them calculated per treatment, were contrasted by quantitative comparisons.

## **3. Results and Discussion**

Corresponding results of average daily weight gain (DG) and average daily supplement intake per animal (DI) with their standard deviations (SD) for each treatment are shown on **Table 3**, where DG was almost identical between treatments, being the difference not statistically significant ( $p > 0.05$ ). DI observed per treatment was almost triple in T2 in relation to T1.

DG results in this study were high for pasture conditions and very superior to what [12] reported both for mineral supplements (0.24 kg/day) as well as with the protein-energy block that used (0.33 kg/day) working with weaning cows on native pastures, carried out between the months of July and October. Similarly, the results were higher than those reported by [13] and [14], both with protein salt supplement (0.48 and 0.38 kg/day) as well as with a protein-energy concentrate (0.32 and 0.55 kg/day, respectively) both carried out in bovines grazing on native pastures. Also, the result was far superior than the result recorded by [15] of 0.33 kg/day in heifers getting mineral supplements on native pastures, as well as the results obtained by [16] of 0.37 kg/day on supplements with protein mineral salt and of 0.21 kg/day on cattle receiving conventional mineral salt; both cases on native pastures. Likewise, DG was superior to those observed by [17], either on groups receiving 0.1% protein salt of live weight (0.592 kg/day) and 0.05% live weight (0.608 kg/day), in the research carried out in the Paraguayan Chaco on steers on native pastures. However, [18] reported closer results to the present study, in steers on native pasture during the summer period without shade (0.650 kg/day) and with shade (0.529 kg/día), both groups had free access to protein blocks (with 28% raw protein).

On **Table 4**, it is shown the offer, refusal and a percentage of average miss of the biomass fodder (in the form of PDM) of the respective pastures utilized by bovines of each treatment (T1 and T2), where we can tell that the initial MSP offer was closer to 2.000 kg/ha. The refusal left was fairly important in both treatments and next to 1.500 kg/ha of PDM. Missing percentage was a little

**Table 3.** Average daily weight gain (DG) and average daily supplement intake per animal (DI) with standard deviation (SD) expressed in kg/day for T1 (grass + conventional mineral salt) and T2 (grass + protein-energy with minerals supplement).

Treatment	DG $\pm$ SD (kg/day)	DI $\pm$ SD (kg/day)
T 1	0.82 $\pm$ 0.164	0.10 $\pm$ 0.042
T 2	0.83 $\pm$ 0.191	0.28 $\pm$ 0.075

**Table 4.** Offer, refusal (kg/ha) and percentage (%) of missing biomass in the form of partially dried matter (PDM) of treatments (T1 and T2).

Treatment	Initial Offer	Refusal Post-grazing	% of missing biomass
T1	1.933	1.550	18
T2	1.966	1.494	23

higher in the ones that consumed protein-energy supplements (T2) (23% vs. 18%).

These percentages of missing biomass fodder that mostly were a consequence of the intake the bovines had, in the present study, were relatively low probably due to the low pressure of the applied pasture, which if it is compared to ranges from 33% to 66% of missing biomass among the lower and higher pressures of grazing reported by [19], and by almost 40% to 70% variations in the percentage of utilization of available fodder, that were increased as the rest period of grazing increased, according to [20].

Thus, it can be concluded that DG for pasture conditions was high, that the utilization of protein-energy supplementation of low consumption did not affect it, even though it positively influenced the percentage of missing biomass fodder.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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