

Elaboration and costs multi-nutritional blocs with goatee leaves (*Pithecellobium acatlense*) consumed by goats in the Mixteca Poblana, Mexico

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ABSTRACT

The elaboration of multinutritional blocs (MB) is an alternative that allows supplement energy, protein, vitamins and minerals, and additionally, it can be administered and take natural resources as protein banks, mainly in the dry season, raising their cost and the concentrates decreasing profitability to producers. An aid is green or dried foliage of the tree-shrub of the Mixteca Poblana that drop their leaves to the ground (dry hay) in the dry season, thus becomes valuable forage consumed by goats, being great for your protein content and low cost in diets of small ruminants in silvopastoral production systems, at the dwindle the foliage of woody perennials in a time of the year. The aim of this study was to develop and meet production costs multinutrient blocks with goatee sheets (*Pithecellobium acatlense*) consumed by goats in the Mixteca Puebla. The study was done in the community of Tehuaxtla, belonging to the municipality Piaxtla in the Mixteca Poblana, which shows a secondary vegetation (arboreal, shrubby) that is consumed by goats in that region. 8 multinutritional blocks were used with *Pithecellobium acatlense* into two groups of 30 goats. Chemical analysis threw goatee 11.7% CP during the dry season and 14.8% CP for rains regarding consumption of BM group A showed 20% less compared to Group B, with respect to consumption of the block multinutrient the group A was 56 g/day/goat, whilst the group B has consumed 73 g/day/goat, where he converted ± 0.14 g/goat/day for this preparation (MB),

with a cost /goat when consuming block/8 days 0.14 USD.

KEYWORDS

Blocs; Supplementation; Trees; Goats; Silvopastoral

1. INTRODUCTION

The tropical regions of Mexico, held 36.8% of the national inventory of sheep and in a smaller percentage goats inventory, however, the predominant production system is extensive or traditional, where the diet of the animals depends on grazing and browsing native species of trees and shrubs, whose nutritional value decreases rapidly with maturity; and during the dry season, food is very nutritious usable [1].

In this system, the caprines are kept in good state only 5 or 6 months of the year, retarding their growth and reproductive efficiency in the dry season; to counteract seasonal variations in forage availability is administered as a supplement block [2].

When supplementing molasses in multinutritional blocks represents an alternative for easy use by small farmers, in addition to several regional ingredients, it can be used in the manufacture of the blocks. No need to invest in infrastructure (feeder) is guaranteed even consumption of small amounts of the supplement for animals [3].

Multinutrient bloc is a dietary supplement rich in nitrogen, energy and generally also in minerals, occurring as a solid mass that cannot be consumed in large quantities by its hardness, due to a cementitious material that is added in its preparation. It makes the animal obtain nu-

trients in small amounts to lick or bite the block [1]. So, the block is a sure way to incorporate the urea in the diet of cattle, facilitating the transportation, handling, storage and supply of animals.

Multinutrient bloc should be designed primarily to provide the nutrients necessary to satisfy the requirements of the microorganisms in the rumen, creating conditions within the rumen fermentation—promoting fiber digestion and bacterial protein production, which results in increased consumption of the basal diet (grasses or fibrous waste), improved digestibility and increased weight gain and milk production [3].

A feeding strategy which could improve productive efficiency in sheep and goatmeat to compensate for variations in the production of dry matter, protein, energy and digestibility in the rainy season, and support the shortage of forage during the dry season, is the use of foliage of trees and shrubs when mixed with other ingredients or raw materials in the region, as corn, hay, straw, NNP raising their nutritional value [4].

[4] notes that the use of blocks for kids' nutritional supplement improves the efficiency of utilization of shrubs in grasslands and in addition, they can be hand-made in the production units [5,6]. In this sense it is necessary to test power with the use of those resources that can decrease the cost of the ration [7-9]. Such is the case of woody plants in Mexico (*Leucaena leucocephala*), which is an important source of forage for their wide availability because it provides fodder and/or fruit at different times of year in some parts of the country for cattle [10]. Moreover, a variety of native trees (legumes) with crude protein content between 14% and 18% are present in the tropics of Mexico [11].

Nutritional support in ruminants, is green or dry foliage of trees and shrubs in the Mixteca Poblana dropping their leaves on the ground (dry hay) in the dry season, becomes valuable forage to be consumed by the goats being the case, goateed (*Pithecellobium acatlense*) that provides low cost proteins in the diet of small ruminants production in silvopastoral systems [12]. The foliage of woody perennials at a certain time of the year, is the only option to produce subsistence food, the MB is an alternative that allows supplements: energy, protein, vitamins and minerals that is used during the dry season, it is a simple but great decision to feed the goats at low cost in the Mixteca. The objective of this study was to develop and determine costs of multinutritional blocks with leaves goatee (*Pithecellobium acatlense*) consumed by goats in the Mixteca Poblana, Mexico.

2. MATERIALS AND METHODS

2.1. Location of the Study

Work done on the Tehuaxtla community, in the municipality of Piaxtla south of Puebla Ranking the Mixteca

region with parallel 17°59'00" and 18°12'30" north latitude, and meridians 98°10'54" and 98°21'36". Region with varied terrain and altitudes ranging from 700 to 2000 m, its flora is composed of deciduous forest, thorny deciduous forest, xeric vegetation, scrub with izotes, secondary vegetation such as tree-shrub, and small localized oak forest areas and grasslands [13]. Warm humid climate with rains in summer and semidry with rainfall (350 - 800 mm) with an average temperature of 23°C. It belongs to two morphological regions: the Petalcingo riverbank south and Acatlán Valley, highlighting the hills as Large, Overweight, Pointer, Tule, Tecomatzin, Quixtepec. Its hydrography is given by Atoyac River Basin, which in the south is crossed from east to west by the rivers Acatlán and Mixteco, from Acatlán Valley and the Mixtecabaja, all those belonging to the upper region of the basin Balsas River [12]. Its fauna is given mainly by deer, coyote, skunk, armadillo, iguana, chameleon and rattlesnake key species [13]. Soil features as: Fluvisol (F), Vertisol (V), Rendzinas (R), Litolol (L) and Luvizol (Lu), as described [14].

2.2. Methodology

He used 7 kilograms of milled leaves fifteen goatee trees (*Pithecellobium acatlense*) plant belonging to the legume family. Subsequently designated the following percentages of the ingredients: 35% foliage goatee, 40% molasses, 5% mineral salts, urea 5%, 10% of binder (cement) and 5% corn stover, then by weighing all components on a hanging scale (watch type) for homogeneously mixed in a wheelbarrow and immediately emptied the component (mixture) in plastic buckets or laminated with 6 liters capacity, which used a machine (bloc construction) to compact the blocmultinutrient developed.

The blocs were left seven days for drying and hardness, to finally be placed in two groups of 30 goats (A and B) to check their consumption in the corral. Drying and milling was performed in the laboratory of nutrition in the BUAP FMVZ through the traditional method in oven with forced circulation of air for 72 hours at 35°C for dehydration of leaves in the case of grinding, the dried material was ground in a hammermill mm mesh to 3000 rev/min.

The compositional analysis goatee (*Pithecellobium acatlense*) to obtain crude protein (CP) was by the Kjeldahl method in the laboratory of Food Science, Graduate School of slides, State of Mexico. The study duration was 8 months (February to September) in 2009. Descriptive statistics were applied through the SSPS 10 for Windows package.

3. RESULTS AND DISCUSSION

Pithecellobium acatlense or goatee, is considered a

tree belonging to the legume family, it is also highly edible plant goats of the MixtecaPoblana. It was found that this is woody forage with high protein nutritional value, throwing in compositional analysis 11.7% protein in dry season, rainy season and protein percentage reached 14.8%, PC values above some grasses consumed by ruminants, which reach an average of 4% to 12% [15].

Table 1, shows the composition of the blocks multinutritional processed and consumed by the two groups of goats belonging to the community in the township TehuaxtlaPiactla.

As shown in **Table 1**, the mixture was estimated multinutrient block per 10 kg, performing another replica with the same formula, percentages and similar amounts, yielding 20 kg of multinutrient component. This yielded eight blocs of 2.5 kg, which were placed 4/group placed goat considered in the study. With regard to *Pithecellobium acatlense* consumption by goats Mixteca region in the two groups managed in the study (A, B) multinutritional blocks, the group B showed 20% higher in group A, in terms of popularity and taste when consumed consistently in 8 days allocated for consumption, this was quantified on the weight of the debris left by withdrawing the goats of the place assigned to the block for consumption during grazing. Is then determined in **Table 2**, the two weighings is estimated multinutritional remaining blocks in the two groups consumed goats considered in the study.

As shown in the above table, the group (goats) kept a better intake B, as it remained for the duration of your supplementation multinutrient bloc averaged 1100 kg/period/weighing, it is probably due, and is an important point, consumption may have been affected in group A by age differences in the study groups and pen space, since the goat group A, their mean age was 20 months and its space/animal was overcome by the group B, as shown in the **Figure 1**.

Some authors such as [16] indicate that there are several factors that affect consumption blocks, such as the hardness of this, forage availability, time of exposure of animals to blocs, level of urea in the block, physiological state and age of the animals however, do not discuss the pen space, since most of the studies indicate that they coincide in the use of block grazing. So, it was just like the age factor they studied animals with those found in this work, which could have affected the consumption of group A.

With respect to consumption multinutrient average bloc group A/goats was 56 g/day, as the group B the average consumed/goats was 73 g/day, it is important to note that consumption also depended multinutritional block the type of ingredients that formed, time consumption and nutritional potential productive phase. As stipulated [17], in developing BM and supplement them in

Table 1. Parts and percentages multinutriciales blocks consumed by goats in the Mixteca Puebla in Mexico.

Ingredients	%	Amounts/block considered component/in 10 kg
Molasses	40	4.0
Goat Beard's leaves	35	3.5
Cement	10	1.0
Urea	5	0.5
Corn stubble	5	0.5
Salts minerals	5	0.5
Overall	100%	10 kg.

cattle and sheep with higher percentages of protein, where consumption reached 600 g/day in large ruminants and in the case of sheep consumption reached 150 g/day, not to mention the extent of consumption for goats, however, reinforces this principle of the composition of the bloc to integrate nutritional potential of ingredients contained in it, as was the case, the BM experience in sheep with a composition: 40% molasses, urea 10%, rice bran 40%, 5% cement with the same percentage salt administered to sheep grazing, as a result consumption ranged between 90 - 110 g/day and a 43.6% crude protein [18].

Looking at these results, the protein content was higher than that found with goatee (*Pithecellobium acatlense*) of 14.8% in the rainy season, which is at the top with 28.8% of those found in this tree, making a difference in quantity and cost of protein used in the diet of these small ruminants. This gives a premise in this study: the animal species in their production system in which they operate, depend on the quantity, quality and preference ingredient in blocmultinutrien, that the number and the high costs the ingredients to be used.

Initial weight was recorded in goats in groups (A and B) studied, finding a significant gain during the supplementation period with blocks, reaching an increase for group A of 115 g/day/goat, in the case of group B slightly reached a weight of 122 g/day/goat, which was not significant. In terms of costs and profitability of the blocks goateed multinutritional in goats studied the Mixteca region, maintain significant costs in developing cheaply multinutritional blocks, allocated to power systems, particularly in supplement diets in certain time or period, when there are low amounts of forage or feed by maintaining and growing profitable production in goats in the MixtecaPoblana, see **Table 3**.

From this table, as noted, the consumption cost is quite cheap block, as it costs \$1.80/goat compared to other supplement through grain or other feed, increase production costs in different production phases up to 25% or 45% when used in some production systems in ruminants

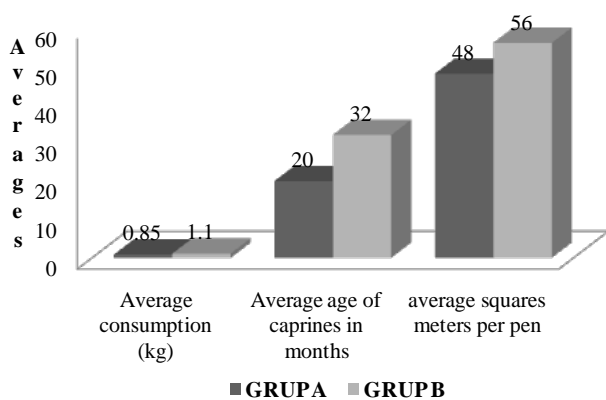
Table 2. Weights and percentages in the block multinutritional consumed by goats in the Mixteca region.

Goats groups studied	Initial weight of the bloc multinutritional	Weighing multinutrient bloc remains at 4 days	Weighing multinutrient bloc remains at 8 days	Bloc kilograms consumed	Intake
A	2.5 kg	1.7 kg	0.8	1.7	68%
B	2.5 kg	1.4 kg	0.3	2.2	88%

Table 3. Ingredients and costs multinutritional blocs consumed by goats in the Mixteca Poblana.

Bloc ingredients	Ingredient amounts	Cost/lot/bloc	Full cost/8 blocs	Cost of consumption/goat
Molasses	8 kg	\$2.80/kg	\$22.40	\$0.37
Goatee foliage (<i>Pithecellobium acatlense</i>)	7 kg	\$6.25/kg	*\$50.00/cosecha	\$0.83
Maize stover	1 kg	\$0.56	\$4.50	\$0.08
Urea	1 kg	\$1.65	\$13.00	\$0.22
Mineral salts	1 kg	\$1.50	\$12.00	\$0.20
Cement	2 kg	\$0.75	\$6.00	\$0.10
Totals	20 kg	\$13.51	\$108.00	\$1.80

\$ = Mexican pesos. * Payment made to a relative of the producer for *Pithecellobium acatlense* harvest.

**Figure 1.** Averages with regard to consumption, age groups and corral goats in the Mixteca Poblana in Mexico.

as determined [16]. This show, that by providing multinutritional blocks with this type of tree fodder present in the Mixteca Poblana, gives significant results in production, ruminal welfare to promote more efficient and better forage, are completely positive economic and rate of return [19].

Table 4 shows the standard deviations in weight obtained during the initial and final weight in the groups studied with the use of the blocks multinutritional with goatee.

It is important to note that the above table the results in terms of average final weight of the two groups was 36.25 kg; keeping with a (\pm SD) of 4.73 kg, which represent 0.49 gr cattle/goats to consume the bloc multinutritional during the eight days that were exposed for consumption, becoming \pm 0.14 g/goat/day of this mixing.

Table 4. Standard deviations in groups A and B goats fed multinutritional blocs Tehuaxtla community in the Mixteca Poblana.

Variables	N	Minimum	Maximum	Mean	\pm SD
Initial weight (kg)	2	A = 32	B = 38	35	4.24
Final weight	2	A = 32.9	B = 39.6	36.25	4.73
Age (months)	2	20	32	26	8.48
Bloc consumption (kg)	2	1.70	2.20	1.95	0.35

4. CONCLUSION

Multinutritional blocs at different times of the year are a tool in animal nutrition of goats in the Mixteca Puebla. In conclusion, the percentage of *Pithecellobium acatlense* (goatee) was 14.8% crude protein, since it is a legume with high protein content. Moreover, it was well accepted by the goats of the Mixteca to consume, having a cost 0.14 USD/goat during the time offered for consumption. Finally, the MB is an alternative to supplement in times of dry season and sustain goat production of Mixtec at low cost.

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