

MANAGEMENT AND NUTRITION

Reproductive Performance of Growing Female Pelibuey Ovines Confined to Pens with Raised Flooring or Restricted Grazing

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ABSTRACT

Background: Ovines will contribute with a larger share in the Cuban diet. However, the current productive results are far from their real potential. The aim of the study was to evaluate the productive performance of growing female Pelibuey ovines confined to pens with raised flooring or under restricted grazing.

Methods: A 60-day experiment was conducted on El Hoyo ovine farm at UEB (Basic Production Unit) Maraguan, municipality of Jimaguayú, Camagüey Cuba. Overall, forty 6-month old female Pelibuey ovines, 16 ± 0.5 kg LW, were chosen and split in two treatment groups, stabling in raised flooring and semi-stabling, with grazing on native graminaceae, following a randomized design. Analysis of covariance considered the initial weights as covariable, which were adjusted to 16.663 kg. The animals were weighed every 30 days, and daily weight gains were estimated.

Results: The group lodged in the pens with raised flooring achieved final weights and gains above ($P \leq 0.01$) the grazing group (24.39 kg and 0.150 kg, 22.34 kg, and 0.099 kg, respectively). Food conversion of the penned animals was also higher (8.9 vs 11.4 kg of DM/kg of gain).

Conclusions: The performance of growing Pelibuey females confined to pens with raised flooring (wooden floorboards) was higher concerning weight at 60 days, mean daily gain, and conversion of foods served in the trough, than the animals with restricted grazing.

Key words: conversion, gain, ovine, semi-stabling

INTRODUCTION

In Cuba, the need to increase food production continues to be a government's concern, and the agricultural sector has been given full responsibility to address this issue (Plaza, 2009).

Some of the alternatives implemented to raise the contents of animal protein in human consumption include the development of tropical or hair ovine herds, which, according to CENCOP (2016), has seen a national annual growth of 5%. This species have a number of characteristics that make it ideal to achieve such purposes (Zervas and Tsiplakou, 2011).

According to Herrera, Jordán, and Senra (2010), a large part of ovine production in Cuba is developed under unsafe or intermediate conditions in terms of management and nutrition. Therefore, the indicators found in most herds are far from the true potential of the species. Weight gains rarely go over 0.08 kg daily live weight, in contrast to the results of other areas, with 0.1 kg gain/animal/day, using diets based on forages, and some supplementation (Ganzábal, 2013).

Besides, female growth retardation is another aspect to consider, which increases during that period until incorporation, along with calving losses per female. Obviously, to increase the production of sheep for

slaughtering, it is important to have breeding animals in good body conditions, and to shorten the period until incorporation to reproduction, seeking high natality and survival of the offspring (Perón, 2005).

As part of stabling systems, pens with raised flooring (wood floorboards) are used in several regions of the world (Febles, 2010). These facilities allow animals to stay in a healthy environment, with little exposure to parasites, protected from predators, little energy consumption, and proper microclimate, throughout the year (Lupton *et al.*, 2007).

The raised flooring system was conceived to breed and fatten sheep for slaughter, though it can also be used for faster growth of young females, in order to breed animals with optimal conditions for reproduction, according to the standards for Pelibuey. Such reports have been made in Argentina by, Giraudó, Villar, and Villagra (2014).

Accordingly, the aim of the study was to evaluate the productive performance of growing female Pelibuey ovines confined to pens with raised flooring (wood floorboards) or under restricted grazing.

MATERIALS AND METHODS

Location, soil, and climate

The experiment was done at El Hoyo ovine farm, from Maraguan Basic Production Unit (UEB), Company for the Protection of Wildlife, in the province of Camagüey. It is located between 21°, 03' north latitude, and 77°, 6167 west longitude, km 9 Cuarto Anillo Road, West Carretera Central, municipality of Jimaguayú. The predominant soils are brown with carbonates, agroproductive category No. 4 (INSMET, Camagüey, 2014). The climate is interior savanna with seasonal moistening. The precipitations are within 1 200-1 300 mm, 70-75% occurring in the rainy season. The maximum temperature varies between 30.7 and 32.2 °C (INSMET, Camagüey, 2014).

Experimental procedure

The experiment was conducted January through March, 2018, and lasted 67 days. Following identification, 40 six-month old growing Pelibuey females weighing 16 ± 0.5 kg, were chosen. They were distributed in two groups (treatments), one of them was confined to a pen with raised flooring made of rustic wood, including the floor (floorboard), and the other was kept on a concrete floor pen, with grazing for four to five hours, starting at 9 am.

The raised-flooring pens were 20 m², and the vital space was 1 m²/animal, inside a house with thatch roofing. Both the walls and floor were made of hardwood, 1 m high from the ground. The troughs were placed outside the pen, and both pens offered 0.5 m²/animal of free space.

The females in the group with restricted grazing were lodged in a pen with concrete floor (20 m²), inside a house with thatch roofing. The vital space comprised 1 m²/animal. The troughs were 30 cm high, guaranteeing 0.5 m²/animal.

The two groups of females received a similar ration twice a day. The group under restricted grazing was fed before grazing (9:00 am), and in the afternoon, upon gathering (3:00 pm). The animals on the raised flooring were given their rations at 9:00 am and 4:00 pm. The ration consisted in 300 g of commercial feed, King Grass (*Pennisetum purpureum* Schumacher), hay from graminaceae, and mineral and common salt *ad libitum*; the grazing animals also fed naturalized pasture. The quality of the drinking water was adequate, and it was freely available.

The enclosure for restricted grazing was 2.5 ha, and the stocking rate was 8 animals/ha. The grass was naturalized, with predominance of hurricane grass (*Botriochloa pertusa* L.), with some infestation of smut grass (*Sporobolus indicus* L.), and only one tree for shade (*Guazuma ulmifolia* Lam).

The adaptation period was one week. A 50 kg ZalterR dynamometer scale with 0.2 kg accuracy was used. Weighing was performed on days 0, 30, and 60 early in the morning, before feeding.

The consumption of food in the pens was based on DM from samples of food dried in a stove, at 38 °C, for 48 h. The foods were weighed at supply, then the leftovers were weighed. Measurements were made twice during the experiment. Grazing consumption was estimated according to Pérez-Infante (2013). Food conversion was estimated through the ratio between the gain during the whole stage and the consumption of foods in the pens.

Statistical analysis

Data normality was checked through the Kolmogorov-Smirnov test. A completely randomized experimental design, and analysis of covariance was performed to contrast the response variables, where the initial weights were considered covariables, and were adjusted to 16.66 kg. SPSS, 21 for Windows (2012) was used.

RESULTS AND DISCUSSION

The weights and gains of the two groups underwent significant differences ($P < 0.01$), more favorable to the animals confined in the raised-flooring pen (Table 1).

Table 1. Live weight and gains of growing Pelibuey females confined in pens with raised flooring and restrictive grazing

Indicators	Stage	Grazing	SE	Sig.
Final live weight (kg)	24.39	22.34	0.214	***
Daily gain (kg/day)	0.150	0.099	0.080	***

The covariable in the model was evaluated as follows: starting weight=16.663 kg.

*** $P < 0.01$

The weight gains achieved in the two treatments were higher than the reports of Fonseca (2004) in grazing ovine herds in the province of Granma, with gains above 100 g/day, and those reported by Holguín (2018) in confined sheep, on *Cenchrus purpureus* and *Tithonia diversifolia* forrage.

The weight increase response achieved was positive, which corroborates the merit of raised-flooring pens for fattening, growing, decreasing parasitic infestations (Escalera *et al.*, 2017), and enhancing food consumption and final product quality of the confined animals (Muñoz-Osorio *et al.*, 2015). This, however, is an important modification in animal habitat, especially ovines, which are well adapted to grazing, and must change their behavior to a large extent (Bianchi and Gaibotto, 2005).

Regarding consumption and conversion of foods supplied in the pens, no differences were observed in the former, but in the latter, toward the raised floorboard ($P < 0.001$), which leads to a more efficient use of foods supplied to the animals kept in raised flooring pens (Table 2).

Table 2. Consumption and conversion of foods supplied in the pen containing growing Pelibuey females confined in pens with raised flooring and restrictive grazing

Indicators	Stage	Grazing	SE	Sig.
DM consumption (kg)	0.83	827.80	4.359	NS
Conversion (kg DM/kg gain)	8.9	11.1	0.484	***

*** $P < 0.001$; NS not significant

In Colima, Mexico, Álvarez (2003) reported more favorable conversions when they evaluated the inclusion of guanacaste meal (*Enterolobium cyclocarpum* Jacq. Griseb) during the growth of confined ovines.

Possibly, this behavior is associated to comfort conditions offered to the animals by the wood floor-board, namely, better hygiene conditions, reduction of caloric stress, and less parasitic infestation, along with a reduction of energy expenses with the suppression of grazing.

The consumption of the two treatments were lower than the ones found by González-Garduño, Torres-Hernández, and Arece-García (2011), in male Pelibuey ovines fed Taiwan grass (*Pennisetum purpureum*) and coconut (*Cocos nucifera*), or cajan pea (*Cajanus cajan*), reaching 0.95 and 0.88 kg DM/day, respectively. However, in the same experiment, the females reached consumption below the ones in this study (0.79 and 0.71 kg/day in the two treatments above).

Moreover, Fonseca (2004) reported higher consumption values in Pelibuey ovines, when different levels of energy concentration were compared, and even the lowest concentration produced values above the values in this research (0.90 kg DM/animal/day).

According to Lyons and Forbes (1990), sheep have the higher nutritional requirements per kg of live weight than cattle and buffaloes. These small ruminants choose some forages in particular, which allow them to meet all their requirements, and also they tend to use plants or parts of plants to make digestion faster. Quickly digested forages go fast through the digestive tract, causing an increase in consumption.

The outcome of this experiment is important to guarantee females with adequate breeding weights before one year of age, as well as the phenotypic traits that allow mating with thoroughbred studs from other more meat-producing breeds, like Dorper and Katadin (Vázquez *et al.*, 2011). The aim is to make use of available capacities at certain moments of the year, when male availability for fattening is low, so a larger number of growing females could guarantee proper development for reproduction.

Another possibility would be improving the females not chosen for reproduction (rejects), which might be sold for slaughter at better prices. Consequently, daily gains and final weight would have to be evaluated to avoid fatty carcass, since females tend to accumulate fat faster than males (Fonseca, 2004).

CONCLUSIONS

The performance of growing Pelibuey females confined to pens with raised flooring was higher than in the animals with restricted grazing on natural graminaceae, especially in terms of weight, mean daily gain, and conversion of foods supplied in the pen.

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AUTHOR CONTRIBUTION

Author participation included the following: Conception and design of research: CSF, LCR, PCA, AGA; data analysis and interpretation: CSF, LCR, CLO, EVA, OA; redaction of the manuscript: CSF, LCR, PCA, AGA.

CONFLICTS OF INTEREST

None