Morphometric characterization of two breeds of hair sheep from the Pastaza Experimental Station

F.D., Reyes[1]
Carrera de Zootecnia. Facultad de Ciencias Pecuarias. Escuela Superior Politécnica de Chimborazo (ESPOCH).
Facultad de Ciencias Veterinarias, Universidad Nacional de Rosario, Argentina, fdreyes@espoch.edu.ec

J.V., Trujillo[2]
Carrera de Zootecnia. Facultad de Ciencias Pecuarias. Escuela Superior Politécnica de Chimborazo (ESPOCH).

H. Díaz[3]
Carrera de Zootecnia. Facultad de Ciencias Pecuarias. Escuela Superior Politécnica de Chimborazo (ESPOCH).

V.A, Hervas[4]
Estación Experimental Pastaza. Facultad de Ciencias Pecuarias. Escuela Superior Politécnica de Chimborazo (ESPOCH).

P.R., Marini[5]
Facultad de Ciencias Veterinarias, Universidad Nacional de Rosario, Argentina
Centro Latinoamericano de Estudios de Problemáticas Lecheras (CLEPL)

Abstract

Sheep of the Blackbelly and Pelibuey breeds adapted to the extreme conditions of the Amazon despite being an introduced species. The objective of this study was to characterize the morphometry of the Pelibuey and Blackbelly breeds belonging to the flock of the Pastaza Experimental Station of ESPOCH that are studied in the project: Amazonian Hairy Sheep Program (PROPEA). Thirty sheep of the Blackbelly (n=15) and Pelibuey (n=15) breeds were used. The following variables were studied: height at withers (ALC), height at rump (ALG), thoracic diameter (DT), anterior rump width (AAG), posterior rump width (APG), chest width (AP), length (L), shank diameter (DC) and live weight (LW), which were analyzed with the Student's t-test for comparison of two independent means. It was observed that the variables ALC, ALG, DT and AAG, showed significant differences ($p<0.001$) and allowed the identification of two morphometrically different groups. It was possible to characterize the two breeds of hair sheep used for the trial through their morphometry; the two breeds present values close to the racial standard and can be used as a basis for other types of crossbreeding.

Keywords: *genetic improvement, morphology, weight, morphometry.*

1. Introduction

Sheep farming can be developed in the Ecuadorian Amazon without affecting the natural environment. For this to happen, it is essential to apply process technologies that generate social, environmental and economic-productive benefits, without affecting the sustainability of the production system (1).

Sheep of the Blackbelly and Pelibuey breeds are generally the mainstay for producers in the Ecuadorian Amazon region for animal protein production since they have adapted to extreme conditions without affecting the native flora and fauna, despite being an introduced species in eastern Ecuador. Both breeds share important characteristics, such as non-seasonal reproductive activity, high fertility and prolificacy, and considerable adaptability to heat, humidity, parasites, food shortages, and other adverse environmental conditions (2; 3; 4).

In recent years, genetic improvement of the Pelibuey and Blackbelly breeds has been oriented towards higher weight gain, feed conversion efficiency and carcass yield, which are generally carried out with poorly directed crossbreeding using specialized breeds imported from other environments. Unfortunately, this has led to a loss of genetic diversity and a lack of evaluation of these adapted sheep's morphological, reproductive and productive characteristics (5; 6).

In Peru and Colombia, in addition to genetic studies, this problem has also been addressed through phenotypic characterization studies (7; 8; 9). Phenotypic characterization is a widely used technique that allows the identification of distinctive characteristics in breeds and has become the basis for differentiating between groups and breeds (10); morpho-structural measurements will contribute to the definition of the breed standard and guide its zootechnical situation.

The objective of this work was to characterize morphometrically the Pelibuey and Blackbelly breeds belonging to the herd of the Pastaza Experimental Station of the Escuela Superior Politécnica de Chimborazo, ESPOCH - Ecuador, which is studied in the project: Programa Ovino de Pelo Amazónico (PROPEA).

2. Materials and methods

Thirty hair sheep of the Blackbelly (n=15) and Pelibuey (n=15) breeds belonging to the flock of the Pastaza Experimental Station of the ESPOCH, located at km 32 of the Puyo-Macas road, belonging to the Vencedores community of the Simón Bolívar parish of the Pastaza canton, Pastaza Province, Ecuador, were studied.

It is located at an altitude of 1031 m.a.s.l., with an average temperature of 20.6 degrees Celsius, average annual rainfall of 4100 mm, relative humidity of 87%, at a longitude of 77052' W, and a latitude of 01037' S.; in the life zone of very humid subtropical forest. They were raised under the same environmental, nutritional and management conditions and had an area of two hectares of pasture.

The area's topography is slightly undulating relief without steep slopes, distributed in large natural plateaus. Although the soils have a very heterogeneous composition, most originate in fluvial sediments from the Andean region of the country.

Measurements were made in March 2022; the ewes used were between 24 and 32 months of age. Feeding was free grazing, with pastures based on Brachiaria decumbens and Brachiaria brizantha. The animals presented normal clinical conditions in terms of functionality of

the digestive, respiratory and circulatory apparatus, body temperature, feeding and social behavior. The sheep were grazed from 7:00 am to 4:00 pm and stabled during the night with consumption of chopped grass and water ad libitum.

The following variables were studied: height at withers in cm (ALC), height at rump in cm (ALG), thoracic diameter in cm (DT), anterior rump width in cm (AAG), posterior rump width in cm (APG), chest width in cm (AP), length in cm (L), shank diameter in cm (DC) and live weight in kg (PV). The values of the variables were measured on the animals with instruments made for this purpose, following the specified methodology (11).

They were analyzed with the Student's t-test to compare two independent means (with Welch's correction in the case of heterogeneity of variances). In none of the cases was the assumption of normality rejected, so all the values reported correspond to the arithmetic mean ± standard error. JMP version 5.0 for Windows (JMP®, SAS Institute, 2003) was used for statistical analysis.

3. Results and discussion

Simple body measurements are extremely important for producers within their flocks (12). In addition, information from ewes used for selection and in conjunction with genetic improvement programs can also be evaluated on a morphological basis (13).

Table 1 shows the values of the arithmetic mean ± standard error of the variables analyzed. The measurements produce reliable information for the characterization and differentiation of sheep populations (14).

Table 1. Arithmetic mean ± standard error of the morphometric variables analyzed.

Variables	Blackbelly	Pelibuey	Value: F	Value: P
ALC (cm)	65,5 ± 1,3	68,4 ± 0,4	8,876	0,0002
ALG (cm)	65,7 ± 1,1	69,1 ± 0,5	6,492	0,0012
DT (cm)	78,3 ± 2,6	91,3 ± 1,0	6,024	0,0018
AAG (cm)	6,29 ± 0,3	7,06 ± 0,1	8,303	0,0003
APG (cm)	5,28 ± 0,3	6,07 ± 0,3	1,483	0,471
AP (cm)	4,19 ± 0,3	4,10 ± 0,2	2,206	0,151
L (cm)	36,0 ± 0,9	37,3 ± 0,7	1,565	0,412
DC (cm)	2,45 ± 0,1	2,49 ± 0,1	1,201	0,737
PV (kg)	38,7 ± 2,1	50,4 ± 1,8	1,386	0,549

Note: height at withers in cm (ALC), height at rump in cm (ALG), thoracic diameter in cm (DT), anterior rump width in cm (AAG), posterior rump width in cm (APG), chest width in cm (AP), length in cm (L), cane diameter in cm (DC) and live weight (LW).

Table 1 shows that the variables height at withers, height at the rump, thoracic diameter and anterior rump width showed significant differences ($p<0.001$) between both breeds, which would indicate that with these variables, both groups could be morphometrically differentiated. While for the variables posterior rump width, chest width, length, shank diameter and live weight, no significant differences were found ($p>0.05$).

Height at withers values for Pelibuey was higher than those reported by (15) of 64.9 cm, by (5) of 65.2 cm and by (9) of 62.0 cm all for Pelibuey; however, lower than the 68.5 reported by (16). The height values at the

withers of Blackbelly ewes were higher than those cited by (3), where values of 61.9 cm in one-year-old animals and 63.0 cm in two-year-old animals but lower than the 66.0 cm in three-year-old sheep reported by the same author.

The rump height values found in the Pelibuey ewes of this work were higher than those reported by (5) with 64.6 cm but lower than the 70.3 cm reported by (16). The rump height values of Blackbelly ewes were higher than the 63.1 and 63.3 cm cited by (3) for one and two-year-old animals, respectively, but lower than the 66.3 cm in 3-year-old ewes; however, the Blackbelly ewes of the present study maintain the trend of slight superiority of rump height for withers height reported by (3).

It is argued that the height at the withers associated with the height at the rump is of great importance since when both have the same value, the individual presents a straight dorsal-lumbar line, favoring the correction of the angle of the rump line, the insertion of the mammary gland ligaments and would allow greater muscular development of the region (17).

In this study, Blackbelly ewes showed a difference of 0.2 cm between height at the withers and height at the rump, while Pelibuey ewes showed a difference of 0.7 cm between height at the withers and height at the rump, being a very little marked difference, tending to horizontality. The thoracic diameter reached a value of 91.3 cm, higher than those reported by (3) of 81.2 cm and 78.8 cm (16) for Pelibuey, lower values of 77.2 cm were also reported in Mexican Pelibuey (15) and (17); while the Blakbelly presented a value of 78.3 cm which is lower than the 81.9 and 86.5 cm in Mexican females of 2 and 3 years of age respectively (3).

The results obtained should be repeated and considered for this particular system analyzed since the ewes studied were raised under semi-intensive conditions with minimal supplementary feeding; many times in other works, ewes receive energy-protein supplementation during puberty, gestation and lactation, which improves their development and adult body size. It should also be taken into account that two factors could negatively influence the body structure of ewes, on the one hand, service during puberty even without adequate development, since their growth is affected by pregnancy (19) and, on the other hand, inbreeding derived from crossbreeding between related animals (14). Authors such as (20) have demonstrated this phenomenon's negative effect on sheep's body development.

Although there are no statistical differences in the other measurements of the trunk region, it is important to consider them since they give the first impression of individuals with meat aptitude and condition the selection criteria, which is based on the compactness and bulkiness of the trunk, the depth and arching of the ribs, width and muscular development of the rump and length of the body, which influence from carcass yield to respiratory and digestive capacity and reproductive facility (17).

It is important to consider that the live weight of the Pelibuey reported in this study is higher than the 41.1 kg reported in Mexican sheep (5) and the 35.8 kg of the Cuban Pelibuey (21); similarly, the live weight of the Blackbelly is higher than the 35.4 kg reported in Cuba and Mexico for 3-year-old females (21; 3).

4. Conclusion

It was possible to characterize the morphometric measurements of the two breeds of hair sheep used for the trial belonging to the flock of the Pastaza Experimental Station of the ESPOCH; the Pelibuey breed has higher

morphometric measurements and live weight than the blackbelly; however, both breeds have values similar to the racial standard so that they could be used as a basis for other types of crossbreeding.

Conflict of interest.

There is no conflict of interest for the publication of this scientific article.

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