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Metabolic crates for alpaca nutrition research: Design, operation and validity

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SUMMARY
For metabolism studies on farm animals, accurate feces and urine collection, as well as accurate feed and water intake measurements, are required. When making metabolism crates, factors like: Animal behavior, reducing the likelihood of injury, and animal cleanliness ought to be taken into consideration. An initial prototype of metabolism crates was created in this study using morphometric measurements taken from thirty five-year-old male Huacaya alpacas. The crates were mostly made of metal for strength and durability and had parts that could be replaced. Two of these metabolism crates were constructed and put through their paces with experimental animals paired up sequentially for five days each.

Keywords: Alpaca nutrition; Metabolism; Ruminant

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INTRODUCTION

During the validation phase, the upgraded design of metabolism crates was put through its paces by being tested at a length and width of 2.00 and 0.55 m, respectively, based on the observed performance. The experimental animals were made to feel more at ease and were made easier to handle by these features. Photos and drawings depict the dimensions and construction details of metabolism crates. Five units were built at the end. The animal performance of five alpacas fed at the maintenance level of intake was evaluated as part of the validation of metabolism crates in terms of: over a two-week period, daily feed and water intake, feces and urine excretion, and diet digestibility [1].

LITERATURE REVIEW

Descriptive statistics were utilized for data analysis. In total, the intake of both dry matter per kilogram of metabolic body weight and a water consumption rate of 100 7.1 ml/kg BW0.75, which was equivalent to 2.3 times the observed DMI (kg/d), were consistent with a number of previous studies that were carried out with alpacas for this feeding regimen. Direct comparisons with published studies regarding fecal production and diet digestibility are difficult to draw because of differences primarily related to diet composition. However, these outcomes appear to match the anticipated performance of the diet. The same is true for the volume of urine which in this study accounted for 19 percent of the daily water consumption. The proposed metabolism crates are found to be suitable for nutritional studies on alpacas [2,3].

Alpaca production in Peru is entirely dependent on grazing, primarily on native grasslands. These environmental conditions (high altitude, variability and scarcity of forage supply, high UV radiation, etc.) characterize Andes ecosystems. that can be difficult to deal with when raising any ruminant livestock, such as cattle or sheep. Even though alpacas (camelids) have successfully evolved to deal with these stressful conditions, the rapid negative effects of climate change have increased the pressure on these ecosystems over the past few decades, and this livestock production system's sustainability may be in jeopardy in the near future knowledge of domestic South American camelid digestive physiology, roughage protein and fiber utilization, and animal energetics (SAC; alpacas and llamas) is still quite limited, with ruminant species serving as a starting point for some extrapolations [4-6].

DISCUSSION

Due to the differences in dry matter intake (DMI) capacity between domestic ruminants and camelids, this may result in an under or overestimation of their nutritional requirements. A factorial approach has traditionally been used by conventional feeding systems worldwide for studies aiming to calculate the balance of nutrients. This approach is based on the assumption that the total requirements of energy or other nutrients are the amounts fed to the animal to fulfill specific requirements for maintenance and productive functions (such as growth, pregnancy, and lactation) [7].

In order to accurately determine their daily intakes, such studies require a controlled supply of feed and water. In order to properly carry out animal nutrition experiments such as nutrient digestibility and balance, it is necessary to use metabolism cages to guarantee an easy collection of feed refusals, feces, and urine for this purpose. In addition, since animal comfort ought to be a major consideration in the design of metabolism crates, these structures need to be in line with the morphology of the animals in order to minimize any additional restrictions on their behavior, particularly when metabolism crates are integrated into respiration chambers.

In the past, developed nations have traditionally developed a significant amount of the scientific foundation for the study of nutrient requirements that supports contemporary ruminant livestock farming under highly controlled conditions. When it comes to SAC, studies that use indoor facilities with metabolism crates to conduct basic research in this area are particularly scarce in the Andean countries. At least for ruminant animals, there are acceptable methods for extrapolating research findings from suitable indoor research facilities (controlled environments) to various free-range-like scenarios. Therefore, studies using SAC may also be able to replicate similar principles [8].

The study's goals were to assess the performance of alpacas housed inside and fed at a maintenance intake level as well as the operability of metabolism crates. Establishing a suitable laboratory for animal energetics, balance trials, and metabolism studies with alpacas destined for the Andes is largely dependent on this kind of research.

The proposed metabolism crates for conducting animal nutrition studies with alpacas at 3800 meters above sea level were tested in three experimental phases-the initial design, the prototype adjustment, and the validation phase—to determine whether or not they were viable. At the Marangan Research Station of the Veterinary Institute for Tropical and High Altitude Research (San Marcos University in Cusco, Peru), all of the trials were carried out during the dry season from August to October 2019. During the study period, the relative humidity was 7.82 percent, and the ambient temperature ranged from 8.4°C to 25.8°C.

The current study was carried out with a license that was approved (number: CEBA 2021-35) from the Veterinary Faculty, under the direction of the Marangan Research station's local animal welfare committee. Every effort was made to alleviate as much suffering as possible. Following recommendations, the alpacas were gradually trained to the indoor conditions (confinement in metabolism crates) at the beginning of the study.

A measuring tape measuring two meters in length was used to take a number of morphometric measurements from thirty adult male alpacas (Huacaya breed) born between 2013 and 2015, when they were five years old on average. Alpacas were trained to stand on a flat surface with a companion nearby for this purpose. The following steps were taken once the animal was properly stopped on a flat surface: 1. height at the withers (the space between the scapula), height of the rump, which is the hip joint's middle point, total length (the distance between the hip and shoulder joints), 4 Height from the ground to the upper frontal edge, also known as forehead height, hip width is the distance between the middle of the hip joint and the opposite joint [9].

The animals were weighed using an electronic scale with a sensitivity of less than 0.5 kg (Tru-TestTM - Econo Plus;) after the tape measurements were finished. (NZ: Auckland) Biometric measures' descriptive statistics are presented. Following the proposed standard model for herbivores, these served as the foundation for the initial design of the two stainless steel metabolism crates. This model has a cubicle for the head and neck, containers for food and water (feeders and drinkers are on the front side of the metabolism crate), and a container underneath for collecting urine. Before beginning the study indoors, two metabolism crates were constructed after the initial prototype was designed and placed in a well-ventilated room [10].

CONCLUSION

Alpacas were divided into pairs in order and remain in the crates for five days. The animals could easily get in and out of the metabolism crates by using a ramp. Alpacas were fed a 70:30 ratio of oat hay and alfalfa pellets on an as-fed basis twice daily (0700 h and 1900 h) for ad libitum intake. Using a forage chopper, oat hay was chopped to a mean particle size of approximately 2 cm. An additional drinker, similar to the one that was already included in the metabolism crate, was used to correct daily intakes for water evaporation and was kept out of the animal's reach.

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CONFLICT OF INTEREST

None.

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