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Growth curves and genetic parameters for growth traits in Bolivian llamas

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Abstract

The present study was carried out in the High Andes of the Department Cochabamba, Bolivia. Two types of llamas were found in the study area: Th'ampullis with higher fleece yields and fitting a fibre type; Kh'aras used as pack animals and fitting a meat-type. Growth curves for height at withers (HW), body length (BL), chest circumference (CC), abdomen circumference (AC) and body weight (BW) were described with the non-linear Brody function. The differences between sexes or types, except in the case of BW, were small.

Equations for predicting body weight from different body measurements that could be easily obtained under field conditions were calculated. Reasonable fits were obtained with the inclusion of chest circumference and body length or chest circumference alone.

Heritabilities and genetic correlations were estimated using animal model procedures based on mother–offspring relationships. Heritabilitiy estimates were 0.36, 0.27, 0.15, 0.09 and 0.11 for BW, HW, CC, BL and AC, genetic correlations ranged from 0.55 to 0.94.

Keywords: Llamas; Body measurements; Genetic parameters

1. Introduction

According to UNEPCA (1999), the population of llamas in Bolivia amounts to 2.4 million heads, representing nearly 60% of the world llama stock. This population is kept by approximately 52,000

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rural families mostly poor and marginalized. A large proportion of the llama population in Bolivia is raised in marginal areas above 3800 m above sea level (masl) in typical high Andean agro-ecosystems where, due to the animals' adaptation to high altitude, its contribution to the livelihood of resource poor farmers is paramount. Llamas provide the farm household with a variety of products such as fibre, meat, manure and are still used as pack animals. While the farm household consumes the majority of llama products with only a small fraction sold, progressively more llama meat and fibre are being marketed reflecting a growing demand.

The aim of the project is to provide a comprehensive description of the system of llama keeping and investigation of possible pathways of improvement. Aspects concerning the national and international market for llama fibre were also investigated (Delgado, 2003; Delgado et al., 2003; Nürnberg and Valle Zárate, 2002). The aim of this study is the description of growth curves for different body traits, calculation of equations for predicting body weight by different body measurements and the estimation of genetic and phenotypic parameters to assess opportunities for genetic selection. As Sölkner et al. (1998) stated, changes in performance achieved by selection are small but permanent and cumulative.

2. Materials and methods

2.1. Location

The study was carried out in 4 rural communities located at the eastern slope of the Andes in Bolivia, in the Province of Ayopaya, Department Cochabamba (17°00′S, 66°30′W).

Communities 1 and 4 are located at 4300 masl, community 2 at 4100 masl and community 3 at 3800 masl. The distance between the communities varies between 3 and 10 km. The rainy season occurs from December to March and the average annual rainfall is about 600 mm. Annual frosts amount to 150 days occurring any time in the year. Animals are kept on natural pasture without any supplementation. The average herd size is 52 llamas with a wide range from 6 to 254 animals (Delgado, 2003). A total of 65 farmers affiliated to ORPACA (Organización Regional de Productos Agropecuarios de Calientes) participated in the study.

2.2. Data description and traits recorded

Data collection took place between November 1998 and January 2001. Body measurements were recorded from 2821 llamas, providing 3894 sets of five body measurements, and live weights were collected from 1536 llamas.

Height at withers (HW) was measured from the highest point of the *processus spinalis* of the *vertebra thoracica* to the floor, chest circumference (CC) was taken behind the forelegs, body length (BL) from the highest point of the *processus spinalis* of the *vertebra thoracica* to the *os sacrum* and abdomen circumference (AC) was taken in front of the hind legs (Fig. 1). Body linear measurements were taken with a tape and weights (BW) were recorded with an electronic balance.

Two different types of llamas were distinguished according to Parra (1999). Kh'aras have no fibre on extremities, head and ears and show a reduced fibre growth on the neck, whereas Th'ampullis show abundant fibre covering extremities, neck and head.

Age was assessed by inspection of the dental plate in young animals and relied on information from farmers in older animals.

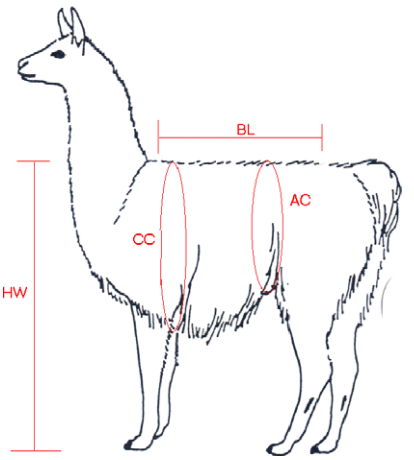

Fig. 1. Body measurements. HW—height at withers, CC—chest circumference, BL—body length, AC—abdomen circumference.