Genetic parameters for fleece weight and fibre characteristics in Huacaya alpacas

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Summary

The aim of this study was to estimate the genetic parameters for fleece weight, the mean and the standard deviation of the fibre diameter in Huacaya alpacas at first shearing. The data was collected from the Mallkini Ranch (Puno). A total of 2430 records at first shearing of Huacaya Alpacas (1228 males and 1202 females) from 2012 and 2015 were analyzed. The genealogy of 11802 Huacaya alpacas (411 sires and 3237 dams) was used. The genetic analysis was performed using a trivariate animal model, including the additive genetic effect of the animal as a random effect; herd, sex and month-year group of shearing as fixed effects; age of shearing as covariate. The direct heritabilities were 0.41 ± 0.05, 0.48 ± 0.06 and 0.27 ± 0.05 for fleece weight, mean and standard deviation of fibre diameter, respectively. The direct genetic correlations were 0.35 ± 0.09 between fleece weight and fibre diameter, 0.40 ± 0.11 between fleece weight and standard deviation, and 0.71 ± 0.06 between fibre diameter and standard deviation. According to the genetic parameters, the fleece weight should be considered in the breeding program of fibre characteristics in alpacas.

Keywords: alpacas, Huacaya, genetic parameters, fleece weight, fibre diameter, standard deviation

Introduction

The alpaca is an animal genetic resource of Peru, which rearing it is the main revenue for populations in the High Andean regions. Alpaca fibre is exported mainly to markets of Europe, North America and Asia, generating new foreign exchange to the country. Therefore, the improvement of the quality of its products through animal breeding will contribute to improve the revenues of the farmers, the trading and the national textile industry (Gutiérrez, 2011).

The estimates of genetic parameters are required to design effective animal breeding strategies (Gutierrez et al., 2009). The genetic and phenotypic correlations must be considered in these programs, because if ignored they could produce unexpected consequences in the genetic response (Gutiérrez et al., 2014).

The heritability for fleece weight has been estimated for several shears with variable results (Wuliji et al., 2000, Paredes et al., 2011 & Gutiérrez et al., 2009). Likewise, the reports of genetic correlations between fleece weight and other characteristics are rare. The objective of the present research was to estimate the genetic parameter for fleece weight, the media of fibre diameter and its standard deviation in Huacaya alpaca of first shearing, which could be used in selection schemes for obtaining an integral improvement of textile value.
Material and methods

The research was realized in the Mallkini Station, center of animal breeding and genetic of alpacas, located in Azangaro, Puno Province, which altitude oscile between 4000 and 4500 m.a.s.l. The period of study was between 2012 and 2015. The productive information correspond to 2430 registers of first shearing of Huacaya alpaca, 1228 males and 1202 females. The genealogic information correspond to 10481 crias with completed information to 88.8% in sire and 94.7% in dams, sums a total of 11802 Huacaya alpacas, 411 sires and 3237 dams, across 5 generations. The model of analysis was a trivariate animal model, considering animal as the additive genetic effect and the residual as the random effect; herd, sex, and month-year group of shearing (March 2012, February 2013, March 2013, November 2013, November 2014 and November 2015) as fixed effects; age of shearing as linear and quadratic covariate. The genetic analysis was realized with REML methodology using AsReml 4.1 Software.

Results and Discussion

The Table 1 presents estimates of heritability (on the diagonal), genetic correlations (above the diagonal) and phenotypic correlations (below the diagonal) from the evaluated traits, with their respective standard errors.

Table 1. Heritability, genetic/phenotypic correlations.

<table>
<thead>
<tr>
<th>Trait</th>
<th>FW(^1) Mean ± Std</th>
<th>FD(^2) Mean ± Std</th>
<th>SD(^3) Mean ± Std</th>
</tr>
</thead>
<tbody>
<tr>
<td>FW</td>
<td>0.41 ± 0.05</td>
<td>0.35 ± 0.09</td>
<td>0.40 ± 0.11</td>
</tr>
<tr>
<td>FD</td>
<td>0.28 ± 0.02</td>
<td>0.48 ± 0.06</td>
<td>0.71 ± 0.06</td>
</tr>
<tr>
<td>SD</td>
<td>0.15 ± 0.02</td>
<td>0.61 ± 0.01</td>
<td>0.27 ± 0.05</td>
</tr>
</tbody>
</table>

\(^1\) Fleece Weight
\(^2\) Fibre Diameter
\(^3\) Standard Deviation

The heritability reported by other authors have been estimated for many shears (Gutiérrez, 2011), in some cases included Suri alpacas (Gutiérrez et al., 2009; Cruz et al., 2011) in the same genetic analysis.

The heritability estimates for fleece weight was between high values as 0.63 ± 0.22 (Wuliji et al., 2000) and 0.71 ± 0.25 (Paredes et al., 2011); and lower values as 0.098 ± 0.016 (Gutiérrez et al., 2009). This difference could be attributed to estimated values for fleece weight at first shearing, where the phenotypic variance is lower than fleece weight considering several shears.

The heritability for medium fibre diameter is higher than presented in other reports, 0.36 ± 0.20 (Paredes et al., 2011); 0.369 ± 0.012 (Cervantes et al., 2010); 0.342 (Gutiérrez et al.,
2014) and 0.412 ± 0.015 (Gutiérrez et al., 2009). On the other hand, some values are lower than given in other reports, 0.73 ± 0.19 (Wuliji et al., 2000) and 0.535 ± 0.032 (Cruz et al., 2011).

The heritability for standard deviation is lower than other reports, 0.417 ± 0.013 (Cervantes et al., 2010) and 0.389 (Gutiérrez et al., 2014); and higher than 0.070 ± 0.038 as reported by Cruz et al. (2011). The genetic correlation between fibre diameter and standard deviation was similar to other reports, 0.677 (Gutiérrez et al., 2014), 0.719 ± 0.010 (Cervantes et al., 2010) and 0.716 ± 0.110 (Cruz et al., 2011). A positive and high correlation between fibre diameter and standard deviation indicates that if selecting for finer fibre, indirectly homogeneous fibre is selected.

The genetic correlation between fleece weight and fibre diameter was higher than in other reports, 0.116 ± 0.060 (Gutiérrez et al., 2009) y 0.28 ± 0.16 (Paredes et al., 2011). A positive correlation between fleece weight and fibre diameter indicates that if selecting for finer fibre, there is an indirect selection for lower performance of the fibre; however, the value of the correlation indicates that we can find animals with desired characteristics like performance and fibre quality.

The genetic parameters could be used for the determination of a selection index that include the studied characteristics. Future researches could include the determination of relative economic values and the estimate of genetic correlation with other characteristics.

**Conclusion**

The heritability estimates and the genetic correlations indicate that the fleece weight should be considered in the breeding programs of Huacaya alpacas.

**List of References**


