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Characterization of camel fibers in regions of Kazakhstan and Uzbekistan

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ABSTRACT

To generate information on Central Asian camel fiber quality, fiber samples of 712 camels from Kazakhstan and Uzbekistan were characterized. Fixed effects involved geographical location, animal age, sex, coat color and species. Camel species are Bactrians (*Camelus bactrianus*), dromedaries (*Camelus dromedarius*) and crosses between both species, hereafter referred as hybrids. Fiber traits included clean fine fiber yield (CY), mean fine fiber diameter (MFD), mean fine fiber diameter coefficient of variation (MFD CV), fine fiber curvature (Curv) and fine fiber staple length (SL). The arithmetic averages of CY, MFD, MFD CV, Curv and SL were respectively 37.3%, 18.0 μm, 30.6%, 87.7 °/mm and 46.0 mm for Bactrians; 29.1%, 21.2 μm, 30.3%, 78.2 °/mm and 52.7 mm for dromedaries; and 42.7%, 17.9 μm, 29.5%, 89.9 °/mm and 47.2 mm for hybrids. Significant age by species interaction was detected for all traits. Overall, Bactrian camels had higher CY, lower MFD, higher Curv and lower SL than dromedaries ($P < 0.05$). The geographical locations significantly differentiated CY and Curv but not the other traits; thus, for the locations studied little could be gained by looking into location variability when planning genetic improvement programs. There were no significant sex differences for all the studied traits, whereas significant differences due to the color of the coat were found only for Curv. The residual phenotypic correlations among CY, MFD and Curv were all high and would be favorable for selection purposes. Likewise, the residual phenotypic correlations between each of these variables with SL would be unfavorable if selection targets an increased SL. The study detected heterogeneity for most fiber quality traits, suggesting that a base is in place for fiber quality improvement.

1. Introduction

Several desert regions of Central Asia have been historically associated with the breeding and production of camels for their skins, fibers, milk, meat, manure and as a means of transportation (Musaev and Baimukhanov, 2001). Through cooperative and state owned organizations during the Soviet Union era, camel fine fiber production reached a commercial orientation that was totally disarrayed at the end of that regime, when individual ownership of land

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and animals were transferred to smallholders (Suleimenov et al., 2006; Iñiguez and Mueller, 2009).

Over the last 2 decades camel producing areas of these countries received minor investment for their development which caused a decline in fiber production and marketing. The present 310 thousand head population of Central Asian camels is concentrated in Kazakhstan and Turkmenistan, where camel populations amount to 169.6 and 120.0 thousand animals, respectively (FAO, 2013). The camel population of Uzbekistan totalizes 20 thousand animals.

Improved management and breeding strategies, along with an improved value chain and marketing for animal fibers, have been proposed to help fiber producing farmers to overcome production constraints and enhance their livelihoods (Musaev and Baimukhanov, 2001; Kerven et al., 2002; Iñiguez and Mueller, 2009).

Baseline information on camel fiber production and camel fiber quality in Central Asian countries is limited but necessary to guide development investments and breeding programs. This work was designed to assess the variability and quality of camel fibers produced in representative locations of Kazakhstan and Uzbekistan and its results are expected to help design programs to improve the incomes and livelihoods of pastoralists.

2. Materials and methods

2.1. Sampling

In March 2002, samples of camel fiber were obtained at different types of farms (cooperative, private and smallholder farms) and locations in Kazakhstan and Uzbekistan where camel fibers are collected each year around April. A total of 712 samples were collected in desert dry locations, these involving 356 samples from southern Kazakhstan (in Otyrar Kuat and Sozak, South Kazakhstan Province), 180 samples from north-central Uzbekistan (in Madaniyat-Kanimekh, Navoiy Province), and 176 samples from northwestern Uzbekistan (in Karakalpak Province). The sampling considered main producing areas and accessibility to locations by the research team.

The samples were obtained from the animal's right mid-side around the ribs, cutting the fibers with scissors at skin level. Geographical location, animal age assessed by inspection of the dental plaque, and color of the coat were determined. In addition to this information, the sex and species: whether dromedary, Bactrian or crosses between these species hereafter referred as hybrids were also recorded. The sampling team in Kazakhstan attempted to obtain equal numbers of Bactrians, dromedaries and hybrids in each flock, whereas in Uzbekistan this was not possible due to the few dromedaries and hybrids available in the flocks. The total number of samples tested for MFD was 298, 182 and 232 for Bactrians, dromedaries and hybrids, respectively and the total number of samples per age group ranged 57–97 (Table 1). Individual samples were labeled with the information obtained and tightly closed in an envelope before analysis.

2.2. Characterization of fibers

Fiber samples were analyzed at the Animal Fiber Laboratory of the Argentinean National Institute for Agricultural Technology (INTA) located in the city of Bariloche. An attempt was made to separate fine fibers and guard hairs by means of a Shirley Analyzer (Couchman and Holt, 1990) but the instrument did not perform this task satisfactorily. The greasy samples were first weighed (average 9.9 g) and then manually dehaired, leaving a fraction hereafter referred as fine fibers. The greasy fine fibers obtained were weighed, scoured (following standard IWTO procedures for greasy wool scouring), oven dried and reconditioned at 65% relative humidity and 20 °C. The clean conditioned samples were weighed and the clean fine fiber yield (CY, expressed in %) was calculated as the relation between clean fine fiber weight and the original greasy sample weight.

The fine fiber fraction of the samples was first measured for staple length (SL, expressed in mm) by stretching up to 5 staples of each sample on a gridded pad and measuring the median staple and then mini-cored to obtain 2 mm

Table 1
Number of observations involved in the different age × species class groups.

Trait	Species	Age (years)									Total
		1	2	3	4	5	6	7	8	9	
CY	Bactrians	25	39	44	46	26	34	26	16	39	295
	Dromedaries	21	20	19	21	19	22	19	21	19	181
	Hybrids	24	31	33	27	22	6	41	20	27	231
MFD	Bactrians	25	40	45	46	26	35	26	16	39	298
	Dromedaries	21	20	19	21	19	22	20	21	19	182
	Hybrids	24	31	33	27	22	6	41	20	28	232
Curv	Bactrian	25	40	45	46	26	35	26	16	39	298
	Dromedaries	21	20	19	21	19	22	20	21	19	182
	Hybrids	24	31	33	27	22	6	41	20	28	232
SL	Bactrians	25	39	45	46	26	35	25	15	39	295
	Dromedaries	19	20	18	21	19	22	20	21	19	179
	Hybrids	24	31	33	27	22	6	41	20	27	231

CY = clean fine fiber yield; MFD = mean fine fiber diameter; Curv = fine fiber curvature and SL = fine fiber staple length.