



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

# IJDR

*International Journal of Development Research*  
Vol. 08, Issue, 03, pp.19416-19419, March, 2018



ORIGINAL RESEARCH ARTICLE

OPEN ACCESS

## BASIC CASHMERE QUALITY INDICATORS OF GOATS OF ZALAAJINST-EDREN CASHMERE BREED

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### ARTICLE INFO

#### Article History:

Received 10<sup>th</sup> December, 2017  
Received in revised form  
26<sup>th</sup> January, 2018  
Accepted 23<sup>rd</sup> February, 2018  
Published online 30<sup>th</sup> March, 2018

#### Key Words:

Cashmere yield,  
Fiber length, Fiber diameter,  
Thickness and Net fiber yield.

### ABSTRACT

In the present A work on selective breeding aimed at further consolidation of key qualities of the race of Zalaajinst- Edren white goats towards increased length and fineness of fibers and upgrading phenotypic characteristics (Dorjbat Yo, 2013) resulted in identification of major productive and phenotypic parameters. Four analogically selected age/sex groups such as: young male and females, and adult females (does) and males (bucks) out of the herd of goats of Zalaajinst-Edren cashmere breed kept under year-round pasture grazing were sampled for studies on cashmere quality and quantity. The intrinsic characteristics of the goats of this breed are the unique white color of cashmere fiber, compact body appearance and excellent adaptation to the Mongolia's Gobi natural environment. The productive parameters of the goats are less different from other goat populations of the same productive profiles: cashmere yield 406.3 (324.2 to 512.4) grams, cashmere fiber diameters – 15.2 (15.1-15.8) microns and fiber length – 60.3 (60.0-68.6) mm with net fiber yield of 55.3% (52.2-58.4%). Other vital appearances, such as body size, milk yield and flesh quantity are similar to those of other goat breeds and selected races reared in Mongolia (Dorjbat Yo, 2014). The cashmere qualitative and quantifiable data of the breed suggest that fibers this breed produces are longer and fine (Dorjbat Yo, 2015). The genotypic patterns of white body and fiber color of goats of Zalaajinst-Edren breed are strongly consolidated to produce white cashmere, only. On average for all population, cashmere yield exceeds other breeds and races by 23.3-43.4 percent with other quality parameters: fiber length – longer by 0.05-25.3 percent and net cashmere fiber yield averaging at 43.49-62.15 percent. The mean fiber diameter ranges at 15.1-15.6 microns. In terms of bodyweight, body size and milk yield, they do not significantly differ from other goat breeds of similar productive classes. These aggregated unique qualitative and quantitative characteristics suggest that Zalaajinst- Edren breed can be used as an improver of black and brown goats raised in the Gobi region.

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Citation: Dorjbat Yol and Erdenebaatar Batjargal, 2018. "Basic cashmere quality indicators of goats of zalaajinst- edren cashmere breed", *International Journal of Development Research*, 8, (03), 19416-19419.

### INTRODUCTION

Goat cashmere represents the only high value and high competitive livestock product for the Mongolian export markets.

Amongst cashmere fibers of various colors, white downy is valued as an organic raw material that meets the top demands of luxury processing in its natural and original quality without any artificial coloring. To increase the volume of Mongolia's cashmere export and uphold the competitiveness of high quality organic cashmere products for world cashmere markets, it needs to raise the outputs of white cashmere along with improved quality of the fibers. This can be achieved

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through multiplication of the population of white cashmere goats in Mongolia and comprehensive genetic upgrading. A white-colored cashmere goat population created by a multiple year diligent selective breeding accompanied with strenuous research activities, was officially recognized by the State Approbation Commission and approved in 2015 by a decree #A-59, of the Minister of Food and Agriculture of Mongolia as a distinct Zalaajinst-Edren breed of cashmere goat (Dorjbat Yo, 2015). The body conformation of goats of the desirable flocks is compact without constitutional defects. Body color is entirely white, hoof and legs are strong. Wool cover comprises a unique white color fleece with long and fine cashmere fibers. Based on body size, body conformation and cashmere fiber characteristics, three genealogical lines can be identified: "Zalaa" with fine cashmere fibers, "Suvdan" with larger body size and "Myandsan" with thicker and dense wool cover (Dorjbat Yo, 2014). As a result of planned breeding program that is being implemented in 8 soums in the Gobi region of Bayankhongor province, the overall count of the goats of this breed has been over a million heads as the main source of white cashmere production in Mongolia – to 350-400 tons annually (Dorjbat Yo, 2013).

## MATERIALS AND METHODOLOGY

**Research sites:** The herd of goats kept under pasture grazing in Shinejinst and Bayan-Undur soums Bayankhongor aimag.

**Sampling:** Four age/sex groups of Zalaajinst white breed goats were sampled for studies on cashmere quality and quantity: young male and females, and adult females (does) and males (bucks) with analogically selected 60 to 120 animals.

**Surveying cashmere yield:** All goats belonging to each age/sex group were combed and fibers collected were weighed with accuracy of 0.01 grams.

**Fiber quality study:** A pack of parameters such as fineness of cashmere fiber and its distribution over different parts of the body, normal and true length of fiber and proportion of cashmere in the fleece was studied for all age/sex groups sampled. The quantity of samples was 1-2 grams, which then were analyzed at the cashmere research laboratory of RIAH and Altai Cashmere, LLC (Dorjbat Yo, 2014). All data underwent to a biometric analysis (Altangerel, 2007).

## RESULTS

### Cashmere yield

On the average for whole population, the yield of cashmere fiber was 406.3 grams, which shows that this indicator has increased by 136.9 grams or 46.1% compared to the same indicator when the population recognized as a selected race (see Table 1). The increase in the fiber yield made possible due to the accurate selection of desired sires for pedigree with an associated strong culling. Another influential factor was that the local goats who served as parent population had inherited high yield traits from native goats and Don crossbreds. As the table 2 shows the average cashmere yield of Zalaajinst-Edren white breed exceeds other breeds and races by 94.6-176.3 grams. Therefore, it can be concluded goats of the breed are one of the high productive goat populations in Mongolia. Can be concluded goats of the breed are one of the high productive goat populations in Mongolia.

### Cashmere fiber diameter

The fiber diameter of goats, averaging at 15.2 microns for the population varies across different age and sex groups: 14.57microns for young females, 14.97 microns for young males, 15.26 microns for adult females and 15.82 microns for adult males (Figure 1). It is believed that the fineness of cashmere at different parts of the body is important for the selection of most suited parameters for technological processing. To identify the microns of cashmere fiber of goats of Zalaajinst-Edren white breed that meet the requirements of cutting-edge processing technology, some 23.7 thousand fibers sampled from different body parts were measured.

The result showed that the fineness ranging at 13-16 microns, which are the suited, comprises 89.69% with 2.86% finer than 13 microns and 7.64% coarser than the average. The mean fiber diameter of samples of white cashmere of Zalaajinst-Edren goats in Shinejinst soum purchased by Altai Cashmere, LLC was 15.6 microns, by which our conclusions (see Table 3) that Zalaajinst-Edren white goats are distinct producers of most fine cashmere in Mongolia. Referring to these findings, a conclusion can be made that the overwhelming portion of cashmere fibers of the breed are evenly distributed all over the body and no remarkable age/sex dependent deviations observed (see Table 4).

Table 1. Cashmere fiber yield, grams

Age and sex	n	M±m	δ	CV	Lim
Young female	120	324.2±9.56	85.7	27.13	133.9-360.8
Young male	30	353.7±10.8	62.4	19.45	240.1-417.0
Adult female	120	435.1±11.5	72.9	27.59	174.4-470.9
Adult bucks	60	512.4±12.39	73.0	22.35	•

Table 2. General review of cashmere yield of goats bred in Mongolia, grams

Breed and selected races	Young female	Young male	Adult female	Adult bucks	Researcher and year
Mongolian native goats	201	210	246	281	
Altai Red breed	350	386	463	598	D. Altangerel, 2015
ErchimBlack race	230	250	285	350	N. Nadmid, 1993
Ulgii Red race	254	236	310.9	348	Yo. Zagdsuren, B. Mandakh, 1996
Bayandelger Red race	250.1	277	420	430	G. Uranchimeg, 2015
Zavkhan Grey breed	389	393.2	476	548	L. Lkhaasuren, 2015
Zalaajinst White race	263.5	258.5	286.5	377	N. Nadmid, 1998
Zalaajinst-Edren breed	324.2	353.7	435.1	512.4	Yo. Dorjbat, 2015

**Table 3. Diameter of fibers of different breeds and races of Mongolian goats, microns**

Mongolian breed, 1990	Altai Redbreed, 2016	Bayandelger breed, 2016	Ulgii Red race, 1996	Zavkhan Grey breed, 2015	Erchemlack race, 1996	Zalaa Jinsy white race, 2000	Zalaajinsy-Edren breed, 2013
14.5	15.4	15.3	16.0	15.2	15.3	15.6	15.2

**Table 4. Distribution of fiber diameter, percentage**

	Number of fivers measured	Distribution of fiber diameter, microns			
		5.0-13.0	13.1-15.0	15.1-16.0	16.0<
Young female	23940	3.9	50.45	34.98	5.92
Young male	23758	2.8	57.01	33.66	5.7
Adult female	23570	2.2	56.78	32.9	7.14
Adult bucks	23700	1.8	54.48	34.5	7.9
Average	23742	2.68	54.68	35.01	7.64

**Table 5. Compared data on cashmere fiber length of selected goat breeds and races, cm**

Breed, races and surveyors	Mongolian breed /D.Tserensonom, 1970/	Breed group, Altai Red/D.Altangerel, 2015/	Bayandelger breed /D.Munguntsetseg, G.Uranchimeg, 2015/	Ulgii Red race /B.Mandakh, 1995/	Zavkhan Grey breed/L.Lkhaasuren, L.Choi-Ish, 2015/	Erchem Black race/N.Nadmid, 1996/	Zalaa Jinsy white race/N.Bayarmagnai, 1999/	Zalaajinsy-Edren breed/the authors. 2015/
Normal	4.5-5.0	5.7	4.98	5.6	4.41	4.88	5.0	6.03
True	4.57-5.32	5.5-6.0	4.77-5.19	5.54-6.16	4.28-5.85	6.1-9.3	5.28-7.43	6.64-7.03

**Fiber length:** Goats of Zalaajinst-Edren breed have long coarse hair, which postulates down fibers are to be respectively longer. As the age advances, both the cashmere and coarse fibers tend to become longer and thicker (Figure 2). The parameters of cashmere quality suggest that the objective of selective breeding of this population should focus to keep the length of cashmere fibers not less than 6 cm, in average. As compared to other cashmere breeds and races, the mean length of cashmere of goats of Zalaajinst-Edren breed is longer 3.3-15.3 mm or 0.05-25.3% (for details see Table 5). However, this indicator is less than Kasgor type, by 32.6-48.4%.

#### Down fiber yield

The proportion of true cashmere fibers in the total fleece of goats of Zalaajinst-Edren white breed are respectively: 54.2-57.15% in young females, 54.4-56.3% in young males, 52.2-54.3% in adult females and 54.0-58.4% in adult bucks, which averages at 52.2-58.4% for the population (Figure 3). This indicator varies across different parts of the body of white goats: around the ladder - 54.41-62.15% and hips -43.49-50.56%.

## DISCUSSION

The first scientific evidence of cashmere quality of native goats in Mongolia emerged in mid 1930s, when Yu. L. Goroshenko (1936) publishes his findings as a Mongolian goat produces 110-160 gram down with diameter of 10-26 microns (Nadmid *et al.*, 2012; Shuljenko, 1954). Amongst the existing cashmere in Mongolia, multiple populations with various body and cashmere colors can be identified, which were created through various breeding programs based on the selection with fleece colors.

However, Zalaajinst-Edren goats are the only white flocks. The inheritance of this trait is extremely high, as in 95 percent of all goats occurs single white color and 99-100 percent of kids from white vs. white breeding are only white, as well. This evidently shows that the inheritance of the white color in this population has been utterly consolidated and this trait has become massive dominant (Dorjba Yo, 2014; Dorjba Yo, 2015 ).

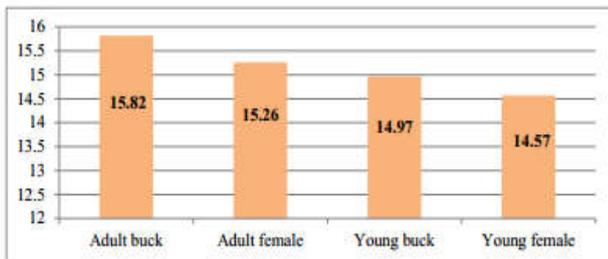


Figure 1. Cashmere fiber diameter, microns

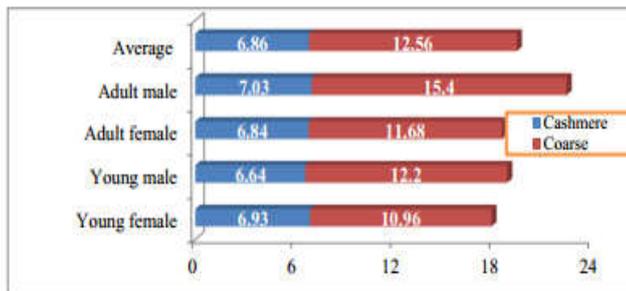


Figure 2. Length of cashmere and coarse fibers, cm

In the near and mid future, the breeding of the goats of Zalaajinst-Edren breed should be focused on two major directions: (i) to maintain the high inheritance of supreme white color, and (ii) preserve the genetic purity of the population. It is known that white color in goats is result of being superseded by genetic directive that prevent melanin from being placed in the hair (Phillip Sponnenberg, 1995). The genetic basis and mechanisms of high inheritance of the white color could be explained by a fact that the sire and dam, each must contribute one /pair of genes, but grandparents get much iffier. Sponenberg (Phillip Sponnenberg, 1995). dismisses that “recessive traits can arise out of nowhere since it can be masked by the dominant. A dominant trait cannot be masked”. Another prove is that red calves occur in black herds of Angus herd because red is recessive to black. The opposite situation – black calves never occur in red herds because red recessive genes cannot dominate black. Again, in his another paper, Sponenberg (Phillip Sponnenberg, 1995) notes.

“In nearly all breeds except the Angora, the answer here will be recessive black”. He continues by saying “if the factors that are present are dominant, it is likely that the goat is masking some recessive genes as well, and could pass those along to offspring. If the goat only shows recessive factors, then it will breed true if mated to a similar goat, or will pick up the dominant genes from the mat e and those will be expressed in the kids”. It seems our discussion about genetic mechanisms is a bit longer, this the case and the way we achieved the creation of white goats producing highly acknowledged and high demanded by markets, cashmere. Another option for breeding strategy of the breed, as we see is the launch of well-planned crossing of existing lines towards improvement of both fiber yield and fineness without affecting the endurance and high adaptive qualities Zaporajtsev, E.B. 2003. Provides ambitious results of such a scheme with goats originated from Pridon and native Kazakh breeds. Mating of dams of fine cashmere/low yield line with those of high fiber yield results in progenies with more yield of fine fibers without serious impacts on the body size and survival.

This would be an orienteer for our future work. Based on testing of multiple variants of selective breeding with goats, another source (Zaporajtsev, 2015) warns that selection for dams and sires for fineness of fibers in cashmere goat raising should not be leading to either shortening of the fiber length or decreasing the fiber yield. Researchers argue that the final color of the goat is due to the interaction of eumelanin (black/brown), pheomelanin (red brown/tan/cream/white), and white spotting (white). It takes practice to see every goat as some combination of these, but this approach is very helpful in figuring out what genes a goat is expressing (<http://www.acga.org.au/goatnotes/E002.php>). It is worth to remind that as mentioned above, the work with crossing black crossbreds from Gobi Gurvansaikhan breed and native goats colored in different assembles. Having it in mind, we assume that the selection, we practiced may have led to demonstrative dominance of recessive genes (overriding of pheomelanin in the colors). As described by Andrew James (<http://www.acga.org.au/goatnotes/E002.php>), two recessive genes, both the phenotype and the genotype of the animal will match the trait conditioned by the recessive gene.

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