Cashmere Production from Maraz Goats[¥]

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Abstract

Cashmere/down production of 118 Maraz goats (36 males and 82 females) aged one to five years and older was investigated. Evaluation was based on the down percentage in undercoat. The overall mean of live weight, fleece weight, down percentage, fiber diameter and fiber length were 26.8 kg, 699.7 g, 27.7 %, 22.5 μm and 57.7 mm, respectively.

Live weight, fleece weight and down percentage were significantly heavier in males than in females. Age affects significantly all studied traits except the fiber length. The effect of interaction between age and sex was significant on most of the studied traits. Correlations among traits were also studied. Possibilities of increasing the cashmere production of Maraz goats in Iraqi-Kurdistan by genetic improvement through selection and improved management are considered.

Keywords: Maraz goat, Body weight, Cashmere quality.

Introduction

Maraz (Kurdi) goats are raised at high altitudes in the mountains of Iraqi Kurdistan. They belong to the Cashmere bearing goat breeds [1-4]. The main purpose of raising Maraz goats is to utilize their outercoat fibers in the manufacture of Kurdish national costume while their undercoat fibers are ignored due to the unfamiliarity of the breeders with the importance of cashmere and the possibility of processing it. Consequently, the breeders' tendency was imposed on increasing the rate of outercoat and decreasing the rate of undercoat. In this respect, it should be mentioned that there was not any importance towards the improvement of animal resources, in particular Maraz goats, in the region, due to the historical background of political crises in this part of the world. Therefore, so far no data have been published concerning the properties of undercoat of Maraz goats.

Base line production data for Maraz down-bearing goats should be established in order to plan for genetic improvement. This research is aimed to describe the undercoat production of these goats quantitatively and qualitatively, together to investigate the effect of sex and age on studied traits.

Materials and Methods

One hundred and eighteen fleece goats (36 males and 82 females) of different ages (1, 2, 3, 4, 5 and over years) were obtained randomly from a private migrating flock in Dol Naran (latitude 36°16´ N, longitude 44°50´ E,

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elevation 1557 m) in Rania District/ Sulaimani Governorate, Iraqi Kurdistan region.

All the animals were kept together during the previous twelve months on pastures, supplemented with hay, wheat straw and black barley grain mixtures when necessary. In the late of March 2002, the goats were hand shorn (prior to initiation of Shedding) and subsequently weighed. Whole raw fleeces were weighed too and packaged individually and sent to the skilled combers for dehairing procedure by traditional combs. Weights of the outercoat and undercoat were recorded. A representative sample was randomly drawn from each undercoat, rinsed in non-ionic detergent and air dried. Then the weights of the different fiber types (down, guard hair & kemp fibers) were determined by visual separation in reference to the method of Doney and Smith [5]. Weights of the down fibers produced per fleece could be expressed as down fibers percentage multiplied by total weight of greasy undercoat.

Average fiber length was calculated by measuring 50 clean fibers randomly by the ruler from each down sample. Diameters of 200 fibers were measured by the projection microscope (Lanameter) from each sample in accordance to the ASMTT [6].

Statistical analysis was carried out using the SAS [7] program to determine the effect of age, sex and their interaction on studied traits and correlations among them. Mean differences were tested using Duncan's Multiple Range Test using GLM of SAS [7]. Data in the form of percentage were converted to arcsine.

Results

Live Body Weight

Table (1) shows that, the overall mean of body weight was 26.8 kg, ranged from 12.5 to 47.0 kg. The effect of age, sex and their interaction on body weight was highly significant ($p \leq 0.01$, Table 2). Body weight increased from 19.0 kg in the group of 1 year old to 36.1 kg in the group of ≥5 years old. Males were heavier than females (31.2 Vs. 24.9 kg, Table 1).

Fleece Weight

The overall mean of greasy fleece and their components, outercoat and undercoat weights were 699.7, 563.4 & 136.3 g respectively (Table 1). The effect of age, sex and the interaction between age and sex on the above traits was highly significant ($p \leq 0.01$, Table 2). In general, the weight of fibers tends to increase with age and the peak was attained from three and four years old and thereafter declined. Males produced heavier fleeces on average by 35% than females.

Undercoat Constituents

The average percentages of undercoat constituents were 27.7, 51.8 & 20.5% for down, guard hair and kemp fibers, respectively (Table 1). This means that the traditional combing is not applicable for separating down fibers due to the higher contamination of guard hair and kemp fibers left with down fibers. The effect of age, sex and their interaction was significant on undercoat constituents (Table 2).

The highest percentage (41.3 %) of down fibers was recorded from the goat aged one year and then it declined with the advancing age reaching 17.2 % at the age of five years. Males exhibited higher percentage of cashmere than females (35.7 Vs. 24.2%, $p \leq 0.05$).

Down Properties

It can be seen from Table 1 that the overall mean of fiber diameter and standard deviation of fiber diameter for Maraz goats were 22.5 & 4.3 µm, respectively, ranging from 15.9 to 28.8 µm for fiber diameter and from 2.2 to 6.4 µm for standard deviation of fiber diameter. Average fiber length was found to be 58 mm (Table 1). The age showed highly significant effect ($p \leq 0.01$) on fiber diameter and standard deviation of fiber diameter. Goats aged one year old produced finner fibers

compared with older animals, whereas the sex of animals does not appear to have a significant effect. However, the effect of interaction of age and sex on fiber diameter was significant ($p \leq 0.05$, Table 2).

Correlation Analysis

The simple correlation coefficients among live weight and studied fleece characteristics are illustrated in Table 3. There were significant positive correlations among each of live weight, greasy fleece weight, guard percentage, fiber diameter and standard deviation of fiber diameter. In addition, there were also significant positive correlations between fiber length and each of undercoat weight, fiber diameter and standard deviation of fiber diameter. On the other hand, there were negative and significant relationships between the down fiber percentages with most studied properties. Down weight correlated significantly and positively with each of undercoat (0.626) and down fiber percentage (0.685) but negatively with each of guard percentage (0.350) and kemp percentage (0.454).

Discussion

The body weight of Maraz goats is within the range reported by Millar [3] that large animals of cashmere goat weighing up to 70 kg, and small animals were less than 11 kg. Earlier work [4] for the same breed obtained similar results of live weight, while observed higher values of greasy fleece weight, which were 1200 & 900 g for males and females, respectively. This difference could be due to the environmental conditions as well as the variability in genetic make up of individuals. The significant effect of age, sex and the interaction between them on fleece weight traits might be explained by differences in body size and level of management. A similar pattern was observed by Restall and Pattie [8] of cashmere in Australian goats concerning the increase of fleece weight with the advancing age up to four years and fleece weight obtained from males were heavier than females.

In the present work, the unselected Maraz goats averaged 38 g of cashmere, with a range of zero g to 157 g. This large variability in down weight suggests considerable scope for selection. Millar [3] reported that the production of undercoat/cashmere per animal varies from a few grams to around 1 kg annually. The low values of cashmere production of Maraz goats may be related to the poor management as farmers are not familiar with the scientific way of breeding goats. The current result indicates that younger goats produced more down fibers than older ones. Conversely, Cochman and McGregor [9] and James *et al*. [10] observed that cashmere production for adult goats was higher than yearling goats and males produced more cashmere than females.

The wide variability of fiber diameter among goats would assist in reducing this character by breeding program. In the review by Miller [3] for various breeds and types of goats, the undrecoat fiber diameter ranged from 11.0 to 20.6 μm for Asian goats, from 11.0 to 30.4 μm for Soviet breeds and their crossbreds, and from 13.4 to 19.0 μm for Feral and domestic goats. Later, Lupton [11] stated that the average fiber diameter of Cashmere ranged from 11 to 19 μm and the range of individual fiber diameter was 5 to 30 μm. Fiber length of Maraz goat is within the range of the cashmere fiber length. Undercoat fiber length varies considerably among Cashmere bearing goats and the most frequently quoted measurements range from 25 to 166 mm [3], whereas Lupton [11, 12] indicated that Cashmere from different sources varies in length from 12 to 90 mm. Concerning the effect of age and sex on down properties, it has been found [9] that the down of adult bucks was significantly coarser by 2 μm than that of yearling bucks. It has also been mentioned that Cashmere goats produce coarser fibers with increasing age [8,11,13]. The absence of a difference in fiber diameter and

fiber length between sexes in the present study is similar to the results obtained by Restall and Pattie [8] but it is in contrast to the commonly held belief that males fibers are coarser and longer than those of females [9, 14-16].

The significant positive correlations among each of live weight, greasy fleece weight, guard percentage, fiber diameter and standard deviation of fiber diameter and between fiber length and each of undercoat weight, fiber diameter and standard deviation of fiber diameter in the present study were expected [17,18]. It is worthwhile to pay great attention to the significant and negative correlations emerged between down weight with each of guard percentage and kemp percentage, which could suggest that selecting goats for higher down weight will lead to improve the quality of produced down through low kemp contamination in the undercoat of Maraz goat fleeces. In addition, the negative correlations between the kemp fiber percentage and all the studied properties may possibly increase the efficiency of selecting Maraz goat.

Conclusions

While the undercoat/cashmere percentage of Maraz goats was lower compared to those of cashmere bearing goats, due to that Maraz goats were not selected for their cashmere production as the breeders were unfamiliar with the importance of cashmere and the possibility of processing it, there was evidence from the results of correlations among traits that selection for higher down weight will lead to improve the quality of produced down. Since the individuals varied in all studied traits, this will make the selection easier.

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Table (1): Means ± S.E. for Live Weight, Greasy Fleece Weight, Undercoat Constituents and Down Properties of Maraz goats.

Character		Overall Mean	Age (Year)					Sex	
			1	2	3	4	≥5	Male	Female
No.of Animals		118	35	23	22	18	20	36	82
Live Weight (kg)		26.8±0.75	19.0±0.53^{e}	25.6±1.23^{d}	28.4±1.25^{c}	31.4±1.67^{b}	36.1±1.36^{a}	31.2±1.70^{a}	24.9±0.68^{b}
Fleece Weight (g)		699.7±35.42	402.8±22.67^{b}	726.1±75.65^{a}	877.1±70.95^{a}	869.9±105.09^{a}	840.6±93.68^{a}	944.1±82.45^{a}	592.4±29.33^{b}
Outercoat Weight (g)		563.4±32.16	308.5±20.56^{c}	569.8±71.63^{b}	696.9±59.23^{ab}	736.3±98.44^{a}	699.8±89.07^{ab}	772.9±74.07^{a}	471.4±27.68^{b}
Undercoat Weight (g)		136.3±6.24	94.3±7.11^{c}	156.3±10.74^{ab}	180.3±17.92^{a}	133.6±14.95^{b}	140.8±15.28^{b}	171.2±13.21^{a}	121.0±6.20^{b}
Undercoat Constituents (%)	Down Fibers	27.7±1.65	41.3±3.37^{a}	26.8±3.54^{b}	20.6±2.46^{b}	22.8±3.14^{b}	17.2±2.10^{b}	35.7±3.35^{a}	24.2±1.74^{b}
	Guard Fibers	51.8±1.76	36.1±2.66^{b}	53.9±3.85^{a}	62.7±3.40^{a}	59.5±3.72^{a}	57.5±3.20^{a}	48.6±3.49^{a}	53.1±2.00^{a}
	Kemp Fibers	20.5±1.15	22.6±2.32^{ab}	19.3±2.12^{ab}	16.5±2.94^{b}	17.5±2.31^{b}	25.2±2.68^{a}	15.7±1.98^{b}	22.6±1.34^{a}
Down Fiber Diameter (µm)	Mean	22.5±0.24	20.2±0.33^{b}	23.4±0.38^{a}	23.6±0.54^{a}	23.6±0.52^{a}	23.2±0.46^{a}	22.4±0.33^{a}	22.5±0.31^{a}
	SD¶	4.3±0.06	4.0±0.11^{b}	3.9±0.09^{b}	4.7±0.12^{a}	4.7±0.17^{a}	4.3±0.12^{ab}	4.2±0.10^{a}	4.3±0.08^{a}
Down Fiber Length (mm)		57.7±1.16	55.9±1.74^{a}	57.3±2.22^{a}	59.3±2.87^{a}	58.8±2.99^{a}	58.7±3.89^{a}	57.2±2.01^{a}	57.9±1.42^{a}

Values within the same row with different superscripts are significantly different (P≤0.05).
SD = Standard deviation of fiber diameter within down/cashmere samples as a separate character.

Table (2): Mean Squares for Live Weight, Fleece Weight, Undercoat Constituents and Down Properties of Maraz goats.

Variance	D.F.	Live Weight	Fleece Weight	Outercoat Weight	Undercoat Weight	Down Fibers	Guard Fibers	Kemp Fibers	Down fiber Diameter		Down Fiber Length
									Mean	SD¶	
Age	4	1349.54**	1925450.53 **	1447825.29 **	42662.39**	1043.54**	1271.71**	371.58**	51.07**	2.07**	92.46
Sex	1	2306.02**	6047775.52**	4564464.52**	108790.31**	393.05*	17.41	813.79**	0.34	0.10	10.95
Age X Sex	4	117.27 **	401784.64 **	342060.61**	10533.83**	295.46*	231.23*	227.88*	12.77*	0.09	329.75
Residual	108	9.37	56993.51	52968.08	2705.48	105.71	93.27	69.78	4.04	0.37	157.92

** $P \leq 0.01$ * $P \leq 0.05$

SD = Standard deviation of fiber diameter within down/cashmere samples as a separate character.

Table (3): Correlation Coefficients for Live Weight and studied Fleece Characteristics of Maraz goats.

Character		Fleece Weight	Outercoat Weight	Undercoat Weight	Down Fibers	Guard Fibers	Kemp Fibers	Down Weight	Down Fiber diameter		Down Fiber Length
									Mean	SD¶	
Live Weight		.711**	.694**	.457**	-.335**	.396**	-.128	.029	.348**	.201*	.026
Fleece Weight			.987**	.579**	-.345**	.476**	-.233*	.100	.378**	.321**	.026
Outercoat Weight				.442**	-.372**	.455**	-.162	-.011	.366**	.307**	-.014
Undercoat Weight					-.032	.348**	-.488**	.626**	.249**	.222*	.212*
Down Fibers						-.777**	-.253 **	.685**	-.356**	-.182*	-.063
Guard Fibers							-.413**	-.350**	.418**	.232*	.177
Kemp Fibers								-.454**	-.128	-.096	-.179
Down Weight									-.059	.072	.086
Down fiber Diameter	Mean									.467**	.384**
	SD¶										.200*

** $P \leq 0.01$ * $P \leq 0.05$

SD = Standard deviation of fiber diameter within down/cashmere samples as a separate character.

References

1. Onions, W.J. Wool, an introduction to its properties, varieties, uses and production, **1962,** Interscience Publishers, New York, USA: 217.
2. Epstein, H. The origin of the domestic animals of Africa, 1971, Vol. II Africana Publishing Corporation. New York. Cited by Gall, C. Goat Production, **1981,** Academic Press Inc., London, UK: 96.
3. Miller, P. The performance of Cashmere goats. *Anim. Breed. Abstr.* **1986,** 54**(**4):181-199.
4. Aziz, Kasim O. and Hamad, Ali H. The study of phenotypic description and fleece characterization of Maraz goats. *Zanco J.for pure and applied Sci*. **2004**, 16(1):53-60.
5. Doney, J.M. and Smith, W.F. The fleece of the Scottish Blackface sheep.1.Seasonal changes in wool production and fleece structure. *J. Agric. Sci*. **1961,** 56:365-374.
6. ASMTT, Australian Standard Method of Test for Textiles, A.S.2001.2.1, Determination of mean fiber diameter of textile fibers by projection microscope, **1978**, Australia.
7. SAS, Statistical Analysis System. User's guide for personal computer. Release 6.12, **2001**, SAS Institute Inc. Cary, NC, USA.
8. Restal, B.J. and Pattie, W.A. The inheritance of Cashmere in Australian goats.1. Characteristics of the base population and the effect of environmental factors. *Livest. Prod.Sci.* **1989**, 21:157-172.
9. Couchman, R.C. and McGregor, B.A. A note on the assessment of down production in Australian Cashmere goats. *Anim. Prod*. **1983**, 36:317-320.
10. Jammes, H., De, Wei and Wei, D. The Cashmere goats of Inner Mongolia. *Chevre*, **1999**, 231:40-42. (In French with English Abstract).
11. Lupton, C.J. Objective methods for characterizing Cashmere. Proc. Business of Cashmere Conf. IV**.** Oct.23-25, **1998**, Bozeman, Montana:1-24.
12. Lupton, C.J. Characteristics of goat fibers for processing consideration. Proc. National Symposium on goat fiber production, processing, and marketing. Oct.14-17, **1993**, Oklahoma City: 1-26.
13. Phan, K-H., Augustin, P., Wortmann, F.J., Enkhjargal, D., Budsuren, S., Badmaanyambuu, R. and Alimaa, D. Quality assessment of Mongolian Cashmere in comparison to other speciality animal fibers. Proc. 11th Int. Wool Res. Conf. 4-9 Sept. **2005**, Leeds, UK. P173:1-4.
14. Bishop, S.C., Wray, N.R. and Russel, A.J.F. Genetics of fiber production in Cashmere goats. Agriculture. Alternative animals for fiber production. A seminar in the community programme for the coordination of agricultural research, **1993,** Peebles, 24-25 Oct.1991: 33-49.
15. YongJun Li, YuJie Lou, WeiMin Luan, MaoNian Lin, XianChen Song, Li, Y.J., Lou, Y.J., Luan, W.M., Lin, M.N. and Song, X.C. Study on Cashmere diameter deviation of Liaoning Cashmere goats. *Chines J. of Animal Sci*. **1999**, 35(2):17-19. (In Chinese with English Abstract).
16. Tsedev, Khishigjargal and Tserenbat, Sedvanchig. Magnificent Cashmere, a look into the luxurious clothing fiber of Mongolia, **2000**, High Plains Publishers, Inc., Kansas, USA:65.
17. Newman, S.A.N. and Paterson, D.J. Estimates of environmental effects for live weight and fleece characteristics of New Zealand Cashmere goats. *NewZealand J. of Agric.Res*. **1996**, 39(3):379-386.
18. MaoNian Li, YongJun Li, YongXin Cao, XuQing Yang, Zhuang WenFa, Li, M.N., Li, Y.J., Cao, Y.X., Yang, X.Q. and Zhuang, W.F. Study on the fleece characteristics of Tibetan Cashmere goats. *Chines J. of Animal Sci*. **1999**, 35(4):15-17. (In Chinese with English Abstract).

بەرهەمی کەشمیر لە بزنی مەرەز

قاسم عمر عزیز
بەشی سامانی ئاژەڵی، کۆلیجی کشتوکاڵ ، زانکۆی سەلاحەدین-هەولێر، هەرێمی کوردستان / عێراق.

پوختە

ئەم توێژینەوەیە لە سەر 118 بڕینەوەی بزنی مەرەز (36نێر وە 82مێ) تەمەنیان لە 1 تا وەکو 5 ساڵ وە زیاتر، بەخێو کرابوون لە مێگەلێکی تایبەتی ناوچەی رانیە/ پارێزگای سلێمانی، ئەنجام دراوە بە مەبەستی دەست نیشانکردنی کەشمیر لە بڕینەوەدا لە ڕووی چەندیەتی و چۆنیەتی. هەڵسەنگاندن ئەنجام درا لە سەر بنەمای ڕێژەی کەشمیر لە پۆشەری ناوەوەی بڕینەوە.
تێکرای گشتی سەرجەم کێشی لەش، کێشی بڕینەوە، ڕێژەی کەشمیر، تیرەی ڕیشاڵی کەشمیر وە درێژی ڕیشاڵی کەشمیر 26.8 کغم ، 699.7 غم، 27.7 %، 22.5 مایکرون و 57.7 ملم بوو یەك بە دوای یەك. دەرکەوت کەوا نێرەکان قووڕسترن لە کێشی لەش و بڕینەوە ($p\leq0.01$) وە زێدەترن لە ڕێژەی کەشمیر ($p\leq0.05$) بە بەراوورد لە گەڵ مێ یەکان. تەمەن کاریگەری بایەخداری هەبوو لە سەر گشت ڕووالەتەکان($p\leq0.01$) جگە لە سەر درێژی ڕیشاڵی کەشمیر. هەروەها تێکەڵ بوونی تەمەن و ڕەگەز کاریگەری بایەخداری هەبوو لە سەرزوربەی ڕووالەتەکان. لە ئەنجامی لێکۆڵینەوە دەرکەوت کەوا چەندیەتی و چۆنیەتی بەرهەمی کەشمیر لە بڕینەوەی بزنی مەرەز ئەکرێ چاك بکرێت لە ڕێگای بەرنامەی هەڵبژاردن و باش کردنی بواری بۆماوەیی و ژینگەیی.

انتاج الكشمير من الماعز المرعز

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الخلاصة

استخدم 118 جزة كاملة لماعز المرعز (36 ذكرا و 82 انثى) باعمار تراوحت بين 1-5 سنة واكثر والمربى لدى قطيع اهلي في منطقة رانية/محافظة السليمانية وذلك للتعرف على كمية ونوعية الكشمير في الجزة. اعتمد التقييم على اساس نسبة الكشمير في الغطاء الداخلي للجزة.
بلغ قيم المتوسطات لكل من وزن الجسم، وزن الجزة، نسبة الكشمير، قطرليفة الكشمير و طول ليفة الكشمير 26.8 كغم ، 699.7 غم، 27.7%، 22.5 مايكرون و 57.7 ملم على التوالي. تبين بان الذكور اثقل وزنا للجسم وللجزة ($p\leq0.01$) واعلى نسبة للكشمير ($p\leq0.05$) بالمقارنة مع الأناث. للعمر تاثير معنوي على جميع الصفات المدروسة ($p\leq0.01$) عدا طول الليفة. كما وان تاثير التداخل بين العمر والجنس كانت معنوية على معظم الصفات المدروسة. أظهرت النتائج الى امكانية زيادة انتاج الكشمير وتحسين نوعيته من الماعز المرعزفي كوردستان-العراق عن طريق الأنتخاب والتحسين الوراثي والبيئي

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