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THE ASSESMENT OF MAIN CHARACTERISTICS AND PROCESSING AVAILABILITY OF WOOL OBTAINED FROM SHEEP BELONGING TO THE PALAS HIGH PROLIFICACY LINE

EVALUAREA PRINCIPALELOR CARACTERISTICI ŞI A PRELUCRABILITAŢII LÂNII OBŢINUTE DE LA OVINELE DIN LINIA CU PROLIFICITATE RIDICATĂ PALAS

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The purpose of these researches was to analyze the quantitative and qualitative parameters of wool obtained from the Palas sheep population with high prolificacy and to assess the processing availabilities of these fibres type.
Average values recorded for the main wool traits ranged between the following limits: wool production 2.86 ÷ 4.72 kilos; fibres fineness 27.28 ÷ 29.32 microns; variability of fineness (CV) 26.88 ÷ 29.94 %; staple length 9.77 ÷ 14.23 cm, variability of length (CV) 18.01 ÷ 22.06 % ; scouring yield 54.05 ÷ 61.44 % and the variability of yield 8.35 ÷ 14.78 %. . This wool has a technological value similar to that obtained from the sheep breed with medium fineness wool (Tigaie, Spanca).
Key words*:* sheep with high prolificacy; wool production; wool fineness; staple length; yield

Introduction

Under the present economic situation sheep raising and exploitation is oriented towards obtaining mixed productions, the efficiency of the farms depending on the level of all types of production obtained by this species. The purpose of this research is to evaluate the characteristics of wool for the sheep belonging to the Palas High Prolificacy Line and the processing availability of this fiber type.

Materials and Methods

The study was performed for the period 1998-2007 and was focused on the quantity and the quality traits of the wool. The production of wool was determined

by individual weighing of fleece for all the sheep effectives. To evaluate the quality of the wool, randomized samples for each category of sheep were collected. On these samples the fiber diameter (fineness), sample (relative) length and scouring yield were measured and the values were processed through statistical methods.

Results and Discussions

The Palas sheep line with high prolificacy was obtained at the experimental center of the Research and Development Institute for Sheep and Goat Breeding, Palas, Constanta starting in 1973, through complex crossbreeding between Romanov, Friza, Palas Merino and to a lesser extend with other breeds (Ile de France, Border Leicester , Finnish Landrace) followed by reproductive isolation and selection in order to increase the prolificacy rate. The main goal of making this sheep line is to obtain father rams for hybrid ewes with high prolificacy rate. In comparison with local sheep breeds, the meat quantities can be doubled through crossbreeding these prolific ewes with rams specialized for meat production

The fleece of this sheep population has a compact texture with an intermediate conical shape of wool bundle specific for medium - fine wool half-breed. The inner aspect of wool bundle is waved with an the average number of 2-3.5 crimps /cm

The average parameters of the wool production for the Palas Prolific Line, based on the data recorded during the shearing time and on the lab tests performed between 1998 and 2007 are shown in table no.1. The table values show for the Palas Prolific Line a fleece weight (wool production) of 2.86 ÷ 4.72 kg/head during the mentioned period of time, with a fiber finesse (diameter) of 27.28 ÷ 29.32 microns, a staple (relative) length of 9.77 ÷ 14.23 cm and a scouring yield of 54.05 ÷ 61.44 %. The body weight at shearing of rams belonging to Palas Prolific Line is greater with 28.68 kg (36.79 %) compared to the ewes .The males yearlings are also heavier with 18.06 kg (13.23 %) compared to the female yearlings. Wool production index calculated as the quantity of wool per unit of body weight was of 77.65 g wool / body kilo for female yearlings in comparison with 67.17 g wool / body kilo for male yearlings. These results, related to the conclusions of other authors [3], show that the greater wool quantity of the males is due to a greater body weight and not to an increase of wool fiber density and length. The data show that during the 10 years that made the object of the analysis for the Palas Prolificacy Line, the wool production for the males had a greater variation than that of females. Thus for the males the differences for the extremes of the average yearly production were of 3.45-3.70 kg and for females these differences were of 0.91 – 1.16 kg.

Wool traits of Palas Sheep Line with High Prolificacy

Table no. 1

Traits	Sheep type	Statistical parameters			Limits for average
		n	$x \pm s_x$	CV (%)	
Body weight at shearing (kg)	rams	114	77.947±1.239	16.985	65.48÷96.38
	ewes	1808	49.271±0,181	15.603	44.07÷56.61
	female yearlings	743	42.265±0.687	14.349	36.29÷49.57
	male yearlings	168	60.325±0.694	14.956	53.94÷71.33
Raw wool production (fleece weight) (kg/head)	rams	115	4.717±0.137	31.072	3.34÷6.79
	ewes	1877	2.859± 0.017	25.330	2.26÷3.17
	female yearlings	774	3.282±0.091	24.507	2.59÷ 3.75
	male yearlings	185	4.052±0.097	32.475	2.76÷6.46
Fiber diameter (microni)	rams	100	29.32±0.624	27.127	25.8÷32.46
	ewes	250	27.628±0.523	29.943	24.93÷31.57
	female yearlings	100	27.280±0.776	28.448	24.62÷30.49
	male yearlings	100	28.606±0.769	26.876	25.03÷30.77
Staple length (cm)	rams	116	11.291±0.195	18.586	10.18÷12.75
	ewes	1873	9.769±0.047	21.045	8.90÷10.37
	female yearlings	772	14.227±0.290	18.009	11.28÷15.22
	male yearlings	185	13.316±0.216	22.056	10.26÷15.76
Scouring yield (clean wool content) (%)	rams	100	61.44±0.513	8.354	57.52÷ 64.20
	ewes	250	54.05±0.504	14.782	50.03÷57.24
	female yearlings	100	56.73±0.714	12.579	51.73÷ 62.81
	male yearlings	100	58.19±0.589	10.134	53.48÷ 63.72

Males are producing more wool than females and there is also a difference in fineness, the females being characterized by finer wool for the same level of selection and feeding. For the Palas Prolific Line the wool production for males is superior by 1.86 kg (39.39%) and for male yearlings by 0.77 kg (19.0 %) compared to females. Also the relative length of wool was superior for the males by 1.52 cm (13.48 %). The fiber diameter was greater by 1.33 – 1.69 microns (4.65 – 5.76 %)

for males compared to females. Regarding the scouring yield, the average value ranged between 54.05 % ÷ 61.44 %. The rams have a yield greater with 7.39 % compared to ewes and the yield of male yearlings is greater with 1.46 % than female yearlings.

The percentage of sheep with the fleece weight above the average of the population determined for categories of sheep and their limits in the period of time on discussion are shown in table 2.

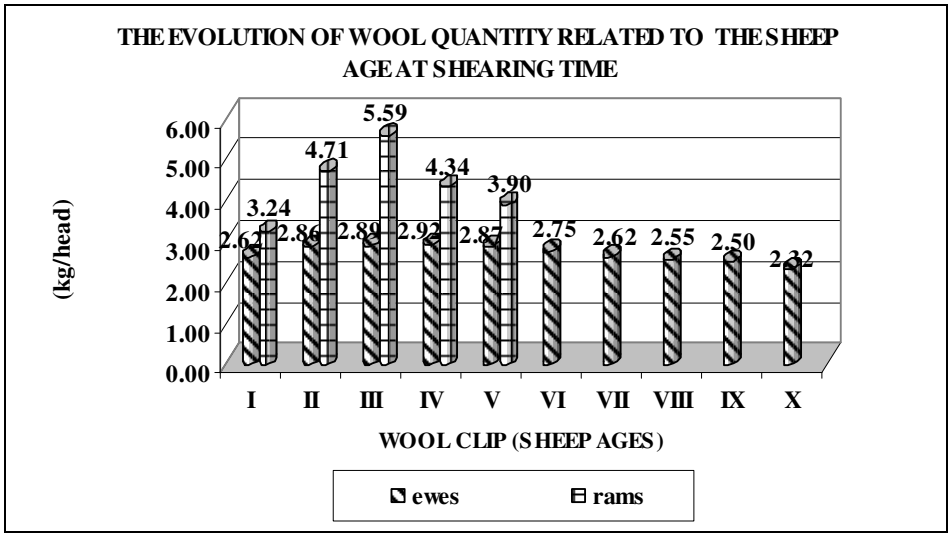
Percentage of sheep with highly fleece weight (%)

Table 2

Category		Total 1998-2007	Limits on years
Palas High Prolificacy Sheep Line	Female yearlings	47.16	40.35 ÷ 57.89
	Male yearlings	43.24	29.41 ÷ 63.63
	Ewes	50.51	42.16 ÷ 52.44
	Rams	43.48	22.22 ÷ 62.50

The great variability for the wool production and for the fiber fineness (24.507 ÷ 32.475 %) and the existence of 43 ÷ 50 % highly fleece weight for the sheep belonging to Palas Prolificacy Line show the possibility of obtaining a substantial genetic gain in the directional progressive selection for wool production, through the incidence of the genetic basis with an adequate breeding conditions.

Regarding the influence of age on wool production for the Palas Prolific Sheep Line, the evolution of the average values of wool production reported to the number of wool clip (sheep ages at shearing time) is shown in graph no. 1.



Graph 1

The wool production of ewes at the Palas Prolific Sheep Line show a moderate growth of 8.39 ÷10.27 % from I wool clip (2.62 kg/head - recalculated) to 2.92 kg/cap for IV wool clip , followed by a progressive decrease to 2.32 kg/head to clip no. X (20.55 % compared to the maximum level at clip no. IV). For the first three shearing seasons the wool production of rams increase with 31.21 ÷ 42.04 % (from 3.24 to 5.59 kg/head) than decreasing gradually with 22.36 ÷ 30.23 %, from IV to V clip (3.90 kg/head at last shearing season)

The relative length of wool had a small variation, between 9.50 ÷ 10.2 cm from the first shearing to the sixth shearing time, after which this parameter decreased progressively to 8.92 cm for the last wool shearing. The efficiency of wool production measured as wool quantity per unit of body weight decrease for ewes from 64.63 g wool/ body kilo (second clip) to 53.05 g wool/ body kilo (ninth clip) and for rams from 55.37 g wool/ body kilo (first clip) to 54.27 g wool/ body kilo (fourth clip)

The wool production is influenced by the prolificacy, thus the ewes having same body weight and fibre length but with single lamb are producing a great quantity of wool compared to ewes having two lambs. In the same time wool production of the unfertile ewes is greater than the quantity of wool obtained from pregnant and lactating sheep [3] . Based on the data recorded for the Palas High Prolificacy Sheep Line regarding the wool production by types of birth (number of lambs/birth) (Table no 3), the results shows that the phenotypic correlation between the wool quantity and the number of the descendents are small, negative and statistically not significant. The wool production of unfertile ewes is greater with 0.091 kg (3.22 %) compared to ewes having one lamb and with 0.102 kg (3.61%) compared to ewes having twins. Wool quantity obtained from unfertile ewes is also greater with 0.602 kg (21.32 %) related to ewes having triplets and with 0.915 kg (32.41 %) compared to ewes having quadruplets.

Wool quantity depending on birth type at Palas High Prolificacy Sheep Line

Table 3

Category	Number of lambs	Raw wool production (kg)			$r \pm S_r$
		n	$x \pm S_x$	CV (%)	
Palas High Prolificacy Sheep Line	0	122	2.823±0.055	21.554	- 0.0649 ± 0.029 (ns)
	1	543	2.732±0.025	21.722	
	2	403	2.721±0.030	22.492	
	3	33	2.221±0.075	19.424	
	4	2	1.908± 0.280	20.744	

The growth of body weight with the purpose of increasing the wool and meat production was a target for the selection of the local sheep breeds. The economic efficiency asks for sheep with a high aptitude of food conversion into animal products, some researchers showing that big sheep are producing less and at higher costs. Under these circumstances the problem is to what limit is justified the

growth of body weight in order to achieve a maximum of production for sheep [3]. The researches done in order to establish the relation between wool production and body weight at shearing on the sheep from Palas High Prolificacy Line revealed statistically very significant correlation for the female yearlings having 41-50 kg (r = 0.288± 0.459 (***)) and for the ewes weighing 51-60 kg (r = 0.269 ± 0.056 (***)). In the same time the efficiency of wool production measured as wool quantity per unit of live weight is greatest for female yearlings weighing less than 50 kg (79.582 ÷ 93.698 g wool/ body kilo), for male yearlings weighing less than 70 kg (64.338 ÷ 74.433 g wool/ body kilo) , for ewes ranging between 41-60 kg (52.063 ÷ 73.330 g wool/ body kilo and also for rams ranging between 71-80 kg. The obtained results are showing that for the specialized sheep lines the efficiency of wool production is also higher for the sheep with moderate body weights

Based on the lab measurements the wool obtained from Palas High Prolificacy Sheep Line is classified according to STAS 844 / 80 (raw wool), in the category of medium fine to medium coarse wool , having a maximum diameter of 37 microns and a minimum scouring yield of 42 % [1]. INCDTP – Bucharest determined the technological value and availability of processing for this wool by carrying out the spinning testing. The average values for the characteristics of wool fiber in the processed batch were: fineness 29.3 microns (CV=35.9 %); absolute length 106.0 mm (CV = 43.7 %); short fibers content (below 30 mm) 10.8 %; short fibers content (below 40 mm) 16.1 %; breaking load (tensile strength) 22.4 cN (CV = 55.2 %); breaking elongation 43.9 % (CV = 18.3 %); scouring yield (industrial) 55.7 %. After scouring the wool was ranked according to STAS 5743/76 in the sort 29 P adequate for processing within worsted spinning system. The yarn type obtained through processing of the wool produced by the prolific sheep was Nm 34/1 from 100 % wool [1]. The physical-mechanical characteristics of the single yarn, compared with the internal standards for this yarn type are shown in Table no 4.

Physical -mechanical properties of single yarn

Table 4.

Category	**UM**	**Yarn Nm 34/1 100% wool sort 29 P**	**Internal Standard Yarn Nm 34 100% wool**
Linear density	tex(Nm)±p%	29(34.5) ± 1.0	27.7(36) ± 1.26
	CV%	2.5	4
Tensile strength (breaking load)	gf±p%	98.1±8.2	130
	CV%	29.0	15.5
Extension at break	%	3.0	6.1
Torsion	tors/m	478 ±5.5 αn=90	500

The yarn obtained is best compared to the standard values with 37.5 % for the variability (CV) of length density, with 25.54 % for the tensile strength and with 50.82 % for the extension at break. Only the variability (CV) of tensile strength exceed with 13.5 % the upper limit required by internal standard. This higher level of variation for the yarn tensile strength is due to the greatest variability (CV) for wool fineness and absolute fibre length [2] .

Subsequent to the processing in worsted system for this type of wool, the following aspects were emphasized: the obtained yarns made of 100% wool are at the upper limit of spinning ability for the Romanian medium fine wools ; no special equipment are required compared to those used for medium fine wool; the behavior during the technological processing was adequate. The wool fibers were used for manufacturing in weaved and knitted products with 100 % wool content and also combined with natural silk and wool-like synthetic fibers.

Conclusions

- The average wool production of the sheep from the Palas Prolific Line for the years 1998 - 2007, ranged between 2.26 ÷ 6.49 kg. The highest values by categories were 6.79 kg for rams, 3.17 kg for ewes, 6.46 kg for male yearlings and 3.75 kg for female yearlings.
- The average diameter of wool fibers by categories of sheep ranged between 24.62 microns and 32.46 microns, the diameter of male wool being higher by 4.63 – 5.77 % than that of female wool.
- The scouring yield of wool (clean wool content) ranged between 50.03 ÷ 64.20 % for all stock differences existing between the categories of sheep. The highest average yield was obtained for rams (61.44 %) and the lowest for ewes (54.05 %).
- According to the physical-mechanical characteristics the wool produced by the sheep with high prolificacy is situate within medium fine wool category. The technological value for this type of wool is similar to that of the wool obtained from sheep breeds with medium fine wool (Tigaie, Spanca). The wool can be used for obtaining a large variety of knitted and woven articles, blended with different types of other fibers.

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