STUDY ON WOOL PRODUCTION IN MALE ANGORA RABBITS

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Abstract

Investigations were carried out in order to study some physical traits (wool length, diameter, tearing force and elongation) of hair types at 2nd, 3rd and 4th shearing. Improving our production some German bucks were bought, and we would like to study if they had any effect on the wool production of progeny.
Wool production increased with body weight and number of harvest. Compared to the previous shearings the values of physical traits of hair types from the 2nd shearing were significantly increased. The highest correlation value was found between thinnest diameter and tearing force. Progeny from German bucks were heavier and produced a slightly longer wool with more bristles.

Key Words: physical parameters of hair types

Introduction

Angora rabbits produce a heterogenous fleece against the nearly homogenous sheep wool, which is due to the three kind of hair types (bristles, awns and downs) composing the coat (Thebault et al. 1989, Rochambeau et al. 1991). The quality of angora fleece is determined by the length and the proportion of the different types of fibres, cleannes and absence of felt (Allain et al. 1992). As a second criterium within the classification (theoretically), the fibre diameter would be useful to take into account, because it significantly determines the utilisation and tautness of the wool (Szendrő 1992, Allain et al. 1992). In practice, however, that objective instrumental measurement because of the relative long procedure and high costs, do not applied. In addition industry needs wool with different characters depending on the final product (longer,bristly wool for outerwear and shorter, wooly wool for underwear). The proportion of bristles, the hair length and its diameter are also changing by season (Farrell et al. 1992) and by the harvesting method with different harvesting intervals: by shearing (every 80-85. day) a fine, short, wooly wool will be produced, while by plucking (every 100-115.day) the fleece will be longer and has a bristly look (Thebault et al. 1989, Szendrő et al.1992, Schlolaut, 1992). The evaluation and comparison of wool quality is rather difficult, while different grading systems are existing in different countries. For instance as was mentioned by Fleishhauer (1988) and Schlolaut (1992), the proportion of coarse hair in Germany is measured numerically, and according to weight in France.

Apart from some publications (Fleischhauer 1988, Marinucci et al. 1989) there are only few data available about the physical parameters of the hair types.

Aim of present study was to investigate some of these traits, and to clear how they are changing and (if it has) what is the connection between them. While we imported some bucks from Germany, we would also investigate, what was their genetical influence on the wool production.

Materials and Methods

The studies were carried out on our rabbit farm from July 1989 to March 1990 with 10, at the 2nd shearing 21-weeks-old angora bucks per group. First group consisted of the progeny from the crossed population with German bucks and the 2nd group was selected from the original rabbit stock. First shearing was done when the rabbits were 60-days-old. During our investigations at the 2nd, 3rd and 4th harvest, the animals were sheared every 13th week (av. 90 day intervals) with electric clippers. The wool was sorted according to quality classes in Hungary. Rabbit concentrate and water were supplied in individual cages, ad libitum.

The following parameters were measured (by groups and shearing): body weight, feed consumption, wool yield. In order to evaluate the wool quality, we collected a sample (1st class wool) from the back of animals. With counting the hair types (bristles, awns and down fibers) using a randomly choosed wool staple from the sample, we calculated the proportion of coarse hairs (bristles). By analysing 50 fibers of each hair types from the wool sample, we also investigated some physical parameters of the wool (e.g. wool length, diameter, thinnest diameter, tearing force, elongation). For determination of the diameter a lanameter (Lanatester FM-31/A), and for measuring the tearing traits an electric tearing machine (FM 27.2) were used (both instrument was made by: Textilipari Műszer-Számítástechnikai Fejlesztő Vállalat, Budapest, Hungary). In addition the wool production/feed consumed and feed consumption/wool produced were evaluated.

The data were analyzed statistically by analysis of variance.

Results and Discussion

Body weight: whereas during our study it was slightly higher in group 1 (2923 vs. 2887 g), differences between the groups were not statistically significant by shearings. The 150-days-old rabbits (2nd shearing) are continuously grown, the daily weight gain was 4.43 g (in both group) between the 2nd and 3rd shearing, but it decreased to 2.35 g to the next harvest ($P<0.05$). In addition animals in group 1 and 2 between the 3rd and 4th shearings grew 1.83 and 2.86 g/day, respectively, so with compensating their losses the 2nd group reached the same body weight at the 4th harvest (Table 1 shows the both groups data together).

Wool production: as Thebault(1992) noticed an increasing wool production by harvest ranks, we found similar significant differences($P<0.05$) both between groups and shearings (122, 162, 211 g for group 1, and 117, 142, 196 g for group 2, respectively). The increasing daily wool yield in order of harvesting number: 1.44, 1.65 and 2.24 g/day. Animals for group 1 gave also at each shearing more wool to a body weight unit (47.0, 53.4, 67.9 vs. 45.8, 48.4 and 62.2 g/g), but the differences were not proved statistically. By wool grading we realised same quality in groups per shearings. In relation to the 2nd harvest, the fleece contained more chaff and felt 3 wool ($P<0.05$) at the 4th shearing (Figure 2).

Feed intake and the wool production/feed consumed: Parallel to the body weight, these traits are also increased, so they were higher at group 1. (the difference was not significant).
Similar to other researchers (Qinyu 1992, Thebault et al. 1992) we found a relative high correlation value between shearing amount and body weight ($r = 0.67$, $P<0.001$).

Physical parameters of the wool

Wool length: it was almost the same by each harvests, only downs have got significantly longer comparing to the previous shearings (Table 2 and 3). In the case of the groups according to hair types we noticed that bucks in group 1 had significantly longer wool than those of group 2 ($P<0.001$, Figure 1).
Wool diameter: by shearings only bristles were with average 1 µm thicker(NS $P>0.05$) in group 1, the two other hair types had the same thickness like group 2. In order of the number of harvest the fleece got thicker, which was mainly due to the bristles. While awns did not change, comparing to the previous harvests downs were significantly thicker at the last shearing.
Thinnest diameter: it was the same by groups. In the case of bristles it increased with diameter continuously from harvest to harvest. Awns became less thin at the 3rd shearing. Because of the relative equal thickness of downs we did not measure them.
Tearing force: it was not noticed any difference between groups. In order of shearings it increased continuously by each hair types. Till in the case of bristles and awns this trait was significantly different only at the 2nd shearing, it changed per shearings by downs.
Elongation: fibers from bucks of group 1 were streched better than by group 2 ($P<0.01$). While it did not change by awns, bristles and downs showed significantly bigger elongation at the 3rd and 4th harvest as compared to the 2nd shearing.
We also determined the critical point along the hairs, where the fibers by tearing were broken, but it changed randomly.

Correlation among the measured physical traits

Apart from the length and diameter with a correlation of $r = 0.47$, we noticed significantly low values between length and the other traits (Table 4). Higher values were found between diameter, thinnest diameter and tearing force ($r = 0.7\text{-}0.8$ $P<0.001$). We found a significant moderate value between tearing force and elongation ($r = 0.54$, $P<0.001$).

Proportion of bristles

The wool produced by the bucks of group 1 contained a little bit more bristles (1.31 vs. 0.99 %, $P<0.05$). It seems to be the same from shearing to shearing (in order of harvesting number and hair types: 1.14, 1.01 and 1.30 by bristles, 1.57, 2.44 and 1.93 by awns and 97.3, 96.5 and 96.7 % by down fibers).

Conclusions

- Wool production increase by the body weight and number of harvest.
- The proportion of bristles do not change per shearing.
- Physical parameters of each hair types at the 2nd shearing are - apart from length-significantly different from those were found at 3rd and 4th shearing.
- Physical traits of awns are hardly changed to bristles and downs with shearing number, so the wool quality is determined mainly by the other two hair types.
- Because there is only a moderate correlation between hair lenght and diameter, but the latter is highly correlated with tearing force, it seems to be important for measurement.
- Progeny from crossed population with German bucks (group 1) had slightly bigger body weight and produced more, longer wool with a larger proportion of bristles.

References

1. Allain,D. Rochambeau,H.de Thebault,R.G. Mollaret,R. Vrillon,J.L. (1992): Relationship between guard hair diameter and tautness in the angora rabbit fleece. Proc.5. WRSA Congr., Corvallis, Vol. C. 1559-1567.
2. Farrell,D.J. Ogisi,E.M.(1992): Influence of shearing on food intake and digestibility of dietary components and the measurement of fiber production in angora rabbits. Proc.5. WRSA Congr.,Corvallis, Vol.C.1550-1559.
3. Fleischhauer,H. Schlolaut,W. Lange,K.(1988): Vorläufige Ergebnisse eines Populationsvergleiches französischer und deutscher Angorakaninchen.
4. Marinucci,M.T. Pieramati,C. Renieri,C. Petroselli,L.(1989): La fibra angora nel coniglio: rilievi di carattere fisico. Rivista di Coniglicoltura 26.37-40.
5. Qinyu,M.(1992): Studies on the method of early selection and early mating in german angora rabbits. Proc. 5. WRSA Congr.,Corvallis, Vol.A.322-328
6. Rochambeau,H.de Thebault,R.G. Grun J.(1991): Angora rabbit for wool production: non genetic factors affecting quantity and quality of wool. Anim. Prod. 52. 383-393.
7. Schlolaut,W.(1992): Evaluation of the quality of angora rabbit wool. Proc. 5. WRSA Congr.,Corvallis, Vol.C.1623-1628.
8. Szendrő Zs. Radnai I. Toth-Zelei I.(1992): Effect of genotype, sex and harvesting method on wool production and wool quality of angora rabbits. Proc.5. WRSA Congr.,Corvallis,Vol. C. 1576-1583.
9. Thebault,R.G. Rochambeau,H.de(1989): Le lapin angora: production et amélioration génétique. INRA Prod. Anim. 2.(2)145-154.

10. Thebault,R.G. Vrillon,J.L. Allain,D. Fahrat,E. Rochambeau,H.de (1992): Effect of non genetic factors on quantitative and qualitative features about angora wool production in French farms. Proc. 5. WRSA Congr., Corvallis, Vol.C.1568-1575.

Figure 1.

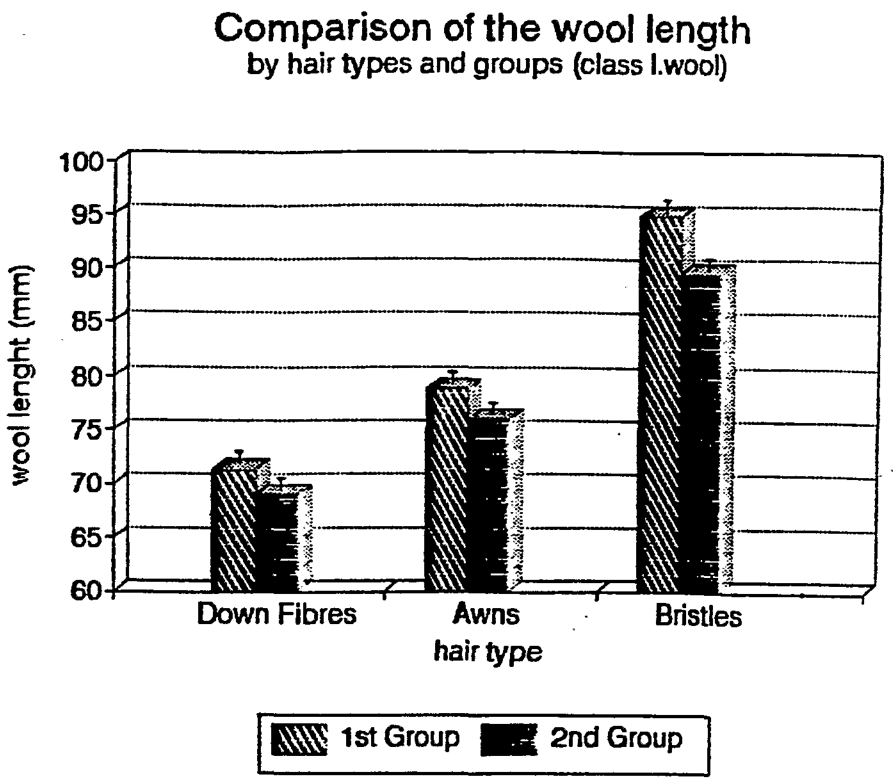

Figure 2.

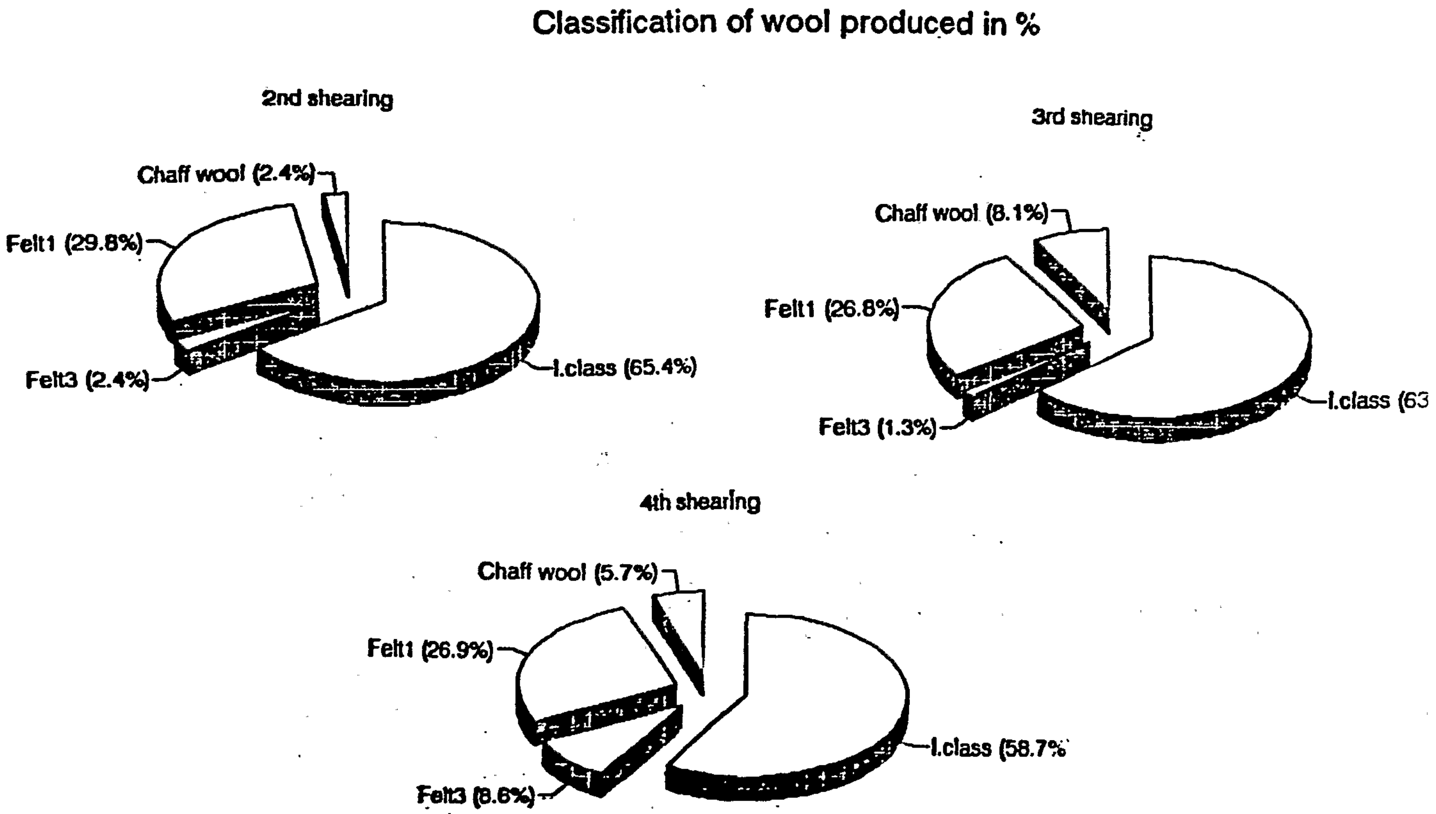

Table 1. Comparison of body weight, wool yield and food intake at 2nd, 3rd and 4th shearing (average and SE of both groups)

Trait n=20		Number of shearing II.	III.	IV.
body weight(bw.),	g	2584a	2992b	3139b
		0.06	0.06	0.06
wool yield(wy.),	g	120a	152b	204c
		5.55	5.70	5.96
wy./day,	g/d.	1.44a	1.65b	2.24c
		0.06	0.07	0.07
wy./bw.,	g/kg	46.4a	50.9a	65.0b
		1.75	1.80	1.88
food intake/day,	g/d.	-	109a	131b
		-	2.41	2.58
wy./food intake,	g/kg	-	15.2a	17.2b
		-	0.61	0.64
daily weight gain,	g/d.	-	4.43a	2.35b
		-	0.34	0.40

Values in rows followed by different letters are significantly different (P<0.05).

Table 2. Some physical parameters of the wool at 2nd, 3rd and 4th shearing (average and SE of both groups)

Trait n=3000		Number of shearing II.	III.	IV.
Wool length,	mm	79.8	79.5	80.7
		0.59	0.60	0.63
Wool diameter,	µm	22.1a	23.4b	24.6c
		0.24	0.25	0.26
Thinnest diameter,	µm	14.6a	16.7b	16.7b
		0.31	0.31	0.33
Tearing Force,	cN	3.34a	4.56b	5.02c
		0.12	0.12	0.12
Elongation,	mm	10.7a	12.8b	12.9b
		0.23	0.31	0.32

Values in rows followed by different letters are significantly different (P<0.05).

Table 3. Physical parameters of hair types at 2nd, 3rd and 4th shearing (average and SE of both groups)

Trait n=1000	Bristles			Awns			Down Fibres		
	II.	III.	IV.	II.	III.	IV.	II.	III.	IV.
W.L.(1), mm	93.5	92.4	91.0	76.5	77.0	79.0	69.4a	69.1a	72.2b
	1.02	1.05	1.09	1.02	1.05	1.09	1.02	1.05	1.09
W.D.(2), µm	33.1a	36.0b	36.9b	19.5	20.2	20.7	13.7a	14.0a	16.3b
	0.41	0.43	0.44	0.41	0.43	0.44	0.41	0.43	0.44
T.D.(3), µm	18.4a	21.3b	22.5b	10.7a	12.1b	10.9a	–	–	–
	0.44	0.45	0.46	0.44	0.45	0.46	–	–	–
T.F.(4), cN	5.79a	8.55b	9.37b	2.55a	2.98b	3.07b	1.66a	2.17b	2.61c
	0.20	0.21	0.22	0.20	0.21	0.22	0.20	2.17	2.61
E.(5), mm	12.3a	14.9b	14.8b	9.86	9.98	9.40	10.0a	13.6b	14.7b
	0.52	0.53	0.55	0.52	0.53	0.55	0.52	0.53	0.55

Type of fibre; Number of shearing

Wool Length(1), Wool Diameter(2), Thinnest Diameter(3), Tearing Force(4), Elongation(5)

Beside hair type values in rows followed by different letters are significantly different (P<0.05).

Table 4. Correlation coefficient values (r) among the measured physical parameters of the wool fibres

Trait n=200	
length-diameter	0.47
length-thinnest diameter	0.33
length-tearing force	0.27
length-elongation	0.05
diameter-thinnest diameter	0.78
diameter-tearing force	0.72
diameter-elongation	0.36
thinnest diameter-tearing force	0.81
thinnest diameter-elongation	0.45
tearing force-elongation	0.54