

Generic progress in the wool utility of L-1 and L-2 Angora rabbits

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Abstract

After pedigree analysis 2 groups of Angora rabbits were formed, with 105 females and 30 males in each group. These groups formed 2 separate lines, L-1 and L-2. The breeding and selection involved the following traits: body weight at the third clipping, wool production at the 1st and 3rd clippings as well as wool utility for the entire time, and wool quality classified according to wool quality norms. A total of 4 generations were analyzed, selection differences described and genetic progress for the examined traits presented. Significant genetic progress was obtained - the body weight at the third clipping was differentiated in the separate sexes and lines (8 to 430g).

Wool production at the third clipping improved genetically in L-1 from 83,7 to 89,2g, and for L-2; from 48,2 to 55,7g. The yearly production of rabbit wool from L-1 and the F₁ generation was 843-861g, while in L-2 from 814,0 to 842g. The genetic improvement was from 191,8 to 357,0 g. There was approximately 8% more wool in Class I.

Angora rabbits are used for their valuable wool. It is known for its unusual physical and technical qualities. It is especially useful for retinning cloth and yarn intended for clothing. Angora wool products, both pure and mixed with another product not only have a very effective appearance but are also healthy. They have a soothing effect on rheumatic pains [3].

The Peoples Republic of China is the main supplier and producer of Angora wool. During the years 1985-1988. China produced approximately 8,000 tons of Angora wool. This comprised approximately 85% of the

worlds production [4,9].

Europe produces relatively little Angora wool, however it remains as a breeding center of Angora rabbits. The leaders in area are Germany and France [4],. The rapid growth in breeding and production in Hungary deserves attention [9].

In Poland, in spite of a developed knit product industry with a tradition in rearing Angora rabbits, this area of production is not widely popular. Angora wool production fell from 15 tons between 1975 and 1979 to approximately 3.5 tons in 1989 [3]. In looking for ways and possibilities of increasing angora wool productivity research was undertaken on creating a high production line.

Materials and methods

The experiment was carried out on the rabbit farm of the Institute of Animal Science Research Station in Zator from 1986 to 1990. After pedigree analysis the experimental material was divided into 2 groups with 105 females and 30 males pergroup. All offspring were also included. Each group formed separate lines, L-1 and L-2. All animals had the same environmental conditions: cages with metal wiring located in a brick building (without heat). The animals were fed a granulated feed of constant composition. Basic feed was rationed: 150g daily when not sexually active and 250g daily for lactating mothers. Young rabbits, after weaning and up to somatic maturity, were fed ad libitum. All animals had constant access to drinking water. Clipping was done when the animals were 60-days-old and later every 90 days, with electric clippers. The wool was sorted or classified according to obligatory quality norms in Poland. In the offspring, wool productivity and its quality was determined at clipping 1,2 and 3.

Rabbit selection for future mothers and fathers in both lines was done after the 3rd clipping by taking the following factors into consideration:

- wool productivity for the three clippings
- percent of wool in quality Class I
- body weight at the 3rd clipping.

Attogether 4 generations were analyzed. Selection differences as

well as the differences between generations for basic traits with respect to wool utility were calculated.

Results and discussion

The mean body weight of F_1 males at the 3rd clipping was similar in both lines (Tab.1 and 2). Females were somewhat heavier. However the differences between sexes within each line or between lines were not statistically significant. For test and bred herds (selective difference) were differentiated.

For L-1 males it was 96 g and for the female, 184g. In line L-2 it was respectively, 204 and 2 g. The F_4 generation of the L-1 line had a mean body weight decidedly heavier and was for males of the test herd 3441g. There was a +430g increase. The increase in the bred herd was +343g. The increases in females was significantly smaller and was +200g, for the test herd and +46g for the bred herd. In the L-2 line increases were, respectively, 307g for test herd males and +122g for the bred herd, and +8g for females from the test herd and +34g for the bred herd.

The body weights of both sexes at the 3rd clipping in both lines L-1 and L-2 were comparable to those [1,4,9]. The selective differences, although decreasing, are relatively high. Also high are the variance coefficients (v) which indicates the possibility of further improvement.

In angora wool essential utility traits are wool productivity and quality. Wool productivity at the 1st clipping "baby productivity" is low. In the F_1 of L-1 it was 19,2 and 19,3g. Decidedly lower productivity was found in both sexes of the F_1 in L-2 (18.0 - 16.5g). The selection differences in F_1 of L-1 were differentiated and were for males, 4,1g and for females 2,1g. In L-2 they were significantly lower and were, respectively, 0,1 and 0,9g.

Wool productivity at the 1st clipping in the F_4 generation for L-1 was 24,6 and 25,0g for the test herd, with a genetic increase of 5,3 and 5,8g. For the bred herd it was 27,2 and 24,3, with a genetic increase of 7,7 and 7,4g. respectively. In L-2 there was a greater differentiation between sexes in productivity. For F_4 males it was

21,5g, and for females, 25,6g, (test herd). Genetic improvement was 3,5 and 9,1g. For the bred herd, improvement involved 7,8 and 10,4g of wool.

Wool productivity at the 1st clipping for both lines and sexes of the F_4 generation can be considered as high and agrees with [2,5,7] give a 3% wool productivity at the 1st clipping. It should be noted that sizeable differences can occur in wool productivity that can be caused by the method of obtaining wool (mechanical electric clippers or chemical- using melatonin).

Wool production at the 3rd clipping of the F_1 generation, L-1, for the test herd was from 121,1g, for males to 131,5g for females. It was significantly higher in L-2: 147,7 and 162,4g, respectively. In the breeding herds of both lines it was higher and the selection difference in L-1 ranged from 35,0 to 48,6g, and in L-2 :10.9 - 36.5g.

In the F_4 of L-1, production in the test herd was 210,3g for males and 212.2 g for females. The genetic improvement occurring over the 4 generations was +89,2g for males and +83,7g for females. In the breeding herd production reached from 228.1 to 231.6g. The selection difference was from 15.4 to 17.8g.

The selection production of the F_4 of L-2 was 203.4g for males and 210.6g for females in the test herd. Improvement ranged from 48.2 to 55.7 g which was lower than in L-1. Wool production in the breeding herd was 218.6 and 220.3g, with genetic improvement ranging from 34.4g in males to 47.0g in females.

Wool production at the 3rd clipping in the F_4 for both lines was high and was greater than 200g for both sexes. Comparable production was recorded by [5,7,8]. Greater production, 250-300g, was obtained by [4,9,10].

Yearly production in the F_1 for both lines was not great. In line L-1 it was 485.5 -527.0g, while in line L-2, 592.0g for males to 650.2g for females. The yearly wool production in the F_4 generation for the L-1 test herd was from 843g for males to 861g for females while in L-2 814.0 and 842g, respectively. Genetic improvement in the test herd ranged from 191.8g to 357g. The improvement was high and the yearly production of the F_4 in the test herd for both lines compares with the higher values cited by various authors, with the exception of those

produced under German conditions. [4,9,10] Recorded at Neu-Ulrichstein, yearly production of 1200g.

The percent of 1st class wool from the F_1 in both lines ranged from 62.3 to 64.1%. By the F_4 generation in both lines it was raised to 70.8-72.1%. Improvement obtained over the 4 generations in both lines was from 8.0 to 8.8%. It is difficult to compare our data with the literature since in different countries there are various criteria for determining wool quality. However there exist a general opinion that high quality animals, such as angora rabbits, are reflected by the percent of 1st class wool. Those with more than 70% 1st class wool are considered excellent. All test animals for both lines fit into this category.

In conclusion, the breeding and selection research carried out brought definite results. The body weights at the 3rd clipping were high and were at the same level as those obtained by countries recognized as leaders in angora rabbit production. Genetic improvement was high and the large selection differences lead one to assume that there are further possibilities of increasing body weights. Wool production at each clipping in both lines was high. The genetic improvement especially in wool production at the 3rd clipping also was high. A yearly production of approximately 850g can be considered as high.

There was a clear improvement in wool quality, and the genetic improvement in this area was satisfactory. The selection differences indicate further possibilities of genetic improvement.

Summary

An experiment was carried out in the Research Station of Institute of Animal Science in Zator which involved 4 generations of angora rabbits. After pedigree analysis 2 groups of rabbits were created. Each group had 105 females and 30 males plus all the offspring in each generation. The two groups were considered as separate lines, symbolized as L-1 and L-2. Throughout the entire experiment constant living and feeding conditions were ensured. In the offspring (test herd) wool production at each clipping as well as wool utility for the

entire time. Wool quality was classified according to Polish norms.

Selection for the breeding herd was done on the results of the following tests:

- body weight at the 3rd clipping,
- wool production for 3 clippings,
- percent of 1st class wool.

The selection breeding resulted in genetic improvement for the analyzed traits. In both lines of test herds body weight the 3rd clipping improved from 8g in L-2 females to 430g in L-1 males. Genetic improvement for wool production from 3 clippings ranged from 48.2 to 89.2, and for yearly production from 191.8 to 357g.

Wool quality improved approximately 8%. The differentiation coefficients and selection differences suggest the possibility of further genetic improvement in the area of wool utility.

References

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Table 2

Obtain of progress in some of traits within Line L-2

Item	Generation	F ₁					F ₄					E ₁ F ₄	
		TH		EH		DS	TH		EH		DS	TH	EH
		\bar{x}	v	\bar{x}	v		\bar{x}	v	\bar{x}	v			
Body weight in 3 th cutting /g/	♂	2985	8,0	3189	4,8	227	3292	12,3	3311	11,1	19	+307	+122
	♀	3100	8,8	3102	5,4	2	3108	14,0	3136	13,7	28	+8	+34
Yield of wool in I st cutting /g/	♂	18,0	32,1	18,1	30,8	0,1	21,5	38,1	25,9	29,7	4,4	+3,5	+7,8
	♀												
Yield of wool in III rd cutting /g/	♂	147,7	27,3	184,2	19,0	36,5	203,4	30,2	218,6	26,7	14,6	+55,7	+34,4
	♀	162,4	24,8	173,3	22,0	10,9	210,6	27,6	220,3	21,3	9,7	+48,2	+47,0
Yield of wool in year /g/	♂	592,0	26,3	737,0	20,2	145,0	814,0	27,3	875,0	24,3	61,0	+222	+138
	♀	650,2	28,3	695,0	21,3	144,8	842,0	25,3	882,0	20,4	40,0	+191,8	+187
Number of wool in I class of quality	♂	62,3	-	-	-	-	70,8	-	-	-	-	+8,5	-
	♀	63,7	-	-	-	-	72,5	-	-	-	-	+8,8	-

Table 4

Obtain of progress in some of traits within Line L-1

Item	Sex	F ₁					F ₄					F ₁ / F ₄	
		TH	v	BH	DS	TH	v	BH	DS	TH	BH		
Body weight in 3 th cutting /g/	♂	3011	7,8	3107	4,6	96	3441	7,4	3450	8,2	9	+430	+343
	♀	3080	8,3	3264	6,8	184	3280	9,9	3310	8,9	30	+200	+46
Yield of wool in 1 st cutting /g/	♂	19,3	28,7	23,4	30,7	4,1	24,6	27,4	27,8	27,2	3,2	+5,3	+4,4
	♀	19,2	36,0	21,3	21,7	2,1	25,0	28,6	28,7	24,3	3,7	+5,8	+7,4
Yield of wool in 3 rd cutting /g/	♂	121,1	27,3	169,7	12,0	48,6	210,3	29,3	228,1	18,2	17,8	+89,2	+58,4
	♀	131,5	21,1	166,5	12,9	35,0	215,2	30,2	230,6	17,3	15,4	+83,7	+64,1
Yield of wool in year /g/	♂	485,5	26,1	599,0	13,2	113,5	843,0	27,8	910,0	17,8	67,0	+357,5	+311,2
	♀	527,0	23,2	667,0	12,6	140,0	861,0	28,3	922,0	18,3	61,0	+334,0	+255,0
Number of wool in I class of quality	♂	63,2	-	-	-	-	71,9	-	-	-	-	+8,7	-
	♀	64,1	-	-	-	-	72,1	-	-	-	-	+8,0	-

TH - Testing herd
 BH - Breeding herd
 DS - Difference of selection