STUDIES ON THE METHOD OF EARLY SELECTION AND EARLY MATING IN GERMAN ANGORA RABBITS

Mong Qinyu

Angora Rabbit Institute, Linyi, Shandong P.R. China, 276002

Abstract

270 rabbits were selected from 90 litters, one male and two female rabbits per litter with similar birth day, and divided into 2 groups. Group 1, 90 female rabbits (one from each litter) were sheared and weighed at 6-10-20 weeks old. Group 2, another 180 rabbits were similarly tested at 6-16-24 weeks old. All the rabbits were given supplied feed from 18 days of age and weaned at 35 days. Pelleted feed and water were supplied in cages ad libitum. Results showed that the performance test system in Group 1 (6-10-20 weeks old) could be used as an early selection method. Forty-three rabbits from Group 2 were weighed and sheared at 203, 303 and 393 days old. The correlation coefficients between the raw wool at 20 weeks, the accumulative amount of raw wool at 6, 10, 20 weeks or the accumulative amount of raw wool at 10, 20 weeks and the first year wool yield were 0.6496, 0.6922 and 0.6203 respectively (P<0.01). There was no significant difference between the reproduction performance at the age of 5 months and that of 6, 7, 8, 9, 10 months. The does could start mating from the age of 5 months old.

Introduction

In China, female rabbits are usually mated at 6~7 months old and males at 8-10 months old. Is it possible to mate the female rabbits at 5 months old and to make early selection for breeding rabbits? The object of this paper was to determine the possibility of using early selection and early mating in order to achieve more rapid genetic progress by reducing the shorter generation interval.

1 Comparison of two production test systems between at 6-10-20 weeks old and at 6-16-24- weeks old

The study was designed by West German rabbit expert Dr. Zimmermann and began in Feb. 1986. All the rabbits were given supplemental pelleted feed from 18 days of age, weaned at 35 and were housed with at libtum access to food and water.

270 rabbits were selected from 90 litters of comparable age (1 male and 2 females from each litter), and divided into 2 groups. 90 rabbits (1 female from each litter) in Group 1 were weighed and sheared at 6, 10 and 20 weeks old. Another 180 rabbits in Group 2 were weighed and sheared at 6, 16 and 24 weeks old. The data were analysed statistically.

The results are summarized in table a and 2.

Table 1 Body weights and shearings at different age (unit: g)

Age		Group 1	Group 2
at weaning	Weight	848.29 ± 111.15	861.00 ±159.75
6 week	Shearing	16.5 ± 3.19	15.88 ± 3.14
	B. W.	105.46 ± 153.22	15.88 ± 3.14
	Felted hair	0	0
10 week	Shearing	28.21± 4.91	86.14 ± 22.79
	B. W.	1639.71 ± 216.15	2672.12 ± 309.72
	Felted hair	0.83 ± 1.61	11.31 ± 10.24
20 week	Shearing	111.80 ± 27.08	127.06 ± 20.10
	B.W.	2976.66 ± 348.14	3430.11 ± 322.71
	Felted hair	9.21 ± 9.42	10.00 12.06

Table 2 Correlations Between Shearing and Body Weight

| | 2nd Time at 10 or 16 week old | | | | | | 3 rd Time at 20 or 24 weeks old | | | |
| | B.W. | | Shearing | | Felted hair | | B.W. | | Shearing | |
	1	2	1	2	1	2	1	2	1	2
2nd Shearing	0.41**	0.53**								
Felted hair	0.13	0.31**	0.24*	0.41**						
3rd B.W.	0.31**	0.51**	0.30**	0.12	0.21	-0.11				
Shearing	0.05	0.22**	0.28**	0.18	0.01	0.21	0.03	0.39**		
Felted hair	0.15	0.16	-0.21	0.26**	-0.29	0.60**	-0.03	-0.006	0.04	0.30**

** P<0.01   *P<0.05

The increase in average daily gain was more rapid at first, then declined. But the daily wool growth increased with age, and reached 1.60 g at 20 weeks of age, which was close to that of the adult. There was no significant relationship between body weight and shearing amount, so body weight and shearing should be taken into account when the rabbitlets were selected as breeding ones.

For an easy analysis, body weight and raw wool production curve was made and it was compared with that made by Dr. Zimmermann in German (Zika curve). The curve during 16-24 weeks old was identical with the Zika curve. There were positive correlations between the body weight (B.W), raw wool production at 20 weeks of age and those at 24 weeks old or at adult, respectively. So the body weight and wool production at 20 weeks of age could be used to predict B.W. and wool prediction at adulthood. According to the theory of Dr. Zimmermann, the heritability (h^2) of daily wool growth was the highest during 18-20 weeks of age, and the wool production at 20 weeks could reflect that as an adult, so this data was useful to selection.

As to the felted hair, there was more felted hair during 10-22 weeks, less during 16-24 weeks of age, we could select for less felted rabbits as breeders at 20 weeks old.

From the above, it was apparent that a performance test at 6-10-20 weeks of age would be feasible and could be used as early selection method. It would be over months earlier than usual.

2 Theory Basis of performance test at the age of 6-10 weeks as early selection

The performance test at the age of 6-10-20 weeks could be used as early selection method. Years' practice has proved it successful. But how about the correlations between the wool production at 6-10-20 weeks of age and that at adulthood? So the following experiment was conducted.

Forty three rabbits were selected randomly from the above group (after the above experiment ended). The body weight, shearing at 230, 303 and 393 days of age and the accumulative shearing from 43-393 days of age were recorded.

The first Shearing after birth was called "fetus hair", this hair usually is not included in the first year wool yield. So the accumulation of each shearing from 43 to 393 days of age was as the first year wool yield.

All results are summarised in Tables 3, 4, 5 and 6.

Table 3 Shearing and B.W. during 0-393 day old   unit: d, g

Age (d)	N	Interval (d)	Shearing	Daily wool growth	B.W.	Daily gain
0-35	43	35	-	-	716.51 ± 99.40	20.47
0-42	43	42	14.12 ± 2.51	0.34	866.51 ±108.69	20.63
36-42	43	7	-	-	-	21.43
43-70	43	28	23.26 ± 4.16	0.83	1507.67 ± 140.14	23.61
71-140	43	70	93.02 ± 8.87	1.33	2710.93 ± 217.82	16.90
141-230	43	90	184.79 ± 17.39	2.05	3683.72 ± 284.46	10.81
231-303	43	73	201.51 ± 21.36	2.76	3983.72 ± 342.73	4.11
304-393	43	90	222.42 ± 21.92	2.47	3943.02 ± 342.73	4.11
43-393	43	350	725.00 ± 50.77	-	-	-

Table 4 The correlation between each shearing amount and the first year's wool yield

Age (week)	n	r	y = a+bx
1st (6)	43	0.0551	-
2nd (10)	43	0.2249	-
3rd (20)	43	0.6496**	y = 379.29 + 3.72x
4th (33)	43	0.6622	y = 365.51 + 3.56x
1-2 accumulated	43	0.2045	
1-3accumulated	43	0.6922**	y = 261.27 + 3.56x
1-4accumulated	43	0.7960**	y = 172.32 ± 1.75x
2-3accumulated	43	0.6203**	y = 360.92 + 3.14x

Table 5 Correlations Between B.W. at weaning 6, 10, 20 or 33 week old and B. W. of adults

Age week	n	r	y=a+bx
at weaning	43	0.1284	-
6	43	0.0950	-
10	43	0.2385	-
20	43	0.6465**	y=1226.01 + 1.02x
33	43	0.6906**	y=917.82+0.83x

Table 6 Correlations Between Shearing amount and B.W.

Age (week)	n	r	y=a+bx
6	43	0.4346**	y=5.42+0.01x
10	43	0.6268**	y=5.219+0.02x
20	43	0.1285	-
33	43	0.1878	-
303 day	43	0.4996**	y=77.48+0.03x
393 day	43	0.3335*	y=144.81+0.02x

At the young stage of growth, daily gain was highest (23.61g), then decreased to only 4.11 g at 230-303 day of age. But at 304-393 day old, daily gain stabilized, because of more movement and less food intake.

At the same time, the daily wool growed increasingly as the rabbit got older. It reached the highest 2.76 g per day at 231-303 day old, equal to that of adults. However, daily wool growth from 304 to 393 day of age declined somewhat, partly due to the longer hair growth period (90 day) and decreased B.W. The average wool yield annually was 900-1000 g according to the 73 days' wool production (231-303 days old) or 90 days' 304-393 days of age). (see Table 3 for details).

To be better understood, the shearing at 6. 10, 20 and 33 weeks of age was called 1st, 2nd 3rd and 4th shearing, respectively. Although there was no significant correlations (P>0.05) between the first, the 2nd or the accumulation of 1st and 2nd shearing and the first year's wool production, there were greater correlations (P<0.01) between the 3rd, the 4th, the 1st-3rd accumulated, the 1st-4th accumulated, or the 2nd-3rd accumulated shearing and the first year's wool production. This may provide a theoretical basis for early selection. It made no difference to select by the 4th and the 1st-4th accumulated shearing or by the 3rd, the 1st-3rd and 2nd-3rd accumulated shearing. But it was earlier 3 months to select by the 3 times' shearing at 20 week of age than by the 4 times shearing at 33 week. Furthermore, the cost was lower, generation interval shorter and genetics advance greater.

Though there was nonsignificant relationships (P>0.05) between the B.W. at 35 days old, B.W. at 6 weeks or at 10 weeks and the B.W. at adult (303 day of age), there were higher correlations

between the B.W. at 20 weeks or at 33 weeks and the adult B.W. (P<0.01). Selection by B.W. could be made as early as 20 week of age. (see Table 5). Between the shearing amount and the body weight at 6, 10 weeks, 303 days (P<0.01) or 393 days of age, there were higher correlations, respectively, but not at 20 weeks and 203 days old, respectively (P>0.05). (see Table 6).

Therefore, both the body weight and wool production should be taken into account when selecting at an earlier age.

4 Application of early selection and early mating

To inspect the applied effect of early selecting and early mating, we recorded the 70 days' shearing (11-20 weeks old) and the body weight at 20 weeks of age of the 1st, 2nd and 3rd offspring from 1987 to 1989. According to the following formula: $y_1=379.29+3.72x_1$ (y_1: expected first year's wool production, x_1: 70 days' shearing) and $y_2=1226.01+1.02x_2$ y_2: excepted B.W. at adult, x_2: B.W. at 20 week old, the first years' wool yield and adult B.W. could be predicted. The 70 days' shearing of the 2nd generation was 9.12 g higher than that of the 1st generation (P<0.01). The amount of the 3rd generation was 6.32 g higher than that of the 2nd generation (P<0.01). The expected first year's wool yield of 2nd generation was 33.90 g (4.5%) higher than that of 1st generation and the expected yield of 3rd generation was 23.50 g (3.09%) higher than that of 2nd generation. But the B.W. at 20 weeks of age and at adult did not differ between the 3 generations (P>0.05).

In conculsion, it would appear feasible to make early selection and early mating based on the performance at 6-10-20 weeks of age. The annual rate of genetic progress would be enhanced as a result.

Table 8   Comparison of the Shearing and B.W. of the 3 Offspring   (Unit: g)

Generation	N	70 days' shearing	B.W. at 20 weeks old	Estimated first year's wool yield	Estimated adult B.W.
1	682	100.99± 386.97	2623.43 ± 386.97	754.61	3908.05
2	623	110.114± 16.98 **	2628.84± 453.220	788.52	3900.33
3	121	116.44 ± 21.46**	2701.18 ± 279.82	812.02	3973.90

** P<.01

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