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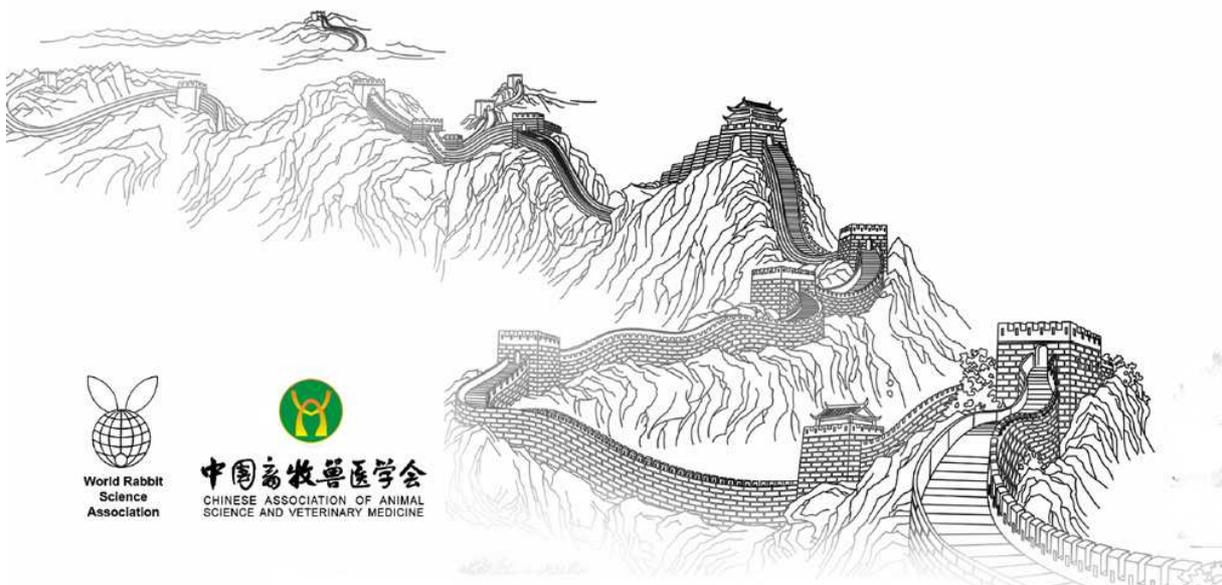
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WAN STRAIN ANGORA RABBIT - A NOVEL BREED IN CHINA

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ABSTRACT

Wan Strain Angora rabbit (WSAR)-a new coarse wool type angora rabbit with high yield and good quality was approved by the Ministry of Agriculture of People's Republic of China in 2010. It started with crossbreeding of Germany Angora rabbit and New Zealand white rabbit and continually was selected and bred for more than twenty years. Body weight, body length and chest measurements at 11-month-old were 4258.26 g, 51.85 cm and 33.47 cm, respectively. The wool yields of 61 days from 5 to 7 month were 211.0 g for male and 216.0 g for female. The annual wool yields for male and female were 1468.9 g and 1590.5 g, respectively. Coarse wool percentages (including awns) at 11-month-old are 16.2% for male and 17.8% for female. The length, diameter, tensile strength and stretching extend of coarse wool at-11 month-old are 9.5 cm, 45.9 μ m, 24.7 cN and 40.1%, respectively; those of fine wool at 11-month-old are 6.9 cm, 15.3 μ m, 4.8 cN and 43.0%, respectively. Litter size is 7.21 for primiparous, litter weight at 3-week-old is 2243.71 g. The body weight at 2-month-old is 1573.81 g. Heritabilities of main quantitative characters were estimated and analyzed using paternal half-sib intra-class correlation. The heritability of wool production, coarse wool rate and body weight at 11-month-old were 0.33, 0.21 and 0.43 respectively. The heritability of litter size at birth, milk ability and litter size at weaning were 0.16, 0.13 and 0.14, respectively.

Keywords: Wan strain angora rabbit (WSAR), Breeding, Wool production performance, Coarse wool rate, Cross.

INTRODUCTION

China is the main country of Angora rabbit industry, accounting for more than 90 percent of Angora fiber in the world. But there was no local rabbit breeds with high productivity, which seriously hampers the development of rabbit husbandry in China. In the 80's last century, the demand for angora wool changed gradually and people tended to prefer products of high coarse wool rate because of its stereoscopic feeling, elegance, warmth retention of these kinds of textiles and so on. At that time, however, there was only French Angora rabbit belongs to the coarse wool breeds and the production performance was not stable in China owing to the changes of feeding conditions. Additionally, the number of French Angora rabbits is inadequate for great demand of China and rabbit importation costs much. Under such circumstances, we started the project of coarse wool Angora rabbit breeding in the 1980's in China.

MATERIALS AND METHODS

Feeding and Management

This study was carried out at the rabbit farm in institute of animal husbandry and veterinary medicine, Anhui academy of agricultural sciences (Hefei China). All rabbits were reared in the same feeding and management conditions during the study, with each adult in a single cage, doe-litter separation, timed suckling and weaning at 42 days. Adults were fed 100 to 150g pelleted feeds daily with 11.6 MJ*GE kg⁻¹, 15%-16% CP, 14%-16% CF and whole rabbits drank *ad libitum*.

Selection and Breeding

They can be divided into three stages.

(1) Cross-breeding stage: The hybrid parents are German angora and New Zealand white rabbit, which characterized by high wool yield and quality for the former and high coarse wool rate for the latter, respectively. After reciprocal cross of two breeds and then backcross with one parent German Angora rabbit, the ideal individuals with both high wool yield and high coarse wool rate from F2 and F3 generations were selected to construct the base population for breeding.

(2) Transverse cross fixing stage: The genetic property of ideal target characters was stable after 3 generations' selection and breeding using transverse crossing fixed method applied to the base population.

(3) Improving and multiplication stage: In the first sub-stage, coarse wool rate was promoted as the main breeding character meanwhile giving consideration to improvement of wool yield through several selection methods, such as early selection and mating at age of 5 months, germplasm evaluation by lab determination and visual assessment, comprehensive selection index, family and individual selection.

Production performances especially coarse wool rate were improved significantly and then tended to be stable gradually after 5 generations' selection. In the second sub-stage, the principal objective was changed to be improvement of wool yield. Most of characters got further enhancement and marked improvement, especially wool yield, after 3 generations of systematic selection and breeding based on homogeneity of indices on the basis of the first sub-stage through renewal of selection index and introduction of restricted selection index.

RESULTS AND DISCUSSION

By systematic selection and breeding for more than twenty years, a new coarse wool type angora rabbit with high yield and good quality named Wan Strain Angora rabbit (WSAR, Figure 1) was approved by the Ministry of Agriculture of People's Republic of China in 2010.

WSAR has whole white hair, red eyes, erect ears, little hair or a pinch of wool on uppermost part of ears and medium body type. Body weight, body length and chest measurements of rabbit at 11-month-old were 4258.26 g, 51.85 cm and 33.47 cm, respectively. And the rabbits can grow rapidly in the early period. The wool yields of 61 days from 5 to 7 months old were 211.0 g for male and 216.0 g for female. The annual wool yields for male and female were 1468.9 g and 1590.5 g, respectively. Wool production rate and percentage of loosen hair were 29.29% and 97.87%, respectively. Coarse wool rates (including awns) at 11-month-old are 16.2% for male and 17.8% for female.

The length, diameter, tensile strength and stretching extend of coarse wool of male (female) at 11-month-old were 9.5cm (10.66cm), 45.9 μ m (44.3 μ m), 24.7cN (22.4cN) and 40.1% (42.5%) respectively, those of male (female) at 11-month-old were 6.9cm (7.3cm), 15.3 μ m (13.8 μ m), 4.8cN (4.2cN) and 43.0% (45.6%) respectively. Reproductive performances are medium. Average litter size is 7.21 and litter weight at 3-week-old is 2243.71g. The body weight at 2-month-old is 1573.81 g. Genetic characters of Wan strain was very stable.

The heritabilities of main quantitative characters were estimated and analyzed using paternal half-sib intra-class correlation. The heritability of wool production, coarse wool rate and body weight at 11-month-old were 0.33, 0.21 and 0.43, respectively. The heritability of litter size at birth, milk ability and litter size at weaning were 0.16, 0.13 and 0.14, respectively.

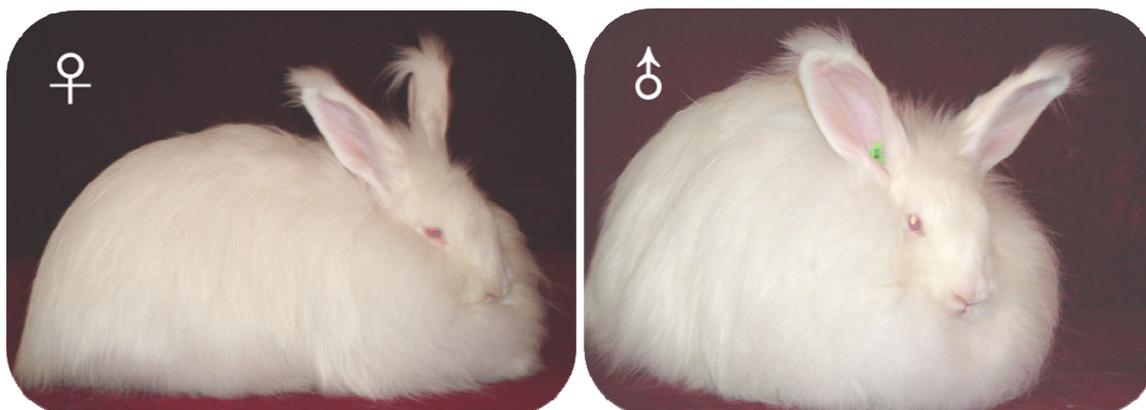


Figure 1 Wan strain angora rabbits. ♀ represents female; ♂ represents male

The results showed that the greatest improvement was achieved in wool yield and coarse wool rate followed by growth (especially for the growth rate in the early stage) and reproduction performance. As a new breed of Angora rabbit, WSAR is excellent in the main objective traits and have good comprehensive production performances.

During breeding processes, we had increased the value of weight coefficients of coarse wool rate and wool yield so as to maximize genetic progresses for both of them. In addition, adjustments of the principal objectives in different selection stages by altering weight coefficients in selection indexes, particularly the combination and alternative use of comprehensive selection index and restricted selection index, underlined the improvement of main traits.

Crossbreeding is an important way for breeding a new species of livestock and poultry (Yang, 1999; Li, 2011). In the present study, German Angora rabbit and New Zealand rabbit were imported to serve as the parents of crossbreeding. Finally, Wan Strain Coarse Angora rabbit was bred successfully with new productivity, breaking away from conventional breeding of Angora rabbits. The new breed combines two incompatible characters (high wool yield and high coarse wool rate) through gene recombination and trait integration, which not only enriches the genetic variability but also achieves the goal of high yield and high quality (Zhao et al., 2004).

Additionally, MAS (Molecular assisted selection) was applied for selection of WSAR on the basis of researches on some biochemical and molecular genetic makers (Wu et al., 2006; Huang et al., 2015). Supporting technology was studied systematically focusing on feeding and management, reproduction and disease control. These achievements were authorized to form four local standards in Anhui province. WSAR and supporting technology have produced tremendous benefits in economy, society and ecology in China (Zhao et al., 2012).

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