

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.906.086>

Breed Effect and Effect of Non-Genetic Factors on Performance Traits of Wool Type Angora Rabbits in an Organized Farm of Kashmir

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ABSTRACT

Wool produced by Angora Rabbits is considered to be one of finest in the wool and its production is only second to sheep wool and mohair. Production of this fibre is influenced by genetic and non-genetic factors and these bear significant correlations with body weights at different ages. Therefore, the present study was undertaken with the objectives to estimate the performance traits of Angora Rabbits, effect of breed and non-genetic influences on the these performance traits of Angora Rabbits under organized sector in Kashmir. The least squares means were 0.39±0.02 (kg), 0.95±0.02 (kg), 2.41±0.07(kg), 454.73±0.74 (gm), 5.65±0.04 (cm), 2.38±0.05 (%) and 12.29±0.04 (μ) for birth weight (BW), weaning weight (WW), yearling weight (YW), average wool yield (AWY), staple length (SL), medullation percent (MD) and fibre diameter (FD), respectively. The effect of sex, year and season was non-significant on all traits understudy whereas the breed effect was significant on AWY, SL and MD only.

Keywords

Angora rabbit,
Performance
evaluation, Non-
genetic factors,
Wool

Article Info

Accepted:
15 May 2020
Available Online:
10 June 2020

Introduction

Rabbit farming is practiced for meat, wool, fur, laboratory animal as well as for biological

production purposes (Dige *et al.*, 2012). Angora rabbit wool is glossy, soft and much warmer than Angora sheep wool (Pokharna *et al.*, 2004). After sheep wool and mohair,

angora rabbit wool is third largest animal fibre produced and utilized throughout world with China dominating the international Angora wool market (Schlink and Liu, 2013) and India as marginal producer. The wool production is influenced by genetic and non-genetic factors (Allain *et al.*, 2004). Wool yield bears a positive and significant correlation with different growth traits (Singh *et al.*, 2006; Garcia and Magofk (2010). Qinyu (2012) have reported correlated response between wool yield and body weight traits. The wool yield and body weights at different ages are quantitative traits governed by polygenic inheritance and are influenced by genetic and non-genetic factors (Allain *et al.*, 2004). Exploration of non-genetic factors that influence quantitative traits and correction of records for these factors are important for estimated genetic parameters and breeding value estimation to show the animal's genetic worth (Rashidi *et al.*, 2008). Therefore, the present study was undertaken to study the effect of breed (French and German Angora) and non-genetic factors (sex of animal, year and season of birth) on growth and wool traits of kits born under organized farm conditions.

Materials and Methods

The data set pertaining to French and German Angora wool type rabbits were collected from Government Angora Rabbit Farm, Wusan-Pattan, District Baramulla, Kashmir for the present study. The data were collected from flock books, body weight and wool record registers maintained at two sheep breeding farms. The information was collected on animal number, sire, dam number, date of birth, birth weight, weaning weight & yearling body weight and annual wool yield from flock books, body weight and wool record registers. Data regarding fiber diameter, medullation percent and staple length were collected from wool analysis reports conducted at fleece testing laboratory Nowshara, Srinagar. The

data were classified to study the effect of breed (French and German Angora) and non-genetic factors like years (2009, 2010 and 2011), gender (Male, Female), and season (Spring, Summer, Autumn and Winter). In order to overcome non-orthogonality of the data due to unequal subclass frequencies, multivariate general linear modal function of SPSS was used to analyze the data with breed (1 to 2), gender (1 to 2), year (1 to 3) and season (1 to 4) as fixed effects. The model adopted for data analysis was, $Y_{ijklm} = \mu + B_i + Y_j + S_k + G_l + e_{ijklm}$ where, Y_{ijklm} is the observation of m^{th} lamb of l^{th} sex, born in k^{th} season and i^{th} year of j^{th} genetic group. μ is overall mean, B_i , Y_j , S_k and G_l is fixed effects of breed, year of birth, season of birth and sex of animal, respectively. e_{ijklm} is error associated with each observation and was assumed to be normally and independently distributed with mean zero and variance $\sigma^2_e N(0, \sigma^2_e)$.

The statistical significance of various fixed effects in the least squares model was determined by 'F' test.

Results and Discussion

The least squares means were 0.39 ± 0.02 (kg), 0.95 ± 0.02 (kg), 2.41 ± 0.07 (kg), 454.73 ± 0.74 (gm), 5.65 ± 0.04 (cm), 2.38 ± 0.05 (%) and 12.29 ± 0.04 (μ) for birth weight (BW), weaning weight (WW), yearling weight (YW), average wool yield (AWY), staple length (SL), medullation percent (MD) and fibre diameter (FD), respectively. Similar estimate of weaning weight were reported by Adelodun (2015) in four breeds of rabbits whereas Siva-kumar *et al.*, (2013) found 0.5 kg birth weight and 0.6-0.7 kg weaning weight in Soviet Chinchilla. Ghosh *et al.*, (2008) in New Zealand White and Soviet Chinchilla found weaning weight and adult weight of 0.6-0.7 kg and 1.8-1.9 kg, respectively.

Table.1 Least squares means (+SE) and tests of significance of factors affecting body weight of rabbit in Kashmir

Particulars	N	BW (kg)	WW (kg)	YW (kg)	AWY (gm)	SL (cm)	MD (%)	FD (μ)
Overall	202	0.39±0.02	0.95±0.02	2.41±0.07	454.73±0.74	5.65±0.04	2.38±0.05	12.29±0.04
P. value		(0.457)N	(0.077) N	(0.753) N	(0.736) N	(0.482) N	(0.959) N	(0.860) N
Spring	107	0.40±0.01 ^a	0.96±0.02 ^a	2.46±0.07 ^a	455.33±0.69 ^a	5.68±0.04 ^a	2.36±0.05 ^a	12.30±0.04 ^a
Summer	24	0.37±0.02 ^a	0.98±0.02 ^a	2.44±0.08 ^a	455.06±0.84 ^a	5.59±0.05 ^a	2.38±0.06 ^a	12.33±0.05 ^a
Autumn	8	0.39±0.04 ^a	0.90±0.04 ^a	2.29±0.18 ^a	454.35±1.80 ^a	5.65±0.10 ^a	2.38±0.13 ^a	12.25±0.10 ^a
Winter	63	0.39±0.02 ^a	0.98±0.02 ^a	2.44±0.10 ^a	454.19±0.99 ^a	5.67±0.06 ^a	2.40±0.07 ^a	12.28±0.06 ^a
P. value		(0.822) N	(0.091) N	(0.459) N	(0.966) N	(0.479) N	(0.977) N	(0.764) N
2009	86	0.38±0.01 ^a	0.97±0.01 ^a	2.48±0.05 ^a	454.55±0.55	5.66±0.03 ^a	2.38±0.04 ^a	12.31±0.03 ^a
2009	69	0.38±0.01 ^a	0.94±0.01 ^a	2.48±0.06 ^a	454.62±0.59	5.69±0.03 ^a	2.37±0.04 ^a	12.32±0.03 ^a
2009	47	0.39±0.04 ^a	0.96±0.04 ^a	2.27±0.18 ^a	455.04±1.82	5.60±0.10 ^a	2.39±0.13 ^a	12.25±0.10 ^a
P. value		(0.952) N	(0.933) N	(0.782) N	(0.000)**	(0.000)**	(0.000)**	(0.174) N
French Angora	127	0.39±0.01 ^a	0.95±0.02 ^a	2.42±0.07 ^a	303.65±0.67a	5.13±0.04 ^a	2.24±0.05 ^a	12.27±0.04 ^a
German Angora	75	0.39±0.02 ^a	0.95±0.02 ^a	2.40±0.09 ^a	605.82±0.93b	6.17±0.05 ^b	2.53±0.07 ^b	12.32±0.05 ^a
P. value		(0.459) N	(0.677) N	(0.629) N	(0.405) N	(0.428) N	(0.907) N	(0.644) N
Male	109	0.38±0.02 ^a	0.96±0.03 ^a	2.38±0.11 ^a	454.32±1.09a	5.63±0.06 ^a	2.38±0.08 ^a	12.28±0.06 ^a
Female	93	0.39±0.01 ^a	0.95±0.01 ^a	2.43±0.06 ^a	455.15±0.64a	5.67±0.04 ^a	2.39±0.05 ^a	12.31±0.04 ^a

Means with different superscripts in the same column within subclass indicate significant differences * P<0.05, ** P<0.01, NS = Not significant, N = No. of observations

Table.2 Phenotypic correlation among performance traits of Angora rabbits

	BW	WW	YW	AWY	SL	MD	FD
BW	1						
WW	0.31	1					
YW	0.23	0.23**	1				
AWY	0.02	-0.01	0.01	1			
SL	0.04	-0.05	-0.01	0.92**	1		
MD	-0.05	-0.05	-0.01	0.46**	0.44**	1	
FD	-0.07	-0.01	-0.02	0.13	0.11	0.03	1

Olonofeso *et al.*, (2012) reported BW and WW of 0.3-0.4 kg and 2.1-2.2 kg, respectively in three breeds of rabbits. Khalil *et al.*, (2013) in Baladi Red and New Zealand White estimated adult weight of 2.2 to 2.5 kg. More or less similar estimates of 335.7 ± 26.2 gm and 656.4 ± 161.0 gm and 949.6 ± 101.1 gm of average wool yield in British Angora and Chinese Angora, respectively were reported by Neupane *et al.*, (2010). However, higher estimates of 775.75 ± 20.45 gm and 949.6 ± 101.1 gm of AWY in German Angora rabbit were observed by Singh *et al.*, (2006) and Neupane *et al.*, (2010), respectively. More or less similar estimates of BW, WW, YW, AWY, SL, MD and FD were found by Assad *et al.*, (2017) in French Angora and German Angora rabbit breeds. The effect of season on performance traits of rodents accounts for variation in weather conditions in terms of temperature, humidity and may be mediated through availability of quantity and quality of feed and fodder. The effect of season was observed non-significant on all the traits under study. Contrary to the results of present study Ghosh *et al.*, (2008) and Dige *et al.*, (2012) in New Zealand White rabbit found significant variation in body weight traits due to season of birth. The year effect is due to variation in management practices, knowledge and/ or experience of the farm manager and workers and facilities available on the farm. However, the effect of year of birth was non-significant in the present study

and may be attributed to similar management provided to rodents by same experienced workers for the three years under study. The effect of sex was non-significant on all the traits and in consonance with Ghosh *et al.*, (2008) and Assad *et al.*, (2017). On the contrary, significant effect of sex on wool yield in Angora rabbit was reported by Sood *et al.*, (2007). The effect of breed was highly significant ($p > 0.01$) on AWY, SL and MD whereas non-significant on BW, WW, YW and FD. Ghosh *et al.*, (2008) also reported non-significant effect of breed on individual weaning weight of local rabbits of subtropical climate. Contrary to the result of the present study Egena *et al.*, (2012) reported significant effect of breed on live litter bodyweight of Rabbit in Minna, Niger State, Nigeria. Chineke (2005) reported significant effect of genotype and non-significant effect of sex on individual kit weight in rabbit breeds and thier crosses. On contrary, breed having non-significant effect on individual weaning weight on local rabbits of subtropical climate were reported by Ghosh *et al.*, (2008). Neupane *et al.*, (2010) and Assad *et al.*, (2017) also observed significant effect of breed on AWY, SL and MD and non-significant effect on FD.

The phenotypic correlations between performance traits are presented in Table 2. The phenotypic correlations between body weight traits were positive in direction and

low to moderate in magnitude. The positive correlations between growth traits suggest that the traits are under the same gene action (Pleiotropy). Chineke (2000), Tiamiyu *et al.*, (2000) and Abdullah *et al.*, (2003) also reported positive phenotypic correlations among different growth traits in different rabbit breeds. The phenotypic correlation of AWY was positive and high with SL and MD. The phenotypic correlation of body weight traits was usually negative with wool quality traits. Similarly, phenotypic association between MD and FD was negative. The positive correlations among growth traits and positive correlation with annual wool yield as well as their negative relationship with wool quality (FD, SL and MD) traits obtained in the present study indicated that increase in body weight would result in corresponding improvement in other traits also.

In conclusion, the breed possesses significant of variation for wool yield, staple length and medullation (%). whereas year, sex and season had non-significant effects on the performance traits of wool type rabbits. The phenotypic association between body weight traits was observed negative. The present study will provide bases for genetic manipulation and improvement of rabbits in temperate conditions of Kashmir.

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How to cite this article:

Nusrat Nabi Khan, A. Hamadani, Ejaz Dar, Mir Shabir, Saba Bukhari, Rukhsana Shah, Aadil Ayaz and Mubashir Ali Rather. 2020. Breed Effect and Effect of Non-Genetic Factors on Performance Traits of Wool Type Angora Rabbits in an Organized Farm of Kashmir. *Int.J.Curr.Microbiol.App.Sci*. 9(06): 676-681. doi: <https://doi.org/10.20546/ijcmas.2020.906.086>