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THE INFLUENCE OF THE FACTOR «GENETIC VALUE OF THE FATHER» ON THE PRODUCTIVE QUALITIES OF THE ROMANOV BREED SHEEP

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Abstract: Sheep farming plays an important role in the production of meat. Romanov breed is known for its high fertility and therefore is used all over the world due to increased production of lambs and lamb meat**.** Meat products are the main food elements of the man. Most of the inhabitants of industrialized countries cannot imagine their menu without meat. Value of meat for human health is known, it supplies protein to the body. The Yaroslavl Region is a leading region of the Romanov sheep breed. Therefore, the aim of our research was to determine the strength and reliability of the influence of the factor «genetic value of the father» on productive characteristics of animals as a factor that helps to increase the productivity of animals. Upon determining the strength of the influence of factors for statistical data have used the procedure of generalized linear models (General Linear Models - GLM), and evaluation components of phenotypic variation attributes were analyzed by multivariate dispersive analysis. Our research has allowed allocating rams with genetic value that has the improving effect. Using the recommended lines the farmers of the Yaroslavl region may increase productive characteristics of animals and the profit of the farms and improve the efficiency of breeding.

Keywords: sheep, genetic factors, productive characteristics, efficiency of breeding

Introduction

Intensification of agricultural production, including sheep and the increase in the demand of products in this sector has accompanied by the creation of new more productive and profitable breeds *(Petrovic, 2006).* With the division of animals into breeds during the last few hundred years, animal breeding has witnessed a dramatic change. A major role in this process has evaluation of genetic modifications in herds and populations of animals *(Kuznetsov, 1983; Moskalenko et al., 2012).* Most recently, the identification of superior rams and their disproportionate genetic contribution via artificial insemination has lifted the pace of genetic gain for production traits *(El Hanafy and El Saadani, 2009; Kijas et al., 2012).*

The preservation of the gene pool of sheep as well as known, highly productive, rare and unique species for use in crossbreeding is important in the development of sheep breeding *(Moskalenko and Nikolaeva, 2013).*

Currently the rams rated by their own productivity and origin are often used for breeding in small farms. Sometimes well-known parents do not give offspring of the same quality, as they are *(Arseniev, 2011; Caro Petrovic et al., 2013).*

Accelerating the race of genetic improvement of the breed by breeding and productive indicators is possible by using rams improvers having high productive offspring *(Mazepkin and Lebedko, 2000; Moskalenko and Konovalov, 2010; Akhtar et al., 2014).* A large part of the phenotypic variation of the main economically important characteristics of sheep due to the influence of genetic components of variation – «mother's line», “father's line» and «genetic value of the father». The influence of the factor «genetic value of father» on productive qualities of sheep ranged from 8 to 17.3% (*Moskalenko and Nikolaeva, 2013).*

The Yaroslavl region it has 6 gene pool farms of Romanov sheep breed. Therefore, the aim of our research was to determine the strength and reliability of the impact of the factor «genetic value of the father» on breeding characteristics of the Romanov sheep breed.

Material and Methods

Selected farms of Uglich municipal district of Yaroslavl region were involved for this study such as «Agrofirm Avangard», PAC «Rodina», LLC «Friendship», LLC «Zarechye». The object of the study were the first Romanov breed ewes lambing (with a total of 856^{-th} - fishing). As the material of our investigations, we used the data of individual breeding ewes’ cards - form № 2, periodical of mating, offspring, individual appraisal and productivity of sheep. According to the genealogical structure of the samples, we studied 13 lines: 3, 13, 18, 20, 25, 29, 34, 115, 267, 450, 508, 541 and 600.

The following evaluation methods of breeding ewes’ signs of the study sample have used: a multivariate analysis of variance, selective genetic parameters. During determination of the strength of the influence of factors for statistical data were used the procedure of generalized linear models (General Linear Models - GLM), and evaluation components of phenotypic variation attributes had analyzed by multivariate dispersive analysis. The influence of the factor «genetic value of rams» on breeding characteristics of Romanov breed ewes was studied by linear model of mixed type**.** The evaluation of components of phenotypic variability was performed using a multi**-** factorial dispersive analysis *(Kuznetsov, 2006).*

Results and Discussion

We estimated the influence of the factor «genetic value of the father» on the variability of productivity characteristics of Romanov breed ewes in gene pool farms of Yaroslavl region according **t**o the methodology of the research. During the investigations, it was established that the phenotypic variability of the studied characteristics of ewes is determined by strong and significant influence of such factors as the «genetic value of the father». The power of influence of this factor is from 5.6% to 17.3% , including live weight – 9.2 %, shearings –17.3 % , awn length - 10.0% ,down length - 16.8 %, the ratio of awn length to the length of down - 8% and the proportion of spine and down – 5% *(Moskalenko and Nikolaeva, 2012).* Assessing the effects of the gradation of the factor «genetic value of the father» on the studied characteristics of ewes is presented in the table 1.

The ram number 5 (line 34) provided significantly plus effect on body weight of studied offspring in comparison with the average for the sample, also - № 190 (line 3) provided, the gradation effect was 6.76 kg (P> 0.95) kg and 8.7 kg (P> 0.99) kg respectively. The ram number 2 (line 18) provided significantly negative influence, also - № 37 (line 541), № 74 (line 115), № 947 (line 3), the gradation effect was - 8.18 kg (P> 0.95) -7.82 kg (P> 0.95); -8.23 kg (P> 0.95); -6.68 kg (P> 0.95) respectively.

According to *Banerjee et al., (2010*), ewe productivity, defined as number (or total weight) of lambs weaned per ewe exposed, is dependent upon the component traits of fertility, litter size, lamb survival and growth and is also a major concern of the sheep industry. In our study, the ram number 86 (line 541) significantly increased the fertility of ewes, the gradation effect was 0.97 lambs (P> 0.95), lowered – the ram number 31 (line 508), the gradation effect - 0.67 lambs. (P> 0.95). *Shaoqi (1997)* stated that fertility maybe dependent on a maternal and a paternal genetic component because mating behaviors of both parents and the quality of their gem cells are responsible for the success of a mating.

The ram number 84 (line 508) provided significantly positive impact on shearing's of ewes, the gradation effect was 0.33 kg (P> 0.99). The ram number 2 (line 20) provided significantly negative impact on the shearing's, also - № 108 (line 29), the gradation effect - 0.47 kg (P> 0.95) and -0.38 kg (P> 0.95) respectively.

In determining the complex breeding value on the basis of productivity of sheep and sheep-skin coat qualities did not found rams with category of «absolute improver» (category «A») in the sample during the study period (table 2).

Table 1. The Effect of the gradation of the factor «genetic value of the father» on productive characteristics of ewes

The factor «genetic value of the father» / Number of the ram	№ Of the daughter	Daughter's characteristics						Category Of the father
		Live weight, kg		Fertility, lambs		Shearings, kg/year		
		SI′	(μ+SI′)±m	SI′	(μ+SI′)±m	SI′	(μ+SI′)±m	
1	2	3	4	5	6	7	8	9
μ (the average value of the sample)	856	-	48.02±0.20	-	1.81±0.02	-	1.90±0.01	-
1	11	-1.13	46.89±2.83	0.33	2.14±0.32	0.17	2.07±0.13	D
2	62	-8.18	39.84±3.98*	-0.04	1.77±0.45	-0.47	1.43±0.18*	D
5	29	6.76	54.78±2.71*	0.23	2.04±0.31	-0.02	1.88±0.13	D
6	33	2.71	50.73±2.27	0.00	1.81±0.26	-0.03	1.87±0.11	D
7	19	-2.29	45.73±2.43	-0.02	1.79±0.28	0.26	2.16±0.11	D
10	34	0.16	48.18±2.26	0.15	1.96±0.26	0.05	1.95±0.10	D
16	7	-1.05	46.97±3.82	-0.78	1.03±0.44	0.24	2.14±0.18	D
19	5	2.81	50.83±3.85	-0.18	1.63±0.44	0.07	1.97±0.18	B
31	10	2.45	50.47±3.07	-0.67	1.14±0.35*	0.11	2.01±0.14	D
34	13	-1.17	46.85±4.13	0.51	2.32±0.47	-0.21	1.69±0.19	B
37	8	-8.24	39.78±3.90*	-0.03	1.78±0.44	-0.29	1.61±0.18	D
60	21	0.68	48.70±2.67	-0.46	1.35±0.30	0.11	2.01±0.12	D
65	34	-3.15	44.87±2.15	-0.33	1.48±0.25	0.15	2.05±0.10	D
74	12	-7.82	40.20±3.00*	0.19	2.00±0.34	0.02	1.92±0.14	D
84	20	-0.73	47.29±2.43	-0.16	1.65±0.28	0.33	2.23±0.14**	D
86	19	2.12	50.14±3.98	0.97	2.78±0.45*	0.19	2.09±0.18	B
94	15	3.09	51.11±3.99	0.73	2.54±0.46	0.10	2.00±0.19	B
100	8	-2.97	45.05±2.86	-0.20	1.61±0.33	-0.12	1.78±0.13	D
105	19	0.40	48.42±3.25	-0.62	1.19±0.37	0.07	1.97±0.15	D
108	29	-5.33	42.69±3.78	0.05	1.86±0.43	-0.38	1.52±0.18*	D
110	10	-1.04	46.98±4.14	0.01	1.82±0.47	-0.01	1.89±0.19	D
111	25	-1.81	46.21±2.66	-0.08	1.73±0.30	0.25	2.15±0.12	D
113	7	4.66	52.68±3.26	-0.16	1.65±0.37	-0.08	1.82±0.15	D
128	14	-4.99	43.03±2.75	0.35	2.16±0.31	0.06	1.96±0.13	D
140	44	2.51	50.53±2.11	-0.32	1.49±0.24	-0.07	1.83±0.10	D
155	29	2.11	50.13±2.39	-0.32	1.49±0.27	-0.13	1.77±0.11	D
186	30	3.53	51.55±2.11	0.12	1.93±0.24	0.04	1.94±0.10	D
190	12	8.70	56.72±3.08**	0.26	2.07±0.35	-0.04	1.86±0.14	D
196	19	-0.76	47.26±2.46	-0.24	1.57±0.28	0.10	2.01±0.11	D
240	46	2.49	50.51±2.19	-0.25	1.56±0.25	0.05	1.95±0.10	D
247	16	1.90	49.92±2.38	-0.06	1.75±0.27	0.04	1.94±0.11	D
252	21	1.27	49.29±2.29	-0.04	1.77±0.26	-0.03	1.87±0.11	D
331	42	0.98	49.00±2.24	-0.44	1.37±0.26	-0.10	1.80±0.10	D
354	37	0.35	48.37±2.44	-0.40	1.41±0.28	0.11	2.01±0.11	D
369	20	-6.32	41.70±2.97	-0.32	1.49±0.34	-0.11	1.79±0.14	D
416	7	0.59	48.61±4.31	0.56	2.37±0.49	0.05	1.95±0.20	B
615	15	-1.42	46.60±4.00	0.31	2.12±0.46	-0.25	1.65±0.19	D
618	10	-5.41	42.61±3.07	-0.05	1.76±0.35	0.06	1.96±0.14	D
907	14	6.75	54.77±3.03	0.42	2.23±0.35	-0.12	1.78±0.14	D
947	9	-6.68	41.34±3.00*	-0.50	1.31±0.34	0.14	2.04±0.14	D
1067	13	5.40	53.42±2.91	0.27	2.08±0.33	-0.07	1.83±0.14	B
1098	8	2.36	50.38±3.29	0.50	2.31±0.38	-0.16	1.74±0.15	D

Note: The difference between the index and the average value of the sample is reliable when * - P> 0.95; ** - P> 0.99; *** - P> 0.999.

We used information about productive and sheep- skin and wool characteristics of the ewes (daughters) to define the complex breeding value of the rams. It was found that the rams were not with the category «Absolute improver» (category «A») in the studied sample during the study period. Factor «genetic value of the father» did not have a significant positive impact on features such as the length of awn, the length of down and the proportion of awn and down.

Fogarty et al. (2005) commented that ewe flock productivity has a major impact on lamb enterprise profitability and stocking rate. Profit is from the sale of lambs (determined by number produced, carcass weight and fat level), skins and ewe wool (weight and fibre diameter). Potential productivity of the ewes for these traits is determined by their genetic merit. The ranking of the sire breeds (and some sires) varied with the production system and environment in which their daughters were evaluated. The said authors also stressed in their study that there were some significant differences between the maternal sire breeds in performance of their progeny; the variation among individual sires within the breeds was far greater for most production traits.

Table 2. The Effect of the gradation of the factor «genetic value of the father» on fur characteristics of ewes

The factor «genetic Value of the father» / Number of the ram	№ Of the daughter	Daughter's characteristics								Category oft he father
		The length of awn, cm		The length of down, cm		The ratio of awn length to the length of down		The proportion of awn and down		
		SI′	(μ+SI′)±m	SI′	(μ+SI′)±m	SI′	(μ+SI′)±m	SI′	(μ+ SI′)±m	
1	2	3	4	5	6	7	8	9	10	11
μ (the average value of the sample)	856	-	2,98±0,03	-	4,75±0,02	-	0,63±0,003	-	7,25±0,04	-
1	11	-0,22	2,76±0,24	0,04	4,79±0,30	-0,02	0,61±0,04	-0,46	6,79±0,60	D
2	62	-0,29	2,69±0,34	0,21	4,96±0,42	-0,08	0,55±0,06	-0,28	6,97±0,84	D
5	29	0,21	3,19±0,23	0,49	5,24±0,28	-0,03	0,60±0,04	0,08	7,33±0,57	D
6	33	0,09	3,07±0,19	-0,14	4,61±0,24	0,04	0,67±0,03	-0,50	6,75±0,48	D
7	19	-0,13	2,85±0,20	0,19	4,94±0,25	-0,02	0,61±0,03	0,01	7,26±0,51	D
10	34	0,05	3,03±0,19	-0,10	4,65±0,24	0,02	0,65±0,03	-0,48	6,77±0,48	D
16	7	0,23	3,21±0,32	-0,14	4,61±0,40	0,06	0,69±0,05	-0,78	6,47±0,81	D
19	5	0,29	3,27±0,32	0,04	4,79±0,40	0,03	0,66±0,05	-0,02	7,23±0,81	B
31	10	-0,25	2,72±0,26	-0,31	4,44±0,32	-0,03	0,60±0,04	0,24	7,49±0,65	D
34	13	-0,09	2,89±0,35	0,99	5,74±0,43	-0,15	0,48±0,06**	0,14	7,39±0,87	B
37	8	-0,31	2,67±0,33	0,03	4,78±0,41	-0,03	0,60±0,05	-0,24	7,01±0,82	D
60	21	-0,14	2,84±0,22	-0,40	4,35±0,28	0,01	0,64±0,04	-0,23	7,02±0,57	D
65	34	0,22	3,20±0,18	0,16	4,91±0,23	0,03	0,66±0,03	-0,78	6,47±0,45	D
74	12	0,03	3,01±0,25	-0,09	4,66±0,32	0,01	0,64±0,04	0,17	7,42±0,64	D
84	20	-0,31	2,67±0,20	-0,87	3,88±0,26***	0,07	0,70±0,03	0,33	7,58±0,51	D
86	19	-0,16	2,82±0,33	0,64	5,39±0,42	-0,13	0,50±0,06*	-0,35	6,90±0,84	B
94	15	0,02	3,00±0,34	0,58	5,33±0,42	-0,10	0,53±0,06	0,18	7,43±0,85	B
100	8	0,20	3,18±0,24	0,24	4,99±0,30	0,01	0,64±0,04	0,13	7,38±0,60	D
105	19	0,34	3,32±0,27	-0,21	4,54±0,34	0,08	0,71±0,05	0,47	7,72±0,69	D
108	29	-0,20	2,78±0,32	0,13	4,88±0,40	-0,05	0,58±0,05	0,09	7,34±0,80	D
110	10	0,06	3,04±0,35	0,84	5,59±0,43	-0,09	0,54±0,06	0,71	7,96±0,88	D
111	25	0,23	3,21±0,22	0,02	4,77±0,28	0,03	0,66±0,04	0,47	7,72±0,56	D
113	7	-0,49	2,49±0,27	-1,28	3,47±0,34***	0,08	0,71±0,05	0,46	7,71±0,69	D
128	14	-0,18	2,80±0,23	0,08	4,83±0,29	-0,02	0,61±0,04	-0,48	6,77±0,58	D
140	44	0,00	2,98±0,18	-0,29	4,46±0,22	0,04	0,67±0,03	0,03	7,28±0,45	D
155	29	0,07	3,05±0,20	-0,03	4,72±0,25	0,02	0,65±0,03	0,71	7,96±0,50	D
186	30	0,12	3,10±0,18	-0,26	4,49±0,22	0,05	0,68±0,03	-0,07	7,18±0,45	D
190	12	0,26	3,24±0,26	0,41	5,17±0,32	-0,03	0,60±0,04	0,09	7,34±0,65	D
196	19	-0,51	2,47±0,21*	-1,03	3,72±0,26***	0,04	0,67±0,03	0,20	7,45±0,52	D
240	46	-0,47	2,51±0,18*	-1,08	3,67±0,23***	0,07	0,70±0,03*	-0,08	7,17±0,46	D
247	16	0,11	3,09±0,20	-0,11	4,64±0,25	0,03	0,66±0,03	-0,20	7,05±0,50	D
252	21	0,01	2,97±0,19	-0,18	4,57±0,24	0,02	0,65±0,03	-0,49	6,76±0,48	D
331	42	0,32	3,30±0,19	0,03	4,78±0,24	0,06	0,69±0,03*	0,23	7,48±0,47	D
354	37	-0,17	2,81±0,21	-0,45	4,30±0,26	0,02	0,65±0,03	0,17	7,42±0,52	D
369	20	0,33	3,31±0,25	-0,13	4,62±0,31	0,05	0,68±0,04	-0,43	6,82±0,63	D
416	7	0,07	3,05±0,36	0,55	5,30±0,45	-0,06	0,57±0,06	-0,07	7,18±0,91	B
615	15	-0,18	2,80±0,34	0,64	5,39±0,42	-0,12	0,51±0,06*	0,09	7,34±0,85	D
618	10	0,21	3,19±0,26	0,15	4,90±0,32	0,02	0,65±0,04	0,04	7,29±0,65	D
907	14	0,12	3,10±0,26	0,31	5,06±0,32	-0,02	0,61±0,04	-0,21	7,04±0,64	D
947	9	-0,13	2,85±0,25	0,07	4,82±0,32	0,00	0,63±0,04	-0,13	7,12±0,64	D
1067	13	0,00	2,98±0,25	0,01	4,76±0,31	-0,01	0,62±0,04	0,04	7,29±0,62	B
1098	8	0,12	3,10±0,28	0,49	5,24±0,35	-0,05	0,58±0,05	1,35	8,60±0,70	D

Conclusion

Our studies have allowed allocating rams having genetic value, which has the effect of improving on the productivity of the flock in which they are used. We recommend using lines and their animal representatives to increase breeding efficiency and preserve the gene pool of Romanov breed sheep.

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Uticaj faktora «genetska vrednost oca» na produktivne kvalitete romanovske rase ovaca

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Rezime

Ovčarstvo igra važnu ulogu u proizvodnji mesa. Romanovska rasa je poznata po visokoj fertilnosti i zato se koristi svuda u svetu radi povećane produkcije jagnjadi i jagnjećeg mesa.Mesni proizvodi su glavni elementi hrane za čoveka. Većina stanovnika u industrijskim zemljama ne mogu da zamisle svoj meni bez mesa. Značaj mesa za ljudsko zdravlje je pre svega u tome što snabdeva organizam proteinima. Jaroslavski Region je vodeći region u gajenju romanovskih ovaca. Dakle, cilj našeg istraživanja bio je da se utvrdi snaga i pouzdanost uticaja « genetske vrednosti oca » na produktivne osobine životinja kao faktora koji pomaže da se poveća produktivnost životinja. Za utvrđivanje jačine uticaja faktora primenjena je statistička obrada podataka. Tom prilikom je korišćen postupak generalnog linearnog modela (Opšti Linearni modeli - GLM). Za evaluaciju komponenti fenotipske varijabilnosti atributa upotrebljene su multivarijacione disperzivne analize. Naše istraživanje je omogućilo identifikaciju genetske vrednosti ovnova sa koji imaju poboljšavajući efekat u potomstvu. Naša saznanja mogu pored naučnog doprinosa biti i od praktične koristi. Upotrebom preporučenih linija odgajivači ovaca u Jaroslavskom regionu mogu unaprediti proizvodne

karakteristike životinja, poboljšati efikasnost odgajivanja i povećati dobit od farmi. Ovaj metod se može primeniti i na drugim populacijama ovaca.

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