

EFFECT OF SOME FACTORS ON THE LIVE WEIGHT IN SHEEP AT DIFFERENT AGES FROM THE NORTHEAST BULGARIAN FINE FLEECE BREED – SHUMEN TYPE

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Abstract

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A study was carried out in order to establish the influence of some sources of specific variance on the live weight in 1981 sheep at different ages, from the Northeast Bulgarian fine fleece breed – Shumen type, born during the period 1990 – 2005. All estimations and the variance analysis were done on the basis of multifactor linear statistical models (Harvey, 1990). The year of birth significantly influenced the live weight at all ages studied. Differentiation between the breeding lines by the live weight was established. The type of mating did not significantly influence the live weight.

Key words: live weight, year of birth, breeding lines, variability

Introduction

The fine fleece breeds preserved in Bulgaria have been considerably reduced, but they are still a valuable gene pool. The analysis of the current state of the fine fleece sheep breeding in Bulgaria requires a new breeding policy with purpose of increasing the economic effectiveness. It is necessary to elaborate a strategy for developing the sub-branch on the basis of modern investigations, analyses, and estimations of the level of genetic diversity. The optimal level of the live weight is very important as the live weight directly influences the financial results and the rest productive traits. The effect of genetic and environmental factors on the live weight in the fine fleece breeds was discussed by Boikovski (1993, 1994, 2006), Todorova (1996), Dimitrov (1998), Chinceva (2000), Dimitrov

et al. (2001), Iliev (1998, 1999, 2001, 2003, 2006), Panayotov (2002), Slavova (2000, 2002), Slavov (2001, 2007, 2008), Stancheva et al. (2005) and Snuman et al. (1996). The dynamics of the phenotypic realization of the live weight in the fine fleece sheep requires objective estimation.

The objective of this study was to establish the effect of some sources of specific variance on the live weight at different ages in sheep from the Northeast Bulgarian fine fleece breed – Shumen type.

Material and Methods

Subject of the study were 1981 sheep from the Northeast Bulgarian fine fleece breed – Shumen type at different ages, from 19 genealogical lines, for a period of 19 years (1990 – 2005).

The results of the live weight values were analyzed at the following ages: 100 days (at weaning), 9 months, 1.5 year, 2.5 years, 3.5 years, 4.5 years, 5.5 years and 6.5 years. The information from the breeding books was used. The data was obtained by the standard methods and directions provided by the Instruction on control of productive traits and complex assessment of the fine fleece sheep breeds (2008).

All estimations and variance analysis were done by multifactor linear statistical models (Harvey, 1990).

Results and Discussion

The data shows that the live weight of lambs from the Northeast Bulgarian fine fleece breed – Shumen type is average 26.856 kg (Table 1). In comparison with the results for this breed and other fine fleece breeds raised in Bulgaria, the abovementioned live weight is lower than the data of Boikovski (1993) for the same breed and for lambs from the Caucasian breed and also lower than the results of Slavova (2002) for the Thracian fine fleece breed. Chinceva (2000) reported about higher live weight for the same breed and Slavov (2008) – for the other intrabreed type of the Northeast Bulgarian fine fleece breed – the Dobrudzha type. Iliev (2003, 2006) reported results lower than our value for the Karnobat fine fleece breed and Todorova (1996) – for the Ascanian breed.

Table 1
Average values for the live weight by ages in sheep from the Northeast Bulgarian breed - Shumen type

Age	Live weight, kg			
	n	\bar{x}	C	E
At weaning	1974	26.856	14.13	0.32
At 9 months of age	1822	51.395	8.49	0.20
At 1.5 year of age	1697	60.727	10.14	0.25
At 2.5 years of age	1207	62.629	9.77	0.28
At 3.5 years of age	737	68.647	7.71	0.28
At 4.5 years of age	291	68.488	6.89	0.41
At 5.5 years of age	67	71.746	7.83	0.11
At 6.5 years of age	31	73.548	5.86	1.05

The average live weight increased up to 73.548 kg at 6.5 years of age. The average live weight at 9 months of age (51.395 kg) was 84.64% of the average live weight of ewe lambs, which demonstrated high growth rate at young age. The early sexual maturity can be proved by the correlation between the average live weight of the ewe lambs and the animals at 4.5 years of age. The average live weight (60.727 kg) at 1.5 year reached 88.67% of the live weight at 4.5 years of age and exceeded by 21.45% the standard requirements according to the Instruction on control of productive traits and complex assessment of the fine fleece sheep breeds (2008). The variation coefficient was the highest at weaning (14.13%). It was lower for the other ages and was within the range from 5.86% to 10.14%. It was a logical consequence of the selection practice by using linear breeding as a basic method for improving the breed. Lambs with lower live weight were left for breeding purposes in order to preserve the linear structure of the herd. The values of the mean accuracy E were low – from 0.11% to 1.05% and showed that the results were representative for the whole population.

The year of birth influenced the live weight at all ages studied (Table 2), highly significant ($P < 0.001$) up to 4.5 years and significant ($P < 0.05$) at the rest ages. The values of F – criteria were especially high at 9 months of age and 1.5 year, which showed that the live weight highly depended on the conditions at earlier age. The sire's line was one of the genetic factors which significantly influenced the live weight from 9 months to 5.5 years of age with different degree of significance ($P < 0.001$, $P < 0.01$, $P < 0.05$). The type

Table 2
F – criterion for the analysis of variance of the live weight in sheep from the Northeast Bulgarian breed

Traits	Sources of variance		
	year of birth	line	type of mating
Live weight			
at 100 days of age			
Df	13	19	2

F- criterion	45.86	1.42	0.07
F- test	+++	n.s.	n.s.
	R = 0.58		
at 9 months of age			
Df	13	19	2
F- criterion	137.51	2.25	2.33
F- test	+++	++	+
	R = 0.79		
at 1.5 year of age			
Df	13	19	2
F- criterion	71.31	3.31	1.31
F- test	+++	+++	n.s.
	R = 0.68		
at 2.5 years of age			
Df	10	18	2
F- criterion	28.93	3.12	0.71
F- test	+++	+++	n.s.
	R = 0.61		
at 3.5 years of age			
Df	9	17	2
F- criterion	26.42	1.67	0.61
F- test	+++	+	n.s.
	R = 0.60		
at 4.5 years of age			
Df	8	15	2
F- criterion	5.33	2.4	0.4
F- test	+++	++	n.s.
	R = 0.63		
at 5.5 years of age			
Df	5	12	2
F- criterion	2.22	2.05	2.01
F- test	+	+	n.s.
	R = 0.74		
at 6.5 years of age			
Df	4	10	2
F- criterion	2.79	1.82	2.52
F- test	+	n.s.	n.s.
	R = 0.85		

of mating as a source of variability did not influence the live weight, except at 9 months of age ($P > 0.05$). The determination coefficient R for the live weight varied from 0.58% to 0.85% which showed that a large part of the variation by this trait was due to the influence of the factors included in the model and the results obtained were representative (Table 2).

The animals born in 1993 and 1994 had better weight development and higher and positive LS-estimations for the live weight (Table 3). The estimations of the animals born in 2005 for all ages were under the average for the population, in 1992 – up to 5.5 years, in 1996 – up to 3.5 years and in 1999 – for all ages, except at 3.5 years of age. The estimations for the other years were not unidirectional.

The values of LS-estimations for the live weight at weaning were positive and the highest in lambs from the lines - 5032, 441 and 86, and negative for lines - 7120 and 757 (Table 4). The animals from line 5032 had high and positive LS-estimations for the ages up to 4.5 years as well, with average to high significance. This line definitely had a positive effect by this trait. The animals from lines - 40368, 40199, 583 and 951349 up to 3.5 years of age had negative effect. The line 6182 and the non-linear animals had lower productivity than the average for the herd for all ages. The ewe lambs from lines 5032, 72776 and 068 considerably exceeded the rest animals at 1.5 year of age. The animals from lines 72776 and 068 at 9 months of age had lower live weight than the average for the herd but they compensated and exceeded the average which was probably a peculiarity of the line. The tracing of the weight development of sheep from line 0251 through all ages showed that up to 9 months of age they had negative LS-estimations. This fact was probably due to unfavorable dam's effect before weaning. At 18 months of age up to 6.5 years the animals from the same line realized their genetic potential by this trait. They are characterized by positive deviation from the average live weight for the herd. An opposite trend was observed in lines 441 and

Table 4
LS-estimations of the effect of the line on the live weight in sheep at different ages from the
Northeast Bulgarian breed – Shumen type

Year of birth	Live weight, kg																	
	at weaning		at 9 months of age		at 1.5 year of age		at 2.5 years of age		at 3.5 years of age		at 4.5 years of age		at 5.5 years of age		at 6.5 years of age			
	n	a	n	a	n	a	n	a	n	a	n	a	n	a	n	a		
0251	51	-0.117	46	-0.205	44	1.722	39	1.117	35	2.244	1	2.526	9	5.335	4	9.296		
068	45	0.737	36	-0.576	35	2.531	1	4.508	1	1.189								
01035	38	0.405	38	-0.246	36	-1.844												
441	4	1.453	4	-3.336	4	-3.867	2	-1.338										
40199	217	-0.360	213	-0.902	209	-1.115	195	-0.228	126	-1.292	80	1.181						
40368	103	-0.819	103	-1.281	100	-2.489	81	-1.314	19	-2.533	5	3.848	1	-6.128				
528	44	-0.049	37	0.118	30	0.646	27	-0.415	12	0.351								
576	98	-0.088	82	-0.103	69	0.33	59	0.117	32	1.002	9	-1.86	5	2.783	3	-1.112		
583	300	-0.511	286	-1.573	271	-1.094	136	-0.516	96	-1.182	38	0.894	2	-15.13	1	6.943		
5032	47	1.878	47	1.6	42	5.8	40	6.776	27	3.064	14	3.097	4	-15.54				
6182	66	-0.430	66	-1.073	58	-1.152	47	-0.225	26	-0.516	10	-3.818			1	-2.092		
757	32	-1.042	30	0.769	28	-1.427	26	-1.143	12	-1.772	4	3.253	1	-0.633				
7120	23	-1.477	21	-2.608	20	-2.034	17	2.801	13	-1.749	5	0.873	4	5.542	3	-0.983		
7418	103	-0.955	97	0.396	87	-0.251	73	0.557	43	0.49	17	4.112	14	3.995	2	-2.385		
72776	76	0.676	72	-0.372	70	3.16	22	-0.039	16	2.006	4	-2.886	3	1.191	2	-5.187		
86	1	1.365	1	9.901	1	4.518	1	-11.76	1	2.499	1	-13.41	1	22.96	1	3.425		
918	74	0.239	54	0.21	50	-0.706	40	2.45	27	0.699	9	0.88	6	-0.032	3	-1.126		
95474	14	-0.072	14	1.27	13	-1.143	11	-0.94	8	-3.134	2	0.537	2	0.752	1	-5.187		
951349	103	-0.476	78	-0.903	67	-0.699	46	-0.031	27	-1	7	0.78						
non-lineal	535	-0.358	497	-1.086	463	-0.886	344	-0.381	216	-0.363	76	-0.009	15	-5.09	10	-1.592		

Table 5
LS-estimations of the effect of type of mating on the live weight in sheep at different ages from the Northeast Bulgarian breed – Shumen type

Type of mating	Live weight, kg																	
	at weaning		at 9 months of age		at 1.5 year of age		at 2.5 years of age		at 3.5 years of age		at 4.5 years of age		at 5.5 years of age		at 6.5 years of age			
	n	a	n	a	n	a	n	a	n	a	n	a	n	a	n	a		
inraline	49	-0.11	47	0.495	45	-0.87	20	-1.06	17	0.289	6	-1.03	2	-4.58	2	-6.33		
interline	975	0.097	896	-0.65	838	-0.06	578	0.189	351	0.373	151	-0.01	40	-1.94	16	4.149		
unidentified	950	0.015	879	0.16	814	0.926	609	0.875	369	-0.66	134	1.043	25	6.523	13	2.184		

01035 where the lambs weaned at higher live weight than the average for the herd had negative LS-estimations for the rest ages. Except for the discussed lines at 3.5 years of age, the animals from line 576 had positive estimations and the ones from line 95474 – negative. Certain dynamics in positive and negative direction was observed in the other lines.

The LS-estimations of the animals which were product of intraline mating were negative, except at 9 months of age (Table 5). The LS-estimations of animals originating from unidentified mating were positive, except at 3.5 years. The LS-estimations of animals, product of interline mating, were not unidirectional.

The heritability values of live weight at different ages were high and varied from 0.984 at 1.5 year of age to 0.396 in animals with completed growth (Table 6). The high degree of genetic diversity in the herd is a prerequisite for successful selection by phenotype even at a young age and the subsequent decrease in values is a logical result from the genotype-environment interaction through the ontogenetic development. Chinceva (2000) also established high values of the heritability coefficient for live weight in the Northeast Bulgarian fine fleece breed – Shumen type and the Caucasian breed. Slavov (2008) reported average to high heritability values for the live weight at different ages in sheep from the Northeast Bulgarian fine fleece breed – Dobrudzha type.

Conclusions

Table 6

Heritability coefficients (h^2) of the live weight in sheep at different ages from the Northeast Bulgarian breed – Shumen type

Live weight	n	$h^2 \pm S h^2$
at 100 days of age	1439	0.817 ± 0.172
at 1.5 year of age	1233	0.984 ± 0.178
at 2.5 years of age	862	0.438 ± 0.122
at 3.5 years of age	520	0.396 ± 0.145

The year of birth influenced the live weight at all ages studied, highly significant ($P < 0.001$) up to 4.5 years of age and significant ($P < 0.05$) for the rest ages. Differentiation between the breeding lines of the Northeast Bulgarian sheep breed was established by the live weight at different ages. The type of mating as a source of variability did not significantly influence the live weight.

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