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ESTIMATION OF BREEDING VALUE FOR ULTRASOUND TRAITS ON LONGISSIMUS DORSI MUSCLE IN BLACK HEAD TELEORMAN

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Abstract: The aim of the present research was to estimate the breeding values for ultrasound measurement characteristics in Black Head Teleorman sheep using self-performance for selection. Biological material was consisted from 67 lambs on weaning period at 102 days. Ultrasound measurements were conducted on Longissimus Dorsi muscle, a very good indicator for meat quality. Average body weight was 31 kg. Ultrasound parameters were measured in two points (3rd and 4th lumbar vertebrae and at 12th rib). The statistics obtained for ultrasound characteristics subcutaneous back fat (2.39; 2.44 mm), muscle depth (22.31; 21.44 mm), eye muscle area (9.00; 8.86 cm²) and muscle perimeter (124.54; 123.89 mm). The breeding value for body weight at weaning day was ranged between -4.42 and 5.20. The breeding values for ultrasound characteristics obtained for subcutaneous back fat thickness ranged between -0.28 and 0.45; muscle depth -2.18 and 2.87; eye muscle area -0.77 and 1.19; muscle perimeter -6.89 and 6.12. The relative breeding value could be a very good classification for lambs in to the selection process to make a better evaluation and to continue the breeding with the best individuals for the ultrasound traits with economic importance in meat quality market.

• Introduction

The aim of this research was to estimate the breeding value using self-performance of the lambs from a local breed, Black Head Teleorman, recently born in 2010, known for its quality, engaged in to the selection process to improve constantly the meat and milk production. Lambs from Black Head Teleorman breed were measured with ultrasound method to obtain subcutaneous back fat thickness, muscle depth, eye muscle area and muscle perimeter in two measurements point on Longissimus Dorsi muscle. These chosen points underline very well an important part of the Longissimus Dorsi muscle used very often in meat carcasses evaluation, methodology implemented with success since 2000 until today. Black Head Teleorman breed recently developed in meat and milk direction with a great genetic potential and economic value for Romanian farmers. Aspects like nutritional value, tenderness, meat color, meat chemical composition, water holding capacity, and pH are very important in understanding the high quality that assembles sheep carcasses.

• Material and method

The ultrasound measurements were accomplished on 67 lambs at 102 days to obtain subcutaneous back fat thickness, muscle depth, eye muscle area and muscle perimeter in two measurements point on Longissimus Dorsi muscle, from Black Head Teleorman sheep by echographia method with modern non- invasive Echo Blaster 64 equipped with LV 7.5 65/64 probe from TELEMED ultrasound Medical System, Milano, Italy. These chosen points underline very well an important part of the Longissimus Dorsi muscle used very often in meat carcasses evaluation, methodology implemented with success since 2000 until today. The equation used to obtain the breeding value was:

$$A_i = h^2 * (P_i - \mu_p)$$

Where:

A_i = the breeding value of the lamb; h² = the heritability of the trait;

P_i = the performance of the lamb; μ_p = the mean coefficient of the population knowing that:



$$b_{A,P} * V_p = cov(A,P)$$

$$b_{A,P} = \frac{cov(A,P)}{V_p} = h^2$$

b_{A,P} = the regression of the breeding value of the selection candidate against its own performance; V_p = phenotypic variance; Cov (A, P) = covariance between breeding value and phenotype.

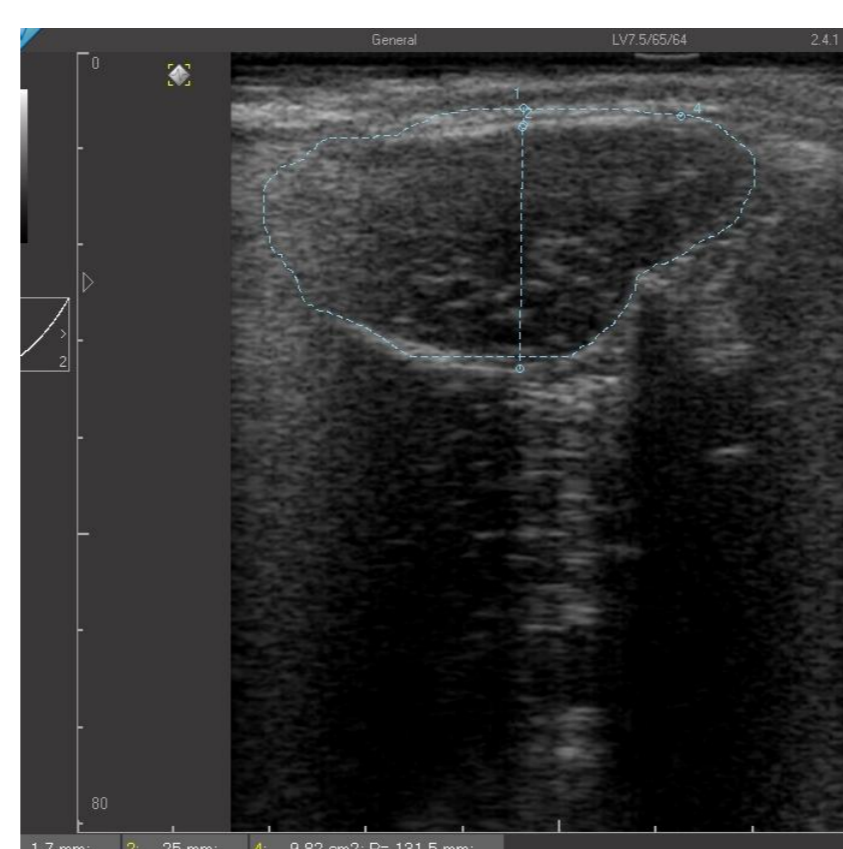
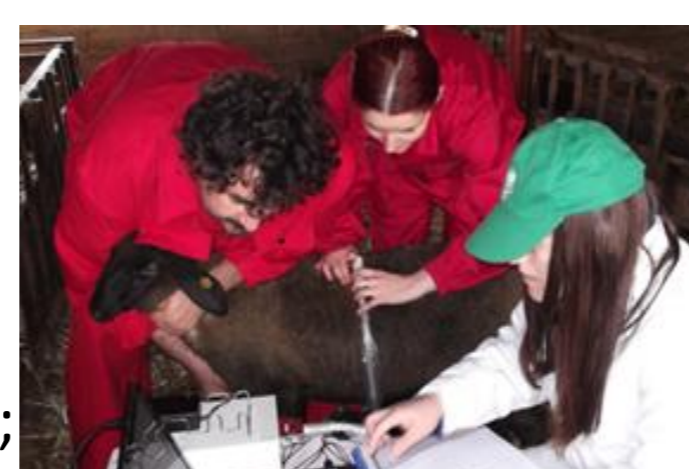
The relative breeding value is:

$$BV\% = 100 + 12 * \left(\frac{BV_{abs} - \bar{X}BV_{abs}}{\sigma BV_{abs}} \right)$$

BV%=relative breeding value;

BV_{abs}= absolute breeding value;

σBV_{abs}= standard deviation of absolute breeding value.



• Results and discussions

Table 1 a The statistics for ultrasound performances for subcutaneous back fat thickness, muscle depth, eye muscle area and muscle perimeter in Black Head Sheep for the first measurement point at 3rd and 4th lumbar vertebrae

The statistics	Back fat thickness (mm)	Muscle depth (mm)	Eye muscle area (cm ²)	Muscle perimeter (mm)
Mean	2.39	22.31	9.00	124.54
Standard Error	0.06	0.42	0.23	1.46
Median	2.40	21.80	8.49	124.60
Mode	2.40	19.00	8.43	120.30
Standard Deviation	0.50	3.46	1.85	11.98
Sample Variance	0.26	11.98	3.41	143.47
Kurtosis	-0.51	0.19	0.13	-0.34
Skewness	-0.08	0.64	0.43	-0.17
Range	2.20	15.30	8.92	50.30
Minimum	1.30	15.70	5.50	97.40
Maximum	3.50	31.00	14.42	147.70
Sum	160.00	1494.60	603.23	8344.30
Count	67	67	67	67
Conf Level (95%)	0.123	0.844	0.450	2.922

Table 1b The statistics for ultrasound performances for subcutaneous back fat thickness, muscle depth, eye muscle area and muscle perimeter in Black Head Sheep for the second measurement point at 12th rib

The statistics	Back fat thickness (mm)	Muscle depth (mm)	Eye muscle area (cm ²)	Muscle perimeter (mm)
Mean	2.44	21.44	8.86	123.89
Standard Error	0.08	0.38	0.21	1.46
Median	2.40	21.20	8.81	123.10
Mode	2.20	22.30	8.31	119.60
Standard Deviation	0.62	3.07	1.68	11.97
Sample Variance	0.39	9.44	2.82	143.32
Kurtosis	0.40	0.18	-0.32	-0.29
Skewness	0.48	0.47	0.04	-0.04
Range	2.70	14.00	7.46	54.20
Minimum	1.40	14.90	4.95	95.20
Maximum	4.10	28.90	12.41	149.40
Sum	163.40	1436.70	593.42	8300.90
Count	67	67	67	67
Conf Level (95%)	0.151	0.749	0.409	2.920

Table 2a The highest breeding values for sheep body weight, subcutaneous back fat thickness, muscle depth, eye muscle area and muscle perimeter in Black Head Sheep for the first measurement point 3rd and 4th lumbar vertebrae

No	Breeding value for body weight	Breeding value for back fat thickness	Breeding value for muscle depth	Breeding value for eye muscle area	Breeding value for muscle perimeter
1	5.20	0.30	2.87	1.19	5.56
2	4.83	0.25	2.77	0.84	5.15
3	4.09	0.22	2.67	0.80	5.10
4	4.09	0.22	2.41	0.79	4.96
5	3.72	0.22	2.08	0.52	4.65
6	3.35	0.16	1.81	0.50	4.57
7	3.35	0.16	1.78	0.48	3.61
8	3.35	0.16	1.51	0.47	3.57
9	2.79	0.16	1.09	0.44	3.21
10	2.76	0.16	1.09	0.44	3.06

Table 2b The highest breeding values for sheep body weight, subcutaneous back fat thickness, muscle depth, eye muscle area and muscle perimeter in Black Head Teleorman Sheep for the second measurement point at 12th rib

No	Breeding value for body weight	Breeding value for back fat thickness	Breeding value for muscle depth	Breeding value for eye muscle area	Breeding value for muscle perimeter
1	5.20	0.45	2.46	0.78	6.12
2	4.83	0.42	2.46	0.77	5.40
3	4.09	0.42	2.16	0.75	4.80
4	4.09	0.29	1.97	0.55	4.78
5	3.72	0.23	1.93	0.53	4.35
6	3.35	0.21	1.90	0.51	4.25
7	3.35	0.21	1.47	0.48	4.11
8	3.35	0.21	1.27	0.48	3.99
9	2.79	0.15	0.98	0.44	3.48
10	2.76	0.15	0.98	0.44	3.43

Table 3a The highest relative breeding values for sheep body weight, subcutaneous back fat thickness, muscle depth, eye muscle area and muscle perimeter in Black Head Teleorman Sheep for the first measurement point 3rd and 4th lumbar vertebrae

No	Breeding value for body weight (%)	Breeding value for back fat thickness (%)	Breeding value for muscle depth (%)	Breeding value for eye muscle area (%)	Breeding value for muscle perimeter (%)
1	127.09	126.42	130.14	135.20	123.20
2	125.16	121.67	129.10	124.67	121.50
3	121.30	119.29	128.06	123.63	121.30
4	121.30	119.29	125.28	123.37	120.70
5	119.37	119.29	121.82	115.31	119.39
6	117.45	114.54	119.04	114.79	119.09
7	117.45	114.54	118.70	114.08	115.09
8	117.45	114.54	115.92	113.75	114.89
9	114.55	114.54	111.42	113.10	113.38
10	114.36	114.54	111.42	112.97	112.78

Table 3b The highest relative breeding values for sheep body weight, subcutaneous back fat thickness, muscle depth, eye muscle area and muscle perimeter in Black Head Teleorman Sheep for the second measurement point at 12th rib

No	Breeding value for body weight (%)	Breeding value for back fat thickness (%)	Breeding value for muscle depth (%)	Breeding value for eye muscle area (%)	Breeding value for muscle perimeter (%)
1	127.09	132.10	129.13	125.40	125.57
2	125.16	130.16	129.13	125.04	122.56
3	121.30	130.16	125.61	124.26	120.05
4	121.30	120.50	123.27	117.97	119.95
5	119.37	116.64	122.88	117.11	118.15
6	117.45	114.71	122.49	116.46	117.75
7	117.45	114.71	117.41	115.68	117.15
8	117.45	114.71	115.07	115.61	116.65
9	114.55	110.84	111.55	114.46	114.54
10	114.36	110.84	111.55	114.25	114.34

• Conclusions: In Black Head Teleorman the breeding values for back fat thickness in both measurement point was displayed between 0.45 and -0.28 in the first point and for the second point were ranged between 0.30 and -0.29, having a slow evolution and a positive effect. The ultrasound characteristics showed that subcutaneous back fat (2.39; 2.44 mm), muscle depth (22.31; 21.44 mm), eye muscle area (9.00; 8.86 cm²) and muscle perimeter (124.54; 123.89 mm) were very good results, which reflect the great genetic potential for this local sheep breed. In the first measurement point the higher relative breeding value was reached by the eye muscle area with 135.2 % explained because this part of Longissimus Dorssi it is closer to a very important muscle on carcass. Also, a relative breeding value of 130.14% was obtained for muscle depth followed by the muscle perimeter on the last place, 123.20%. In conclusion this ultrasound traits along with body weight could be used as an index for selection process for Black Head Teleorman lambs very early in their productive life to obtain the best individuals and to improve constantly the quality and quantity of muscle on lamb carcass.

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