STUDY OF MORPHOLOGICAL CHARACTERS OF GRAY STEPPE CATTLE IN ROMANIA

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Abstract

Researches were carried out on a number of 122 Grey Steppe breed females grouped into 8 groups: 3 groups in cattle unit increase: SCDCB Dancu Iasi (38 heads), USAMV Cluj (4 heads), Roua-Group Ialomița (3 heads), and 5 lots in Neamt population households (Tazlău - 6 heads, Tupilați-7 heads) and Tulcea (39 heads in Chilia Veche, Letea -18 heads and Pardina -7 heads), aiming the main parameters morphological body development. The results were statistically analyzed using SPSS 19 program and statistical significance was done using ANOVA test. Following the study it was found a decrease in height at withers parameter value to values that decrease well below minimum recorded according to specialized data, horizontal length of the trunk retains the same value date and the chest perimeter parameter value is higher today. Regarding weight, it currently remains elevated (393.42 to 500.3 kg) compared to the values quotes in the literature (372 kg in 1961 and 415 kg in 1982).

Key words: Gray Steppe, morphological parameters, body weight

INTRODUCTION

Gray cattle breed is in the attention of specialists with different studies regarding its evolution in time, now being considered an endangered species [2].

The aim of this paper is to establish the current values regarding the morphological features of gray cattle in different breeding areas, in specialized units and individual farms, compared to those reported in different previous periods.

MATERIAL AND METHOD

Researches were carried out on 122 cows grouped in 8 groups: 3 groups in bovine breeding units: SCDCB Dancu Iaşi (38 heads), USAMV Cluj (4 heads), Roua-Grup Ialomița (3 heads); and 5 groups in the farms of the population from Neamț county (Tazlău - 6 heads, Tupilați - 7 heads) and Tulcea (Chilia Veche - 39 heads, Letea - 18 heads and Pardina - 7 heads). Through biometric determinations, it was followed the physical growth of cows from the units used in the study.

The statistical interpretation and processing of obtained data was carried out with the aid of the program SPSS 19 referring to the position and variation estimators (arithmetic mean $\overline{X}$, standard deviation of the mean ±s, standard deviation s, variation factor V%) for the studied features.

Establishing the significance of differences between the values of features to the analyzed groups was carried out with the aid of the Fischer test, through the ANOVA method.

The analysis of inheritance was calculated based on the following calculus formula:

$$h^2 = \frac{s^2 G}{s^2 G + MS_w} \times 4$$

RESULTS AND DISCUSSIONS

Synthetically analyzing the average values of the main indicators of the physical growth to gray cattle present in specialized breeding units, different variations were determined (table 1).

In the case of gray cattle at first lactation from S.C.D.C.B. Dancu, the following average values were registered: the height to withers of 122.7 ± 0.78 cm, the thoracic perimeter of 181.7 ± 1.48 cm, the horizontal length of the trunk of 149.8 ± 2.19 cm, body weight of 500.3 ± 9.34 kg.

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Following the body growth to gray cattle from U.S.A.M.V. Cluj in the first lactation the following average values were distinguished: the height to withers of 119 ± 0.57 cm, the thoracic perimeter of 170 ± 4.93 cm, the horizontal length of the trunk of 137 ± 3.51 cm, body weight of 417.6 ± 44.33 kg.

Analyzing the morphological parameters to gray cattle from Roua-Grup, in the individual farms were also determined different variations of the morphological features analyzed: the height to withers of 124.3 ± 3.71 cm, the thoracic perimeter of 176.3 ± 11.25 cm, the horizontal length of the trunk of 158.3 ± 8.17 cm, body weight of 506.6 ± 48.41 kg.

In the farms of the population were registered also different variations of the morphological features analyzed (tab. 2).

Table 1 Average values and variability of the body growth to gray cattle in the first lactation in specialized breeding units

Specification		Height at withers	Thorax width	Thorax depth	Thorax perimeter	Horizontal body length	Rump width at hips	Rump width at thighbone joint	Rump width	Shinbone perimeter	Body weight
SCDCB DANCU	n	38	38	38	38	38	38	38	38	38	38
	$\overline{X}$	122.7	43.65	63.60	181.7	149.8	45.07	43.05	49.60	17.21	500.3
	$\pm s_{\overline{x}}$	0.78	0.59	0.64	1.48	2.19	0.45	0.47	0.38	0.17	9.34
	s	4.81	3.68	3.96	9.14	13.55	2.80	2.91	2.36	1.09	57.61
	V%	3.92	8.44	6.24	5.03	9.04	6.21	6.76	4.76	6.35	11.51
	Min	117	36	52	154	124	39	39	43	15	405
	Max	130	51	69	204	171	51	49	53	19	690
USAMV CLUJ	n	3	3	3	3	3	3	3	3	3	3
	$\overline{X}$	119	38.3	63	170	137	43	41	47	16.33	417.6
	$\pm s_{\overline{x}}$	0.57	0.66	2.88	4.93	3.51	0.57	1.52	1.15	0.33	44.33
	s	1	1.15	5	8.54	6.08	1	2.64	2	0.57	76.78
	V%	0.84	3.01	2.88	5.02	4.43	2.32	6.45	4.25	3.53	18.38
	Min	118	37	58	162	133	42	39	45	16	348
	Max	120	39	68	179	144	44	44	49	17	500
ROUA-GRUP	n	3	3	3	3	3	3	3	3	3	3
	$\overline{X}$	124.3	44	63	176.3	158.3	46	43.33	49.33	17.66	506.6
	$\pm s_{\overline{x}}$	3.71	1.73	2.30	11.25	8.17	1.52	0.666	0.33	0.33	48.41
	s	6.42	3	4	19.50	14.15	2.64	1.15	0.57	0.57	83.86
	V%	5.17	6.81	6.34	11.05	8.93	5.75	2.66	1.17	3.26	16.55
	Min	117	41	59	154	142	43	42	49	17	410
	Max	129	47	67	190	167	48	44	50	18	560
Fischer Test	F	**0.971**	**2.020**	**0.069**	**1.583**	**1.659**	**0.923**	**0.670**	**1.860**	**1.325**	**2.584**
	p	**0.387**	**0.145**	**0.934**	**0.217**	**0.202**	**0.405**	**0.517**	**0.168**	**0.276**	**0.087**
		ns.	ns.	ns.	ns.	ns.	ns.	ns.	ns.	ns.	ns.

ns. = no significant differences;* = significant differences; *** = highly significant differences

In the case of gray cattle from Tazlău, the following average values were determined: height to withers of 123 ± 2.12 cm, with variations between 117-128 cm, thoracic perimeter of 187.83 ± 7.59 cm, with variations between 155-206 cm, total length of 190,83 ± 8.35 cm, with variations between 151-207 cm, body weight of 541 ± 60.86 kg.

In the case of gray cattle from Tupilați, the following average values were determined: height to withers of 119.42 ± 1.42 cm, with variations between 115-125 cm, thoracic perimeter of 184.85 ± 4.39 cm, with variations between 172-207 cm, total length of 191.42 ± 5.89 cm, with variations between 167-211 cm, body weight of 486.42 ± 44.73 kg.

Table 2 Average values and variability of the body growth to gray cattle in the first lactation in the individual farms

Specification		Height at withers	Height at back	Height at rump	Height at the tail	Thorax depth	Substernal void	Oblique body lenght	Horizontal body length	Total lenght	Rump lenght	Thorax lenght	Head lenght	Thorax width	Chest width	Rump width at hips	Rump width at thighbone joint	Rump width at ischium	Head width	Thorax perimeter	Shinbone perimeter	Body weight
U.M.		cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	cm	Kg
TAZLĂU	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	$\overline{X}$	123	121.5	124.66	125.66	69.66	53.33	148.5	135.66	190.83	49	84.16	47.66	44.66	40	47.33	42.66	17.5	21.5	187.83	17.41	541
	$\pm s_{\overline{X}}$	2.12	1.94	1.64	1.68	3.1	1.96	6.25	4.51	8.35	0.93	3.13	1.38	2.94	1.86	1.97	1.66	1.33	0.56	7.59	0.55	60.86
	s	5.21	4.76	4.033	4.13	7.6	4.8	15.31	11.05	20.45	2.28	7.67	3.38	7.2	4.56	4.84	4.08	3.27	1.37	18.6	1.35	149.09
	V%	4.24	3.92	3.23	3.28	10.91	9.00	10.31	8.15	10.72	4.65	9.12	7.1	16.12	11.4	10.23	9.56	18.69	6.41	9.9	7.79	27.55
	Min	117	117	119	120	58	48	123	120	151	45	70	42	34	34	39	36	13	19	155	15	28
	Max	128	1299	130	130	79	60	168	151	207	51	93	51	53	44	52	47	21	23	20	19	70
TUPILAȚI	n	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	$\overline{X}$	119.42	120.57	124	125	68.85	50.57	149.71	131.14	191.42	47.71	83.57	48	44.57	39.71	49.14	42.71	16.57	21.42	184.85	17.64	486.42
	$\pm s_{\overline{X}}$	1.42	1.04	1.23	1.11	1.37	2.09	3.46	3.01	5.89	0.71	1.32	0.84	1.93	0.8	1.01	0.68	0.99	0.428	4.39	0.35	44.73
	s	3.77	2.76	3.26	2.94	3.62	5.53	9.17	7.98	15.6	1.88	3.5	2.23	5.12	2.13	2.67	1.79	2.63	1.13	11.62	0.94	118.34
	V%	3.16	2.289	2.63	2.35	5.26	10.94	6.13	6.09	8.15	3.96	4.19	4.65	11.5	5.38	5.43	4.21	15.91	5.29	6.28	5.35	24.32
	Min	115	117	119	120	64	44	135	121	167	44	80	45	37	37	46	40	14	20	172	16	360
	Max	125	124	124	128	75	58	161	142	211	49	89	52	53	43	54	45	22	23	207	19	710
CHILIA-VECHE	n	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
	$\overline{X}$	120.46	119.8205	124	124.94	65.69	54.76	146.41	134.3	182.82	50.07	80.38	46.64	43.53	38.46	47.23	42.05	16.66	21	179.35	17.91	461.89
	$\pm s_{\overline{X}}$	0.69	0.68	0.64	0.55	0.871	0.71	1.95	1.7	2.51	1.19	1.57	0.54	0.77	0.58	0.81	0.45	0.35	0.21	2.12	0.19	16.53
	s	4.31	4.29	4.05	3.44	5.44	4.474	12.2	10.61	15.7	7.47	9.83	3.39	4.84	3.63	5.09	2.84	2.2	1.35	13.25	1.22	103.23
	V%	3.58	3.58	3.267	2.75	8.28	8.17	8.33	7.9	8.59	14.93	12.24	7.28	11.12	9.44	10.77	6.76	13.22	6.46	7.39	6.83	22.35
	Min	108	107	111	116	51	49	128	113	160	41	49	36	31	32	32	34	13	18	150	15	257
	Max	126	128	132	132	75	68	169	155	216	79	99	53	53	47	60	51	21	23	202	21	660
LETEA	n	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	$\overline{X}$	121.16	119.55	123.22	124.16	63.55	57.61	144.77	139.94	179.88	48.611	78.61	46.22	40	36.38	45.83	42.05	17.5	20.77	175.88	18.36	436.72
	$\pm s_{\overline{X}}$	1.33	1.08	1.06	1.02	1.37	1.02	2.75	3.1	3.18	0.82	1.745	0.73	0.95	0.9	0.95	0.8	0.59	0.34	3.01	0.35	20.6
	s	5.65	4.61	4.53	4.32	5.81	4.36	11.68	13.18	13.53	3.5	7.4	3.13	4.07	3.83	4.04	3.4	2.52	1.47	12.79	1.51	87.42
	V%	4.67	3.86	3.67	3.48	9.14	7.58	8.07	9.42	7.523	7.2	9.42	6.78	10.18	10.54	8.83	8.09	14.43	7.11	7.27	8.23	20.01
	Min	110	108	113	115	53	49	121	118	152	40	59	39	29	30	34	32	14	18	145	15	245
	Max	130	1277	133	132	75	68	166	165	199	53	94	50	47	46	50	48	22	23	197	21	610
PARDINA	n	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	$\overline{X}$	120.35	117	118.0	117.78	57.21	63.14	130.85	122.57	-	32.57	67.14	41.28	-	30.57	36.42	34.42	16.71	20.28	168.42	16.57	393.42
	$\pm s_{\overline{X}}$	4.29	1.27	1.08	1.23	4.45	0.98	2.35	6.06	-	1.61	2.15	0.99	-	0.86	0.868	1.13	0.77	1.37	3.99	0.39	28.42
	s	11.35	3.37	2.86	3.26	11.79	2.6	6.22	16.05	-	4.27	5.69	2.62	-	2.29	2.29	2.99	2.05	3.63	10.56	1.05	75.19
	V%	9.43	2.88	2.42	2.77	20.61	4.13	4.76	13.09	-	13.12	8.48	6.36	-	7.52	6.31	8.69	12.31	17.93	6.2	6.38	19.11
	Min	111	112	114	114	47	60	121	105	-	27	62	37	-	27	32	31	15	15	158	14.5	335
	Max	145	121	123	124	83	67	139	148	-	40	75	45	-	33	39	38	21	26	188	17.5	540
Test Fischer	F	**0.402**	**1.073**	**3.555**	**6.083**	**4.440**	**8.924**	**3.111**	**2.978**	**1.392**	**13.363**	**4.734**	**5.223**	**2.833**	**9.197**	**9.670**	**10.5**	**0.519**	**0.639**	**2.366**	**2.743**	**2.001**
	p	**0.807**	**0.376**	**0.011**	**0.000**	**0.003**	**0.000**	**0.020**	**0.025**	**0.253**	**0.000**	**0.002**	**0.001**	**0.045**	**0.000**	**0.000**	**0.00**	**0.722**	**0.636**	**0.061**	**0.035**	**0.103**
		ns.	ns.	*	***	***	***	*	*	ns.	***	***	***	*	***	***	***	ns.	ns.	ns.	*	ns.

ns. = no significant differences;* = significant differences; *** = highly significant differences

Following the studies carried out concerning the body weight of gray cattle from Chilia Veche, Tulcea county, the following average values were distinguished: height to withers of 120.46 ± 0.69 cm, thoracic perimeter of 179.35 ± 2.12 cm, total length 182.82 ± 2.51 cm, body weight of 461.89 ± 16.53 kg.

In the case of gray cattle from Letea, Tulcea county, the following average values were determined: height to withers of 121.16 ± 1.33 cm, thoracic perimeter of 175.88 ± 3.01 cm, total length 179.88 ± 3.18 cm, body weight of 436.72 ± 20.6 kg.

Following the studies carried out concerning the body weight of gray cattle from Pardina, Tulcea county, the following average values were distinguished: height to withers of 120.35 ± 4.29 cm, thoracic perimeter of 168.42 ± 3.39 cm, oblique body lenght of 130.85 ± 2.35 cm, body weight of 393.42 ± 28.42 kg.

The analysis of the inheritance factor has registered average to high values in case of cows from all analyzed units, which denoted a genetic determinism which varies from average to large for all features taken into account for the study (table 3).

The analysis of inheritance factors of the morphological features to gray cattle at first lactation from S.C.D.C.B. Dancu denote a medium genetic determination with values varying between 0.27 to the depth of the thorax and 0.43 for the body weight.

The analysis of inheritance factors of the morphological features to gray cattle at first lactation from U.S.A.M.V. Cluj and Roua-Grup denote a medium genetic determination with values varying between 0.25 to the thorax width and 0.43 for the body weight.

For the morphological features of gray cattle from private owners, the analysis of inheritance factors denote a medium genetic determination, with variations of the values between 0.32 for the depth of the thorax and 0.47 for the body weight.

Table 3 Inheritance factor (h^2) for the factors studied to gray cattle

Caracter	h^2 SCDCB Dancu	h^2 Usamv Cluj şi Roua Grup	h^2 Individual farms
Height to withers	0.37	0.37	0.36
Body weight	0.43	0.43	0.47
Thoracic perimeter	0.33	0.32	0.35
Sloping body length	0.29	0.34	-
Rump width at hips	0.30	0.35	-
Rump width at thighbone joint	0.31	0.32	-
Rump width at ischium	-	0.33	-
Thoracic width	-	0.25	-
Thoracic depth	0.27	-	0.32

The analysis of parameters concerning the body growth to gray cattle currently bred in different specialized breeding units and individual farms denoted different variations of values, compared to those reported in time by the specialty literature. Therefore, the height to withers has registered variations between 128-133.39 in the period 1920-2009, at present reaching average values in specialized units, between 119 cm (U.S.A.M.V. Cluj) and 129.5 cm (S.C.D.C.B. Dancu), and in individual farms to average values between 119.42 cm and 121.16 123 cm, being determined a reduction of the value of this feature up to a level situated under the minimum value of data registered by the specialty literature (fig. 1 and 2).

The statistical analysis of differences for this feature is insignificant, both between the values of this feature for animals from bovine breeding units (table 1) as to private owners (table 2).

The horizontal length of the body currently registers average values between 130.85– 157 cm, which are within the variation limits previously reported by the specialty literature, except for the animals from Pardina locality, with body dimensions decreased for this feature (130.85 cm) (fig.1 and 2).

Among the specialized units in breeding bulls are not determined statistically significant differences as the horizontal length of the body is concerned (table 1), unlike the batches of individual owners,

where a statistically significant difference occurs (table 2). As the thoracic perimeter is concerned, variations between 168.42 cm are currently registered at Pardina and 194.3 cm at SCDCB Dancu (fig.1 and 2) which are higher in comparison to the previously reported variations (167.13 cm in 1925 and 189 cm in 2009), the differences being statistically insignificant.

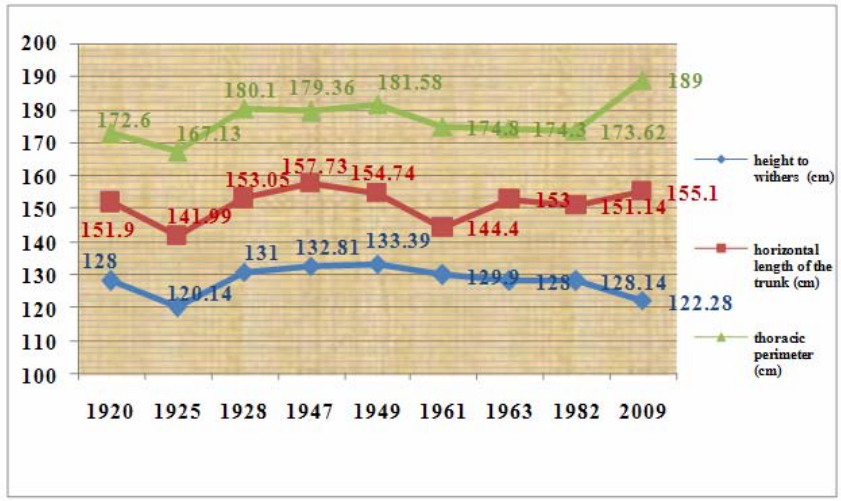

Fig.1 Values concerning the body growth to gray cattle, by various authors (1920- Dumitrescu A.[2]; 1925- Constantinescu G.K.[2]; 1928- Țurcanu T.[2]; 1947- Cardaş A. [1]; 1949-Dincă Gh.şi Țurcanu T.[2];1961,1963-Miriță I.[3];1982-Miriță I.[4];2009-Creangă Ş., Maciuc V. [2]

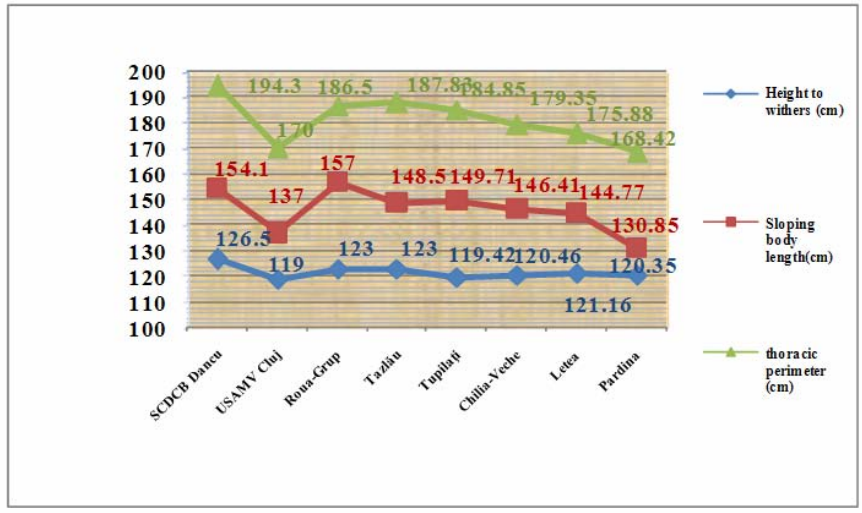

Fig. 2 Values concerning the body growth to gray cattle following results

As the body weight is concerned, higher average values are registered, ranging between 393.42–500.3 kg, compared to the previously reported variations, mentioned in the specialty literature (372 kg in 1961 and 415 kg in 1982) (fig. 3). No significant differences were determined for the feature of body weight at animal batches taken into account for the study.

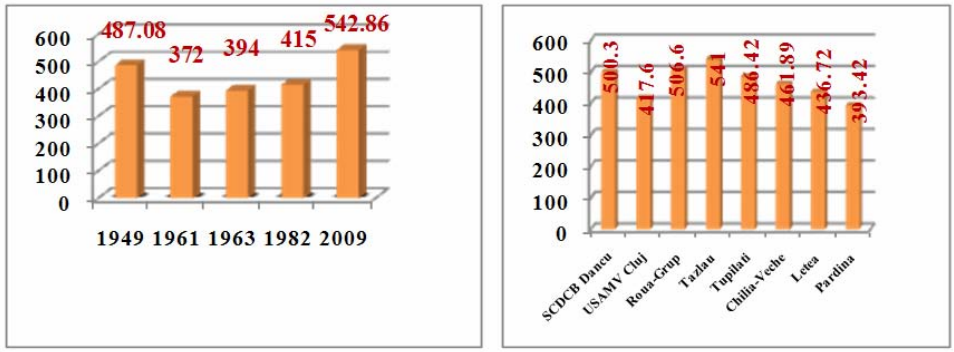

Fig. 3 Values concerning body weight, by various authors 1949- Dincă Gh. şi Ţurcanu T.[2]; 1961,1963- Miriță I. [3];1982- Miriță I. [4];2009- Creangă Ş., Maciuc V. [2] (left) and valuea concerning body weight following results (right)

In case of animals bred in specialized units insignificant differences are determined for all the values of morphologic parameters analyzed at first lactation (table 1). In individual farms significant differences are determined for height to rump; the horizontal and oblique length of the body, the width of the chest and the perimeter of the fluid and very significant differences for height at the base of the tail, the depth of the thorax, the height of the sternum, the length of the rump, thorax, head and width of the chest and of the croup measured at hip and coxo-femoral joint (table 2).

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CONCLUSIONS

1. For the main analyzed parameters, the study determines the following: a reduction of the height to withers with values that decrease under the minimum value reported by the specialty literature; a conservation of the value of the feature horizontal length of the body at present, except for the animals of Pardina locality, and an increase of the thoracic parameter and of the body weight, as a result of improvement of conditions of breeding and feed.

2. The analysis of inheritance factors for morphological features of gray cattle denotes a medium genetic determination for the depth of the thorax and a high genetic determination for the body weight.

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