

OBJECTIVE MEASUREMENT OF COAT COLOR VARIETIES IN THE HUNGARIAN GREY CATTLE

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Introduction:

When preserving genetic resources one of the most important tasks is to maintain the typical characteristics of the breed in order to avoid losing the available genetic variability. Therefore, traits without economic value at the moment (the so-called 'non-food function' traits) should also be conserved.

Hungarian animal breeders and professionals were among the first to realize the importance of preserving animal genetic resources and took steps in order to rescue breeds threatened by extinction. Nowadays, the only cattle breed that is under protection in Hungary is the Hungarian Grey cattle. Its preservation is supported by excellent secondary traits (good fertility, calving ease, good mothering ability, good grazing ability) and other valuable qualities such as the different coat color varieties, horn conformations and horn color varieties.

The Hungarian Grey cattle is characterized by a great variety of coat colors, which are genetically determined and vary within the given breed character not only by age but are affected by the season, as well.

Material and methods:

Research has been done in the largest Hungarian Grey cattle stock at the Hortobágy Society for Nature Protection and Gene Conservation. In order to compare the Hungarian Grey cattle with its closest relative, 15 Maremmana bulls were measured at the Istituto Sperimentale per la Zootecnia, in Monterotondo, Italy. For objective measurement of coat color the Minolta Chromameter CR-410 was applied, which measures the reflectance of the light from the coat compared to a calibration plate. The $L^*a^*b^*$ color space, defined by the International Commission on Illumination (CIE) in 1976 is the most widely used color space for measuring color of domestic animals objectively (Curik et al., 2002). The L^* value shows the lightness of the color on a scale from 0 to 100, the lower values indicating the darker color. The a^* value indicates the red/green, while the b^* value indicates the yellow/blue chromaticity of the color on a scale ranging from +60 to -60. These three color attributes together define the position of a specified color within a 3D color space.

The measurements of the adult animals were always connected to some work (vaccination, checking of the ear-tags) performed in the stock. Calves were measured after birth, occasionally in the period of January-April, 2006.

As the front and the rear part of the body is usually darker, we determined three main measurement areas: the neck-shoulder, the side and the thigh-croup area. Three-four measurements per measurement areas were made.

Data were analyzed by using SPSS 11.0 for Windows (SPSS Inc., Chicago, IL).

Results and discussion:

Coat color of new-born calves

The Hungarian Grey cattle belongs to the Podolian group of cattle which is characterized by the fact that calves are born with a reddish coat color and become grey at the age of 4-6 months. However, several coat color varieties of new-born calves can be distinguished: dark reddish, reddish and light reddish.

Table 1: Minimum, maximum and mean L*a*b* values of the light reddish, reddish and dark reddish coat color varieties

				Minimum	Maximum	Mean±SD
Light reddish	n=47	L*	*	49,26	84,58	64,24±7,09
		a*	*	0,14	7,44	3,53±1,79
		b*	*	3,71	21,78	11,99±3,52
Reddish	n=94	L*	ns	38,53	66,98	52,36±4,76
		a*	ns	2,12	74,85	6,47±3,77
		b*	ns	7,26	23,40	15,74±2,29
Dark reddish	n=40	L*	*	35,29	58,50	45,59±4,22
		a*	ns	4,32	9,96	7,22±1,05
		b*	ns	10,18	20,31	16,08±1,89

*P<0.05

We determined that 52% of the measured calf population was reddish-colored, while the proportions of the lighter and darker categories were 26% and 22%, respectively. Statistically significant differences were found among the L* values of the three groups. Concerning the other two values: the a* and the b*, only the light reddish animals differed significantly from the other two groups (Table 1).

Coat color of adult animals

The coat color of the Hungarian Grey cattle ranges from silvery to dark crane and the color of the bulls is usually more diversified (Bodó et al., 2002).

The coat color of the Hungarian Grey cattle is not only changing by the age but is affected by the season, as well. The winter coat is usually darker and contains more red hairs than the summer coat. Heifers in winter and in summer coat were measured (Table 2).

Table 2: L*a*b* values of the winter and summer coat of Hungarian Grey heifers

Heifers		L*	a*	b*
		Mean±SD		
Winter coat (n=42)	neck	49.45 ^a ±7.09	1.71 ^a ±0.54	8.03 ^a ±2.48
	side	52.37 ^b ±5.65	1.81 ^a ±0.54	8.96 ^b ±2.31
	thigh	53.61 ^b ±7.29	1.90 ^a ±0.58	9.89 ^c ±2.61
Summer coat (n=160)	neck	53.50 ^a ±4.75	1.74 ^a ±1.01	12.73 ^a ±1.53
	side	59.86 ^b ±4.15	0.92 ^b ±0.61	12.41 ^b ±1.67
	thigh	61.23 ^c ±3.73	0.58 ^c ±0.58	11.96 ^c ±1.54

^{a,b,c}: P<0.05

We found that the winter coat can be characterized by lower L* (indicating the darker coat color) and b* values and by higher a* values (indicating the higher number of red hairs in the

coat) than the summer coat. Concerning the three main measurement areas, we found that only the L*a*b* values of the neck-shoulder area differed significantly from the other two measurement areas. However, in the case of the summer coat, statistically significant differences were found among the L*a*b* values of all three measurement areas.

The Maremmana breed:

The Maremmana breed is often regarded as the closest relative of the Hungarian Grey cattle, which was transformed slightly different by the different environment during the centuries. The coat color of the two breeds is almost identical but generally there are more darker-colored animals in the Maremmana breed.

For comparing the coat color of the two relative breeds, we measured 15 Maremmana bulls at the Istituto Sperimentale per la Zootecnia in Monterotondo, Italy. (The age of the bulls ranged from 1 to 1.5 years). The L*a*b* values of the two breeds are compared in *Table 3*.

Table3: L*a*b* values of the Hungarian Grey and Maremmana bulls' coat

			Hungarian Grey bulls (n=36)			Maremmana bulls (n=15)		
			Min.	Max.	MeanSD	Min.	Max.	MeanSD
neck	L*	*	19.20	62.90	36.49±9.41	27.45	56.18	40.87±7.30
	a*	ns	0.51	2.97	1.35±0.45	0.97	2.02	1.34±0.29
	b*	*	1.50	12.10	6.61±2.41	2.22	8.67	5.34±1.77
side	L*	*	38.30	64.40	54.25±5.33	42.71	70.61	61.37±7.12
	a*	ns	0.23	2.53	1.31±0.44	0.66	2.45	1.33±0.41
	b*	*	6.10	13.20	9.37±1.39	5.25	11.32	8.41±1.56
thigh-croup	L*	*	39.30	67.10	56.81±4.70	48.43	70.30	60.34±6.24
	a*	ns	0.02	2.27	1.16±0.35	0.51	1.81	1.06±0.29
	b*	*	6.00	12.40	9.09±1.41	4.94	9.38	7.44±1.23

*P<0.05

Results have shown that the measured Maremmana bulls were slightly lighter than the Hungarian Grey bulls, supported by the lower L* values of the Maremmana coat. Differences were statistically significant in the case of all three measurement areas. Concerning the a* value, we found no statistically significant differences between the two breeds. However, the Hungarian Grey bulls were characterized by higher b* values than the Maremmana bulls.

Conclusions:

The Hungarian Grey cattle shows a wide range of coat color varieties which are changing not only by age but are affected by the season, as well. The calves are born with a reddish coat color and become grey at the age of 4-6 months. We found that approximately half (52%) of the measured population was reddish-colored, while the proportion of the lighter and darker animals were 26% and 22%, respectively. Winter coat of the Hungarian Grey heifers were characterized by lower L* and higher a* values, indicating a darker coat containing more red hairs than the summer coat. The measured Maremmana bulls were found to be slightly lighter than the Hungarian Grey bulls, which is contradictory to the general opinion that Maremmana animals are darker than the Hungarian Grey individuals.

References:

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CIE: Commission Internationale de l'Eclairage (<http://www.cie.co.at/cie>)

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