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# Morphological characteristics of Amiata donkey reared in Tuscany

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**ABSTRACT** - In this work were studied morphological characteristics and biometric parameters of the Amiata donkey. The Amiata donkey is a local endangered breed and derives from the homonym mountain in Tuscany. This donkey, which was used, over the past, like pack animal in farms and in mines, is now involved in milk production, onotherapy and trekking. The averages and the standard deviations of the biometric parameters and the frequency of the morphological characters of foals, adult females and stallions were calculated. The measures of the adult females were estimated by ANOVA considering three different classes of age: 3-4, 5-6, over 6 years old. The average sizes were: height at withers of 129.8±4.7 and 125.8±5.6 cm, thorax circumference of 145.6±7.8 and 145.0±7.8 cm, front shank circumference of 18.3±0.8 and 16.9±1.5 cm, for stallions and adult females respectively. All the observed donkeys presented dark grey coat with the shoulder stripe. The zoometric indices of the adult females did not differ between the classes and showed that the somatic adult proportions had already reached in 3-4 years old donkeys. This breed showed the features of the ancestors: the shoulder stripe of the *Equus asinus africanus* and the legs stripes of the *Equus asinus somaliensis*.

*Key words:* Amiata Donkey, Biometrics, Morphological characteristics.

**Introduction** - In Italy there are 7 asinine local breed, including the Amiata donkey. The Amiata donkey is a Tuscan endangered breed (ARSIA, 2006) that is in the list of the “Repertorio delle popolazioni Equine riconducibili a gruppi etnici locali” (A.I.A., 2008). This donkey derives from the Amiata Mountain, located in Siena and Grosseto provinces, in southern Tuscany. The shoulder stripe and the more or less clearly visible legs stripes are features of the Amiata donkey ancestors: the *Equus asinus africanus* and the *Equus asinus somaliensis* (Arzilli, 2006). This breed was used in the past like pack animal in the farms and in the mines for the carrying of the typical “earth colours” for painting. The Amiata donkey is now utilized for milk production, for onotherapy and trekking. **The aim of this paper is the morphological characterization and the check of the biometric parameters of the Amiata donkey.**

**Material and methods** - Material for the studies of the biometric characteristics was provided by 67 animals (48 females, 8 stallions and 11 foals) in 9 donkey-farms in the provinces of Grosseto (6), Siena (2) and Livorno (1). The measures were: height at withers and height at croup, thorax circumference, trunk and rump length, biiliac width, bitrochanter width and biischiatric width, right front-shank length and circumference. The biometric indices were calculated: Body Index (BI), Relative Trunk Length (RTL), Lateral Body Conformation (LBC), relationship between Thorax Circumference and Withers Height (TC/WH), Dactyl-Thoracic Index (DTI) (Catalano, 1985; Meregalli, 1980). For each measure and each different class (foals, adult females and stallions) the average and the standard deviation were estimated. The absolute and percentage frequency of the different morphological characteristics, with specific reference to the coat and some permanent features, were also calculated. The variation of the morphological characteristics was estimated submitting the data of the adult females

to ANOVA (SAS, 2002) following a linear model with the fixed effects of the age of the donkeys (3 classes: 3-4, 5-6, over 6 years old). The differences of the average were tested by Student's t test.

**Results and conclusions** - The measures of the table 1 showed an height at withers, a circumference of the thorax, and a front shank circumference comparable with the measures enclosed in the specific literature (Arzilli, 2006) and in the "Breed Standard" of AIA (<http://www.aia.it/>, 2006). The zoometric measurements and the biometric indices indicated a **small size donkey that is able to the transport in steep areas and in the mountain paths.**

Through the visual evaluation (table 2) some body features of the breed were showed: dark grey coat with shoulder stripe, **typical of the *Equus asinus africanus***, grey mane with dark mane tip, **dark**

Table 1. Measures and biometric indices of foals, adult females and stallions (average  $\pm$  s.d.).

		Foals		Adult females		Stallions	
			No.		No.		No.
Withers height	cm	114.1 $\pm$ 13.6	11	125.8 $\pm$ 5.6	48	129.8 $\pm$ 4.7	8
Croup height	cm	119.9 $\pm$ 14.1	10	129.0 $\pm$ 5.8	48	133.0 $\pm$ 7.2	8
Trunk length	cm	115.6 $\pm$ 17.8	9	136.5 $\pm$ 8.2	48	138.3 $\pm$ 13.1	8
Thorax circumference	cm	127.8 $\pm$ 14.8	10	145.0 $\pm$ 7.8	48	145.6 $\pm$ 7.8	8
Chest width	cm	27.3 $\pm$ 1.6	7	29.7 $\pm$ 3.5	48	32.7 $\pm$ 3.0	8
Front shank length	cm	15.6 $\pm$ 1.3	10	16.9 $\pm$ 2.3	48	17.6 $\pm$ 1.9	8
Front shank circumference	cm	17.3 $\pm$ 1.6	7	16.9 $\pm$ 1.5	48	18.3 $\pm$ 0.8	8
BI		91.2 $\pm$ 8.7	9	94.2 $\pm$ 3.6	48	94.9 $\pm$ 7.1	8
RTL		102.3 $\pm$ 7.3	9	108.6 $\pm$ 5.2	48	106.5 $\pm$ 8.5	8
TC/WH		113.0 $\pm$ 6.3	10	115.4 $\pm$ 5.6	48	112.2 $\pm$ 3.8	8
LBC		98.3 $\pm$ 7.4	9	92.3 $\pm$ 4.4	48	4.4 $\pm$ 7.8	8
DTI		13.1 $\pm$ 1.0	7	10.7 $\pm$ 3.5	48	12.5 $\pm$ 0.4	8

and hard wearing hooves. Many donkeys showed also other special features not found in the "Population Register", but that the breeders account as peculiarities of the Amiata donkey: the dovetail, a distal ends branch of the shoulder stripe (18% of foals, 10% of adult females and 25% of stallions); the zebra stripes or the typical dark spot on the fetlock, are the features of the *Equus asinus somaliensis* (72.7% of foals, 79.2% of adult fe-

Table 2. Main features of foals, adult females and stallions.

	Foals		Adult females		Stallions	
	No.	%	No.	%	No.	%
Dark grey coat	11	100.0	48	100.0	8	100.0
Shoulder stripe	11	100.0	48	100.0	8	100.0
grey mane with dark mane tip	11	100.0	48	100.0	8	100.0
Dark hooves	11	100.0	48	100.0	8	100.0
Hard wearing hooves	11	100.0	48	100.0	8	100.0
Incomplete dovetail	1	9.1	7	14.6	1	12.5
Complete dovetail	2	18.2	5	10.4	2	25.0
Dark spots on the neck and on the jaw	5	45.4	10	20.8	2	25.0
Zebra strips or dark spot on the fetlock	8	72.7	38	79.2	5	62.5

males and 62.5% of stallions); the symmetrical dark spots on the neck and in the jaw (45.4% of foals, 20.8% of adult females and 25.0% of stallions).

The Table 3 showed the somatic measures of the adult females of different ages. The height at withers, the height at croup and the thorax circumference increased in the under 5-6 years old individuals and then these measures stabilized. However, the body indices BI, LBC, RTL and TC/WH did show significant changes, and indicated how the body proportions had already reached at 3-4 years of age. This was also in accordance with the Breed Standard that fixed at 30 months the reference parameter for the adults. The pelvis region continued to rise until 5-6 years of age, when there are a lot of primiparous dams. The front shank circumference agreed with the Standard breed and with the biometric parameters reported by Arzilli (2006). The DTI was slightly higher than the same index reported by Cecchi *et al.* (2007).

Table 3. Measures of adult females at different ages.

		3-4 y.old	5-6 y.old	>6 y.old	RSD	Sign.
Withers height	cm	122.2 <sup>b</sup>	127.9 <sup>a</sup>	126.1 <sup>a</sup>	5.218	**
Croup height	cm	126.1 <sup>b</sup>	131.5 <sup>a</sup>	128.7	5.491	**
Trunk length	cm	132.1 <sup>b</sup>	137.6 <sup>a</sup>	138.4 <sup>a</sup>	7.952	n.s.
Thorax circum.	cm	139.4 <sup>b</sup>	146.7 <sup>a</sup>	147.0 <sup>a</sup>	7.212	**
Croup length	cm	37.5 <sup>b</sup>	40.6 <sup>a</sup>	41.5 <sup>a</sup>	3.845	**
Billiac width	cm	38.5 <sup>b</sup>	42.1 <sup>a</sup>	41.0 <sup>a</sup>	3.507	*
Bitrochanteric width	cm	37.2 <sup>b</sup>	40.9 <sup>a</sup>	38.7	3.714	*
Bihiatic width	cm	16.6	16.8	17.4	2.873	n.s.
Front shank circum.	cm	16.9	17.3	16.6	1.520	n.s.
Front shank length	cm	17.3	16.7	16.9	2.386	n.s.
BI		94.7	93.7	94.1	3.608	n.s.
LBC		92.7	93.2	91.2	4.404	n.s.
RTL		108.0	107.6	109.7	5.196	n.s.
TC/WH		114.0	114.9	116.6	5.572	n.s.
DTI		10.3	11.8	10.1	3.491	n.s.

n.s. = not significant; \*\*= $P \leq 0.01$ ; \*= $P \leq 0.05$ . <sup>a,b</sup>:  $P \leq 0.05$ .

ancestor, the *Equus asinus somaliensis*. This paper showed some features of the Amiata donkey which are not present in the "Population Register" but that are known by the expert at the breed; these features are the dovetail and the symmetrical dark spots on the neck and on the jaw.

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Through the results of this work was possible to draw the following conclusions: the main measures corresponded to those listed in the standard population and the 30 months old Amiata donkeys showed the adult body proportions. Just the measures of the croup of the females increased up to the adulthood. This region is directly implicated in the parturition that is typical of over 4 years old dams. All the individuals showed the features of the breed: the dark grey coat and the shoulder stripe confirmed a certain parentage with the *Equus asinus africanus*. The frequent zebra stripes in the legs derived from the other