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New findings in equine practice**



 **La Venaria Reale**



**Centro Internazionale del Cavallo
Orsento (TO), 11th-13th November 2010**

**Cascina Rubbianetta Parco Regionale La Mandria
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Physical and chemical properties on hoof of different equine breeds

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Riassunto: Sono state studiate alcune caratteristiche qualitative dello zoccolo di cavalli di razze Anglo-Arabo, Hallinger, Maremmano e Cavallino di Montebello. La qualità dello zoccolo influenza lo stato di salute del piede e conseguentemente lo stato di benessere dell'animale. Il piede forte riduce o rende addirittura superflui gli interventi di ferratura. Lo zoccolo di stato valuta tramite analisi morfologica e visiva; attraverso test di durezza e tramite analisi chimica con particolare riferimento al contenuto idrico. Gli errori del cavallo osservati hanno mostrato un rapporto tra le dimensioni della corona e la base plantare non diversi tra le razze (0.80 in media) e conforme agli standard riportati in letteratura. L'unguento, compatto ed omogeneo, non è mai risultato affetto da lesioni o patologie evidenti. La durezza non differiva tra i tipi genetici. Il contenuto in acqua della parete è significativamente più alto nei soggetti Hallinger e più basso nei Montebelloni (27.8% vs. 21.3%). Analogamente correlato ha mostrato il contenuto in proteine grezze (71.2% negli Hallinger e 77.0% nei Montebelloni). I soggetti Anglo-Arabi e Maremmani hanno mostrato, per l'umidità e per le proteine, valori intermedi. Le razze hanno anche valori del sale simili tra le razze.

Parole chiave: Anglo-Arabi, Hallinger, Maremmano, Cavallino di Montebello, durezza e composizione chimica dello zoccolo.

Summary: The aim of this work was to assess hoof qualitative characteristics in Anglo-Arabian, Hallinger, Maremmano and Montebello equine breeds. The quality of the hoof affects foot health and consequently could have an impact on animal welfare; resistant hoofs can promote the "barefoot horse". The hoof quality was evaluated through the morphology and visual analysis, the hardness test and the chemical composition. Horses showed good conformation with homogeneous nail, being the coronary (0.80) congruent with the standards. The moisture content in hoof wall was significantly higher in Hallinger horse and lower in Montebello pony (27.8% vs. 21.3%). The crude protein content was significantly higher in Montebello and lower in Hallinger (77.0% vs. 71.2%). Maremmano and Anglo-Arabian horses showed mean values in moisture and protein content. The ash content was similar among breeds.

Key words: Anglo-Arabian, Hallinger, Maremmano and Montebello equine breeds, hoof hardness, hoof chemical composition.

Introduction

Foot health is of utmost importance in horse management. The foot health is conditioned by the nail quality. A healthy and strong hoof has solid and resistant nail, able to protect the inner foot from the soil roughness and pathogens. A resistant hoof can promote the "barefoot horse", reducing hoofcare operations to ordinary foot cleaning.

In this study the hoof hardness and resistant characteristics of different equine breeds were determined. The studied breeds were the Anglo-arab, the Hallinger and the Maremmano horses, which are used in different equine disciplines, and the Montebello pony used by young and inexperienced people. This work is included in a wide project aiming to improve the diffusion of Montebello pony through the study of hoof quality. The high quality of hoof in Montebello pony (Sargentini et al., 2008) could promote the diffusion of the breed. This would be important during the diffusion of Montebello pony for saddle and driving, which are the main aptitudes of this breed. The histomorphological Agriculture Department (DRA) of Florence University studied saddle and driving ability in Montebello pony (Torci et al., 2008); the good performances of these aptitudes, observed during the trial, must be supported by a high quality hoof. In this work hoof characteristics of different breeds were compared. In particular, hoof characteristics of Montebello pony were compared with those of some horse breeds usually used in different equine disciplines.

Material and Methods

This trial included 8 Anglo Arab horses (Comacina horse breeding – Biodiversity Territorial Office (U.T.B.), 'Cape Pisside dello Stato', (C.F.S.), Siena), 11 Haflinger (Fornale and Amena horse breedings – U.T.B., C.F.S., Pieve Santo Stefano), 7 Maremmano (Comacina horse breeding, U.T.B., C.F.S., Siena – Fornale horse breedings, U.T.B., C.F.S., Pieve Santo Stefano) and 8 Montebelloni pony (Benedictini horse breeding, and U.T.B., Siena). All the horses were tested in box with internal paddock.

After hoof shaving, on every horse on the front left leg, the morphological and qualitative characteristics were analysed:

- Morphological characteristics:
 - Foot solidity: was calculated through the ratio of crown circumference and foot planar circumference. The solidity is lower in dichotomophic breeds and higher in meso-trichotomophic breeds (Castano, 1994).
- Qualitative characteristics:
 - Hoof hardness: was determined through a digital durometer Same Tools (Shore 0). To obtain the mean values on every hoof portion, a double measurement on wall, white line and sole were performed.
- Wall chemical composition (as sampled):
 - Water content: were obtained with a preliminary sample hoof pre-hydration (50°C/24 h.) and followed by drying up (105°C/4 h.).
- Crude protein: evaluated with the Kjeldahl CBS-APFA method.
- Crude ash: evaluated with the CBS s.r.l. 15400 (CBS/1871).

Hardness and chemical composition results were calculated using one way ANOVA, through the PROC GLM (SAS, 2002). Breed was considered as influencing factor. The means were compared through the L.S.-means Student's t.

Results and Discussion

Hoof morphologic characteristics were significantly different between Maremmano, Haflinger and Montebelloni equines (table 1); Maremmano presented the largest hoof followed by Haflinger, and Montebelloni pony while Anglo arab horse hooves did not differ from other breeds. These results partially reflect the morphological characteristics of the examined breeds: Maremmano is the largest horse, Montebelloni pony is the smallest and the Haflinger is intermediate. The Anglo arab is morphologically similar to the Maremmano horse, but with lighter bone structure; this body structure is related with dichotomophy (bats and smaller foot, in all breeds the front foot ideal solidity (54) (Castano, 1994) was shown in this study.

Table 1. Foot size and proportion.

		Anglo arab	Haflinger	Maremmano	Montebelloni
Crown circumference	cm	38.08 ± 2.12 BC	39.60 ± 1.88 B	44.36 ± 1.73 A	33.78 ± 1.00 C
Foot planar circumference	cm	43.00 ± 1.88 BC	44.87 ± 0.78 B	51.08 ± 1.35 A	40.23 ± 0.78 C
Crown circ. / foot planar circ. relationship		0.88 ± 0.06	0.87 ± 0.02	0.86 ± 0.04	0.84 ± 0.02

The results concerning the wall, sole and white line hoof hardness (table 2) did not show significant variations among different breeds. However, Montebelloni pony had tender hoof in comparison with the other prototypes. The sole and the white line hardness is similar in both Tuscan breeds and higher in Haflinger and in Anglo Arab. The hoof hardness is conditioned by different factors: breed, season, husbandry conditions (Fitz, 2008). According to some authors (Zanker, 1991) a high hoof is not necessarily a hoof with higher resistance.

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