61th Annual Meeting of the European Association for Animal Production, Heraklion, Greece, August 23-27th, 2010

LINEAR EVALUATION SYSTEM FOR TYPE AND QUALIFIERS EVALUATION IN THE SPANISH ARAB HORSE

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Introduction

The Arab horse is bred for its conformation which is a very important characteristic in this breed due its relationship with the beauty and the influence of conformation to sports performance (Langlois et al., 1978; 1979; Holmström et al., 1990). To meet the standard requirements for this breed, conformation is assessed by expert judges during the ECAHO (*European Conference of Arab Horse Organization*) morphological shows, even though show judgements are basically subjective as in most of horse breed (Bowling and Ruvinsky, 2000). Therefore, the implementation of objective methodologies assessing morphology is of major importance in the horse industry. One attempt is the development of a linear type assessment system. This methodology is based on the description of animal morphology on a biological scale, including the whole range in the analysed population (Samoré et al., 1997). This is a system designed to obtain an objective analysis of morphological characters and to maximize the relationship between morphological traits and functional aptitudes. So a linear evaluation system for type has been established to collect morphological information in the Spanish Arab horse Breeding Program. The aim of this study was to evaluate the qualifiers to select the trained persons who will be in charge of the collection of linear scored data.

Material and Methods

The evaluation system consists of 29 variables directly related with a body measurement and 19 subjective variables (but linear scored). Additionally, 9 traits of movements and 1 of temperament were included (also linear scored). The scale ranged from 1 to 7.
After a training period, a test was made to verify the system and to choose qualifiers to the routine evaluation. 17 qualifiers were analysed and each one evaluated 8 different horses making 2 repetitions.
Two parameters were used to evaluate the qualifiers:

- The **reliability,** that is probability that the score given by the qualifier is in accordance with the measured value. This was computed for variables related with a body measurements and for movements.
- The **repeatability,** defined as the probability of a qualifier giving the same score to a horse that is evaluate in two different moments of their evaluation. This was computed for all variables except movements.

Both were computed as:

$$1 \quad \frac{\sum (d)^2}{n * range}$$

Where d is the deviation from the measured value or from a different moment evaluation, respectively, n is the number of animals evaluated and the range in this case is 6[2].

The final qualifiers' score was a combined index: $0.5 * rel.morph + 0.3 * rep - 0.2 * rel.mov$

Table 2. Repeatability for the subjective variables.

VARIABLE	REPEATABILITY
Harmony	0,98
Racial quality	0,98
Head size	0,97
Head expression	0,98
Head profile	0,96
Neck shape upper line	0,96
Neck shape under line	0,98
Back-Loin line	0,93
Hindlimb muscularity	0,97
Forelegs front view	0,95
Knee front view	0,96
Forelegs side view	0,90
Knee side view	0,99
Forelegs hoofs	0,99
Hindlegs back view	0,97
Hock back view	0,98
Hindlegs back view	0,96
Hock side view	0,90
Hindlegs hoofs	0,99
Temperament	0,96

The qualifiers attained a repeatability ranged from 0.89 to 0.98, the reliability for morphological traits ranged 0.92-0.97 and for movements traits, 0.93-0.99. Eleven qualifiers passed the evaluation (≥0.96), but during the next two years the system and the qualifiers will be tested and revised after that time to ensure the correct development of the system in this breed.

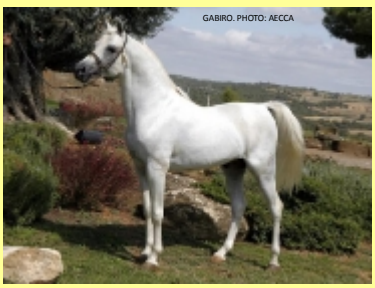

Table 3. Reliability for the movements variables.

VARIABLE	RELIABILITY
Walk: Rhythm	0,98
Walk: Four-beat clarity	0,97
Walk: Stride length	0,97
Walk: Elasticity	0,95
Trot: Stride length	0,98
Trot: Elasticity	0,96
Trot: Impulsion	0,95
Trot: Equilibrium	0,98
Trot: Swing phase duration	0,95

Results and Discussion

Table 1. Reliability and repeatability for the 29 variables directly related to a body measurement.

VARIABLE	RELIABILITY	REPEATABILITY
Head length	0,97	0,97
Head width	0,98	0,98
Neck length	0,92	0,95
Neck angle	0,94	0,95
Chest width	0,89	0,96
Thoracic depth	0,94	0,92
Thoracic width	0,95	0,97
Thoracic perimeter	0,96	0,99
Height of withers	0,96	0,94
Scapula angle	0,96	0,93
Scapula lenght	0,99	0,98
Arm angle	0,96	0,97
Arm length	0,95	0,95
Back length	0,95	0,97
Loin length	0,98	0,97
Croup length	0,97	0,98
Croup width	0,97	0,98
Croup angle	0,97	0,95
Hip-stifle length	0,96	0,94
Buttock-stifle length	0,97	0,94
Leg angle	0,97	0,97
Leg lenght	0,94	0,92
Tail heigth	0,95	0,98
Forearm length	0,97	0,95
Fore-cannon length	0,97	0,94
Fore-cannon perimeter	0,97	0,93
Fore pastern angle	0,91	0,92
Hind-cannon length	0,92	0,98
Hind-cannon angle	0,97	0,96

In table 1, 2, and 3 are shown the reliability and repeatability for all the studied variables. The reliability values were from 0.89 (chest width) to 0.99 (scapula length). The highest repeatability (0.99) was for hoof variables (forelegs and hindlegs) and for side view of the knee and the lowest for hock side view and for side view of forelegs (0.90). The movements' traits reliability were more than 0.95. It is recommended a reliability higher than 0.90. To ensure the reliability of the system, variables with a reliability value below 0.90 are not acceptable, therefore the chest width should be removed from the evaluation sheet. The 70% of the variables corresponding to a body measurement attained a reliability higher than 0.95.

Conclusions

Almost all variables achieved the levels of reliability/repeatability to ensure a quality linear scored data. The 65% of the qualifiers passed the evaluation. But, after the first year , an analisys of the collected data is recommended in order to reduce the amount variables included in the evaluation sheet.

Acknowledgements

The authors wish to thank the "Subdirección General de Medios de Producción Ganaderos" of the Spanish Ministry of the Environment and Rural and Marine Environment for their support. We also thank the Spanish Arab horse Association for their collaboration.