Genetic analysis of morphological traits in 2 French draft horses and in Haflinger breed

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AIMS OF THE STUDY

Request from French breeds of Ardennais, Cob normand and Haflinger

Genetic analysis of data from linear scoring ➔ estimation of breeding values for the scored horses and their pedigree horses

Data :

Ardennais 1223 scored horses for 27 traits
Cob normand 607 scored horses for 39 traits
Haflinger 2866 scored horses for 33 traits

+

Pedigrees French data

SIRE, les Haras-nationaux

Horses used for the analysis
- Ardennais 4410
- Cob normand 1808
- Haflinger 6526

RESULTS FOR THE HAFLINGER ANALYSIS

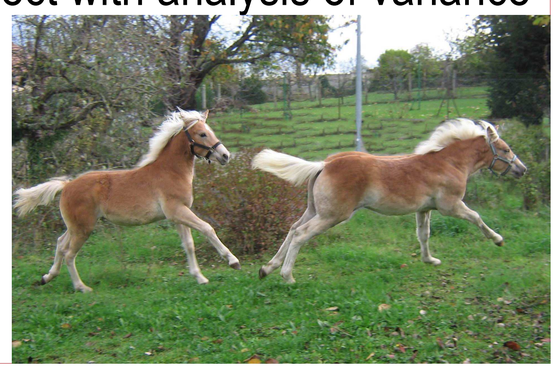
Score of evaluation = environnemental effects + genetic effects

➔ REML multiple traits analysis with WOMBAT software created by Karin MEYER (2007)

Fixed effects used in the model

For each trait if significant effect with analysis of variance (P<=0,05) :

- Year of linear scoring
- Age
- Degree of fat
- Judge
- Region of birth
- Sex



Correlations between the main traits

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Height at withers (1)	**0,67**	0,45	0,42	**0,55**	0,06	0,37	0,11	0,15	0,40
Cannon bone circumference (2)	**0,63**	**0,51**	**0,64**	0,24	*-0,03*	0,17	0,03	0,02	0,14
Thickness of cannon bone (3)	**0,62**	**0,89**	**0,55**	0,22	*-0,03*	0,15	0,02	0,07	0,14
TYPE IN THE BREED (4)	**0,79**	0,43	0,41	**0,38**	0,23	**0,58**	0,24	0,29	**0,76**
COAT AND MARKS (5)	0,06	*-0,18*	*-0,13*	0,23	**0,28**	0,16	0,12	0,13	0,49
MODEL (6)	**0,61**	0,34	0,20	**0,77**	0,13	**0,34**	0,30	0,31	**0,70**
STAND (7)	0,23	0,11	0,15	0,39	0,26	**0,51**	**0,15**	0,28	**0,58**
GAITS (8)	0,39	0,11	0,19	**0,55**	0,18	**0,69**	**0,60**	**0,21**	**0,67**
TOTAL OF THE TRAITS (9)	**0,62**	0,25	0,26	**0,85**	**0,47**	**0,85**	**0,68**	**0,81**	**0,36**

Genetic correlations (rg) | **heritabilities** | Phenotypic correlations

Total of the traits will depend greatly on Model, Type in the breed and Gaits (rg>0,80)

Heritabilities estimated

Traits	h²	*standard errors*	
Height at withers	**0,67**	*0,04*	
Cannon bone circumference	**0,51**	*0,00*	measurements
Thickness of cannon bone	**0,55**	*0,57*	
Development	**0,56**	*0,27*	
Harmony	**0,36**	*0,01*	basic criteria
Presence	**0,22**	*0,04*	
Temperament	0,14	*0,08*	
TYPE IN THE BREED	**0,38**	*0,01*	**synthesis of basic criteria**
Marks	**0,36**	*0,11*	
Coat	**0,36**	*0,05*	basic criteria
Head	**0,31**	*0,03*	
Hair	**0,52**	*0,16*	
COAT AND MARKS	**0,28**	*0,02*	**synthesis of basic criteria**
Neck	**0,27**	*0,10*	
Upper line	**0,30**	*0,05*	
Depness	**0,29**	*0,03*	
Shoulder	**0,23**	*0,03*	
Hip	**0,27**	*0,05*	basic criteria
Withers	**0,20**	*0,04*	
Flanks	0,11	*0,02*	
Loin	**0,25**	*0,06*	
Forelegs	0,16	*0,02*	
Hindlegs	0,16	*0,03*	
MODEL	**0,34**	*0,02*	**synthesis of basic criteria**
Stand : front view	0,05	*0,07*	
Stand : side view	0,13	*0,03*	basic criteria
Rectitude	0,16	*0,04*	
STAND	0,15	*0,05*	**synthesis of basic criteria**
Scope	0,16	*0,06*	
Engagement	0,19	*0,05*	basic criteria
Impulsion	0,15	*0,04*	
GAITS	**0,21**	*0,06*	**synthesis of basic criteria**
TOTAL OF THE TRAITS	**0,36**		**sum of synthetic criteria**

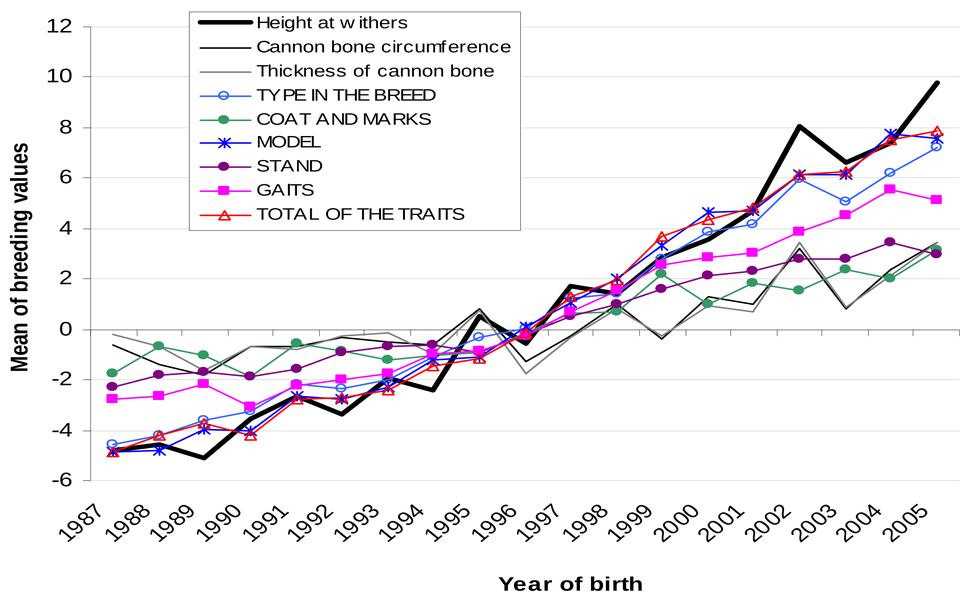
- Measurements : highest estimates ➔ more objective criteria
- Stand : lowest estimates ➔ also observed in others breeds

CONCLUSION : ADVANTAGE FOR SELECTION

Genetic evolution of scored Haflinger

(phenotypic standard-deviation = 20)

- Positive evolution of all traits since 1987
- Height at withers (highest heritability) has the most increased



Tools for breeders

Diffusion of genetic data of stallions and mares