

INFLUENCE OF FOREIGN TROTTER POPULATIONS IN THE SPANISH TROTTER HORSES' BREEDING VALUES



Gómez, M.D. ¹, Cervantes, I. ², Valera, M. ³, Molina, A. ¹

¹ Dpt. of Genetics, University of Córdoba, Spain.

² Dpt. of Animal Production, University Complutense of Madrid, Spain.

³ Dpt. of Agro-forestry Science, University of Seville, Spain.

ABSTRACT

The Studbook of Spanish Trotter Horses (STH) was created in 1979 to register the trotter horses born in Spain. Nowadays, it has 17,859 horses registered till 2007. This Studbook remains open to include animals from other trotter populations all around the world, artificial insemination being the most frequent reproductive practice. Therefore, a 37.3% of the registered horses are imported from foreign trotter populations. USA and France are the most represented countries of origin in the pedigree (23.3% and 18.7% of the horses have more than 75% of influence of USA and French founders, respectively).

The aim of this study was to analyze the influence of the genetic contribution of foreign populations on the breeding values for 4 performance traits analyzed in the STH: annual earnings (AE), percentage of first placing in a year (PFP), time per kilometer (TPK) and best annual racing time per hippodrome and type of start (BRTHS).

The breeding values were estimated using the BLUP animal model used in the systematic genetic evaluation of this population following Gómez et al. (2010). Data included 285,538 racing records from 5086 horses. A response surface regression analysis was performed for each trait using the breeding values for those traits as dependent variables; the genetic contribution of USA, France, Italy and Spanish founders were used as independent variables, with linear and quadratic adjustment. Also the interactions between effects were included.

For TPK, France and USA percentages were statistically significant, whereas for BRTHS, only the genetic contribution of USA founders was significant, being no significant for the other traits. The interaction effect between France and USA was statistically significant in AE, TPK and BRTHS. Finally, the best combination to maximize the breeding value was explored.

AIM

To analyze the influence of the genetic contribution of foreign populations in the breeding values for four performance traits in the Spanish Trotter Horse population.



MATERIAL AND METHODS

- ✓ A total of 285,538 racing records from 5086 horses (55.1% males and 44.9% females).
- ✓ Four performance traits: annual earnings (AE), percentage of first placing in a year (PFP), time per kilometer (TPK) and best annual racing time per hippodrome and type of start (BRTHS).
- ✓ Database and models defined by Gomez et al. (2010).
- ✓ A response surface regression analysis was performed for each trait using the breeding values as dependent variables to determine the level of significance for each country and combinations. The genetic contribution of USA, French, Italian and Spanish founders were used as independent variables, with linear and quadratic adjustment, using SAS and Statistica 6.0.

RESULTS AND DISCUSSION

Significant variables for each trait and regression coefficients are shown in table 1. There is no significant variables for the PFP. The genetic contribution of USA is statistically significant in TPK and BRTHS and France is significant only in TPK. The interaction effect between France and USA is statistically significant for AE, TPK and BRTHS.

This fact is clear to the breeders that use French and USA stallions as reproducers in the population. And therefore, France and USA are the countries with higher contribution in the STH population (Gómez et al., 2010).



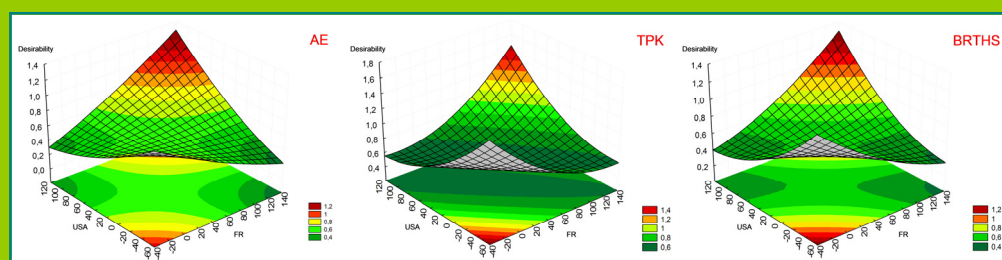
Table 1. Significant variables for each trait using the regression surface response method ($p < 0.05$) and regression coefficients.

Trait	Significant effects	Regression coefficients
AE	FR*USA	0.0003
	FR	-0.0462
TPK	FR ²	0.0003
	USA	-0.0451
	USA ²	0.0003
	FR*USA	0.0005
BRTHS	USA	-0.0189
	FR*USA	0.0003

Where: AE is annual earnings, PFP is percentage of first placing in a year, TPK is time per kilometer, BRTHS is best annual racing time per hippodrome and type of start, USA is States United of America and FR is France.



Figure 1. Graphic representation of desirability surface for USA*France for the three significant traits.



The graphic representation of the desirability regression for USA*France combination is shown in figure 1 for AE, TPK and BRTHS. Inspecting the desirability profiles can show which levels of the predictor variables produce the most desirable predicted responses on the dependent variables.

The overall shape of the curve determines whether the estimated stationary point is a maximum, a minimum, or a saddle point. The canonical analysis indicates that the predicted response surface is shaped like a saddle. Therefore, the estimated surface does not have a unique optimum.

CONCLUSIONS

We can conclude that there is no an unique best combination, but it is clear that both USA and France genetic contribution are producing an increase in the performance in the STH. More studies in this topic are necessary in order to determine the genetic basis of the interaction between population origin.

