Partial Results Regarding the Genetic Analysis of Thoroughbred Horse from Cislău Studfarm: Reproductive Isolation and Age Structure

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Abstract
This study is a part of an ample research concerning the genetic analysis (history) of Thoroughbred horses from Cislău studfarm. The genetic analysis studies are a part of Animal Genetic Resources Management because just start of them we elaborate the strategies for inbreeding management. This study has as purpose to present two important aspects of genetic analysis: reproductive isolation level and age structure.This parameters has a capital importance in animal breeding because there has a directly influence in animal population evolution. The reproductive isolation situation was quantified using the relation elaborated by S. Wright in 1921. The age structure situation is based on the age distribution histogram. The analysis showed that the Nonius horse from Izvin stud is a reproductively isolated population and have its own evolutionary path. Age structure is not balanced with negative repercurssions on generation interval.

Keywords: isolation, Cislau, genetic, Thoroughbred, reproductive, horse.

1. Introduction

This study is a part of an ample research concerning the genetic analysis (history) of Thoroughbred horses from Cislău studfarm. The genetic analysis studies are a part of Animal Genetic Resources Management because just start of them we elaborate the strategies for inbreeding management [1]. This study has as purpose to present two important aspects of genetic analysis: reproductive isolation level and age structure. This parameters has a capital importance in animal breeding because has a directly influence in animal population evolution. The population acceptance criteria are four: reproductive isolation, morphological and physiological differences, environmental requirements and genetic size [2]. The reproductive isolation level is the most important criteria for population acceptance, the other three being in according to them [3]. This parameter is very important because only reproductive isolated populations have an own evolution, in contrary they are influenced by evolving of immigrants populations. The age structure have a double importance: for exploitation because influenced directly average age, and on the other hand, for animal breeding because is influenced the generation interval and population variability [4].

2. Materials and methods

The biologic material are represented by 3 sire stallions and 38 mares, Thoroughbred,

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representing the entire reproductive nucleus from Cislău stud farm at this time (December 2010).
The reproductive isolation level was quantified using the follow relation [1]:

$$C.I.R. = \frac{AA-(AI+II)}{AA+AI+II},$$

where: AA – number of individuals accepted for reproduction in analyzed interval with both autochthons parents; AI – number of individuals accepted for reproduction in analyzed interval with one autochthon and one immigrant parent; II – number of individuals accepted for reproduction in analyzed interval with both immigrants parents.
The age structure can be described by weight of different age categories from entire population [4]. The age structure is expressed in years.

3. Results and discussion

The results regarding reproductive isolation coefficient (RIC or CIR) are showed in table 1.
The age structure for Throughbreed horse from Cislău stud farm is presented in table 2 and in the figures 1 and 2. The moment of this study is approach to the last import, and that is the reason who make easy for us the identification of immigrants parents. Before analyzing datas presented in table 1 we must specificate some things. We can observe, from table 1, big number of fathers who activate in reproductive nucleus by two reasons: first because of the immigrants stallions imported and introduced in reproductive nucleus, and second because of overlaping generation. All tihis make possible finding of current sire stallions also at the parents level. Such notice a genetic persistence of immigrants in reproductive nucleus, as a following of maintaining of individs with minimum one immigrant parent, probably because of the desire to create genetic variability necessary for selection and and for changing some characters in the direction of immigrant populations.
Observing the sire stallion ascendence for analyze of R.I.C., we discover two individuals with one immigrant parent (Odiseu stallion with his father imported from Poland, and Tezeu stallion with his father imported from Great Britain). Regarding to the brood mares, we identify 16 mares with one immigrant parent (father imported from Poland or Great Britain), two with both immigrant parents (themselves immigrants), imported from Island and U.S.A..
Datas presented in table 1relieve the fact that the Thoroughbreed livestock from Cislau studfarm it's not a population with his own evolutive way (R.I.C.=0.024). The sire stallion livestock (R.I.C.= -0.333), dominated by individuals with one immigrant parent (N = 2), and the broodmares livestock dominated by mares with one immigrant parent (N = 16) and another two mares with both immigrant parents, relieve the fact that the analyzed livestock is situated in the genetic irradiation area of population from which became immigrants (R.I.C. = 0.024). The situation is more obvious at the parents level (R.I.C. = -0.130) and at the grandparents level (R.I.C. = -0.139), as we can see in table 1, where we observe also a great weight of individuals with one immigrant parent (41.3%) and imported (15.2%). The age structure of Thoroughbreed livestock from Cislau studfarm is presented in table 2 and in the figures 1 and 2. Presented datas relieve an unbalanced age structure, totally improper from the economic and genetic point of view. When analysis start, the sire stallions have age between 9 and 16 years, distributed in three cathegories (one stallion for each cathegory), old, and broodmares have ages between 3 and 7 years old, distributed in 12 cathegories.

Table 1. The reproductive isolation coefficient values

Specification		No.	Immigrants (I)	Parents			R.I.C.
				AA	AI	II	
Reproductive nucleus (RN)	♂	3	-	1	2	-	-0.333
	♀	38	2	20	16	2	+0.053
	Total	41	2	21	18	2	+0.024
Parents of RN	♂	13	5	2	6	5	-0.692
	♀	33	2	18	13	2	+0.091
	Total	46	7	20	19	7	-0.130
Grandparents of RN	♂	31	19	5	7	19	-0.677
	♀	41	9	26	6	9	+0.219
	Total	72	28	31	13	28	-0.139

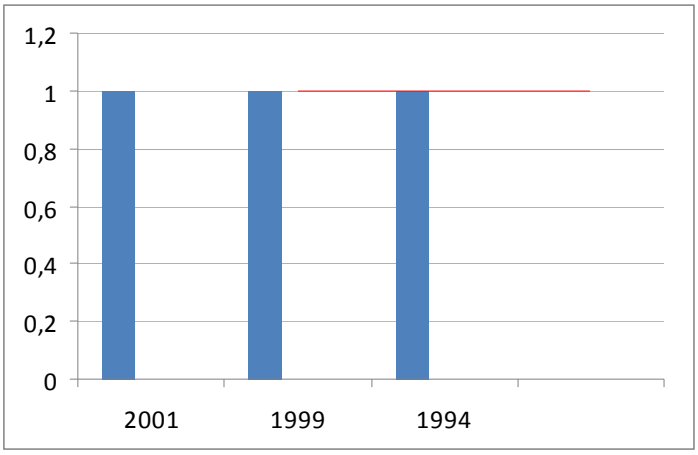

Figure 1. Sire stallions age structure

Table 2. Thoroughbred age structure in Cislau studfarm

Sex	Total	Birth year																						Average age
		1993		1994		1995		1997		1999		2000		2001		2002		2003		2004		2005		2006		2007		
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
M	3			1	33.33					1	33.33			1	33.33													12 ± 1.7
F	38	2	5.26	2	5.26	1	2.64	2	5.26	2	5.26	6	15.79			3	7.89	1	2.64	4	10.53	3	7.89	4	10.53	8	21.05	7.87 ± 0.71

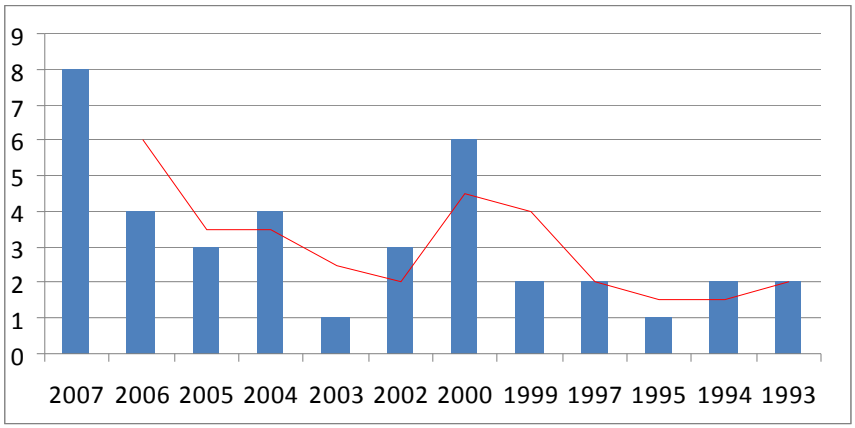

Figure 2. Brood mares age structure

4. Conclusions

- Reproductive isolation

Presented situation reveals two facts: either existence of concerns for correction of some productive traits (velocity or external traits), or the desire to increase genetic variability for creating an action field for artificial selection.

For whatever reasons of this massive and continuous big import of sire stallion and broodmares, the situation it seems to come in the positive field, observing the increasing trend of R.I.C.. If this trend is not caused by fortune, it reveals existence of a strategy for reproductive isolation in Thoroughbred livestock from Cislau studfarm. If this strategy exist it's important to take in to account increasing of reproductive nucleus.

If the reproductive isolation situation will continue in the future, and Cislau studfarm will remain a multiplication farm for immigrants, his rank, on the national studfarm map, will be not more than a financing point of studfarms from other countries (of which carried imports). If this imports will be continued with the hope for correction some productive traits (who's proper testing can't be done anyway because of the lack of a hippodrome), all this situation will reveal incompetency and dilettantism.

- Age structure

An unexplained fact is that, from 2004 till now, not even one stallion was admitted for reproduction in reproductive nucleus.

The big number of mares (8), borne in 2007 and accepted in reproductive nucleus in 2010 is one of the big achievements. If the situation persist it will make possible a balance age structure If we consider an average pregnancy period for horse of 11 months (0,92 years), on average age of sire stallions (12 years), we obtain a generation interval by males at 12.92 years. For mares, at an average age of 7,87 years, we obtain a generation interval at 8,79 years, due to weight of 21.05% young mares accepted in reproductive nucleus. Estimated value for this paramether at livestock level is at 12,96 years.

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