Partial Results Regarding the Genetic Analysis of Nonius Horse from Izvin 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 Nonius horses from Izvin 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, Izvin, genetic, Nonius, reproductive, structure.

1. Introduction

This study is a part of an ample research concerning the genetic analysis (history) of Nonius horses from Izvin 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 4 sire stallions and 35 mares, Nonius breed, representing

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the entire reproductive nucleus from Izvin 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 Nonius horse from Izvin stud farm is presented in table 2 and in the figures 1 and 2.
The analyzed data from table 1 relive the fact that the Nonius livestock from Izvin studfarm is a population with an independent evolution from other similar communities (RIC = +1.000), all the individuals who activate in reproductive nucleus having both parents born in Izvin studfarm.

Table 1. The reproductive isolation coefficient values

Specification		Nr.	Immigrants (I)	Parents			R.I.C.
				AA	AI	II	
Reproductive nucleus (RN)	♂	4	-	4	-	-	+1.000
	♀	35	-	35	-	-	+1.000
	Total	39	-	39	-	-	+1.000
Parents of RN	♂	8	-	8	-	-	+1.000
	♀	20	-	19	1	-	+0.900
	Total	28	-	27	1	-	+0.929
Grandparents of RN	♂	17	1	14	2	1	+0.647
	♀	22	-	20	2	-	+0.818
	Total	39	1	34	4	1	+0.744

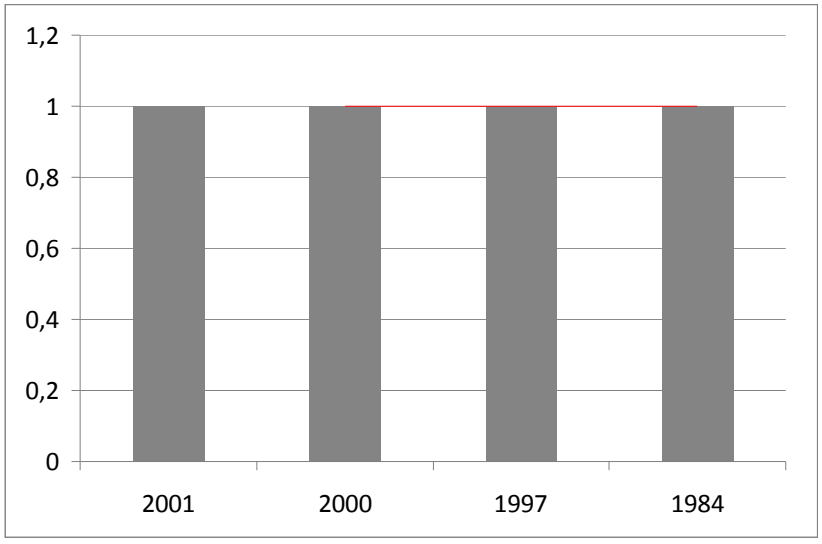

Figure 1. Sire stallions age structure

Table 2. Nonius horse age structure in Izvin studfarm

Sex	Total	Birth year																						Average age
		1984		1993		1994		1995		1996		1997		1999		2000		2001		2002		2003		2004		2005		2006		
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
M		1	25									1	25			1	25	1	25											14.5 ± 3.4
F				2	5.71	2	5.71	1	2.86	1	2.86	1	2.86	5	14.29	5	14.29	6	17.14	1	2.86	2	5.71	4	11.43	2	5.71	3	8.57	9.57 ± 0.62

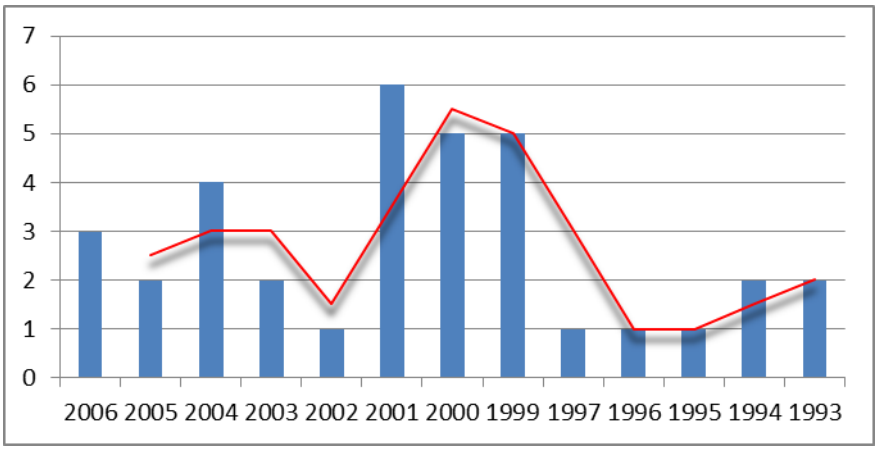

Figure 2. Brood mares age structure

The big number of males who apears in the same time with advancing in ascendence is given by overlaping generations.

At the parents of RN level, the R.I.C. = 0.929, mantain population on his own evolutive way, the difference from +1.000 is given by one mare, Plocon 19, who have an immigrant father, the romanian trotter stallion Plocon, from Dor Marunt studfarm.

At the grandparents of RN level we find four individuals (two stallions and two mares) who have one immigrant parent, the stallion Nonius 8, imported from Hungary, from Mezöhegyes studfarm.

The Nonius livestock age structure is presented in table 2 and in the figures 1 and 2.

From presented datas and from graphical representation of age distribution, we observe an unbalanced age structure improper for maximizing genetic gain and economical efficiency. We can talk only for brood mares, because, for sire stallions the age distribution is equal (one stallion for each cathegory: 9, 10, 13 and 26 years old). The mares have ages between 4 and 17 years, organised in 13 cathegories.

If we consider an average pregnancy period for horse of 11 months (0.92 years), on average age of sire stallions (14.5 years), we obtain a generation interval by males at 15.42 years. For mares, at an average age of 9.57 years, we obtain a generation interval at 10.49 years. Estimated value for this paramether at livestock level is at 12.96 years.

Smollest value of the interval by mares is due to the admittance in reproductive nucleus to a big number of mares between 2002-2004 (born between 1999-2001).

4. Conclusions

- The Nonius livestock from Izvin studfarm is a population with his own evolution, total distinctive from Mezohegyes Nonius livestock.
- The value of reproductive isolation coefficient, equal with +1.000 corresponds to a complete reproductive isolation.
- The sex ratio (1:8.75) is between normal limits. Age structure is unbalanced, improper for maximizing genetic gain.
- The average age, for Nonius horse from Izvin stud farm, have very different values between sexes: 14.5 years for sire stallions and 9.57 years for mares, and this fact make as the generation interval, estimated through this parameter, (considering an average value of 0.92 years for gestation in horses), at the populational level, to be at 12.96 years (bigger on the males way because of holding males offsprings from old fathers).

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