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GENETIC ANALYSIS OF PURE ARABIAN BREEDING IN THE REPUBLIC OF CROATIA

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Original scientific paper

SUMMARY

Pure arab breeding in the Republic of Croatia has very long tradition. Till the 18th century organized breeding was implemented only in bishop Stud Farm Đakovo. Afterwards pure arab breeding was implemented in many private Stud Farms mostly located in Slavonian and Srijem region. Pure arab, traditional arab and araber (arabrasse) population of horses make together arabian breeding in the Republic of Croatia. Numerical strength of these three populations has increasing trend through out the years. First imports which were ground for foundation of pure arab breeding in Croatia realized in year 1991. Today, population of pure arab breeding count 37 head, from which 28 is imported and 9 born in Croatia. Pedigree depth in 4, 5, 6, 7, 8, 9 and 10 generation show average coefficient of inbreeding of 1.899%, 3.15%, 4.413%, 5.434%, 6.243%, 6.974% and 7.552%. According to genealogy in all pedigree depths, coefficient of inbreeding was higher (P < 0.01) in imported arab horses than in those born in Croatia.

Key-words: pure arab, Croatia, breeding development, inbreeding

INTRODUCTION

In history, arabian horses have were always known as beautiful, intelligent, brave, romantic and loyal breeds (Čačić, 2005a). As the oldest breed, arabian horses are the only true genuine thoroughbred. To preserve and increase the quality, the breeding has to be guided the same as originated: closed and in high level of credibility. That kind of breeding resulted in low level of genetic variability, enabling domination of arabian horses in any other breeding.

In our country arab breed is the oldest breed of horses and according to data first breeding was founded in year 1374 in the bishop Stud Farm in Đakovo with 10 mares and one stallion (Čačić, 2005b). In the Republic of Croatia, arabian population of horses consists of three populations: traditional arab horses as the largest (81.5%), araber population as the middle in size (9.5%) and pure arab population as the smallest (9%), being the object of this research.

On the territory of the Republic of Croatia arabian breeding vanished at the end of 19 century. Revival of breeding started at the beginning of 90s. In the last few years, interest of breeders as well as the trend of numerical strength records have been increased mostly as a result of horse import.

The stud Farm "Šargo" from Čađavica was a pioneer of significant import of pure arab horses, that are mostly founders of today's breeding. Recently time this role has been taken by PZ „Stud Farm Višnjica" from Višnjica near Slatina.

Pure arab horses are only bred in pure blood and at the end this population is final. It is very important from the very beginning to make modern breeding program and systematically avoid possibility of inbreeding depression which could prolong selection response to setup goal, mostly due to relatively small population. This population is at the beginning of its development aiming to breed horses with high exterior characteristic and usage ability.

Showed results came out of scientific project «Analyze and genetic improvement of sport horse breeds in Croatia», conducted in support of the Ministry of science, education and sport in the Republic of Croatia.

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Inbreeding appears when closely related individuals copulate (Crow and Kimura, 1970). Copulate individuals have one or more common ancestors making inbreeding related to the sum of ancestors represented in its parentage. Two individuals with common ancestor can carry one ore more ancestors alleles (Falconer, 1989). Inbreeding coefficient of the individual is an average possibility that two alleles of locus are identical to offspring. One of consequences of inbreeding is increase homozygote and decrease heterozygote genotypes in population (Falckoner and McKay, 1996). In final population, inbreeding is unavoidable process while it is not possible to avoid copulation of individuals that don't posses one or more identical ancestors in their generations. Selection response in closed breeding is compensated with inbreeding resulting in reduced genetic variability for distant selection and can cause inbreeding depression in performance. This fact should be considered whole designing breeding program (Gama and Smith, 1993).
Inbreeding is often the subject of research in horse breeding and many authors find correlation between inbreeding and performance. The influence on reproduction parameters is found by Müller et al. (1987a, 1987b, 1987c), Mahon and Chunningham (1982), Klemetsdal and Johnson (1989) etc., correlation to morphological parameters is found by Gandini et al (1992), Dolvik and Klemetsdal (1994) etc., to performance by Klemetsdal (1998) and Müller et al. (1987a, 1987b, 1987c).

MATERIAL AND METHODS

Research included all 37 pure breed arab horses of both gender and all age categories, registered in Croatian register. Inbreeding analysis was conducted in pedigree depth of 4 to 10 generation. Statistical analysis and result review was made by statistical package TesioPower 5.0, Version 5.0 (2002) and Microsoft® Office Excel, Microsoft Office Professional Edition (2005).

RESULTS AND DISCUSSION

Pure arab population in the Republic of Croatia includes 37 head, 20 male and 17 female. The whole population makes 28 imported animals and other 9 were born in Croatia. First animal of pure arab breed was imported in 1991. The most intensive import was recorded in 2006 (Figure 1). Most of the horses were imported from Hungary and Slovenia (Figure 2).

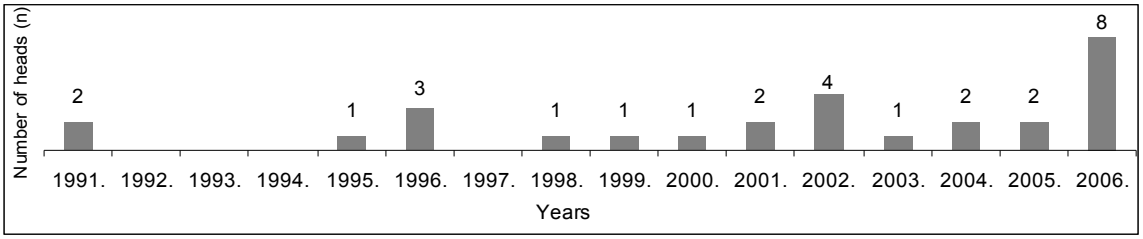

Figure 1. Import of pure arab horses into Croatia by years

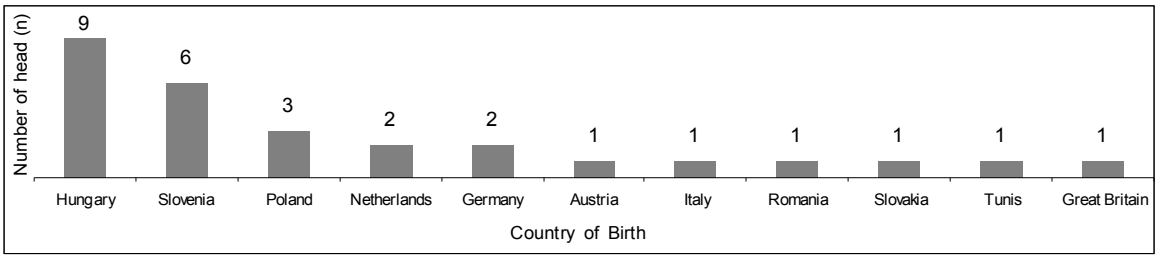

Figure 2. Number of imported pure arab horses by country

First pure arab foal born in Croatia was stallion Sakar Ibn Zarka, born on 26 May 1998, by Australian stallion Zarka (1993) and Tunisian mare Ziada (1997). Since that year till the beginning of 2007, 8 more foals were born making total of 9 Croatian born foals (Figure 3).

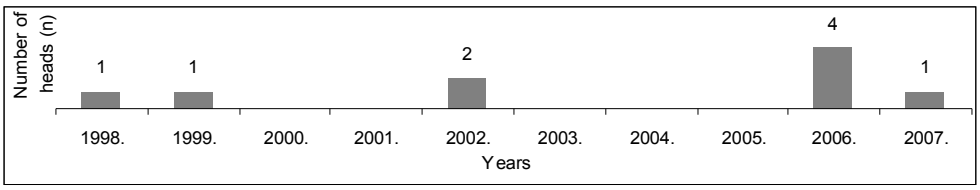

Figure 3. Pure arab horses born in Croatia by year

Breeding includes 17 line bred arab horses, and they are as follows: Kehailan Abu Argub (216 Semrie, 1896), Schechan (60 Adjuze, 1876), Managhi (87 Glule, 1852), Shuweymah Saabah (Chérifa, 1869), Dahman Um Amr of Ibn Hemsi (Dahma, 1876), Obayan (Delilah, 1893), Dahman Shahwan (El Dahma, 1879), Kehailan Ajuz (Gazella), Seglawi Jedran of Ibn Soudan (Ghazieh), Kehailan Jellabi (Jellabiet Feysul), Slawuta (Milordka, 1810), Murana I, 1808., Kehailan Rodan (Rodania, 1869), Kehailan Moradi (Sahara), Kehailan Ajuz (Samaria, 1882), Hadban Enzahi (Venus) and Kehailan Ajuz Ras El Fedawi (Wild Thyme, 1876). Line breeding Kehailan Moradi (Sahara) is the most represented with 7 horses or percentage of 18.92% (Figure 4).

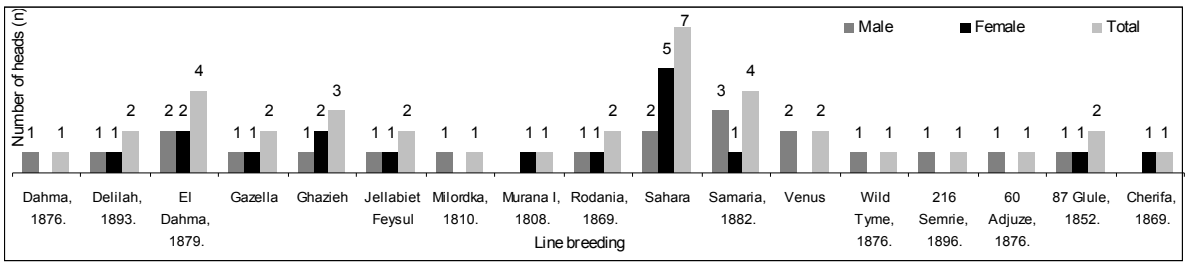

Figure 4. Representation of breeding line of pure arab horses in Croatia

Since the population is relatively small it is very important to research coefficient of inbreeding. Level of inbreeding depending on pedigree depth was from the smallest percentage of 0% in all pedigree depths, except in the depth of 10 generations. The highest level of inbreeding was recorded between 14.06% on four to 29.83% on 10 generations of ancestors (Table 1).

Table 1. Coefficient of inbreeding for pure arab horse in Croatia (in %)

	Pedigree depth – number of generations /number of ancestors						
	4/30	5/62	6/126	7/254	8/510	9/1022	10/2046
Minimum	0	0	0	0	0	0	0,01
Average	*1.899*	*3.15*	*4.413*	*5.434*	*6.243*	*6.974*	*7.552*
Maximum	14.06	18.9	20.94	24.97	27.31	28.71	29.83
Standard deviation	3.215	4.215	4.872	5,507	5.92	6.217	6.411

Comparison of inbreeding coefficient in sex showed no statistically significant difference in male or female horses (Figure 5).

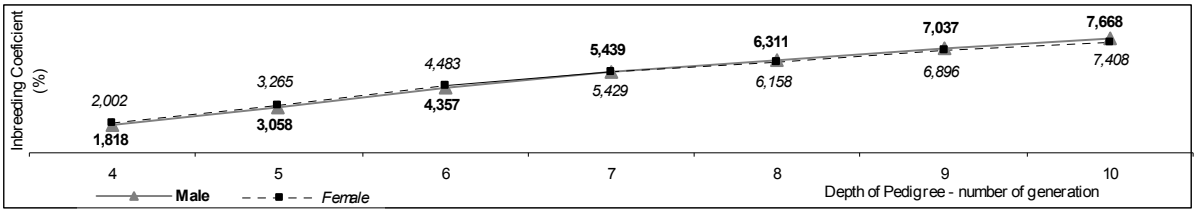

Figure 5. Inbreeding level comparison according to sex

Comparison of subpopulation born in Croatia and imported pure arab horses showed statistically significant higher coefficient of inbreeding ($P < 0.01$) in animal imported in Croatia in all pedigree depths (Figure 6).

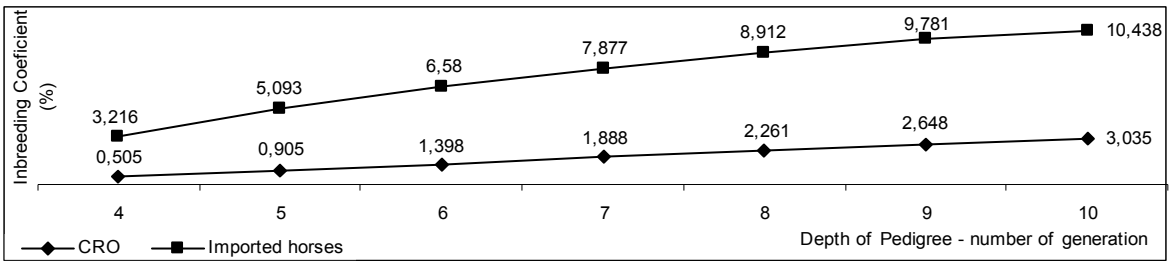

Figure 6. Comparison of inbreeding level by the origin - country of birth

It should be pointed out that Croatian population showed higher average level of inbreeding compared to results of Gazder (1954) in American arab breeding. Except the lower level of inbreeding in American breeding, Croatian population showed wider range of variation compared to American population (1.47% - 2.84%). Compared to research of inbreeding in other breeds, results of this Croatian breeding research show higher level than research of Bohlin and Rönningen (1975), Pieramati et al. (2003), Zechner et al. (2002), Wilkens et al. (1990), Dušek (1991), Buis (1976), while higher level of inbreeding determined Fletcher (1946) and Čurik (2000).

CONCLUSION

Pure arab breeding in Croatia is relatively short, but with distinctive trend of positive development. The most of horses originated from other countries which were periodically imported from early 90s till today. Smaller part of pure arab horses were born in Croatia. Satisfactory result of compared average coefficient of inbreeding between imported subpopulation of horses and subpopulation born in Croatia should be pointed out. The comparison showed significantly lower level of inbreeding in horses born in Croatia. The reason of this result is genetic distance between imported animals. This way, using systematically planned breeding, inbreeding depression can be successfully avoided, even though the relatively small population number. High number of stallions at the same time makes avoiding of inbreeding depression easier. On the other hand, high number of male and lower number of female animals significantly slows down increase and expansion of breeding.

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