

## Inbreeding Study on the Iranian Arab Horse Population

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**Abstract:** When conducting breeding programs and to design systems of mating, the inbreeding population percentage changes should be considered. Crosses non-scientific population of the Iranian Arab horses do it that purity has been threatened. This pedigree breed after DNA tests will be recorded by WAHO. To determine the status of inbreeding in the pedigree mentioned horse population based on information of riding federation was studied. According to continuously published since 1976, registered pedigree was done. Pedigree of this research while at the WAHO was recorded. Using software Matvec horses inbreeding coefficient was calculated descriptive statistics and available data with SAS software was investigated. Data size of about 15 generations had. Total population horse and count the number of sires and dams are 2522, 413 and 870 respectively. Based on strain, sex, color, breeding province and breed purity pedigree was classified. The average inbreeding coefficient of the whole population and in inbred horses 2.1 and 7.8 respectively. The highest average inbreeding coefficient related to strain Dejelfan (5.1 percent), female (38.3 percent), black horses (5.1 percent), the province Khuzestan (38.3 percent) and pure Iranian Arab horse race (38.3 percent). The lowest average inbreeding coefficient related to strain Hadban (0 percent), white horses (0.4) and the province of Tehran (0.1 percent). Average coefficient of inbreeding in the population under study than the results of similar studies is not very high. But given the repeated use of one or more stallions limit the kinship relationship with most mares have a continuation of this policy and if the desired population mean inbreeding will increase. Therefore, breeder's horse must for mating horse's specialist's advice to take.

**Key words:** Horse • Iranian Arab horse • Inbreeding • Mating and WAHO

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### INTRODUCTION

From about 5000 to 6000 years ago human mating horses to meet their needs based on the program have done. It is known that artificial selection causes genetic changes in populations of horses and animals with the ability of production is expected [1,2]. To run anybreeding program is necessary to first determine the desired goals and be defined. Breeding goal to change the relative value of the desired genetic traits in breeding programs is defined. The purpose of horse breeding programs, identify, select and produce progeny of horses that have the genetic capacity are better than the average population. Thus, genetic capacities offspring, more parental generation is.

Overall, the breeding goal trait or traits are considered which have the effect of production and yield. The traits of the economic impact on farmer profits are. After considering the appropriate goals, appropriate genetic variation in traits that have high impact on profitability will be achieved are [3].

Programs in the process of breeding and mating systems should be designed considering that the percentage of inbreeding population is not more than standard. Inbreeding standard is different for different traits. Any dominance genetic effects on traits have more influence, more impact from changes in the trait population percentage inbreeding takes. Typically investigate the effect of inbreeding on different traits in different population through statistical analysis can be investigated. If the relationship between animal there is the progeny resulting from inbreeding will. Whatever the genetic relationship between parents is more, much more progeny inbreeding. Lead to increased inbreeding is homozygote loci. Usually if being homozygous, adverse effects of unfavorable alleles are detected. So is the relationship of animal mating is avoided. If the yield traits of increasing inbreeding population decrease, which is called inbreeding depression occurred.

Inbreeding coefficient is simply the percentage of genes with similar allele from a common ancestor are inherited [4-7].

Negative effects of inbreeding on traits related to having a close relationship with fitness (including fertility), are in wild animals, laboratory and domesticated animals have been studied. But the effects of inbreeding on fitness traits that are associated with less (such traits conformation) in a limited number of studies have investigated [4].

Inbreeding Depression in the effects of dominance (such as incomplete dominance, complete dominance and over dominance) involved. The effect of non additive genes controlling traits Inbreeding Depression is more is more. Also increasing the share of non additive genetic components that control traits causes' loss resulting from the inbreeding is more.

Effect of inbreeding for statistical methods and laboratory there. The statistical method of regression desired traits on inbreeding coefficient of animals used. In cases where pedigree information is available from molecular markers (i.e. specifying the relationship between individual heterozygosis and traits under study) is used [2 , 8].

Inbreeding coefficient of inbreeding is a relative measure of value than the base population (including non-relatives animals) is defined. Coefficient of inbreeding in the pedigree figures to base animals that are assumed non-relatives are reported. So long pedigree information and the unknown are the factors that should be reported with inbreeding coefficients. Effect of complete pedigree on accurate estimation of inbreeding has been confirmed in various studies [4, 9-11].

In a study of the conformation traits in the Haflinger horse breed was Italia, it was observed that the effect of inbreeding on traits wither height and chest circumference in horses older than four years and was significant ( $P < 0.001$ ). In the age group of less than four years of inbreeding on any of the traits were not significant ( $P > 0.05$ ) [5].

Reproductive efficiency is not high horse. Mean calving in Italian and Irish Thoroughbred mares by 67 percent. Because of that kinship in this breed by sex is rare, the effects of inbreeding on fertility is statistically significant ( $P > 0.05$ ). But the effect of age on fertility is significant ( $P < 0.001$ ) [12].

In a study that was conducted on Brazilian pony, it was found that 10 percent increase in inbreeding, wither height, croup height and Body length respectively, 2.8, 2.9 and 0.1 centimeter decrease gain [13].

The Iranian Arab horse is one of the first breeds of horses have been domesticated. Since its creation in 2000

BC i.e. about 1500 years before the emergence of Arab horses are Arab countries. Horses in the century among the best horses Sardar Mohtasham Bakhtiari were grown. Sardar Mohtasham after death, his horses was divided between his sons. Horses to one of the boys called Mohtasham Sardar Majid Bakhtiar had reached the highest reputation. Majid Bakhtiar horses later as the first group to record The Iranian Arab horse to World Arabian Horse Organization (WAHO) was presented [14 , 15].

In 1974 AD, with the action of horse breeders in Iran (Ms. Gharagozlou) features original Arab horse Khuzestan as the first group was submitted for evaluation to WAHO. Pedigree of the first book in 1976 AD was approved by WAHO and then published by the Federation of riding [14].

Given the non-scientific cross breed these are necessary to maintain the national capital, many studies to be conducted and the scientific development of completely. The purpose of this study inbreeding status in The Iranian Arab horse population is.

## MATERIAL AND METHODS

Due to lack of scientific studies and lack sufficient breed associations registered in Iranian horse breed classification is controversial. According to most experts of the three Arabian horse breed, Turkmen and Kurds and there is a Caspian pony. The Iranian Arab horse or The Iranian Asil horse is among the Iranian pure breeds. In this breed have many fans worldwide.

Generally, there are nine strains of Arabian horse. Strains of Arabian horse are simply Vaznan, Koheilan, Obayan, Saglavi, Hamdani, Hadban, Dejelfan, Moangi and Showeiman [15]. Now due to some mating between different strains is done, the differentiation of strains is difficult. Each strain in the past has had characteristics that were identified with it. For example, paint bay strain Showeiman, beauty strain Saglavi, black strain Hadban, courage horses and pygmy strain Obayan Hamdani strain can be named.

Arabian horse breed between different provinces of Iran are exchanged. The exchange mainly buying and selling horses, mares with a stallion by blending other areas and migration is done. 6 different color strains The Iranian Arab horse was observed (Table 5).

**The Iranian Arab Horse Breeding:** The Iranian Arab horse dispersal is high. But overall in the three provinces Khuzestan, Yazd and Tehran population is high.

Table 1: Information about the Iranian Arab horse population

No. horses in total	No. sires in total	No. dams in total	No. horses with progeny	No. horses without progeny	No. animal with unknown sire	No. animal with unknown dam	No. base horses	No. base sires	No. base dams
2522	413	870	1283	1239	1	5	566	209	357

This breed racing speed, endurance, jumping and beauty are used. In some cases, the hybridization to produce horses as breed base is used. At present the Arab horse individually, multiple, clubs and in some cases to 20 to 70 complexes are grown.

In previous years several other countries of the Arab horses and purchased The Iranian Arab horse population arrived. Due to the reputation of the horses on to intercourse frequency is used. This increase in average inbreeding coefficient is above society. Now The Iranian Arab horse population can be divided into two categories: 1.Iranian Arab pure 2.Arab Iranian and foreign hybridization.

**The Iranian Arab Horse Pedigree:** Pedigree file for the preparation of two herd books were used. The herd books by the Federation of riding have been reported [14, 16]. In the two herd books about each horse information such as name, father name, mother's name, date of birth, gender, etc. is available.

Only animals that breed purity about it with DNA testing confirmed the two books have been recorded. Contents contained in this herd books approved by the WAHO is. After birth because of Arab horses to confirm the breed in the herd book and register of approved WAHO, DNA tests are.

Preparation of computer files pedigree of these two books were very time consuming and difficult. Unlike other livestock, horse's routine identification is based on animal names. Despite being on the neck of each horse a number (using N) is carved, but this number is subject to a special order. Therefore it cannot be used for information. There are two books on logarithms typing errors cause problems with identification and characteristics of the horses were. Table 1 information about the population studied of the Iranian Arab horse is presented.

Data evaluated in this study is about 15 generations. The oldest animal in 1952 AD was born. It is a serial number1. Horse's pedigree information in file (like the name) with the letters was recorded. For doing statistical analysis was required to be converted to numbers. Software used in data analysis capabilities has not letters. Convert letters to numbers for software Matvec [7] was used.

**Inbreeding Estimation:** Inbreeding due to horse relationship mating is produced. The rate of relationship parents is greater; Inbreeding also related to offspring will increase. Due to the frequent use of a limited number Stallion, expected average Inbreeding Coefficient in the Iranian Arab horse population is high. Inbreeding coefficients of animals studied using software Matvec [7] was estimated.

Descriptive statistics of a coefficient Inbreeding's (whole population and Inbreeding population) of the Iranian Arab horse separation strain, sex, color and breeding province using the software SAS [17] were investigated.

## RESULT AND DISCUSSION

Results of a descriptive study the Iranian Arab horse population in Tables 2 to 7 are presented.

Selected for study because this breed, there are two books of riding pedigree Federation [14 , 16], respectively. Examination it was found that about 686 horses (27.2 percent), inbred are. The maximum amount of inbreeding was estimated (38.3) related to the population was inbred horses. The average inbreeding coefficient in the whole population and inbred horse 2.1 and 7.8 were estimated (Table 2).

Pedigree information used in this study was related to the 15th generation. Average change in inbreeding per generation was estimated 0.14 percent.

In a study that was conducted in Ireland, the average inbreeding coefficient in the fifth generation of the mare Thoroughbred (with population 10569) 0.96 percent was calculated. The research data were used 21.5 generations. 60 mares were randomly selected, 12.5 percent of their average inbreeding coefficient was calculated. Average inbreeding coefficient of 0.58 percent per generation was calculated. Amounts presented in this study are higher [6].

In another study calculated the mean coefficient of inbreeding (using information pedigree47515) horse Connemara Ireland (4.65), Britain (4.44), France (4.17), Sweden (4.72), Denmark (4.18), Finland (4.97) and the North American region (4.04) was performed [18]. Average inbreeding coefficients in all cases the amount calculated in this study further.

Table 2: Inbreeding percentage of the Iranian Arab horse population

No. horses in total	No. inbred horses	Mean of inbreeding coefficient in population	Mean of inbreeding coefficient in inbred horses	Minimum of inbreeding coefficient in inbred horses	Maximum of inbreeding coefficient in inbred horses
2522	686	2.1	7.8	0.1	38.3

Table 3: Inbreeding percentage in strains of the Iranian Arab horse

	Mean of inbreeding coefficient in whole population	Minimum of inbreeding coefficient in whole population	Maximum of inbreeding coefficient in whole population	Mean of inbreeding coefficient in inbred horses	Minimum of inbreeding coefficient in inbred horses	Maximum of inbreeding coefficient in inbred horses
Dejelfan	5.1(132)*	0.0	37.5	12.7(41)*	0.2	37.5
Hamdani	3.0(340)	0.0	27.4	8.2(92)	0.2	27.4
Koheilan	2.4(615)	0.0	31.3	7.0(157)	0.2	31.3
Moangi	1.3(44)	0.0	25.0	6.0(10)	0.4	25.0
Obayan	1.8(189)	0.0	25.0	6.5(38)	0.1	25.0
Saglavi	2.6(170)	0.0	31.3	12.4(26)	1.0	31.3
Showeiman	4.5(22)	0.0	25.0	14.4(6)	6.3	25.0
Hadban	0.0(8)	0.0	0.0	0.0(0)	0.0	0.0
Vaznan	3.1(1002)	0.0	38.3	7.2(316)	0.1	38.3

\* Numbers in parentheses the number of horses are discussed.

Table 4: Inbreeding percentage in male and females of the Iranian Arab horse

	Mean of inbreeding coefficient in whole population	Minimum of inbreeding coefficient in whole population	Maximum of inbreeding coefficient in whole population	Mean of inbreeding coefficient in inbred horses	Minimum of inbreeding coefficient in inbred horses	Maximum of inbreeding coefficient in inbred horses
Male	2.9(1041)*	0.0	31.3	7.4(314)*	0.1	31.3
Female	2.6(1481)	0.0	38.3	8.1(372)	0.1	38.3

\* Numbers in parentheses the number of horses are discussed.

Table 5: Inbreeding percentage in different colors of the Iranian Arab horse

	Mean of inbreeding coefficient in whole population	Minimum of inbreeding coefficient in whole population	Maximum of inbreeding coefficient in whole population	Mean of inbreeding coefficient in inbred horses	Minimum of inbreeding coefficient in inbred horses	Maximum of inbreeding coefficient in inbred horses
Bay	2.4(857)*	0.0	26.6	8.0(199)*	0.1	26.6
Chest	2.9(737)	0.0	38.3	7.5(218)	0.1	38.3
grey(black & white)	2.8(634)	0.0	31.3	6.6(162)	0.1	31.3
grey(brown & white)	2.7(162)	0.0	37.5	8.0(52)	0.1	37.5
black	5.1(115)	0.0	28.9	9.7(47)	0.1	28.9
White	0.4(17)	0.0	2.7	2.3(8)	2.0	2.7

\* Numbers in parentheses the number of horses are discussed.

Table 6: Inbreeding percentage in breeding provinces of the Iranian Arab horse

	Mean of inbreeding coefficient in whole population	Minimum of inbreeding coefficient in whole population	Maximum of inbreeding coefficient in whole population	Mean of inbreeding coefficient in inbred horses	Minimum of inbreeding coefficient in inbred horses	Maximum of inbreeding coefficient in inbred horses
Khuzestan	2.7(1315)*	0.0	38.3	9.2(234)*	0.1	38.3
Yazd	2.6(392)	0.0	17.7	4.3(165)	0.3	17.7
Tehran	3.0(531)	0.0	27.7	5.6(202)	0.1	27.7
Lorestan	2.4(153)	0.0	25.8	5.9(44)	0.8	25.8
Mashhad	1.7(19)	0.0	7.8	4.6(6)	0.9	7.8
Kermanshah	0.8(19)	0.0	5.3	5.3(2)	5.3	5.3
Fars	0.9(11)	0.0	2.0	1.8(4)	1.6	2.0
Esfahan	3.3(65)	0.0	18.6	6.0(25)	0.3	18.6
Kerman	1.9(14)	0.0	6.3	4.7(4)	3.3	6.3

\* Numbers in parentheses the number of horses are discussed.

Table 7: Inbreeding percentage on breed purity of the Iranian Arab horse

	Mean of inbreeding coefficient in whole population	Minimum of inbreeding coefficient in whole population	Maximum of inbreeding coefficient in whole population	Mean of inbreeding coefficient in inbred horses	Minimum of inbreeding coefficient in inbred horses	Maximum of inbreeding coefficient in inbred horses
Pure(Iranian)	3.0(1536)*	0.0	38.3	12.6(280)*	0.1	38.3
Impure	2.4(986)	0.0	37.5	4.5(406)	0.1	37.5

Impure: horses due to the Iranian Arab horse intercourse with Arabian horses that arrived from other countries

\* Numbers in parentheses the number of horses are discussed.

Average change in inbreeding per generation Italian Haflinger horse, 0.9 percent reported that the amount provided for the Iranian Arab horse in this study is higher [5].

In a study of about six generations Mangalarga Marchaor Brazilian horses were used. Average change in inbreeding per generation (0.38), the average inbreeding coefficient in the whole population (2.27) and horses inbred (7.00) was calculated [13].

Average change in inbreeding per generation and the average inbreeding coefficient in the whole population of the study results further. But in the mean inbreeding coefficient of inbred horses presented in this study is much less.

The highest coefficient of inbreeding in the whole population to strain Dejelfan (5.1 percent) and lowest in the whole population inbreeding coefficient related to strain Hadban (zero percent) is. Information Hadban strain was related to the limited number of horses. So may mean inbreeding coefficient due to lack of enough information is impressed.

The highest and lowest average inbreeding coefficient of inbred horses in order for the two strains is Showeiman and Moangi. The maximum coefficient of inbreeding (38.3 percent) was calculated for Vaznan strains (Table 3).

The average inbreeding coefficient for males (2.9 percent) and females (2.6 percent) in the whole population was calculated. The average inbreeding coefficient for inbred horses in males (7.4 percent) and females (8.1 percent) was calculated. The highest coefficient of inbreeding (38.3 percent) to female (Table 4).

In horses grouped according to body color, the highest average inbreeding in the whole population of the black horse (5.1 percent) was observed. The highest and lowest average inbreeding coefficient of inbred horses to horses in black (9.7 percent) and white horses (2.3 percent) was calculated. The maximum coefficient of inbreeding (38.3 percent) was calculated for horses Chest (Table 5).

In Category horses based on breeding province, the highest average inbreeding coefficient in the whole population in the province of horses Esfahan (3.3 percent) was observed. The maximum coefficient of inbreeding estimated the whole population in horses Khuzestan (38.3 percent), lowest mean coefficient of inbreeding in the inbred horses in the province of Tehran (0.1 percent), highest average coefficient of inbreeding in the inbred horses in the province of Khuzestan (9.2 percent) were estimated (Table 6.)

The average inbreeding coefficient of pure Iranian and impure horses groups in the whole population were 3.0 and 2.4 percent respectively. The average inbreeding coefficient of inbred Iranian horses (12.6 percent) than horses impure (4.5 percent) were estimated. The maximum inbreeding coefficient for horses pure Iranian (38.3 percent) were estimated. The maximum coefficient of inbreeding (37.5 percent) for impure horses was estimated (Table 7).

Average inbreeding in the study population compared to similar research results is not very high. But given the repeated use of one or a limited stallion relationship with most mares have a relative in case of continuation of this practice in the population desired average inbreeding will increase. More Stallion develop and provide consultancy services, increasing the risk of inbreeding in the population can be reduced.

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