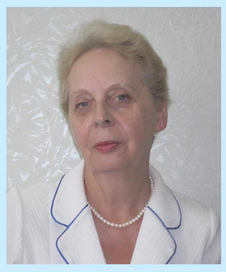
INBREEDING AND HOMOZYGOSITY IN THE THOROUGHBRED HORSE



L.A. KHRABROVA

The All-Russian Research Institute for Horse Breeding

391105 Divovo, Ryazan Region, Russia, www.ruhorses.ru

E-mail: labgenetics79@gmail.com, l.khrabrova@yandex.ru

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Introduction

Thoroughbred horse breed originated from 3 famous sires and 70 foundation mares recorded in the General Stud Book (1791). A closed system of breeding for more than 40 generations contributed to the genetic consolidation of the breed and inevitably resulted in increase of inbreeding. The study was carried out to assess the level of homozygosity of TB horses on STR-markers depending on the degree of inbreeding in pedigrees.

Material and Methods

Microsallite genotypes were determined at each of 13 panel loci (AHT4, AHT5, ASB2, HMS1, HMS2, HMS3, HMS6, HMS7, HTG4, HTG6, HTG7, HTG10, VHL20) for a sample of 1945 horses registered in the Russian Stud Book (182 stallions, 566 dams and 1197 foals). Inbreeding level was estimated by Wright`s inbreeding coefficient (F_x) in 5 generations in pedigrees.

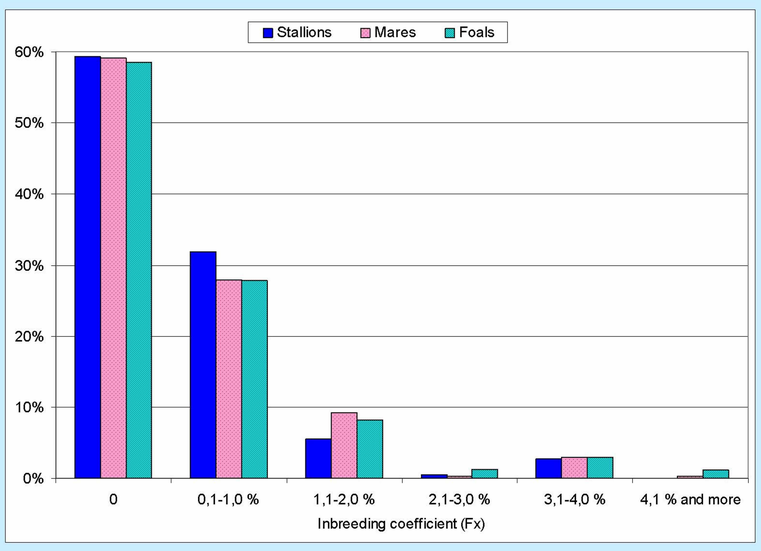

Figure 1. The ratio of inbred horses in groups of stallions, mares and foals

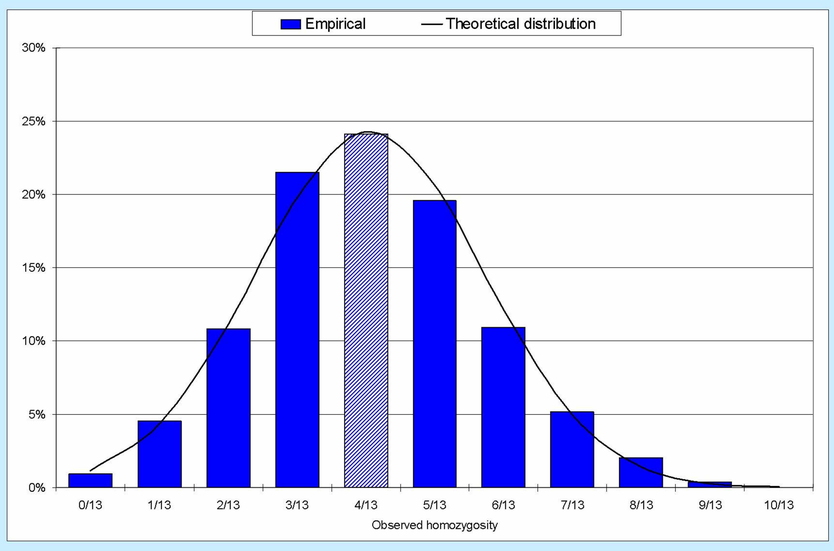

Figure 2. The distribution of TB horses with different degrees of homozygosity of STR`s loci

Results

The most of tested horses (58,8%) resulted from outbreeding method and only 0,8% had $F_x > 4,1\%$. Proportion of inbred horses in groups of stallions, mares and foals was similar (Fig. 1). Degree of homozygosity horses had normal distribution ($P<0,01$) with 30,8% modal class (Fig. 2). Degree of homozygosity didn't change significantly in $F_x < 3,0\%$ (Fig. 3). Only in $F_x > 3,0$ there was insignificant increase of this parameter from 31,2-32,6% to 35,6%. So it is suggested that the use of moderate inbreeding doesn`t lead to increase of homozygosity in the TB horse.

Table 1. The distribution of the TB horses on the degree of homozygosity and the level of inbreeding

Degree of homozygosity	Level of inbreeding Fx (%)						N (%)
	0	0,1-1,0	1,1-2	2,1-3,0	3,1-4,0	≥4,1	
0/13 0.0%	11	1	0	0	0	0	12 (0,62%)
1/13 7,69%	52	23	8	0	0	0	83 (4,27%)
2/13 15,38%	124	64	16	2	6	1	213 (10,95%)
3/13 23,08%	246	113	27	5	13	3	407 (20,93%)
4/13 30,77	276	137	43	6	10	3	475 (24,42%)
5/13 38,46%	224	125	34	3	10	6	402 (20,67%)
6/13 46,15%	125	54	18	0	12	1	210 (10,80%)
7/13 53,85%	59	23	8	1	3	1	95 (4,88%)
8/13 61,54%	23	6	4	1	3	1	38 (1,95%)
9/13 69,23%	4	2	2	0	1	0	9 (0,46%)
10/13 76,92%	0	1	0	0	0	0	1 (0,05%)
Total	**1144**	**549**	**160**	**18**	**58**	**16**	**1945**

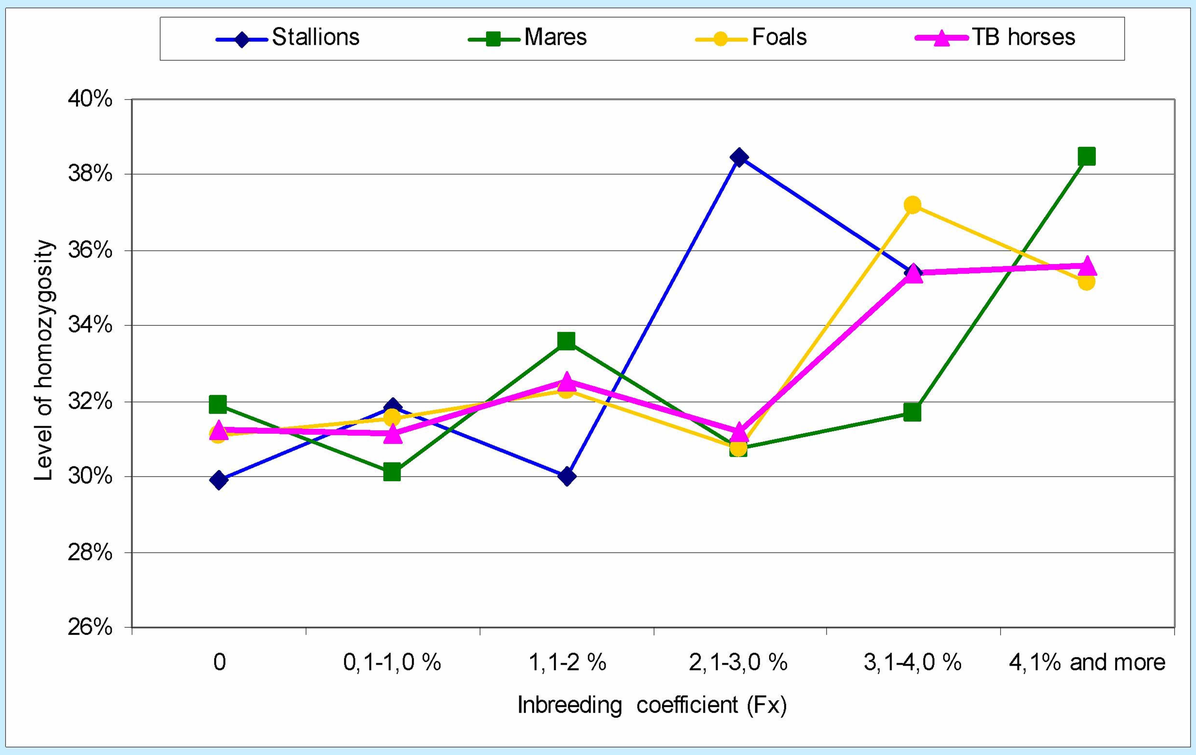

Figure 3. The level of homozygosity TB horses with different coefficient of inbreeding

Conclusions

The degree of homozygosity of TB horses on STR panel loci varies in the range of 0 - 78% and has a classical normal distribution. STR and other DNA-markers may be used for assessment of homozygosity of horses as outbred pedigrees don't guarantee high heterozygosity of animals.