AGRICULTURAL SCIENCE AND TECHNOLOGY, VOL. 11, No 3, pp 198 - 202, 2019
DOI: 10.15547/ast.2019.03.033

Population status, breeding policy and perspectives for the development of the Danubian horse breed

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(Manuscript received 12 June 2019; accepted for publication 22 July 2019)

Abstract. *The population status and breeding policy of the Danubian horse breed were studied for a relatively long period, from 1953-2017. The study traced the change in population number of the breed in decades and by different categories of animals. The analyses show a strong reduction in the number of Danubian horses in all categories. The small number of newborn foals is associated with the lowering number of breeding mares especially after the 1980s. In the last decade, according to an officially published bulletin by the breeding organization on the other hand, there was an increase in the number of mares and stallions and inconsistent with that number of breeding horses, newly born foals. In a historical aspect, the breeding policy of the Danubian horse showed some interesting and unpublished so far facts. Those facts are related, on the one hand, with the origin of the mares that became founders of families and, on the other hand, with the use of stallions of different breeds for input of purebred animals.*

Keywords: Danubian horse, population structure, breeding

Introduction

The formation of the Danubian horse breed was closely related with the requirements of the rural agricultural areas for working horses. After 1930 there was a necessity for a horse that is heavier, stronger and endurable, for a modern and successful agriculture (Karaivanov, 1975). According to the author that period revealed great opportunities for breeding Nonius horses, a horse breed that had a supremacy over the other horse breeds used as harness working horses. After the introduction of the Nonius horse breed to Bulgaria it has been subject of interest to many researchers in the horse breeding field. Hadjidimitroff (1941) studied the development of the Nonius breed in the region of Bela Slatina town and its impact on the improvement of the local horses. The author recommended that the work with the breed should proceed and be extended to other regions of Bulgaria. The Danubian horse was officially recognized as a breed with a Ministry Act No. 631 in 1951. For the first time the official name of the breed – Danubian horse was cited by Dimitrov (1952). The publication ended with a recommendation to invigorate the breeding and distribution of the Danubian horse, which was more massive and with greater working abilities compared to other working horses. Great contribution in studying the Danubian breed in details had Karaivanov (1963a,b, 1971, 1975) and Karaivanov et al. (1989). The authors analyzed the results of the so-called "grading-up" or backcrossing and presented some details and peculiarities in the development of the breed. The Danubian breed has been studied in some other aspects as well, such as inter breed differentiation (Barzev, 1988, 1990), breeding value (Karadzhov, 1997a) and reproductive traits (Karadzhov, 1997b), dynamics of the line structure of the breed (Barzev et al., 2007).

Analyzing the results of those researches we can see the dynamics in the development of the breed and its transformation and affirmation as light-weight harness breed used for work. Karaivanov (1975) described the Danubian horse as a not very high horse, with massive, slightly elongated body, and with massive bone structure. The Danubian horses differ from the other Bulgarian horse breeds by their craniometric characteristics. They are well-known for their level-headed temperament and excellent harness qualities.

The aim of the study was to establish the dynamics in the development of the Danubian horse population and the breeding policy in the studied period. According to that we examined the average annual number of horses in the population divided in categories by decades and explored the breeding policy in the population during the different time periods.

Material and methods

The study covered a long period of time, from 1953 to 2017 and included all breeding stallions and mares together with the young horses of the Danubian breed, bred in the former national stud farm "Clementina" near the town of Pleven, and the horse farm of Trakia University - Stara Zagora. The data for the population size and the breeding

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activity results were taken from the annual zoo-technical documentation of the farms. The information for the period after 1999 was collected from the officially published reports by the National Association of Horse Breeding (Jordanov et al., 2013; 2014) and the annual catalogues of the Executive Agency for Selection and Reproduction (Dimov et al., 2011; Nikolov et al., 2013; Yordanov et al., 2017). Calculations of the average number of horses were made using the classical statistical methods via the MS Excel 2010 Software.

Results and discussion

Number of horses in the breed. Gathering large groups of breeding animals and their affirmation as a breed is in a relationship with some factors that determine the ability to maintain these populations, such as geographical and climate conditions, social and economic state as well as the human factor. For a complete characteristic of a breed, in addition to the mentioned above, there is one other important element – sufficient number of animals in the population.

The examples in horse breeding on a world-wide scale are different. Most popular European breeds such as Hanoverian, Holstein, Sell-France, Oldenburg, etc., maintain a population with 10-20000 broodmares and 500-600 stallions with affiliation to a certain number of sire lines. When it comes to harness horse breeds, the population sizes are significantly smaller than that. For the conditions in Bulgaria the minimal number of the elite broodmares needs to be near 200. The small number of broodmares, on the other hand, is related to the necessity of maintaining a larger number of sire lines – 7 or 8. According to the number of animals in the population, FAO classified the breeds in the following groups (Scherf, 2000):

1. Extinct;
2. Critical;
3. Endangered;
4. Not at risk.

In addition to those four main groups, there are two supplementary groups – *critical-maintained* and *endangered-maintained.* With those categories are identified populations which have critical or endangered status, but there are active conservation programs for them. In accordance with that classification of FAO, the Danubian horse belongs to the *endangered-maintained* category.

In Table 1 and Table 2 are presented the average annual number of breeding mares and stallions and their progeny bred in the stud farm "Clementina" by decades.

Table 1. Number of Danubian horses by category during the period 1961-1980, bred in the stud farm "Clementina"

Years	Number of horses by category										
	Stallions	Brood-mares	Male foals 4 yo	Male foals 3 yo	Male foals 2 yo	Male foals yearlings	Female foals 4 yo	Female foals 3 yo	Female foals 2 yo	Female foals yearlings	Station-bred stallions
1961	9	101	29	37	41	NI*	30	31	30	NI	NI
1962	8	87	35	40	31	NI	25	25	46	NI	50
1963	8	82	35	30	31	NI	24	43	36	NI	46
1965/1966	8	93	21	27	25	NI	25	26	28	NI	47
1967/1968	6	78	15	22	40	NI	22	17	31	NI	NI
1968/1969	7	76	13	25	35	NI	11	21	33	NI	NI
1969/1970	10	70	11	23	17	NI	14	18	34	NI	NI
Av. annual number	8	83	22	29	31		21	25	34		47
1970/1971	5	66	14	16	28	NI	9	33	23	NI	NI
1971/1972	4	57	3	13	27	NI	15	12	19	NI	NI
1972/1973	5	62	10	18	23	NI	8	17	24	NI	NI
1973	4	64	2	8	19	NI	4	12	21	NI	NI
1974	4	55	7	11	24	NI	5	10	13	NI	NI
1975	5	51	4	9	14	NI	6	7		NI	NI
1976	5	55	3	9	13	NI	6	10	19	NI	NI
1977	7	56	9	10	18	NI	8	17	11	NI	NI
1978	7	64	10	12	13	NI	11	9	11	NI	NI
1979	7	63	6	12	15	NI	9	7	16	NI	NI
1980	5	60	4	5	8	NI	2	10	20	NI	NI
Av. annual number.	5	59	6	11	18		7	13	13		

*NI - No Information

Table 2. Number of Danubian horses by category during the period 1981-1999, bred in the stud farm "Clementina"

Years	Number of horses by category										
	Stallions	Brood-mares	Male foals 4 yo	Male foals 3 yo	Male foals 2 yo	Male foals yearlings	Female foals 4 yo	Female foals 3 yo	Female foals 2 yo	Female foals yearlings	Station-bred stallions
1981	5	53	3	6	17	NI*	9	12	15	NI	NI
1982	6	54	2	9	17	NI	6	10	23	NI	NI
1983	6	47	2	6	13	NI	5	15	11	NI	NI
1984	5	47	6	10	16	2	14	9	9	7	NI
1986		52	6	8	7	11	5	8	14	15	12
1987	3	49	6	7	8	12	7	9	15	10	12
1988	5	45	6	8	12	20	8	13	10	14	NI
1989	4	42	6	10	19	16	8	9	14	14	NI
1990	4	43	7	10	14	8	6	6	11	18	10
Av. annual number	4	48	4	8	13	11	7	10	13	13	11
1992	5	35	4	5	9	11	5	13	14	9	NI
1993	4	35	4	6	11	17	13	10	8	6	NI
1994	8	32	3	7	11	8	7	5	6	7	NI
1995	4	36	2	5	5	7	4	6	7	2	11
1996	4	30		2	6	13	6	3	2	12	10
1997	3	29	2	4	7	8	2	2	8	9	9
1998	5	31	3	5	4	9	2	8	8	6	9
1999	4	31	3	2	3	2	5	6	4	1	9
Av. annual number.	4	32	3	4	7	9	5	6	7	6	9

*NI - No Information

Tracing the changes in the size of the population by decades, it is clear that there was a trend for high reduction of the number of horses in all categories. Also, it should be noted that the low number of newborn foals is in correlation with the falling number of broodmares. Karaivanov (1975) pointed out a significantly high percent – 74,45% of newborn foals for a ten-year period (1965-1974). In the recent study number of newborn foals presented approximately 50% of all broodmares.

According to the data published by National Association of Horse Breeding, in 2013 the number of horses controlled by the association registered in the Stud book and the Register of the breed was 264 in total, 127 of them were broodmares, 23 were stallions and 37 were newborns (Figure 1). In 2014 the total number of controlled horses rose to 301, with 148 broodmares, 23 stallions and just 18 newborns. Only three years later in 2017 the number of horses in the population jumped up to 486. It is very intriguing how the population size is growing in numbers, contrary to the low number of registered newborn foals.

The number of broodmares gave the possibility for developing a certain breed of horses, with no threat of the effect of inbreeding. We believe that it is appropriate to clarify under which conditions a horse is being enrolled either in the Studbook or Register of the Danubian breed.

In the STUDBOOK can be enrolled only horses with approved origin – proved by documents. Purebred is considered any horse originating from a mare with affiliation to the approved family structure formed in the „Clementina" stud farm and a licensed stallion from one of the following breeds – Danubian, Thoroughbred or Nonius. The descendants in fourth generation representing Thoroughbred and Nonius breed should not be more than 8. Purebred is considered any horse with four generations of approved population when in fourth generation at least 7 out of 16 descendants belong to the Danubian breed. All other horses, which have in their pedigree descendants of the Danubian breed, but do not meet the other requirements, are enrolled in the REGISTER of the breed (Hinkovski et al., 2011).

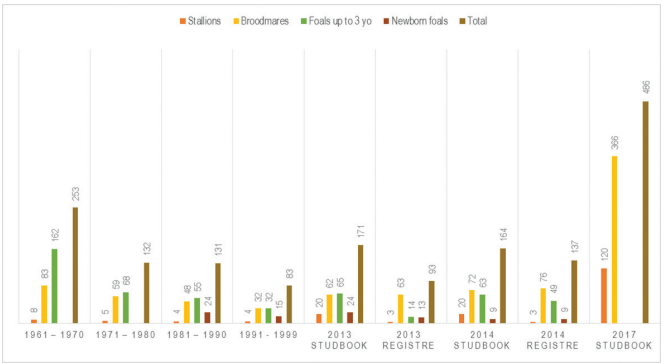

Figure 1. Average annual number of horses by category during the period 1961-2017

Following the dynamics in the population status of the Danubian breed, it was quite obvious that the number of mares registered in the annual zoo-technical documentation of "Clementina" was far under the required number for conducting a normal breeding process. So there is a great possibility that mares born in the stud farm on a later stage were bred by private owners. Mares in the private sector at that time were not considered part of the population and were not controlled by the horse breeding department. Based on the low number of newborns, we believe that the number of broodmares in the private sector wasn't that big. So we can definitely state that the number of the broodmares in the Danubian breed was always under the critical minimum.

A study carried out in the 1990s shows that for the period 1981-1990, out of 48 broodmares, 35 belonged to seven of the known families in the breed. Twelve of them belonged to the family of Zhandarma, ten to the family of Mara Y, five to the family of Norvegia, three to the family of Nonka, two mares were with affiliation to the families of Alena II and Leska II, and just one mare presented the family of Frayla. The presence of breeding stallions with affiliation to just four sire lines (Zdravko, Lider, Hrabar, Kalif) at that time was a prerequisite for inevitable inbreeding. In fact, the inbreeding applied at that time could be classified in two levels: one – when there was only one common ancestor and two – when there were two or three common ancestors, also known as complex inbreeding. Close breeding was applied for just one mare regarding the stallion Hrabar, but the growing rate of inbreeding was comparatively high, calculated by Falconer (1986). According to the author the growing rate of inbreeding in the herd for one generation should range from 0.5-2%. In the study mentioned above, this coefficient was 2.7% which is above the recommended level.

Breeding policy. One of the most talked-about topics among Danubian horse breeders is the "purity" of their mares and stallions. It is important to clarify the terminology and classify them as purebred and crossbred horses. Whether some "un-pure" horses are defined as crossbred, depends on the criteria set down in the breeding program of the breed. In view of that all horses with Thoroughbred and Nonius sires should be considered purebred Danubian horses.

In a historical aspect, the breeding policy of the Danubian horse showed some interesting and unpublished so far facts. For example, some of the foundation mares had diverse origin, Zhandarma and Akula were Anglo-Arabian mares and Leska II was a half-bred Thoroughbred. A less-known fact is the inclusion of the Russian trotter Guslar as a breeding sire in the population. He became a sire of 62 foals during the period 1953-1966 (Table 3). His descendants Gluhar and Gordeliv had 29 foals in total. The number of female foals included in the breeding process as broodmares on different stages, originating from Guslar, is 13.

Table 3. Results of the breeding policy carried out in the Danubian horse population during the period 1953-1999

Horse farm	Trotter stallions			Thoroughbred stallions			Hanoverian stallions		
	Nr. of stallions	Nr. of foals	Used for breeding	Nr. of stallions	Nr. of foals	Used for breeding	Nr. of stallions	Nr. of foals	Used for breeding
"Clementina" stud farm	2	91	13	19	146	16	3	12	--
Trakia university horse farm	--	--	--	7	73	9	8	65	3

Hadjidimitroff and Delov (1964) described in details the purpose of that breeding policy. The main porpoise was, having the Danubian horse, a horse with good exterior and constitution to improve the speed trait and movement of horses. In that way they expected to increase the capacity of agricultural and transport work of the Danubian horse. The authors studied not only the movements, but also the growth and development of the progeny. They stated that the purebred Danubian foals are predominant with their growing abilities up to 2 years of age, but at 3 years of age there was a turning point when the crossbred horses catch-up and even outrun the purebred. Speed was tested on the racetrack at a distance from 1600 to 2400m. Results showed significantly better performance for the crossbred foals. In conclusion, the authors state that crossbreeding Danubian mares with Russian trotter stallions is favorable and recommend that the crossing should continue. Nearly at the same time period, the Thoroughbred stallions were introduced to the population of Danubian horses. The aim was to produce a sport type of horse known as Bulgarian "hunter." This type of crossings was carried out in the stud farm "Clementina" and in the breeding nucleus of Danubian mares in the farm to the Horsebreeding Department of Trakia University. In "Clementina" 19 Thoroughbred stallions were used with a total number of born foals 146. Sixteen of them were included as broodmares in the population. On a later stage three Hanoverian stallions were used as sires and they had 12 foals born in the stud.

During the first years of formation of the Danubian mare nucleus in the farm of Trakia University, Thoroughbred and Hanoverian stallions were used for breeding. Until 1964 stallions of different breeds were used – Pleven horse, East Bulgarian horse, Arabian horse, etc. After 1965 mainly Thoroughbreds were used for breeding. In 1978, when the first Hanoverian stallions were imported to Bulgaria the interest in mating Danubian mares with Thoroughbred stallions dropped dramatically. By crossing Hanoverian stallions and Danubian mares were received 138 foals, and some of them laid the foundations of the "Bulgarian sport horse."

There is a curious fact that after the official recognition of the Danubian horse as a breed in 1951, there was no Nonius stallion used for breeding in the population. First importation of Nonius stallions in the new history of the breed was made in 2004. Those were Nonius-Mester VI-25, Nonius-Matroz IV-21, they did not meet the requirements of the exterior type that is typical for the Danubian horse, and that is the reason, they were not used widely for breeding. In 2016 was imported Rablo N-122, who is still at the beginning of his breeding career and it is way too early to make conclusions. All three newly imported stallions represent sire line "A" of the Nonius breed.

Perspectives for future development of the Danubian horse. Danubian horses are, and for the future should be developed as a main harness breed in Bulgaria. Once again we would like to make it clear, that using stallions other than Danubian, for breeding in the population is not a mistake, when it corresponds with the guidelines stated in the breeding program. Their progeny should be considered as a "purebred" and not as a "crossbred" horse. The type of crossing - using Nonius or Thoroughbred stallions at some point, to "refresh" the blood, is fundamental for maintaining and improving the breed, on the one hand, and for widening the

genealogy, on the other hand. This is the only way to preserve the Danubian horse and its qualities as we know it – a light-weight harness horse, with an agricultural proclivity. In our opinion there are three possible ways for future development of the breed:

✓ to maintain the Danubian horse as a harness horse suitable for agricultural work;

✓ to use Thoroughbred stallions for production of horses suitable for the equestrian sports;

✓ to lighten up the type of the horses and production of horses for driving championship. This could be possible by introducing suitable Nonius stallions in the population.

Conclusion

Tracing the change in horse population numbers of Danubian horse breed by decades, it is clear that there was a trend for decreasing the number of horses in all categories until 1999. After that year it is hard for us to explain the growing population number, having in mind the low number of registered newborn foals. In the Danubian horse population, in order to improve the harness traits, Trotter stallions were used. For improvement of the sport abilities of the horses, Thoroughbred and Hanoverian stallions were used. The breeding methods used in the Danubian horse population gave the possibility to expand the genealogical structure, and at the same time to maintain the breed as a harness horse suitable for agricultural work.

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