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Preliminary study on spermatological characteristics of frizzled Hungarian ganders

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ABSTRACT

One of the most significant results in the poultry breeding researches of the 20th century was the elaboration of the technique of artificial insemination. By its help higher fertility rate and reduced reproduction problems can be reached in the different poultry species.Although, the low fecundity rate (62-63%), the susceptibility to monogamy, asynchronism of the sexual activity in the two sexes, the hygienic problems (phallus-disease, infection during mating) and the seasonality indicate the need of the routinely application of the artificial insemination in the goose breeding, in the practice it is achieved only ad hoc.Contrary to the generally used farm types with the frizzled goose there were no examinations focused on the parameters of male reproduction. The aim of our investigations was to determine the quantitative and qualitative parameters of frizzled gander semen (average volume, concentration, motility, morphology, frequency of abnormalities, viable: dead cell ratio) ensuring a basis for the long and short term storage of gander semen and the ex situ gene conservation.
(Keywords: spermatological characteristics, frizzled Hungarian ganders)

INTRODUCTION

The origin of the Hungarian goose is dated back to the Roman era, when domestication of the greylag goose (*Anser anser*) took place in the Carpathian basin. During the centuries the breed became well adapted to the special conditions and farming systems of the country. Its feather colours vary from white to greyish or spotted, and it is characterized by good fatty liver, meat and feather quality. Frizzled Hungarian goose is a unique variety of old Hungarian goose, which is considered now as a typical poultry breed for Hungary.

A new gene conservation programme of this breed has been started recently by the Institute for Small Animal Research (ISR, Gödöllő), where a growing population of white, greyish and spotted individuals – collected from Transylvanian villages – are maintained *(Szalay*, 2002*)*.

In behaviour, production and reproduction parameters this hardy, resistant breed is genetically close to its ancient form (low egg production, strong seasonality, short reproductive cycle, poor sexual dimorphism). As a part of *ex situ* gene conservation programme the need of sperm cryoconservation of this breed has raised. As a first step the monitoring of suitability for artificial sperm collection, of the characteristic signs of the phallus and of the sperm parameters was carried out in Gödöllő, in the spring sexual cycle of this year.

MATERIALS AND METHODS

Birds and husbandry

14 two-year-old frizzled Hungarian ganders selected from 52 free ranged individuals from the poultry gene bank stock of ISR were used for the investigations. The birds involved in the study were housed individually in 2 m^2 individual cages under an artificial lighting programme of 10L/14D at the beginning of March, which was increased to 12L/12D to the end of the month. They were fed *ad libitum* by a commercial food for breeding geese (17% crude protein, 12 MJ/kg metabolisable energy). The selection and training were carried out from the middle of February to the beginning of March according to the following points of view: good health, steady temper, appropriate size of phallus (at least 50-55 mm), good and quick (10-15 sec) reaction ability for massage technique. During the experimental period the caged males had visual and sound contact with females.

Semen preparation and evaluation

Samples of semen were collected once a week by dorsal-abdominal massage by the same two persons into a single layer glass artificial vagina. In order to get clean ejaculates food was removed from the cages one day before sperm collection. Evaluation of samples was done at room temperature in the laboratory of ISR. The qualification of the semen was carried out macroscopically (volume, colour, consistency, uric, faecal or blood contamination) and microscopically (motility, concentration, morphology of spermatozoa, ratio of live/dead sperm).

The motility of spermatozoa was scored subjectively by the same operator under x 250 magnification from 0 to 3, where 0=immotile spermatozoa; 1=5-30%; 2=35-70%; 3>75% motile spermatozoa. From time to time the motility was checked objectively by a version of computer aided sperm analyser (CASPAR, Picktron Ltd. Hungary) as well. The evaluation of concentration was carried out by the use of a special chamber developed for sperm counting (Makler counting chamber, Sefi-Medical Instruments, Israel). For determine the morphological abnormalities and the ratios of live/ dead spermatozoa smears were stained by anilin-eosine and examined under oil immersion objective (×1250 magnification). The proportions of abnormal spermatozoa were assessed subjectively out of at least 200 cells.

RESULTS AND DISCUSSION

According to *Kisné* and *Hargitai* (1995) usually 50-60% of Hungarian ganders are suitable for semen collection, however, in this case only 30% of frizzled Hungarian males gave good response to massage. The handling of the ganders was not easy due to their wilder temper.

The lengths of the phalluses are 40-50 mm during the reproductive cycle and 25-35 mm out of this period, which is shorter by 1-2 cm than that of the meat type breeds *(Csuka* and *Ledec,* 1984*).*

During the mentioned two months altogether 40 semen samples were collected, from which 28 ejaculates were appreciable for assessment. Some samples were contaminated by faces and/or urates; the volumes of others were too small for the assessment. Two ganders did not produce any sperm during the cycle. The various sperm parameters can be seen in *Table 1* and *2*.

Table 1

Mean values of semen of frizzled Hungarian ganders

Ganders	Volume (µl)	Motility (scores 0-3)	Concentration (10^6sp/ µl)	Ratio of live/dead sp (%)
1	130	3, 3	1.665	84/16
2	344	3, 2, 1	0.996	89/11
3	412	2	1.14	93/7
4	125	2	0.98	-
5	-	1	-	-
6	300	3, 3, 3	0.565	76/24
7	250	3, 3, 3	1.05	93/7
8	210	3, 3, 1, 1	1.375	84/16
9	133	1, 0	0.26	-
10	300	3, 1	-	-
11	-	-	-	-
12	293	2, 2, 2	0.811	86/14
13	261	2, 1	0.425	75/25
14	120	1	0.7	-
Mean value	***258***	***2.071***	***0.900***	***84/16***
Extreme values	80-700	0 - 3	0.26 – 2.25	93/7 % – 70/30

Table 2

Ratios of the various morphological abnormalities in the frizzled Hungarian gander semen (%)

Gan-der	Micro-head	Big nuclei	Bulb head	Broken head	Other head anomaly	Acro-some anomaly	Swollen mid-piece	Crook ed neck	Double tail	Bro-ken tail	Ben-ded tail
1	0.5	11	15	4	2	8.5	1	7.5	0	1	0
2	0	9.3	5.5	3.3	2.5	11.3	1.2	5	0	1.7	1.5
3	0	8	7.5	3	4	13.5	2.5	9	0	1.5	2
6	0	7	3.5	3.2	4	10.7	0.2	5.4	0	2	1
7	0	11	3	1	0	15	0	1	Non examined		
8	0	5	6	4	4	4.7	0.7	8.5	0	1.2	2
12	0.5	3.2	1.5	2.25	1.2	19.7	0.2	0.7	0	0.7	0.7
13	1	2.5	5.5	1	1	6.5	2.5	3	0	0.5	1.5
Mean value	***0.2***	***7***	***5.3***	***3***	***2.5***	***11.4***	***0.9***	***5***	***0***	***1.3***	***1.3***

The main value of semen volume of frizzled Hungarian ganders was at the lowest level of the average range compared to the different breeds**:** White Italian: 160-230 µl (*Lukaszewicz*, 2001), Kubanskaya: 400-1300 µl (*Kurbatov*, 1976), Landes: 300 µl (*Sellier et al.*, 1995) and 720 µl (*Nickolova* and *Guerzilov*, 2000), Benkowsky White: 660 µl (*Nickolova* and *Guerzilov*, 2000).

There are not many data about gander sperm motility but the spermatozoa of frizzled ganders showed poorer motility than that of White Italian ganders, which produced 60-70% positive movement (*Lukaszewicz*, 2001).

Regarding to the concentration there were extreme deviations among the values (0.26-2.25x10^6/µl) however the mean value was similar to be find in others breeds:

White Italian: 0.320-0.980x10^6/µl (*Lukaszewicz*, 2001), Landes: 0.500x10^6/µl (*Sellier et al.*, 1995) and 0.268x10^6/µl (*Nickolova* and *Guerzilov*, 2000), Benkowsky White: 0.300x10^6/µl (*Nickolova* and *Guerzilov*, 2000).

The ratio of live/dead spermatozoa shows an acceptable value with 84% live cells though *Lukaszewicz* (2001) found better ratio in White Italian gander semen: 93/7.

The ratio of morphologically abnormal spermatozoa was around 37%, which is lower than that of White Italian semen with around 50% *(Lukaszewicz,* 2001*)*. The most frequent anomalies are the different types of acrosome aberrations (11.4%) and – interestingly – the big nuclei spermatozoa (2.5-11%). This anomaly was shown to be frequent (10-40%) in Houbara bustard semen *(Lindsay et al.,* 1999*)* and in guinea fowl semen (*Barna,* personal communication) and these spermatozoa are presumed as diploid cells.

The ratio of bulb heads - as immature forms - is high as well despite that the sperm collections were not too frequent (once a week).

As a conclusion, artificial sperm collection is difficult from this breed, the reproductive season is too short to get many semen samples and the sperm quality is a bit poorer than the average of commercial breeds. In spite of these difficulties the need of sperm freezing of this species justifies the resumption of such investigations.

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