

OBSERVATIONS REGARDING SOME PHENOTYPIC CORRELATIONS BETWEEN THE MORPH METRIC FEATURES OF SPERMATOZOA IN DOMESTIC ANIMALS WITH ECONOMIC PURPOSES

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Abstract

Morphological type classification of spermatozoa is an important component of the modern semen evaluation; however, current methods of analysis are subjective and highly variable between technicians. Artificial insemination using cryogenic preserved semen is a common management tool of the contemporary livestock producer.

There was setting off animal groups depending on different factors. There were used random images of the samples with the aid of a specialized soft .For the special sperm files there were determined the indices: total length of spermatozoa, head length, head width, tail length. The analyzed data were statistically remade, being recorded the main population parameters: the average, its error, the standard deviation, the coefficient of variability.

There were also established the absolute and relative differences among the different categories of age and species. It was carried out the significant difference testing among the above categories with the aid of the Student test. There were also calculated the phenotypic correlation values among the analyzed features, after these were recorded the conclusions.

Key words: morphometry, sperm, cryo preservation, morphologic assessment

INTRODUCTION

In the last two decades, following the perfection of the technical devices and investigation equipment in the field of biology there were gone up the studies over the biologic features in the different species of animals.

Starting from the fact that the cyto morphometry researches are not too many and also not very diversified we have proposed the comparative assessment of bull and boar semen with the aid of morphometry in these two species with economic purposes, depending on the reproducers age.

MATERIAL AND METHOD

Having in view this proposal there were made notices and measurements on 120 boar ejaculates and 160 bull ejaculates. There were

carried out samples coloured with eosin-nigrosin. They were grouped by the two studied species, swine and cattle and by age categories: young and adult boars and also young and adult bulls. There were used random images of the samples previously obtained and the computerized analyzes were made with the aid of Integrated Sperm Analyse System ISAS Projectes I Serveis R+D S.L. For each special sperm file there were determined the indices: total length of spermatozoa, head length, head width, tail length. The analyzed data were statistically remade, being recorded the main population parameters: the average, its error, the standard deviation, the coefficient of variability. After these there were also established the absolute and relative differences among the different categories of age and species. It was carried out the significant difference testing among the above categories

with the aid of the Student test. There were also calculated the phenotypic correlation values among the analyzed features, after these were recorded the conclusions.

RESULTS AND DISCUSSIONS

The primary data were grouped by species and age category (young and adults) and statistically remade and the results regarding the measured sizes (sperm head length, head width, tail length and total sperm length) are shown in four tables. The first cyto morph metric determinations in spermatozoa in Romania were made by A.T. Bogdan and C. Cristea in 1975. The results offered by these studies reveals the fact that in boar, the length of the spermatozoa head varied between $3,986 \pm 0,037$ microns and $4,642$ microns, but the tail length from $39,912 \pm 0,785$ microns to $47,188$ microns.[1]

One of the analyzed size was the length of the spermatozoa head, the values depending on species and age are shown in table 1 and chart 1.

We notice that between the two analyzed species appeared differences as: the highest value of spermatozoa head length was recorded in adult bulls this being as average $9,71 \pm 0,04$ microns. On the second place are recorded the adult boars with an average length of the spermatozoa head as $9,44 \pm 0,44$ microns.

In the same table we may notice that within each species there are also differences between the two age categories, which show the superiority of the older males. Thus, between the adult boars and the young boars the difference was $0,35$ microns (3,80%) and between adult bulls and young bulls $0,74$ microns (8,25%). Tiberiu Feredean, in the book „Reproduction in swine” considered the sperm cell a unique cell by its particularities (motility, fertility, development capacity and division), with a specific structure and a large autonomy, the author quoting values of the morph metric features in boars, as: total length of the $54,58$ microns, with limits between $49,2$ - $62,4$ microns, head length $8,51$ microns, head width $4,21$ microns [2].

Another measurement carried out at the spermatozoa head level was its length, which values depending on species and age are presented in table and chart 2.

Also regarding this feature, it may notice the same hierarchy as in the head length. The adult bulls spermatozoa had recorded the highest value of the head: $5,71 \pm 0,82$ microns, they were followed by the adult boars with $5,55 \pm 0,15$ microns.

The reported differences in the two age categories emphasize the higher value of the head width in adult animals, but expressed as percentage they are lower than in the head length, varied between 1,40% (in swine) and 2,33% (in bulls).

It was measured the spermatozoa tail length, and the average values and their differences are presented in table and chart 3.

In this size too it has appeared differences, which situated the species in the same decreasing order– cattle, swine– and ages – adult animals, young animals. In youth, the average value of the tail length was $41,80 \pm 2,94$ microns in young boars and $54,91 \pm 1,45$ microns in young bulls.

Within each species, the length of the tail in young males spermatozoa was lower with 1,80% (swine) and 3,33% (cattle). L. M. Thurston, in 1999, in Maryland, S.U.A., at the IV-th international conference regarding the boar sperm preserving presented a study where with the aid of ASMA (Automatic Sperm Morphology Analysis System) remarked significant differences concerning the different sizes of spermatozoa, in Landrace males. [3].

- tail length ($P=0,770$);
- head width ($P=0,736$);
- head length ($P=0,615$).

Regarding the tail length, the author mentioned above noticed that there are three subpopulations: 10-22 microns, 22-73 microns and 73-130 microns. In Landrace boars there are more spermatozoa with a tail length within 73-130 microns.

As it was expected in the total length of spermatozoa too there were emphasized differences between species and age category, these being presented in table and chart 4.

From the adult animals the bulls were the ones with the highest value of the total spermatozoa length of $66,72 \pm ,82$ microns and then the boars with $51,96 \pm 1,07$ microns.

Regarding the age, we may notice that in swine, the difference between young males

and adult ones was the lowest, representing 1,60%, and in bulls the difference was much lower, thus 3,27%.

In the paper „Metabolic particularities of spermatozoa in farm animals”, Radiana Tamba-Berehoiu and N. Constantin reported in boar a total length of spermatozoa between 50 and 75 microns, comparatively the bull

ones (60-80 microns), ram (70-100 microns) or stallion (60 microns).

In 2004, in bulls, Bîrțoiu I. A. Established by computerized morphometry that the length of the head was only 3,32 microns, the tail length and the intermediary piece 78,49 microns.

Table 1 Spermatozoa head length depending on species and age

Species	Age category	$\bar{X} \pm s_{\bar{X}}$	
boar	Young boars	9,09 ± 1,30	
	Adult boars	9,44 ± 0,44	
	Difference	Absolute	0,35
		Relative	3,80
bull	Young bulls	8,97 ± 0,17	
	Adult bulls	9,71 ± 0,04	
	Difference	Absolute	0,74
		Relative	8,25

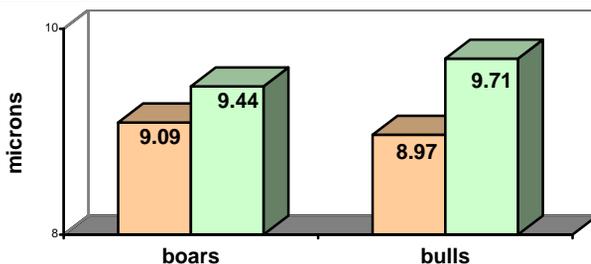


Chart 1. Spermatozoa head length

Table 2 Spermatozoa head width depending on species and age

Species	Age category	$\bar{X} \pm s_{\bar{X}}$	
Boars	Young boars	5,47 ± 0,67	
	Adult boars	5,55 ± 0,15	
	Differences	Absolute	0,08
		Relative	1,40
Bulls	Young bulls	5,58 ± 0,32	
	Adult bulls	5,71 ± 0,82	
	Differences	Absolute	0,13
		Relative	2,33

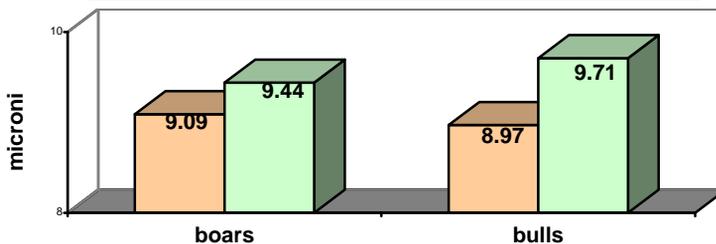


Chart 2. Spermatozoa head width

Table 3 Spermatozoa tail length depending on species and age

Species	Age category	$\bar{X} \pm s_{\bar{X}}$	
Boars	Young boars	41,80 ± 2,94	
	Adult boars	42,56 ± 1,29	
	Difference	Absolute	0,76
		Relative	1,80
Bulls	Young bulls	54,91 ± 1,45	
	Adult bulls	56,75 ± 0,86	
	Difference	Absolute	1,83
		Relative	3,33

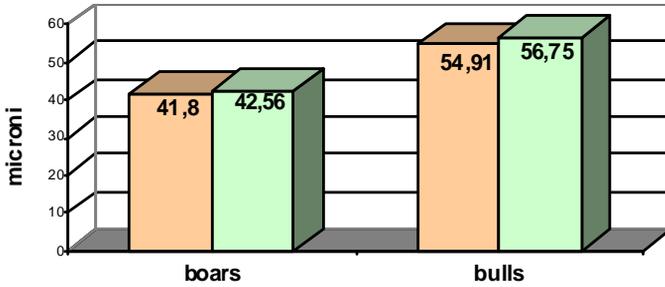


Chart 3. Spermatozoa tail length

Table 4 Spermatozoa total length depending on species and age

Species	Age category	$\bar{X} \pm s_{\bar{X}}$	
Boars	Young boars	51,15 ± 0,48	
	Adult boars	51,96 ± 1,07	
	Difference	Absolute	0,81
		Relative	1,60
Bulls	Young bulls	64,62 ± 1,44	
	Adult bulls	66,72 ± 0,82	
	Difference	Absolute	2,11
		Relative	3,27

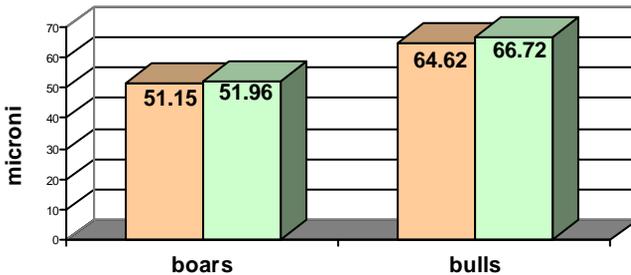


Chart 4. Spermatozoa total length

CONCLUSIONS

1. The spermatozoa dimensions analyzed depending on age and species presented different values, emphasizing the superiority of the bull sperm.

2. There are differences regarding the age of the reproducers, so in the adults there were recorded higher values than in younger males, the differences expressed as percentage between the ages categories, no matter the species varied between 1,40-8,25%.

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