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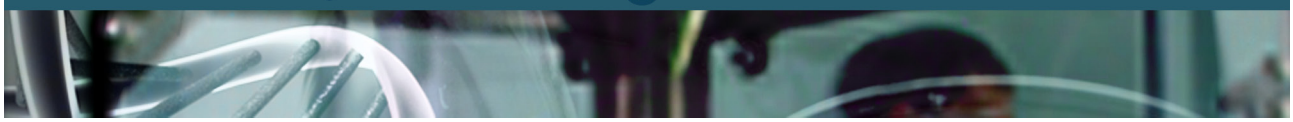

COMPARATIVE ANDROLOGIC EVALUATION BETWEEN NELLORE AND BRANGUS BULLS

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Abstract

The study was carried out at a farm in the region of Araçatuba, State of São Paulo, from August 1 to October 20, 2017. Thirty-five Brangus and ninety-three Nellore bulls were evaluated, at the recommended andrological exam parameters, such as: scrotal circumference measurement, motility, whirl, force, and evaluation of spermatic pathology. Mean scrotal circumference values were: 37.61 (± 2.50) for Brangus and 35.18 (± 2.08) for Nellore. It was observed a tendency to increase scrotal circumference according to age, and it is possible to estimate using the linear regression equation: y = 0.538x + 28.80 for Brangus, the determination index (R^2) was 0.83 and the correlation (r^2) between the variables was 0.91, and for Nellore bulls, y = 0.584x + 20.24, R^2 = 0.771 and r^2 = 0.87.

Keywords: Cattle breeding. Andrologic examination. Bovine breeds

Introduction

Studies have been carried out in order to establish criteria and parameters to evaluate the fertility and individual quality of bulls, physical and morphological characteristics of the semen and scrotal circumference, and functional characteristics such as sexual precocity, development and reproductive capacity. The application of this knowledge allows the selection of early bulls and genetic improve (Lopes et al., 2009).

For the selection of bulls for reproduction, the following steps are necessary: general clinical examination, andrologic examination and libido test. These examinations together indicate superior bulls that are indicated for breeding. But for this selection, there is a need for high knowledge and adequate equipment.

The reproductive evaluation of bulls constitutes a set of analyzes used to determine your reproductive potential, the sum of factors inherent to reproduction such as age, puberty, semen quality, scrotal circumference and libido, and should be supported by body condition to put into practice the processes that culminate in the mating (Santos et al., 2005).

Revision of Literature

Nellore Breed

Nellore is the name of a district of the ancient Madras Province, State of Andra, located on the eastern coast of India, where the first animals were shipped to Brazil.

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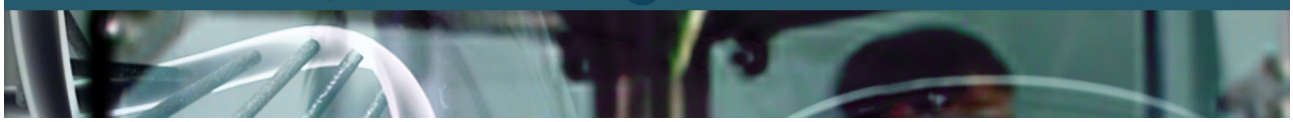


Torres Homem Rodrigues da Cunha was a major importer to the State of Minas Gerais, enthusiastic about the adaptation of the Nellore to the tropical regions, and in the State of Paraná the highlighted importer was Celso Garcia, from the city of Londrina, assisted by professor Aurelino Menarim, a great connoisseur of the breed. Thus, the production of meat in Brazil that until 1960 was concentrated in the State of Rio Grande do Sul, became reality in the north of São Paulo and in the States of Midwest, due to the binomial Nellore and *Brachiaria* (Hartmann, 2012).

It is currently estimated that Brazil has a herd with more than 200 million beef cattle raised in pasture, 75% of which are Nellore breeds and its crosses. Cows show ease of calving, excellent maternal ability, rusticity, and low maintenance cost. Nellore is the breed in Brazil that has the carcass closest to the standards established by the market and has as main characteristics the high flavor and the low fat content of marbling (ABCZ, 2017).

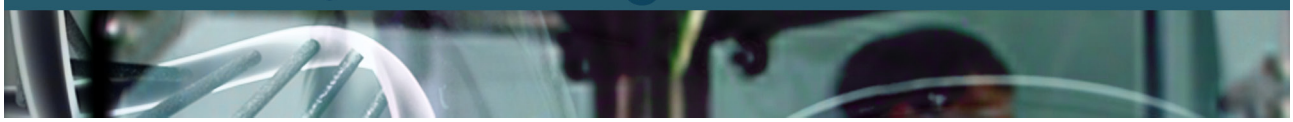
The Brangus Synthetic Race

The Brangus breed is a crossbreed between the Angus and Nellore or Brahman breeds. The first experiments that resulted in the Brangus were carried out in 1912 in Louisiana - USA for a creation that presented high degrees of productivity even created in inadequate conditions. In Brazil, the first crosses were made by technicians from the Ministry of Agriculture, in Bagé (RS), in the 1940s, which resulted in the Ibagé breed. Years later, due to the successful crosses in the United States, the name of the breed changed to Brangus-Ibagé, until it became Brangus. Consolidated to unite the rusticity of zebu breeds and the advantages of Angus (meat quality, sexual precocity, high maternal potential), the result becomes a complete breed, with advantages of calving ease; high weights at weaning and at one-year age; great weight gain, both in pasture and in confinement; early females entering reproductive life at 15 months; besides the effect of heterosis on carcass characteristics and meat texture, which results in a valorized product (ABB, 2017).

Evaluation Of Reproductive Capacity In Bulls

It consists of observing the number of copulations the sire can perform during 40 minutes in estrus cows. It should always be taken into account that the number of males is higher than that of females (2: 1). Always must be used for the serviceability test and for the libido test, females in estrus, they can be induced with estradiol cypionate and should be adequately contained to facilitate mating. It should be observed the behavior of mating and intercourse between 30 to 60 minutes for zebu. After evaluating the number of complete amounts, rank the result in:

- Weak: a mating without interest;
- Good: one mating and continues the interest;
- Very good: more than one complete mating and continuous interest (Barbosa et al., 2005).



Andrologic Exam

Identification and anamnesis

In accordance with the Brazilian College of Animal Reproduction (CBRA, 2013) information about the owner / farm and the animal is required in the andrological examination. About the animal is important to note: the species, breed, name, tattoo, registration number, date of birth and, where possible, weight and information about the parents. Other items can also be added, such as:

- Date of the finding of the amendments;
- Evolution of the ongoing process;
- Treatments performed and clinical responses and health and reproductive status of the herd or group of animals;
- Regime of sexual activity (natural mating / semen donor);
- Pregnancy index;
- Condition of handling and feeding.

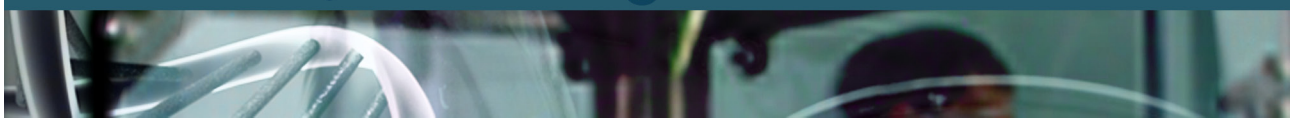
Physical Characteristics Of Semen

When the semen is obtained, it will be evaluated for physic characteristics as appearance, color, volume and microscopic characteristics as force, mobility, whirl, spermatic concentration and morphology, and other exams (Santos et al., 2005). Semen consists basically of seminal plasma and spermatozoa. It may also contain other elements, such as lipoid granules, crystals, bacteria and epithelial cells. The first evaluation of semen is done initially with the naked eye, without the aid of any instrument (macroscopic evaluation). Semen is then evaluated by laboratory methods and microscopy (Gonçalves et al., 2014).

Aspect and Volume

The volume of the ejaculate should be read directly in the collection tube and expressed in milliliters, it is relative and depends on the method of collection and the sexual regime prior to harvesting and does not require minimum or maximum value (Barbosa et al., 2005).

The semen should be uniform in appearance opaque, which indicates high levels of sperm concentration. Translucent samples contain few spermatozoa (Hafez and Hafez, 2004). Samples with curdled appearance, containing lumps of material, should not be used; this indicates infection. Appearance may be creamy, milky, opalescent or watery. The creamy appearance corresponds to high sperm concentrations (greater than or equal to 1 million / mm^3) and the aqueous indicates low concentrations (less than or equal to 0.2 million / mm^3) (Gonçalves et al., 2014). The sample should not contain hair, dust and other contaminants (Barbosa et al., 2005).



Whirl

The evaluation of swirling is performed by placing a drop of semen on a blade previously heated at 37 ° C and can be rated from zero to five where zero is the absence of swirling and five the maximum value given to a marked mass movement, which are observed under an optical microscope using a 10x objective lens (which with a 10x eyepiece will result in 100x) (CBRA, 2013).

Motility

Subjective evaluation that which represents the number of moving spermatozoa, expressed as percentage performed under a microscope with objective of 10 to 40x (Palhano, 2008). Progressive motility of 70% has been adopted as a reference value, this means that genetic selection has good results, but even so it still finds bulls with a variation of 40 to 80% (Gonçalves et al., 2014).

The force expresses the speed of sperm movement with progressive motility and in the same way that the whirling occurs at a scale of zero to five, according to the speed of progressive movement:

- 0: absence of progressive movement;
- 1: slow movement;
- 2: active movement;
- 3: very active movement;
- 4: most active movement;
- 5: vigorous movement.

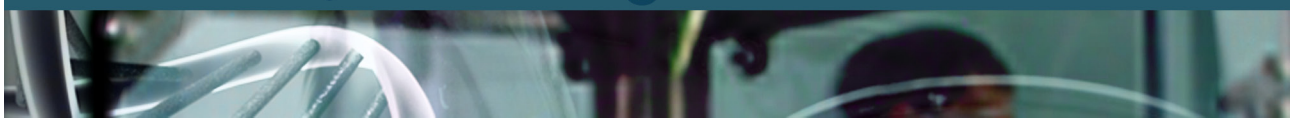
For evaluation purposes, the force must have the minimum value of three (Barbosa et al., 2005).

Concentration

Established by counting the cells in the Neubauer chamber in cubic millimeter (mm^3) or cubic centimeter (cm^3). Concentration undergoes variations due to extrinsic factors, such as the collection method, frequency of sexual activity of the reproductive tract, conditioning, and intrinsic factors such as age, size and testicular hygiene status (CBRA, 2013).

According to Gonçalves et al. (2014), the total number of spermatozoids in the ejaculate can range from 0.4 to 20 x 10^9 (expected average value: 6 to 7 x 10^9). The spermatozoa should be counted in five squares, on each side of the chamber, totaling ten large squares.

Sperm morphology is an essential component for semen examination, giving the estimation of the percentage of normal or structurally sound spermatozoa, as well as the distribution of the different morphological defects (Fernandes and Moraes, 2009).



Analysis of Morphological Characteristics

Major Defects

They are classified as major defects according to Palhano (2008): acrosome pathology, nuclear vacuole, proximal cytoplasmic droplet, undeveloped spermatozoa, teratologies, intermediate defects, strongly folded / coiled tail, narrow at the base, tail wrapped around the head, pseudo drop, pyriformis, abnormal small head, abnormal contouring head, among other defects.

The maximum tolerance value is less than 20%. The rigor or tolerance in the interpretation of this characteristic should take into account the clinical and spermatic characteristics of the animal and even the distribution of the individual defects (Freneau, 2011).

Minor Defects

They are classified as minor defects: distal cytoplasmic drop, coiled tail, thin head, isolated normal head, abaxial, retro-abaxial and oblique, folded tail, normal small head, giant, short or broad heads and prominent acrosome (Palhano, 2008).

The maximum tolerance value is up to 30%, respecting the limit of 70% of normal and including the distribution of individual defects (Freneau, 2011).

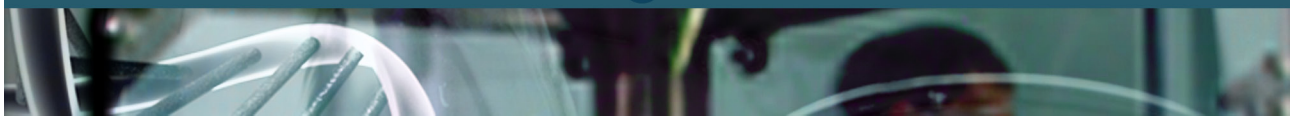
Total of Defects

Sperm morphology is normal for animals that after reaching sexual maturity have a maximum of 15% in the sum of the major defects, 24% in the minor defects and adding the major defects to the minor defects does not exceed 30% of total defects (Palhano, 2008). The individual defect limits are around 5% for major defects and 10% for minor defects (Freneau, 2011).

Interpretation of Results

At the end of the andrological examination, with the results of the general clinical examination, the bull is classified as to the prognosis of its use for reproduction:

- Approved - Those that do not present restrictions of any nature
- Approved with restrictions - Those that present, in any of the evaluated parameters, undesirable characteristics, but reversible or considered of high variability. In that case, subsequent examinations are indispensable to allow the final conclusion of the award.
- Temporary disabilities - those presenting common genetic and acquired problems that require other tests for the differential diagnosis.
- Definitive disapproved - those presenting conclusive irreversible pathologies, inheritable or not (gonadal hypoplasia, severe testicular degeneration, alteration of discharge, among others) (Costa e Silva, 2015).



MATERIAL E METHODS

The research was carried out in the period from August 1 to October 20, 2017 in the region of Araçatuba - SP. A total of 128 bulls were used, of which 35 Brangus and 93 from Nellore race, all of them aged less than 42 months. The clinical examination and measurement of the scrotal circumference were performed initially, followed by the collection of semen through the electroejaculator. The ejaculate semen was previously evaluated in the microscope for motility, swirling and force, and then evaluation of spermatic pathology.

The method of electroejaculator consists of the induction of ejaculation through electrical stimulation of the medulla at the level of the fourth lumbar vertebra, with fast electrical stimuli of 200 mA, lasting 2 to 3 seconds at intervals of 0.5 seconds (Gonçalves et al., 2014). The intensity and time of stimulation should be increased progressively, until ejaculation. Once the animal releases the pre-ejaculate, more intense and frequent stimuli (300 mA) and prolonged wave duration (3 to 5 seconds) are performed.

Artificial vagina is the method that best corresponds to the hygienic requirements for obtaining bovine semen, used for bulls in permanent harvest regime. The artificial vagina consists basically of a rigid rubber cylinder, open at both ends, inside a flexible latex tube is attached, which is fixed the edges of the rigid tube by means of elastic strips, forming a compartment there between. In this compartment warm water and air are introduced, aiming at obtaining a final temperature for harvest between 39 and 41° C.

The semen was collected in a small glass graduated container, which was attached to one end of the apparatus, at another end constitutes the portion that was performed a vulvar function in which the penis was introduced (Gonçalves et al., 2014).

Results and Discussion

In Table 1 are shown the means of scrotal circumference (SC) of Brangus and Nellore bulls analyzed, according to age.

Table 1: Scrotal circumference means of Brangus and Nellore bulls at different ages.

Age (Months)	Scrotal circunference			
	Brangus		Nellore	
	(n)	Mean ± Standard deviation	(n)	Mean ± Standard deviation
12 a 15	14	36,39 ± 2,41	0	---
15,1 a 24	17	38,79 ± 2,65^{A}	14	33,60 ± 2,04^{B}
24,1 a 30	2	39,75 ± 3,18^{A}	69	35,76 ± 2,25^{B}
30,1 a 36	1	41,0	10	36,9 ± 3,41
TOTAL/ MÉDIA	34	37,92 ± 2,80^{A}	93	35,56 ± 2,50^{B}

* Different letters in the row indicate statistical difference p <0.05.

Brangus SC superiority was observed in all studied ages, indicating that these breeders are more precocious and transmit their characteristics to the progeny.

One can observe the tendency of SC increase according to age, and it is possible to estimate it of Nellore bulls using the linear regression equation: y = 0.584x + 20.24. The coefficient of determination (R^2 = 0.771) shows that the equation model explains more than 77.1% of SC variations in addition to other environmental and genetic factors, such as: nutritional factors, macro and microelements, inherited maternal factors, management, etc. The coefficient of determination (R^2) is a measure of adjustment of a generalized linear statistical model, such as linear regression, in relation to the observed values. The R^2 varies between 0 and 1, indicating in percentage, how much the model can explain the observed values. The correlation between age and SC was high, with r^2 = 0.87, indicating that when age increases there is an equivalent increase in SC. For Brangus bulls, the linear regression equation was y = 0.538x + 28.80, the coefficient of determination was 0.83 and the correlation between SC and age was 0.91.

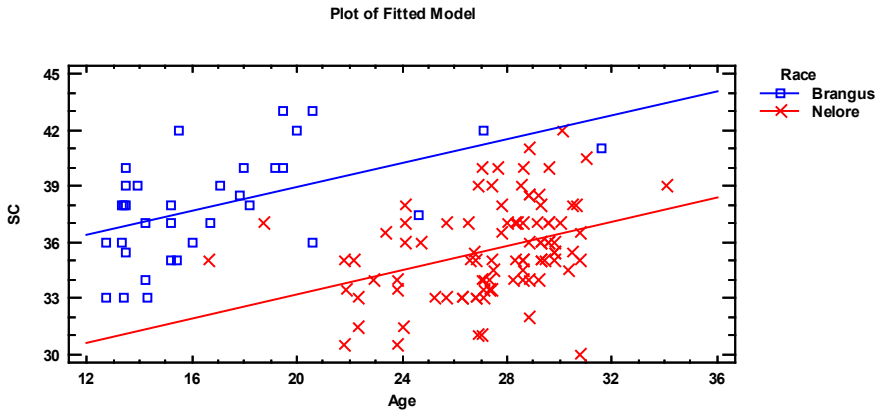


Figure 1: Distribution of Scrotal Circumference of bulls according to age, for Nellore and Brangus. Araçatuba, SP, from October 2016 to October 2017, n = 128.

The SC has great importance from the reproductive point of view, given that 1 cm more in the SC of a bull represents the production of 1.5 million more sperm. This fact represents a great advantage for the freezing of semen, due to the production of more doses. So it is an economic feature. In addition, due to the high heritability, the SC of the bulls is an important characteristic in the reproductive aspect of their daughters, considering that every 1 cm more of SC anticipates the puberty of the daughters in 75 days, and thus, when they reach the minimum weight, may enter in the reproduction group (Hartmann, 2012). For the races studied in the present study, the minimum weight for the first insemination of heifers is 280 kg and a minimum body condition score is 3.5.

In Table 2 it can be observed the means of motility, whirl and force of Brangus and Nellore bulls analyzed, according to age.

Table 2 - Results of motility, whirl and force of Brangus and Nellore bulls in the period from 01/08 to 20/10/2017

AGE (MONTHS)	NUMBER OF BULLS		MOTILITY (%)		WIRL		FORCE	
	B	N	B	N	B	N	B	N
12 to 15	3	0	73,3	-	3,3	-	3,3	-
15,1 to 24	11	2	70,0	68,3	3,0	2,8	3,0	3,0
24,1 to 30	19	28	65,2	69,6	3,0	2,9	3,2	3,1
30,1 to 36	2	9	80,0	67,7	3,0	3,0	3,0	3,2
36,1 to 42	0	50	-	70,2	-	3,0	-	3,3
Means	35	93	72,1	68,9	3,1	3,1	3,1	3,1

Whirl and Force: 0: absence of movement; 1: slow movement; 2: active movement; 3: very active movement; 4: most active movement; 5: vigorous movement. B: Brangus; N: Nellore

It can be observed that the values of motility in Brangus bulls were superior to those of Nellore bulls. With this information it can be inferred that, during the studied period, there was superiority of the synthetic race over the natural race, in this characteristic. Concerning turbulence and vigor, no differences were observed.

Conclusion

The Nellore and Brangus breeds adapt well to the tropical climate of the southeastern region of Brazil, where the work was carried out. There is greater precocity in the Brangus breed, under productive and reproductive aspects, since if there is a nutritional balance that meets the maintenance and production requirements. This is due to the effects of heterosis, which result in increased dominance and epistasis among genes.

The veterinary technical assistance service should evaluate reproductive performance using well-defined criteria and numerical information to support farmers in decisions about choosing the best bulls.

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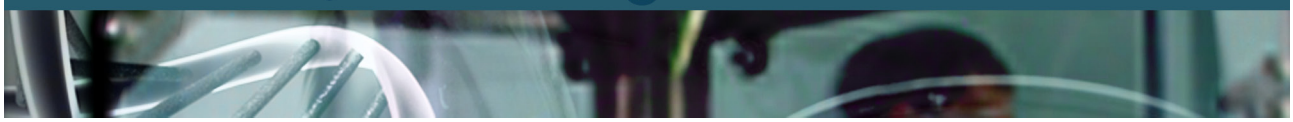

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