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J.H.W. Diniz
https://orcid.org/0000-0002-6769-8699
A.C.B. Teixeira
https://orcid.org/0000-0003-1195-6967
J.A.N. Riveros
https://orcid.org/0000-0002-8326-2748
R.F.G. Peres
https://orcid.org/0000-0003-0152-161X
D.Q. Fonseca
https://orcid.org/0000-0003-4217-8029
E.C.R. Cunha
https://orcid.org/0000-0003-3679-9398
V.M.T. Vilela
https://orcid.org/0000-0001-8583-0828
D.F. Silva
https://orcid.org/0000-0002-0388-1849
A.M.P. Leo
https://orcid.org/0000-0003-2174-2209
R.C.F.T. Palhares
https://orcid.org/0000-0002-6744-1025
L.Z. Oliveira
https://orcid.org/0000-0001-6660-9191

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The importance of updated criteria in breeding soundness examination of commercial Nellore bulls for the herd reproductive improvement

[*Importância de critérios atualizados na avaliação andrológica de touros Nelore a campo para a evolução reprodutiva do rebanho*]

J.H.W. *Diniz*[1], A.C.B. *Teixeira*[1], J.A.N. *Riveros*[1], R.F.G. *Peres*[2], D.Q. *Fonseca* [3], E.C.R. *Cunha*[3], V.M.T. *Vilela*[1], D.F. *Silva*[1], A.M.P. *Leo*[1], R.C.F.T. *Palhares*[1], L.Z. *Oliveira*[1*]

[1]Escola de Veterinária - Universidade Federal de Minas Gerais - Belo Horizonte, MG
[2]Nelore Paranã - Fazenda Eldorado - Iaciara, GO
[3]AgroSB - Palmas, TO

ABSTRACT

The aim of this work was to compare results of breeding soundness examination (BSE) of Nellore bulls (n=1257) according to evaluation criteria from two different classification tables (traditional-Table1 used since 1997 and an updated-Table2-proposed in 2020). Data were separated into 3 categories: questionable animals in Table1 and Table2 (Q1Q2), animals approved in Table1 and questionable in Table2 (A1Q2) and animals approved in Table1 and Table2 (A1A2). BSE parameters were submitted to ANOVA (P<005), according to age groups. Higher (P<0.0001) scrotal perimeter (PE) were observed in A1A2 category (18-24m=33.4±2.4cm; 24-36m=34.5±2.2cm; 36-48m=36.6±1.7cm; >48m=38.6±1.7cm) compared to A1Q2 (18-24m=29.05±0.98cm; 24-36m=30.3±0.6cm; 36-48m=32.9±1.0cm; >48m=34.8±1.0cm) and to Q1Q2 (24-36m=26.8±2.0cm; 36-48m=30.0±0.1cm; >48m=31.3±1.1cm), for all age groups. At the age of 36-48months (Q1Q2=2.7±0.3; A1Q2=3.2±0.3; A1A2=3.3±0.6) and >48months (Q1Q2=3.0±0.4; A1Q2=3.3±0.5; A1A2=3.4±0.5), animals with better andrological classifications presented higher (P<0.05) body condition score (BCS). Additionally, at age >48m, higher sperm Motility (P=0.0250) and Vigor (P=0.0335) were observed in animals A1Q2 (Mot=55.5±14.7%; V=3.21±0.82) and A1A2 (Mot=55.8±12.2%; V=3.23±0.81) compared to Q1Q2 (Mot=50.2±17.4%; V=2.77±0.82). It was concluded that bulls approved using strict selection criteria demonstrated higher PE and BCS, regardless of the age. The utilization of updated classification tables is highly recommended for further reproductive potential development of Nellore bulls in the field.

Keywords: andrology, bovine, fertility, scrotal perimeter, classification tables

RESUMO

O objetivo deste estudo foi comparar os resultados obtidos no exame andrológico a campo de touros Nelore (n=1257) de acordo com os critérios de avaliação de duas tabelas de classificação (uma tabela tradicional – tabela 1 – proposta em 1997 e uma nova tabela atualizada – tabela 2 – proposta em 2020). Os dados foram separados em três categorias: animais questionáveis nas tabelas 1 e 2 (Q1Q2), animais aprovados na tabela 1 e questionáveis na tabela 2 (A1Q2) e animais aprovados nas tabelas 1 e 2 (A1A2). Os parâmetros foram submetidos à análise de variância (P<0,05), por faixa etária. Observou-se maior (P<0,0001) PE no grupo A1A2 (18-24m=33,4±2,4cm; 24-36m=34,5±2,2cm; 36-48m=36,6±1,7cm; >48m=38,6±1,7cm) em comparação ao grupo A1Q2 (18-24m=29,05±0,98cm; 24-36m=30,3±0,6cm; 36-48m=32,9±1,0cm; >48m=34,8±1,0cm) e este maior (P<0,0001) que Q1Q2 (24-36m=26,8±2,0cm; 36-48m=30,0±0,1cm; >48m=31,3±1,1cm) em todas as idades. Nas faixas etárias 36-48m (Q1Q2=2,7±0,3; A1Q2=3,2±0,3; A1A2=3,3±0,6) e >48m (Q1Q2=3,0±0,4;A1Q2=3,3±0,5; A1A2=3,4±0,5), animais com melhor classificação andrológica apresentaram melhor (P<0,05) escore de condição corporal (ECC).

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*Autor para correspondência (*corresponding author*)
E-mail: leticiazoccolaro@yahoo.com.br

Adicionalmente, na idade >48m, maiores motilidade (P=0,0250) e vigor (P=0,0335) foram observados nos animais A1Q2 (Mot=55,5±14,7%; V=3,21±0,82) e A1A2 (Mot=55,8±12,2%; V=3,23±0,81) comparados aos animais Q1Q2 (Mot=50,2±17,4%; V=2,77±0,82). Concluiu-se que touros aprovados na tabela com critérios mais rigorosos de classificação (tabela 2) apresentaram maior PE e ECC, independentemente da idade. Assim, a utilização de tabelas classificatórias atualizadas é fundamental para maior desenvolvimento do potencial reprodutivo de touros Nelore a campo.

Palavras-chave: andrologia, bovino, fertilidade, perímetro escrotal, tabela classificatória

INTRODUCTION

Selecting bulls with high reproductive potential is recognized as important, given their effective impact on livestock production efficiency. Genetic improvement programs aim to increase livestock productivity by increasing the frequency of desirable genes (Siqueira *et al*., 2013) and scrotal perimeter (PE) remains an important selection criteria for bulls from beef cattle production systems. Since PE is a reproductive parameter of practical assessment, highly repeatable and moderate-to-high heritability (Bergmann *et al*., 1996; Pereira *et al*., 2002; Siqueira *et al*., 2013; Fonseca *et al*., 2019) this characteristic received great attention of Nellore breed researchers in the last decades (Pinto *et al*., 1989; Fonseca *et al*., 1997; Silva *et al*., 2002; Viu *et al*., 2006; Siqueira *et al*., 2013; Fonseca *et al*., 2020).

According to Siqueira *et al*. (2013) the selection to PE improvement does not determine direct economic benefit, but it results in reproductive precocity and increased weight gain of the herd (higher birth weight, weaning weight and yearling weight). In addition, PE is also correlated with important reproductive traits of female (age at first partum and probability of pregnancy) and male offspring (testicular volume and sperm concentration) (Bergman *et al.*, 1996; Eler *et al*., 1996, 2004; Ahmad *et al.*, 2010; Siqueira *et al*., 2013; Ayala *et al.*, 2016). Moreover, the importance of bioeconomic impact of bull breeding soundness examination (BSE) in cow-calf systems is clear, since they have substantial impact on the genetics of the herd (Menegassi *et al*., 2011).

For Nellore breed, several bull classifications tables are recommended in order to select animals with greater reproductive capacity (Fonseca *et al*., 1997; Vale-Filho, 2001, 2010; Fonseca *et al*., 2020). However, the lack of updated information regarding those selection criteria can interfere on breed development and genetic improvement. Hence, the aim of this work was to assess a large-scale BSE of a commercial beef cattle farm and to compare the results obtained from bull selection criteria according to two classification tables for Nellore breed (a traditional table classification proposed in 1997 and an updated table, newly proposed in 2020).

MATERIAL AND METHODS

In the present study, field data of BSE from 1257 Nellore bulls (*Bos taurus indicus*) from the same commercial group of beef cattle production (Pará, Brazil) was utilized. All animals were pasture raised under extensive system and natural breeding regime. Bulls were maintained in pasture of *Brachiaria brizantha* or *Brachiaria decumbens*, supplemented with mineral salt and free access to water. On the day of BSE, the age of each animal was recorded, and the body condition score (BCS) was measured, always by the same experienced technician, on a 1 to 5 scale (where 1 = very thin and 5 = obese; Hougton *et al*., 1990).

The BSE consisted of reproductive clinical examination of each animal, including assessment of PE using a measuring tape in centimeters (Willet and Ohms, 1975) and assessment of semen quality (sperm motility = Mot; vigor = V; sperm morphological defects as major defects= DMa, minor defects = dme and total sperm defects = TDE; Blom, 1973), according to the Brazilian College of Animal Reproduction (Manual…, 2013). Electroejaculation (Eletrojet®, Eletrovet, São Paulo, SP, Brazil) was utilized for semen collection.

Immediately after each semen collection, microscopic analysis was performed. Hence, 10μL of semen was deposited between slide and cover slip (warmed at 37 °C) and evaluated under optical microscope with 100x magnification (model ICS standard 25, Zeiss, Oberkochen,

Germany) for sperm motility assessment (Mot, expressed as a percentage) and vigor (V, expressed on a 0 to 5 scale). Another semen aliquot was used for sperm morphology assessment. Sperm morphology was assessed by optical microscope with 1000X magnification (model ICS standard 25, Zeiss, Oberkochen, Germany). The staining preparation was performed according to the manufacturer´s instructions of fast panotic commercial kit (Laborclin® Ltda., Pinhais, PR, Brazil). After staining preparation, the slides were air-dried prior to microscopic immersion evaluation, performed with 1000x magnification. A total of 200 cells per sample was evaluated.

Animals with genetic disorders or severe clinical alterations were considered unsatisfactory and were excluded from the data utilized for this study (once a cause of fertility disorder was considered as a definitive diagnosis and/or of genetic origin the animal was discarded from this study). Hence, animals that were classified as unsatisfactory (considered "inapt") are not included in BSE data of the present study. Then, four age groups were established (18 to 24 months, 24 to 36, 36 to 48 and above 48 months) and bulls that had their reproductive parameters from BSE fully evaluated (n = 1257) were classified as Questionable or Approved (Excellent, Very good or Good) according to a traditional table (Table 1) described by Fonseca *et al*. (1997). Also, the same data (n = 1257) was used to classify the animals as Questionable or Approved (Excellent, Very good or Good) according to a new (updated) table (Table 2) described by Fonseca *et al*. (2020). Finally, the data were separated into 3 groups: questionable animals in Table 1 and in Table 2 (Q1Q2), animals approved in Table 1 and questionable in Table 2 (A1Q2) and animals approved in Table 1 and in Table 2 (A1A2).

In order to analyze the results grouped according to the BSE classification tables, the variables (mean ± standard deviation) of the groups Q1Q2, A1Q2 and A1A2 were compared separately by age (18 to 24 months, 24 to 36 months, 36 to 48 months and> 48 months). Andrological parameters (BCS, PE, Mot, V, DMa, dme, TDE) were submitted to analysis of variance and differences among groups were analyzed using the Tukey test (Graphpad Instat; Version 3.06, Graphpad) where P <0.05 was considered significant.

Table 1. Classification table for Nellore bulls (*Bos indicus*), based on scrotal perimeter (PE) and semen characteristics proposed by Fonseca *et al*. (1997)

Parameters	Classification			
	Excellent	Very good	Good	Questionable
1-Sperm Motility				
Vigor	5	4 < 5	3 < 4	< 3
Progressive Motility (%)	≥ 75	60 < 75	30 < 60	< 30
Points awarded	21 - 25	16 < 21	10 < 16	< 10
2-Sperm Morphology				
Major defects (%)	≤ 5	> 5-10	> 10-20	> 20
Total defects (%)	≤ 10	> 10-15	> 15-30	> 30
Points awarded	30 - 35	25 < 30	15 < 25	< 15
3-Scrotal Perimeter (cm)				
Age in months				
12 to < 18	≥ 26.0	24.0 < 26.0	21.5 < 24.0	< 21.5
18 to < 24	≥ 31.5	28.5 < 31.5	26.0 < 28.5	< 26.0
24 to < 36	≥ 35.0	32.0 < 35.0	29.0 < 32.0	< 29.0
36 to < 48	≥ 37.0	33.5 < 37.0	30.5 < 33.5	< 30.5
> 48	≥ 39.0	36.0 < 39.0	33.0 < 36.0	< 33.0
Points awarded	35 - 40	25 < 35	15 < 25	< 15
TOTAL POINTS	86 - 100	66 < 86	40 < 66	< 40

According to Fonseca *et al*. (1997), a score is given according to sperm characteristics and scrotal perimeter. Animals are classified as Satisfactory (excellent, very good or good) or as Questionable (animals not recommended for reproduction) after BSE.

Table 2. Classification table for Nellore bulls (*Bos indicus*), based on scrotal perimeter (PE) and semen characteristics proposed by Fonseca *et al*. (2020) - A new and updated proposition

Parameters	Classification			
	Excellent	Very good	Good	Questionable
1-Sperm Motility				
Progressive Motility (%)	≥ 75	60 < 75	50 < 60	< 50
Vigor	5	4 < 5	3 < 4	< 3
Points awarded	21 - 25	16 < 21	10 < 16	< 10
2-Sperm Morphology				
Major defects (%)	≤ 3	4 - 10	11 - 15	> 15
Total defects (%)	≤ 10	11 - 15	15 - 30	> 30
Points awarded	30 - 35	25 < 30	20 < 25	< 20
3-Scrotal Perimeter (cm)				
12 to < 18 month	≥ 33.5	31.5 ≤ 33.4	29.5 ≤ 31.4	≤ 29.4
18 to < 24 month	≥ 34.0	32.0 ≤ 33.9	30.5 ≤ 31.9	≤ 30.4
24 to < 36 month	≥ 35.5	33.0 ≤ 35.4	31.5 ≤ 32.9	≤ 31.4
36 to < 48 month	≥ 38.5	36.5 ≤ 38.4	35.0 ≤ 36.4	≤ 34.9
> 48 month	≥ 39.5	38.0 ≤ 39.4	36.5 ≤ 37.9	≤ 36.4
Points awarded	35 - 40	30 < 35	15 < 30	0
TOTAL POINTS	86 - 100	71 < 86	45 < 71	< 45

According to Fonseca *et al*. (2020), a new score is given according to sperm characteristics and scrotal perimeter. Animals are classified as Satisfactory (excellent, very good or good) or as Questionable (animals not recommended for reproduction) after BSE.

RESULTS AND DISCUSSION

In order to demonstrate the importance of updated selection criteria during bull BSE for genetic improvement of commercial beef farms, we evaluated andrological parameters of Nellore bulls in natural breeding regime. Then, we compared the evaluation criteria based on two classification tables from different decades, in order to verify differences in the mean parameters achieved in each assessed characteristic. It was observed that, regardless of the age, overall BCS was 3.33 ± 0.93 (n=1257) and Table 3 demonstrates the effect of different classification criteria on PE and BCS means at different age groups.

Table 3. Mean (± Standard Deviation) of scrotal perimeter (PE) and body condition score (BCS; scale from 1 to 5) of 1257 Nellore bulls submitted to field andrological examination based on classification tables proposed by Fonseca *et al*. 1997, 2020

Age group	Parameter	Q1Q2	A1Q2	A1A2	P value
18 to 24 months	PE	X	29.05 ± 0.98 cm ^{a}	33.4 ± 2.4 cm ^{b}	P<0.0001
	BCS	X	2.7 ± 0.2 ^{A}	2.9 ± 0.4 ^{B}	P=0.0640
	N	0	10	34	
24 to 36 months	PE	26.8 ± 2.0 cm ^{a}	30.3 ± 0.6 cm ^{b}	34.5 ± 2.2 cm ^{c}	P<0.0001
	BCS	3.0 ± 0.3 ^{B}	3.3 ± 0.3 ^{A}	3.1 ± 0.5 ^{AB}	P=0.0819
	N	6	27	78	
36 to 48 months	PE	30.0 ± 0.1 cm ^{a}	32.9 ± 1.0 cm ^{b}	36.6 ± 1.7 cm ^{c}	P<0.0001
	BCS	2.7 ± 0.3 ^{a}	3.2 ± 0.3 ^{b}	3.3 ± 0.6 ^{b}	P=0.0988
	N	6	55	53	
> 48 months	PE	31.3 ± 1.1 cm ^{a}	34.8 ± 1.0 cm ^{b}	38.6 ± 1.7 cm ^{c}	P<0.0001
	BCS	3.0 ± 0.4 ^{a}	3.3 ± 0.5 ^{b}	3.4 ± 0.5 ^{c}	P=0.0003
	N	61	428	499	

a,b,c: different lowercase letters in the same line indicate P<0.05; A,B: different capital letters in the same line indicate P<0.10; Q1Q2 = animals considered questionable in Table 1 (Fonseca *et al*., 1997) and in Table 2 (Fonseca *et al*., 2020); A1Q2 = animals considered approved in Table 1 (Fonseca *et al*., 1997) and questionable in Table 2 (Fonseca *et al*., 2020); A1A2 = animals considered approved in Table 1 (Fonseca *et al*., 1997) and in Table 2 (Fonseca *et al*., 2020).

As observed in Table 3, using the updated table (Table 2) for the field selection of sire reproductive potential, a total of 47% of the animals (regardless of age) would not have reached the ideal classification parameters. In other words, if the criteria for bull selection were based on the former table (Table 1), a total of 94% (n = 1184) of them would be maintained on the property for the distribution of their genes at the next breeding season. In contrast, if the property adopted a more rigorous selection criterion (approving animals based on Table2), only 53% (n = 664) of the animals would be maintained in the farm reproductive program.

Thus, the use of higher challenge criteria contributes to genetic herd improvement because it reduces the use of bulls presenting lower reproductive potential, which reduces production costs. Additionally, despite the unquestionable economic importance of using selected animals with higher reproductive potential, it is still important to emphasize the possibility of including a greater number of cows per bull, rather than the traditionally used reason of 25:1 (Fonseca *et al*., 2020). Moreover, in Table 3, it was interesting to observe higher (P <0.0001) PE in A1A2 bulls compared to bulls from other categories (Q1Q2 and A1Q2) in all age ranges. This difference precisely illustrates the genetic evolution obtained in PE parameter for Nellore breed considering this important selection criteria over the years.

The use of PE criterion for selecting Zebu animals could be questioned (Caldas *et al*., 1999; Unanian *et al*., 2000), since the predominance of testicles of long shape in *Bos indicus* (Siqueira *et al*., 2012) could suggest that testicular volume (VT) was a reproductive parameter more appropriate (than PE) for selection of animals with increased precocity and reproductive performance (Siqueira *et al*., 2013). If so, some Nellore bulls with long testicles could be eliminated due to this racial pattern because they might present smaller PE than their contemporaries with oval testicles (Unanian *et al*., 2000). However, positive and highly accurate genetic relationships between VT and PE indicated that the latter is an appropriate characteristic for predicting testicle size in Nellore bulls, and should be adequately used in selection programs for this breed (Dias *et al*., 2008).

Additionally, other authors (Quirino *et al*., 1999; Sesana *et al*., 2007; Dias *et al*., 2008) have shown that bulls with larger PEs have greater testicular volume and body weights. These findings imply that selection for reproductive characteristics based on PE is positively and directly related to selection for VT, sexual precocity and ponderal development, as well as for several other indirect reproductive and productive progress (Siqueira *et al*., 2013). Another interesting aspect to be observed in Table 3 was the results of BCS according to bulls' categories Q1Q2, A1Q2 and A1A2. Statistical tendency (P<0.10) and/or statistical differences (P<0.05) of higher BCS were observed in animals with better andrological classifications in several age groups. This is an important indication that, besides the evidenced improvement in reproductive precocity, a careful selection for animals with higher PE also contributes for selection of animals with greater weight development efficiency, an extremely desirable factor in beef industry.

Early body growth increases weight gain efficiency and presents strong influence on herd profitability. Favorable genetic correlations between PE and body weight traits have been described in several studies (Koots *et al*., 1994; Bergmann *et al*., 1996; Eler *et al*., 1996; Lôbo, 1998; Quirino *et al*., 1999; Dias *et al*., 2008; Devkota *et al*., 2008; Lira *et al*., 2008), which demonstrates a common genetic basis between these characteristics (Siqueira *et al*., 2013). Moreover, it indicates compatibility for body growth and fertility in the Nellore selection programs (Dias *et al*., 2008). Salvador *et al*. (2002) highlights that the positive high correlation between bovine PE and body weight suggests that PE is also an indicative parameter for identifying bulls with greater weight gain potentials, corroborating our findings.

Still, besides the higher PE observed in A1A2 category compared to A1Q2 in all age groups, it is also noteworthy that the mean PE of 33.4 cm achieved by pubertal animals (18-24 months) of A1A2 category is similar to the average PE (32.9 cm) achieved for adult animals (36-48 months) approved only in the antique table (category A1Q2). Such results illustrate and emphasize the notoriety of andrological examination for field sire selection and confirm the high repeatability and heritability of PE (Fonseca *et al*., 2019). Satisfactory semen characteristics of sperm

motility and morphology usually present favorable correlations with testicular development, which denotes the importance of PE also for these parameters (Siqueira *et al*., 2013; Fonseca *et al*., 2019). The data of semen characteristics for each classification category according to age groups are demonstrated in Table 4.

Table 4. Mean (± Standard Deviation) of sperm motility (Mot), vigor (V), major defects (DMa), minor defects (dme) and total sperm defects (TDE) of 1257 Nellore bulls submitted to field andrological examination based on classification tables proposed by Fonseca *et al*. 1997, 2020

Age group	Parameter	Q1Q2	A1Q2	A1A2
18 to 24 months	Mot	X	55.0 ± 14.3 %	47.1 ± 15.4 %
	Vigor	X	2.99 ± 0.67	2.94 ± 1.05
	Dma	X	2.78 ± 1.30	3.20 ± 2.58
	Dme	X	2.00 ± 2.06	4.00 ± 3.81
	TDE	X	4.8 ± 1.9 %	7.2 ± 5.2 %
	N	0	10	34
24 to 36 months	Mot	45.1 ± 19.4 %	57.4 ± 17.0 %	55.1 ± 13.6 %
	Vigor	2.70 ± 0.84	3.18 ± 0.75	2.96 ± 0.71
	Dma	2.33 ± 2.31	3.75 ± 3.21	3.57 ± 2.46
	Dme	3.67 ± 2.52	4.54 ± 2.77	3.79 ± 3.37
	TDE	5.6 ± 4.7 %	8.3 ± 4.3 %	7.4 ± 4.4 %
	N	6	27	78
36 to 48 months	Mot	63.3 ± 8.2 % ^{AB}	58.1 ± 8.9 % ^{A}	61.2 ± 12.8 % ^{B}
	Vigor	2.83 ± 0.52	3.23 ± 0.74	3.24 ± 0.85
	Dma	2.33 ± 1.51	3.42 ± 1.75	3.77 ± 2.37
	Dme	2.10 ± 1.79	3.50 ± 3.14	4.23 ± 3.20
	TDE	4.3 ± 3.0 %	6.9 ± 3.6 %	8.0 ± 3.9 %
	N	6	55	53
> 48 months	Mot	50.2 ± 17.4 % ^{a}	55.5 ± 14.7 % ^{b}	55.8 ± 12.2 % ^{b}
	Vigor	2.77 ± 0.82 ^{a}	3.21 ± 0.82 ^{b}	3.23 ± 0.81 ^{b}
	Dma	2.37 ± 2.37	3.22 ± 2.35	3.02 ± 2.37
	Dme	3.47 ± 3.45	2.85 ± 2.73	3.09 ± 2.74
	TDE	5.8 ± 3.8 %	6.1 ± 3.7 %	6.1 ± 3.8 %
	N	61	428	499

a,b: different lowercase letters in the same line indicate P<0.05; A,B: different capital letters in the same line indicate P<0.10; Q1Q2 = animals considered questionable in table 1 (Fonseca *et al*., 1997) and in table 2 (Fonseca *et al*., 2020); A1Q2 = animals considered approved in table 1 (Fonseca *et al*., 1997) and questionable in table 2 (Fonseca *et al*., 2020); A1A2 = animals considered approved in table 1 (Fonseca *et al*., 1997) and in table 2 (Fonseca *et al*., 2020).

It can be observed in Table 4 that, in the age group >48 months, higher values for sperm motility (P=0.0250) and vigor (P=0.0335) were observed in animals A1Q2 and in animals A1A2 compared to Q1Q2 category. Additionally, statistical tendency (p=0.0741) for higher motility was identified in the age 36-48 months, for A1A2 animals (which were approved in the most updated classification table and went through a more rigorous selection criterion) compared to A1Q2. The low number of animals belonging to Q1Q2 category in this age group did not allow further conclusions regarding to it.

Similarly, the literature demonstrates positive correlation with reproductive potential and semen production traits (Bergman *et al*., 1996; Ahmad *et al*., 2010; Ayala *et al*., 2016) and implies that bovine sires with greater testicular development are genetically more prone to present increased sperm motion characteristics and reduced sperm defects (Quirino *et al*., 1999; Dias *et al*., 2008). Thus, bull selection based on PE may leads to favorable indirect selection for semen characteristics (Siqueira *et al*., 2013). Therefore, in this work it was possible to verify that the classification tables used in the field must evolve as the genetic improvement has been improved, reinforcing the importance and the need to increase the requirements of the andrological parameters of Nellore bulls, as it allows the selection of superior sires. Meticulous bull

selection provides greater benefits for the breed, as they contributes for higher fertility rates and additive genetic gains. Hence, putting the information here provided all together, this work highlights the importance of updated requirements in BSE classification tables for the further development of Nellore reproductive and productive potential as well as field genetic improvement.

CONCLUSION

Breeding soundness examination using stricter and narrow parameters for bull classification has a positive effect on productive and reproductive variables. It is a low-cost management practice and, thus, an inexpensive tool for technology implementation on the beef cattle production system. It contributes to increasing calf quality and calf production and generates positive impacts on the overall beef production chain. Animals approved at breeding soundness examination using the most updated and strict classification table presented higher scrotal perimeter and better body condition score, as well as adequate semen parameters, regardless of age. Thus, the results here presented denote an evident advance of Nellore genetic improvement in the reproductive aspect and demonstrate that the evolution of classification tables (always demanding updated and higher indexes) is a fundamental tool for further development of reproductive potential of Nellore bulls in the field.

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