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Behavioral assessment during breeding soundness evaluation of beef bulls in Rio Grande do Sul

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Abstract

The aim of this study was to evaluate the rejection rates of bulls in the behavioral assessment (libido and mounting capacity) and the importance of this step in the breeding soundness evaluation of 30,700 beef bulls in the state of Rio Grande do Sul, Brazil. Bulls from the following breeds were evaluated: Aberdeen Angus, Red Angus, Hereford, Polled Hereford, Devon, Shorthorn, Brangus, Braford, Montana, Santa Gertrudis, Charolais, Limousin, Brahman, Nelore, and Tabapua. In order to investigate the relationship between the binary variable (*approved* or *rejected* in different steps of the breeding soundness evaluation) and age groups (young and mature bulls), the Chi-Square test (PROC-FREQ) and the Tukey test were used. The general rejection rates in the breeding soundness evaluation were 13.7 and 22.7% for young and mature bulls, respectively. In the present study, problems in the sexual behavior of bulls accounted for the rejection of 3.6 to 5.2% of young and mature bulls, respectively. Lack of libido and/or mounting capacity were shown to be important problems in relation to the total number of possible causes of rejection of bulls in the breeding soundness evaluation. Several factors may affect the expression of libido and/or mounting capacity at pasture, and the conditions under which this step is carried out may influence the results. Performing behavioral assessment as part of the breeding soundness evaluation has been shown to be important to the thorough reproductive evaluation of bulls. The rejection of bulls in the behavioral assessment may suggest that this step should be performed regularly, rather than just being complementary to the standard breeding soundness evaluation.

Keywords: breeding soundness evaluation, bulls, libido, mounting capacity.

Introduction

Bulls play a prevailing role in increasing reproduction rates in beef herds and they account for more than 90% of calves born in Brazil. They mount cows and heifers at pasture, with the greatest diversity possible, both in the topography of the field and in its environment.

The behavioral assessment parameters (libido and mounting capacity) influence the fertility rates of the herd being assessed, as bulls are expected to mount and impregnate large numbers of females (Chenoweth *et al*., 1979, 1984; Vale Filho *et al.*, 1994; Costa e Silva *et al*., 1998; Santos, 2001; Menegassi and Vieira, 2006).

The sexual behavior of bulls depends on social interaction, which is grounded on genetic, environmental, nutritional and hormonal factors, as well as on sensorial acuity, age and experience. Besides that, it depends on the hierarchy or dominance among the bulls. It is characterized by courtship, erection, penile protrusion, mounting, intromission, ejaculation and refractory period (Chenoweth, 1983, 1997).

Menegassi *et al*. (2011) have shown that the performance of the breeding soundness evaluation (BSE), including the behavioral assessment, in a 1/42 bull/cow ratio, allowed for an increase of 31% in calf production, 13.8 calves/bull/year, an increase of 24 kg of calves/cow/year, and a cost-benefit relation of US$19.4 per dollar invested.

During breeding soundness evaluation of bulls, veterinarians do not always perform sexual behavior assessment, which includes libido and mounting capacity tests. Consequently, some bulls that have not been subjected to a thorough reproductive evaluation may be left in breeding herds. Several factors may affect behavioral assessment during breeding soundness evaluation, such as the previous experience of the bulls (Boyd et al., 1989). Therefore, the reproductive behavioral assessment should be carried out very carefully, since it may lead to inconsistent results between tests and final performance of bulls at pasture (Crudelli, 1990: Costa e Silva, 1994).

Lopes *et al.* (2009) concluded that neither the andrological classification in scores nor the sexual behavior assessment were efficient to predict the breeding potential of Nelore bulls in terms of pregnancy rate at the end of the breeding season.

The objective of this study was to analyze the rejection rates in the behavioral assessment and the importance of this step in the breeding soundness evaluation of beef bulls.

Material and Methods

The experiment consisted of analyzing breeding soundness evaluation records from the database of the Bull Reproductive Assessment Program

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(PARTO), which is carried out by the National Rural Training Service of Rio Grande do Sul. Bulls of the following breeds were evaluated: Aberdeen Angus, Red Angus, Hereford, Polled Hereford, Devon, Shorthorn, Brangus, Braford, Montana, Santa Gertrudis, Charolais, Limousin, Brahman, Nelore, and Tabapua. Two- to three-years-old bulls constituted a specific group of 19,608 animals destined for sale in agriculture and livestock shows and auctions; and four- to ten-years-old bulls (mature bulls), totaling 11,632 animals, were used on breeding farms.

Veterinarians trained by PARTO, following the standards of the Brazilian Association of Animal Breeding, carried out breeding soundness evaluation on ranches in 54 counties of the state of Rio Grande do Sul. The evaluation consists of four steps: Step I - general physical examination; Step II - genital tract examination; Step III - semen evaluation; and Step IV - behavioral assessment: libido and mounting capacity to complete copulation.

Libido was considered as the intention, drive or desire of the bull to mate, and mounting capacity as the completion of mating. The tests were carried out in a pen with one or two cows restrained in an artificial insemination chute; the use of cows in estrus was not regarded as necessary. Initially, bulls were placed together in an adjacent pen so that they could observe other bulls mounting for 10 to 15 minutes in order to be pre-stimulated. Bulls were tested in pairs for a maximum time of 10 minutes. The result was interpreted as presence or absence of libido and/or mounting capacity. If a bull seemed too restless, lethargic or aggressive, it was given another opportunity to express its sexual behavior, this time with a cow in heat in a pen or at pasture.

The breeding soundness evaluation was carried out as follows: first, a general physical examination was performed, followed by genital tract examination, semen evaluation and behavioral assessment. If a bull was rejected in one of the tests, it was not subjected to the subsequent step. Therefore, the results of the genital tract examination correspond only to the bulls approved in the general physical examination. Similarly, the results of the semen evaluation include only bulls that were approved in both the general physical examination and genital tract examination. Consequently, the general rejection rate is cumulative for these three steps, and the number of bulls rejected in more than one step cannot be quantified. As some farms did not have adequate facilities, not all of the bulls approved in the three previous steps were subjected to the behavioral assessment. This is why the number of bulls included in this step is lower than that of bulls approved in the first three steps of the breeding soundness evaluation.

The Statistical Analysis System software package (SAS Institute, Cary, NC) was used to analyze data. In order to analyze the relationship between the binary variable *approved* or *rejected* in the different steps of the breeding soundness evaluation and age groups (young and mature bulls), the Chi-Square test (PROC-FREQ) and the Tukey test were used.

Results

The rejection rates in the breeding soundness evaluation were 13.7 and 22.7% for young and mature bulls, respectively (Table 1).

In the present study, problems in the sexual behavior of bulls accounted for the rejection of 3.6 to 5.2% of young and mature bulls.

The general physical examination, the genital tract examination, the semen evaluation and the behavioral assessment showed no differences in terms of means of rejection (Table 1).

Table 1. Rejection rates (%) of two- and three-years-old and over three-years-old bulls, according to the steps of the breeding soundness evaluation.

Description	Two and three years old			Over three years old			Mean for both groups
	n	Bulls rejected (n)	Rejection percentage (%)	n	Bulls rejected (n)	Rejection percentage (%)	
General physical	19,068	653	3.42	11,632	757	6.51	4.96[b]
Genital	18,415	1,061	5.76	10,875	931	8.56	7.16[a]
Semen	17,354	616	3.54	9,944	634	6.37	4.95[b]
Behavioral	7,994	284	3.55	6,140	322	5.24	4.39[b]
Mean	15,707	653,5	4.06[B]	9,647	661	6.67[A]	5.28
Total	19,068	2,614	13.71	11,632	2,644	22.73	17.12

Different lower-case letters in columns and different capital letters in rows indicate statistical difference ($P < 0.001$).

The absence of libido and/or mounting capacity has shown the importance of these problems in relation to the total number of causes of rejection of bulls in the breeding soundness evaluation (Table 2). In young bulls, the behavioral assessment is as significant as the semen evaluation; in mature bulls, it shows its importance as part of the breeding soundness evaluation in relation to other problems.

Table 2. Main causes of rejection of the bulls evaluated.

Causes of rejection	Two and three years old		Over three years old	
	n	2 and 3 years (%)	n	Over 3 years (%)
Libido and/or mounting capacity	7,994	3.55^{aB}	6,140	5.24^{bA}
Semen	17,354	3.54^{aB}	9,944	6.37^{aA}
Testicles and epididymides	18,415	2.61^{bcB}	10,875	3.51^{cA}
Body condition/teeth	19,068	2.28^{cdB}	11,632	4.15^{cA}
Vesicles and ampullae	18,415	2.03^{dB}	10,875	2.74^{dA}
Legs and feet	19,068	0.70^{eB}	11,632	1.70^{eA}
Penis	18,415	0.62^{eB}	10,875	1.19^{fA}
Sheath	18,415	0.50^{eB}	10,875	1.19^{fA}

Different lower-case letters in columns and different capital letters in rows indicate statistical difference ($P < 0.001$).

Discussion

The total cumulative rejection rates observed in this study are in accordance with the rates expected. According to Radostits *et al*. (1994), in a bull population, 10 to 20% are rejected due to low semen quality and quantity, physical defects that prevent the animal from copulating and absence of libido.

In this study, the rejection rates found in the behavior assessment are as significant as the ones found in the semen evaluation. Other authors, such as Menegassi and Vieira (2006), upon examining Aberdeen, Angus, Hereford, Charolais, Devon, Limousin and Nelore bulls, found similar rejection rates (15.7%) in both semen evaluation and behavioral assessment.

Although the behavioral assessment of bulls is not always carried out, rejection rates of 42.5% in a total rate of 20.7% have been reported due to absence of libido and mounting capacity in mature bulls (Blockey, 1984). In a study evaluating 7,021 young bulls and 5,669 mature bulls, Acuña and Campero (1997) observed rejection rates of 5.2 and 6.4%, respectively, concerning libido evaluation and mounting capacity.

Farms are not usually prepared to perform the behavioral assessment due to a lack of both environmental and organizational structures. Besides, as this step of the breeding soundness evaluation is time-consuming, particularly when Zebu bulls are examined, veterinarians seldom perform it. Furthermore, several factors may affect the expression of libido in the field (Petherick, 2005), and the conditions under which this test is performed may influence the results (Coulter and Kozub, 1989). Although libido and mounting capacity tests may not be sufficient to precisely determine pregnancy rates (Parkinson, 2004), it is possible to assert that the chances of obtaining good pregnancy rates are higher when bulls approved in the general physical examination, genital tract examination and semen evaluation also show mounting capacity.

In conclusion, the behavioral assessment, as a step of the breeding soundness evaluation, has shown to be important for correct reproductive evaluation of bulls. The rejection rates in the behavioral assessment of bulls have demonstrated that this step should become obligatory, rather than being just a complementary test during breeding soundness evaluation in bulls.

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