Including Data On Culled Heifers On Breeding Values For Age At First Calving, Nellore Cattle

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Introduction

Even though the reproductive traits are considered very important, generally they don`t receive enough attention in genetic evaluations, either because they are difficult to measure and/or due to difficulties in the results interpretation (Donoghue et al., 2004). The age at first calving (AFC) is one of the most important , as it is in this age that the reproductive life of the female begins, and its reduction is directly related to its useful life, just as it is related to the smaller generation interval (Bergmann, 2000). The anticipation of AFC is directly related to the herd efficiency and profitability (Dias et al., 2004). The study of AFC often does not consider the females that did not show this trait and frequently only those that calve and which offspring are weighted are included. To obtain more accurate results, Notter (1988) suggested the threshold approach to attribute predicted values for the females that did not calve. Johnston and Bunter (1996) penalize the open females with a fixed value. Sorensen et al. (1998) described a model with the use of Gibbs sampling to the censured data with the objective of including the failed females. The objective of this work was to study these alternatives for the estimation of genetic parameters relative to age at first calving in the Nellore breed, as well as to compare results of sire ranking based on their AFC breeding values considering two data sets: one including all the exposed heifers and the other with only those which offspring are weighted.

Material and methods

The data of this study included heifers of Nellore breed in the database of the Brazilian Association of Zebu Breeders (ABCZ). To compare the results of sire ranking based on their AFC breeding values, two data sets were considered: one including all the exposed heifers (ALL) and the other with only those which offspring were weighted (BWT), processing afterwards three ranking correlation (SAS, 2008) considering the lower levels 0.25; 0.30; and 0.40 of BIF accuracy as restriction. The files included annotations of the heifer, sire and dam, feeding management, date of birth, herd, date and type of the first exposition to reproduction, type of mating (artificial insemination – IA or natural service – NS), date and type of other occasional mating and date of the calving with confirmation of the mating and type that originated it.

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The files used in this study were prepared with the use of the software SAS (2008). We considered only the females born from 1998 to 2002, created in an exclusive pasture regime that were exposed to artificial insemination (AI) or natural service (NS) at least once, calved or not calved. The contemporary groups (CG) were formed considering the herd, the year and season of birth, besides the type of mating (AI or NS). The calving seasons were: 1-from October to December; 2-from January to March; 3-from April to June; and 4-from July to September. In order to the CG be considered valid they included at least 10 females, with at least 40% of them calved. Table 1 shows the means and quantitative descriptions of the samples analyzed.

Table 1: Means of age at first calving (AFC-month), and quantitative description of the data sets analyzed (ALL and BWT)

	ALL	BWT
Means	42.98±9.39	39.46±6.86
Herds	2,110	373
All CG	9,052	1,329
CG with AI	1,840	405
CG with NS	1,162	117
CG with AI & NS	6,050	807
Observations	237,760	28,566

Three approaches were used to manage the mating and calving data as to include the heifers that although exposed didn`t calve. The first one used the penalty methodology (PEN), suggested by Johnson and Bunter (1996). We added 21 days to the date of simulated pregnancy of the heifers that were open, using as a basis the date of the actual last conception of their contemporary group. Thus their simulated age at first calving was obtained. In this case the software used was the GIBBS2F90. The second alternative was similar to the first, but now employing the methodology of censured data (CEN), that is, with the use of the truncated normal distribution to generate the censured data (Sorensen et al., 1998). In this case we used the software GIBBS2CEN. The third alternative considered the methodology of categorical data (CAT), suggested by Notter (1988) attributing the value 1 (one) to the ones that didn`t calve and the value 2 (two) to those that calved, using the software THRGIBBS1F90. All these software are from the family BGF90 (Mizstal et al., 2002). Two bivariate analyses were done: the first one considering PEN and CEN and the second one considering PEN and CAT. In addition to the contemporary groups, the model included the fixed effects of the age of the mother of the heifer at calving (linear and quadratic) and age of the heifer at the mating (linear) and the random effects of animal and residue. The components of (co)variances for AFC were estimated with the use of the Bayesian approach by means of Gibbs sampling.

Results and discussion

The results of the heritability estimates obtained in this study for AFC, including the data of the heifers that although mated didn`t calve, with the use of different approaches (PEN, CEN or CAT), are 0.071±0.007; 0.071±0.007; and 0.077±0.008, respectively. The results obtained are similar to those found by Donoghue et al. (2004), that obtained estimated values of

0.05±0.01; 0.07±0.01; and 0.05±0.01 for days to calving, working with Australian Angus females, with the PEN, CET and CAT approaches respectively. In contrast, they are a little below the values found by Dias et al. (2004), that used Nellore heifers (from 0.09±0.03 to 0.16±0.03), as well as Mercadante (1995) that found the value 0.23±0.11 for Nellore also. On the other hand, working with Nellore, Gressler (1998) obtained an estimated value of 0.01 that is well below those found in this study.

The low values found are possibly due to the fact that the great majority of farmers expose their heifers to mating only when they reach a certain age. This probably contributes to the reduced expression of the genetic variability. It should be noted that for all the approaches the estimates were the same size and comparable to those estimated without the inclusion of females that didn't calve.

The estimates of genetic correlations considering the pairs of approaches PEN-CEN and PEN-CAT to age at first calving were 0.998±0.001 and 0.993±0.004 respectively. There are not many studied alternatives to include females that have not calved. Donoghue et al. (2004), obtained correlations of ranking of Australian Angus sires of about 0.99 and 0.77 to PEN-CEN and PEN-CAT respectively when they studied the trait days to calving. Note that this trait is highly correlated with age at first calving as Forni and Albuquerque (2005) that found the estimated value of 0.94 for Nellore.

The results obtained in this study indicate that the practiced approaches are similar.

Table 2 shows the sires ranking correlations considering the two data sets (ALL and BWT) for the three lower levels of BIF accuracy.

Table 2: Sires ranking correlations (RC) according the breeding value of data sets (ALL and BWT) and the lower level of BIF accuracy

Accuracy lower level	Sires	RC
0.25	564	0.551
0.30	185	0.601
0.40	94	0.650

These results show that the sire rankings are different when all heifers are consideredinstead of only those which have weighted offspring.

Conclusion

The results of this study suggest that alternatives PEN, CEN and CAT are similar in order to including the culled heifers in genetic evaluation of age at first calving. Furthermore, the rank correlation comparing sires breeding values estimated for the two samples were around 60%, showing that the rankings of the sires on each evaluation are different.

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