

COUNTRY: BRAZIL

SESSION: ANIMAL GROWTH AND DEVELOPMENT

GENETIC PARAMETERS FOR GROWTH TRAITS IN A CANCHIM BEEF CATTLE HERD¹

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ABSTRACT

The objective of this study was to estimate genetic parameters for male and female body weights at birth (BW), weaning (WW), twelve (W12) and eighteen (W18) months of age, body weight gains from birth to weaning (DGBW) and from birth to eighteen (DGB18) months of age, and days to gain 175 kg from birth to weaning ($D175=175/DGBW$) and 450 kg ($D450=450/DGB18$) from birth to slaughter in a Canchim beef cattle herd. The restricted maximum likelihood method, with models that included the fixed effects, and the additive direct and maternal, permanent environmental, and residual random effects, depending on the trait, was used. Heritability estimates were 0.41, 0.28, 0.38, 0.28, 0.26, 0.30, 0.23, and 0.23 for BW, WW, W12, W18, DGBW, DGB18, D175 and D450, respectively. Genetic correlations varied from 0.28 to 0.97 among weights, from 0.11 to 0.97 among weights and weight gains, from 0.00 to -0.98 among weights and D175 and D450, and from -0.63 to -0.98 among weight gains and D175 and D450, and were equal to 0.69 for DGBW and DGB18, and 0.76 for D175 and D450. These estimates suggest that progress by selection for all these traits is possible, and that selection for anyone of them should result in favorable correlated responses in the others, with the exception of BW.

KEYWORDS

Beef cattle, body weight, days to gain certain weight, genetic correlation, heritability, weight gain.

INTRODUCTION

Several traits have been used as selection criteria in the genetic evaluation programs for beef cattle in Brazil. Genetic parameters for selection criteria are needed for the planning of effective breeding programs. The objective of this study was to estimate genetic parameters for several growth traits used as selection criteria in the genetic evaluation programs for beef cattle in Brazil.

MATERIALS AND METHODS

Data on body weights at birth (BW), weaning (WW; 240 days), twelve (W12; 365 days) and eighteen (W18; 550 days) months of age, on body weight gains from birth to weaning (DGBW) and from birth to eighteen (DGB18) months of age, and on

days to gain 175 kg from birth to weaning ($D175=175/DGBW$) and 450 kg ($D450=450/DGB18$) from birth to slaughter of 7,152, 6,126, 5,448, 4,585, 6,127, 4,616, 6,127 and 4,615 males and females of the Southeast - Cattle Research Center's Canchim beef cattle herd, born from 1953 to 2001, were used to estimate heritabilities and genetic correlations. These animals were raised under pasture conditions receiving a mineral mixture all over the year. The restricted maximum likelihood method, with models that included the fixed effects of year and month of birth, sex, and age of cow as a covariable (linear and quadratic effects), and the additive direct and maternal, permanent environmental, and residual random effects, depending on the trait, was used. Age of cow and the maternal random effects were used only for the pre-weaning traits (BW, WW, DGBW and D175). One- and two-trait analyses were done to estimate the variance and covariance components, using MTDFREML (Boldman et al., 1993). The relationship matrix was composed of 8,865 animals.

RESULTS AND DISCUSSION

The heritability estimates, obtained by the one-trait analyses, were equal to 0.41 ± 0.04 (BW), 0.28 ± 0.04 (WW), 0.38 ± 0.03 (W12), 0.28 ± 0.03 (W18), 0.26 ± 0.04 (DGBW), 0.30 ± 0.03 (DGB18), 0.23 ± 0.04 (D175), and 0.23 ± 0.03 (D450), suggesting that these traits will respond to mass selection. For BW, WW, W12 and W18, these estimates are, in the same order, within the range of 0.33 and 0.76, 0.29 and 0.78, 0.29 and 0.68, and 0.30 and 0.54, but below the average of 0.46, 0.51, 0.40 and 0.41 of those reported in the literature (Freitas & Vencovsky, 1992; Alencar et al., 1993; Freitas et al., 1994; Mascioli et al., 1996; Mascioli et al., 1997; Alencar et al., 1998; Mascioli et al., 2000; Silva et al., 2000; Gianlorenço et al., 2002; Mello et al., 2002) for the Canchim breed. Also for the Canchim breed, Oliveira et al. (1983), Mascioli et al. (1997) and Mascioli et al. (2000) estimated, respectively, heritabilities of 0.38, 0.37 and 0.39 for DGBW, while Oliveira et al. (1983) obtained the value of 0.37 for DGB18. For the Nelore breed, Albuquerque & Fries (1996), Marcondes et al. (1998), Ortiz Peña et al. (2000), Garnero et al. (2001) and Simonelli et al. (2001) obtained heritabilities of days to gain 160 kg from birth to weaning (D160) that ranged from 0.09 to 0.40, with average of 0.20. The maternal heritabilities obtained for the pre-weaning traits were 0.05, 0.10, 0.10 and 0.08 for BW, WW, DGBW and D175, respectively, suggesting that it will be difficult to obtain genetic progress for maternal ability for these traits. For the Canchim breed, Alencar et al. (1998) and Mello et al. (2002) estimated, respectively, the values of 0.04 and 0.03 for BW and the values of 0.10 and 0.04 for WW. For the Nelore breed, Albuquerque & Fries (1996), Fries et al. (1996), Ortiz Peña et al. (2000), and Simonelli et al. (2001) reported the values of 0.07, 0.06, 0.10 and 0.06 for DGBW, and the values of 0.14, 0.12, 0.09 and 0.16 for D160, respectively. The genetic correlations between the direct and the maternal effects were equal to -0.07 (PN), -0.42 (P240), -0.44 (GND) and -0.40 (D175), showing that for all traits, except BW, there is genetic antagonism between the direct and the maternal effects. For the Canchim breed, Alencar et al. (1998) and Mello et al. (2002) obtained the values of -0.06 and -0.04, and of -0.54 and 0.01 for BW and WW, respectively. For the Nelore breed, values from -0.24 to 0.08 were reported for DGBW (Ortiz Peña, 1998; Simonelli et al., 2001) and from -0.77 to 0.05 for D160 (Ortiz Peña, 1998; Marcondes et al., 2000; Simonelli et al., 2001).

The genetic correlations among the traits, obtained by the two-trait analyses, are presented in Table 1.

The genetic correlations among the body weights were all positive (0.28 to 0.97), and those involving BW were the smallest ones. These estimates are similar to that reported by Mascioli et al. (1996) for the Canchim breed. The genetic correlations between DGBW and DGB18 was 0.69, a value that is below the value of 0.90 obtained by Oliveira et al. (1983).

The genetic correlation between D175 and D450 was 0.76, a value that was expected since the last trait contains the first one.

The genetic correlations among the body weights and the weight gains varied from 0.11 to 0.97, and were lower when involving BW. These estimates agree, in general, with others obtained for the Canchim breed (Mascioli et al. 1997; Mascioli et al. 2000).

The genetic correlations of the growth traits with D175 and D450 were negative (-0.29 and -0.98), with the exception of that of BW with D450 that was 0.00. Garnero (1999) found a correlation of -0.87 between W18 and D160, for the Nelore breed. The genetic correlations of DGBW and DGB18 with D175 and D450 were negative (-0.63 to -0.98). The correlations were higher and close to -1.0 when the weight gains were directly involved in the calculation of the others traits (D175 and D450). The results of this study agree with Simonelli et al. (2001) who estimated a correlation of -0.95 between DGBW and D160, in Nelore cattle.

CONCLUSIONS

Progress by mass selection for all the studied traits is possible, and that selection for anyone of them should result in favorable correlated responses in the others, with the exception of BW.

REFERENCES

ALBUQUERQUE, L.G., FRIES, L.A. 1996. Conseqüências genéticas de selecionar pelo numerador ou contra o denominador do GMD. In: CONGRESSO BRASILEIRO DAS RAÇAS ZEBUÍNAS, 2., 1996, Uberaba. Anais.... Uberaba: ABCZ.

ALENCAR, M.M., BARBOSA, P.F., BARBOSA, R.T. 1993. Parâmetros genéticos para peso e circunferência escrotal em touros da raça Canchim. Revista da Sociedade Brasileira de Zootecnia, v. 22, n. 4, p. 572-583.

ALENCAR, M.M., TREMATORE, R.L., BARBOSA, P.F., FREITAS, A.F. 1998. Efeitos da linhagem citoplasmática sobre características de crescimento em bovinos da raça Canchim. Revista Brasileira de Zootecnia, v. 27, n. 2, p. 272-276.

BOLDMAN, K., KRIESE, L., VAN VLECK, L.D. 1993. A manual for use of MTDFREML – A set of programs to obtain estimates of variances and covariances. USDA – ARS.

FREITAS, A.R., FAVORETTI, A.C., ALENCAR, M.M., PEGORIN, M.J. 1994. Uso da máxima verossimilhança restrita e transformação canônica para estimação de parâmetros genéticos de características de crescimento em bovinos. Revista da Sociedade Brasileira de Zootecnia, v. 23, n. 3, p. 394-401.

FREITAS, A.R., VENCOVSKY, R. 1992. Métodos de estimação de variância e parâmetros afins de características de crescimento em bovinos. In: REUNIÃO ANUAL DA SOCIEDADE BRASILEIRA DE ZOOTECNIA, 29., 1992, Lavras. Anais....Lavras: SBZ, p. 119.

FRIES, L.A., BRITO, F.V., ALBUQUERQUE, L.G. 1996. Possíveis conseqüências de seleção para incrementar pesos às idades-padrão vs. reduzir idades para produzir unidades de mercado. In: REUNIÃO ANUAL DA SOCIEDADE BRASILEIRA DE ZOOTECNIA, 33., 1996, Fortaleza. Anais....Fortaleza: SBZ, v. 1, p. 310-312.

GARNERO, A.V. 1999. Comparação de critérios de seleção em gado de corte visando precocidade de crescimento. 1999. 87p. Dissertação (Mestrado em Genética) - Faculdade de Medicina, Universidade de São Paulo, Ribeirão Preto,

GARNERO, A.V., LÔBO, R.B., BEZERRA, L.A.F., OLIVEIRA, H.N. 2001. Comparação entre alguns critérios de seleção para crescimento na raça Nelore. Revista Brasileira de Zootecnia, v. 30, n. 3, p. 714-718.

GIANLORENÇO, V.K., MELLO, S.P., ALENCAR, M.M., CASTRO-PEREIRA, V.M. 2002. Correlações genéticas do peso e do perímetro escrotal de machos com o tempo de permanência de fêmeas em um rebanho da raça Canchim. In: SIMPÓSIO NACIONAL DE MELHORAMENTO ANIMAL, 4., 2002, Campo Grande. Anais.... Campo Grande: SBMA/CNPQC/EMBRAPA. CD-ROM

MARCONDES, C.R., BERGMANN, J.A.G., ELER, J.P., FERRAZ, J.B.S., PEREIRA, J.C.C., PENNA, V.M. 2000. Análise de alguns critérios de seleção para características de crescimento na raça Nelore. Arquivo Brasileiro de Medicina Veterinária e Zootecnia, v. 52, n. 1, p. 83-89.

MARCONDES, C.R., BERGMANN, J.A.G., ELER, J.P., PEREIRA, J.C.C., FERRAZ, J.B.S. 1998. Estimativa de componentes de variância e parâmetros genéticos das características dias para 160 kg e taxas de crescimento relativo pré e pós-desmama, em animais da raça Nelore. In: CONGRESSO BRASILEIRO DAS RAÇAS ZEBUÍNAS, 3., 1998, Uberaba. Anais... Uberaba: ABCZ, p. 385-387.

MASCIOLI, A.S., ALENCAR, M.M., BARBOSA, P.F., NOVAES, A.P., OLIVEIRA, M.C.S. 1996. Estimativas de parâmetros genéticos e proposição de critérios de seleção para pesos na raça Canchim. Revista da Sociedade Brasileira de Zootecnia, v. 25, n. 1, p. 72-81.

MASCIOLI, A.S., FARO, L., ALENCAR, M.M., FRIES, L.A., BARBOSA, P.F. 2000. Estimativas de parâmetros genéticos e fenotípicos e análise de componentes principais para características de crescimento na raça Canchim. Revista Brasileira de Zootecnia, v. 29, n. 6, p. 1654-1660.

MASCIOLI, A.S., PAZ, C.C.P., FARO, L., ALENCAR, M.M., TREMATORE, R.L.,

ANDRADE, A.B.F., OLIVEIRA, J.A.L. 1997. Estimativas de parâmetros genéticos e fenotípicos para características de crescimento até a desmama em bovinos da raça Canchim. Revista Brasileira de Zootecnia, v. 26, n. 4, p. 709-713.

MELLO, S.P., ALENCAR, M.M., SILVA, L.O.C., BARBOSA, R.T., BARBOSA, P.F. 2002. Estimativas de (Co)Variâncias e Tendências Genéticas para Pesos em um Rebanho Canchim. Revista Brasileira de Zootecnia, v. 31, n. 4, p. 1707-1714.

OLIVEIRA, J.A., DUARTE, F. A.M., LÔBO, R.B., BEZERRA, L.A.F. 1983. Genetic analysis of performance traits in Canchim cattle. II. Weight gain. Revista Brasileira de Genética, n. 1, p. 81-92.

ORTIZ PEÑA, C.D. 1998. Análise de critérios de seleção para precocidade sexual e de crescimento de bovinos da raça Nelore, no Paraguai. 1998. 143p. Dissertação (Mestrado em Melhoramento Genético Animal) - Faculdade de Ciências Agrárias e Veterinárias, Universidade Estadual Paulista, Jaboticabal.

ORTIZ PEÑA, C.D., QUEIROZ, S.A., FRIES, L.A. 2000. Comparação de critérios de seleção para precocidade de crescimento pré-desmama em bovinos Nelore, no Paraguai. In: REUNIÃO ANUAL DA SOCIEDADE BRASILEIRA DE ZOOTECNIA, 37., 2000, Viçosa. Anais... Viçosa: SBZ, p. 204.

SILVA, A.M., ALENCAR, M.M., FREITAS, A.R., BARBOSA, R.T., OLIVEIRA, M.C.S., NOVAES, A.P., TULLIO, R.R., CORRÊA, L.A. 2000. Herdabilidade e correlações genéticas para peso e perímetro escrotal de machos e características reprodutivas e de crescimento de fêmeas, na raça Canchim. Revista Brasileira de Zootecnia, v. 29, n. 6, Suplemento 2. p. 2223-2230.

SIMONELLI, S.M., SILVA, M.A., SILVA, L.O.C., FONTES, C.A., TORRES, R.A., MARTINS, E.N., SAKAGUTI, E.S. 2001. Critérios de seleção para características de crescimento no período pré-desmame em bovinos da raça Nelore. In: REUNIÃO ANUAL DA SOCIEDADE BRASILEIRA DE ZOOTECNIA, 38., 2001, Piracicaba. Anais.... Piracicaba: SBZ, p. 675-677.