ZOOTECNIA BRASIL
Centro de Convenções da PUC-GO | Goiânia-GO
27 a 30 de agosto de 2018

55ª
REUNIÃO ANUAL DA
SOCIEDADE BRASILEIRA
DE ZOOTECNIA

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28º CONGRESSO
BRASILEIRO DE
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CONSTRUINDO SABERES, FORMANDO PESSOAS E TRANSFORMANDO A PRODUÇÃO ANIMAL

PREDICTION OF AVERAGE DAILY GAIN IN BEEF CATTLE UTILIZING 3D IMAGES

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Average daily gain (ADG) is one of the main metrics used in the farms. An automated, assessment of ADG could be used to evaluate the productivity index, increasing the profitability of the beef cattle industry and monitor growth curves in beef cattle without causing stress to animals. The objective of this study was to ADG of beef cattle utilizing 3D images. Two hundred and thirty-four Nellore cattle images were collected and used to develop the models. Data collection was divided in four phases, Weaning at 244 days of age and 202.3 Kg (± 27.1), Stocker at 457 days of age and 213.9 Kg (± 25.1), Initial Feedlot at 590 days of age and 334.5 Kg (± 29.2) and Finish Feedlot at 763 days of age and 449.5 Kg (± 47.5). ADG was measured: 1) Weaning - Stocker, 2) Weaning - Initial Feedlot, 3) Weaning - Finish Feedlot, 4) Stocker - Initial Feedlot, 5) Stocker - Finish Feedlot and 6) Initial Feedlot - Finish Feedlot. The image was segmented and 27 features were automatically extracted, including body volume, dorsal area, dorsal length, width dorsal in 6 points, height dorsal in 6 points, Back Curvature in 2 points and 10 Descriptive Fourier measures. These variables were then used to develop four models: Multiple Linear Regression (MLR), Least Absolute Shrinkage and Selection Operator (LASSO), Partial Least Squares (PLS), and Artificial Neural Network (ANN). To validate the models were performed cross-validation Leave-One-Out. The biometric features automatically extracted were consistently associated with ADG. All linear models presented to good fit to ADG. 1: (MLR: $R^2 = 0.17$, LASSO: $R^2 = 0.36$, PLS: $R^2 = 0.44$ and ANN: $R^2 = 0.41$). 2: (MLR: $R^2 = 0.58$, LASSO: $R^2 = 0.67$, PLS: $R^2 = 0.76$ and ANN: $R^2 = 0.67$). 3: (MLR: $R^2 = 0.38$, LASSO: $R^2 = 0.59$, PLS: $R^2 = 0.67$ and ANN: $R^2 = 0.73$). 4: (MLR: $R^2 = 0.14$, LASSO: $R^2 = 0.40$, PLS: $R^2 = 0.47$ and ANN: $R^2 = 0.41$). 5: (MLR: $R^2 = 0.50$, LASSO: $R^2 = 0.74$, PLS: $R^2 = 0.71$ and ANN: $R^2 = 0.70$). 6: (MLR: $R^2 = 0.43$, LASSO: $R^2 = 0.76$, PLS: $R^2 = 0.76$ and ANN: $R^2 = 0.75$). The PLS was the best all the others model (RMSEP = 0.08, 0.04, 0.04, 0.10, 0.06, 0.11 kg respectively). Results indicate that image analysis can be used as a potential tool for prediction of ADG.

Keywords: ANN, LASSO, MLR, PLS

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