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Use of three-dimensional models as an alternative to evaluate body condition in cattle: preliminary results

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Body condition in cattle is closely related to reproductive performance and it is widely used as a parameter to select embryo recipients. The aim of the present study was to evaluate the potential of using three-dimensional models (3D) to assess body condition in bovine. Cross-bred (Holstein-Zebu) cows were used (n=70). In the first experiment, 3D models of the posterior region of the animals were generated using an infrared sensor connected to a laptop computer equipped with custom-developed software (ReconstructMe). Another software (Rhinoceros) was used for measurements. At the base of the tail, depth was measured from a perpendicular line between the skin surface and the reference line traced between both ischium. In rump region, the reference line was traced between ilium and ischium. In lumbar region, reference line was traced between transverse and spinous processes of the lumbar vertebra near the 13th rib. As reference parameters were used, as follows: visual evaluation of the body condition score (BSC, Edmonson et al., 1989), and measurement of fat thickness by ultrasonography at insertion of biceps femoris muscle (region 1) and the region of longissimus dorsi muscle between 12th and 13th ribs (region 2), both performed by the same technician immediately after 3D model construction. The association between variables was evaluated by Pearson's correlation method. The values obtained by objective measurements using 3D models were highly and significantly correlated with BCS and fat thickness in regions 1 and 2, both at the base of the tail ($R=0.80$, $R=0.62$ and $R=0.62$; respectively, $P<0.0001$) and rump regions ($R=0.72$, $R=0.71$ e $R=0.72$; respectively, $P<0.0001$). On the other hand, the measurements performed at dorsal region had lower correlations with the reference parameters ($R=0.47$, $R=0.28$ and $R=0.35$; respectively, $P<0.05$). In the second experiment, three experienced BCS evaluators (A1, A2 and A3) received colored images and 3D models of the posterior region of the animals used in the first experiment. Each evaluator assigned BCS values to the colored images and thereafter to the 3D models, without knowing the relation between them. Correlations between the evaluators tended to be higher for BCS values assigned to 3D models (A1 x A2, $R=0.84$; A1 x A3, $R=0.91$; A2 x A3, $R=0.81$; $P<0.0001$) than for BCS values assigned to colored images (A1 x A2, $R=0.79$; A1 x A3, $R=0.85$; A2 x A3, $R=0.79$; $P<0.0001$). These results demonstrate that objective assessment of body condition using 3D models is consistent with the conventional evaluation by visual score or by subcutaneous fat thickness using ultrasonography; and 3D models can also be used to subjective evaluation of BCS.

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