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Factor analysis to evaluate the relationship between longevity, milk production and linear type traits in Holstein cows

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The longevity and milk production in dairy activity are desirable, because of the relationship with profitability. However the selection for longevity is limited by the time of obtaining the records and the low heritability. The type traits to be obtained early in life and some present moderate genetic correlations with longevity and milk production has been used as indirect predictors of these traits. But the large number of type traits and high degree of interrelationships between them can provide inaccurate estimates of their relationship to longevity and milk production. This study aimed to evaluate the relationship of longevity and milk production until 305 days in first lactation with scores formed from 21 linear type traits obtained through factor analysis in Holstein cows. The data bank was constituted of 19,678 records at linear classification, production and reproduction of Holstein cows, collected by ABCBRH¹ technicians between the 1996 and 2008 period. The measures of longevity studied were: total milk production in all lactations (Long1), number of lactations initiated (Long2), total number of days during all lactations (Long3), time from birth to the last control dairy, in months (Long4), and time of the first calving to the last dairy control, in months (Long5), and milk production until 305 days in first lactation (PL305). The analysis of factors for type traits was conducted by FACTOR of SAS^{®2} through Maximum Likelihood method. Initially seven type traits that did not suit the factor analysis and were excluded, then remaining 14 traits. From these traits were extracted two factors with eigenvalues greater than one. In the first were significant the rear udder height, rear udder width, udder texture, udder cleft, loin strength, bone quality and final score, being this factor named mammary system. The second was named of cow structure for presenting significant the stature, top line, chest width, body depth, rump width, angularity, fore udder attachment and final score. Later were formed two score, corresponding the traits of the first factor (EPF) and the second factor (ESF). The scores were obtained by multiplying the sum of the factor loadings of the significant traits of each factor with their respective phenotypic measures. The relationship of scores with longevity and PL305 was verified by the linear regression, with the GLM of SAS ^{®2}. The effects considered in the model were: fixed effects for scores of type traits, herd, classifier, age at calving and the random effects of animal and residual. Linear regression of the EPF was not significant only with Long4. In contrast the ESF was significant only with Long1 and PL305. The significant relationship of EPF with measures of longevity and PL305 suggests that cows with udder high, wide, soft, elastic, with strong central ligament, loin strength and with good bone quality are associated with higher permanence in the herd and produce more milk at first lactation. The significant relationship between ESF with the PL305 and Long1 indicates that improvements can be obtained for PL305 through the traits related to the structure of the cow, because Long1 represents longevity and also is related to milk production, because Long1 is the sum of milk yield in the whole life of the cow. The significant phenotypic relationship between EPF with measures of longevity and PL305 can contribute to the indication of the most important traits for integrating a selection index. Also, it can result in gains related to longevity, combined with an increase in milk production. Traits like loin strength, bone quality, rear udder width, udder texture, udder cleft and final score, may contribute to longevity and PL305 improvement in Holstein cows.

Keywords: final score, milk production, number of lactations initiated, regression, udder texture

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² Statistical Analysis System

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