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Singular versus composite trait: what difference for maternal traits selection in meat sheep?

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In France, selection of maternal traits for meat breeds is mainly based on few traits: litter size, lamb viability and pre-weaning weight. Each trait is independently evaluated through a BLUP animal model and selection is based on a linear combination of estimated breeding values (EBV) according to the breeding goal of each breed. Is the selection based on a composite trait, the “litter weight”, which encompasses current selected traits, be more adapted and comprehensive to breeders? We first estimated the genetic parameters of both singular traits and the composite trait. We then analysed changes on potentially selected animals that occurs when moving from singular traits to composite trait selection. Official records from 2006 to 2019 of two meat sheep breeds, Ile de France (80,484 ewes and 261,069 litters) and Blanche du Massif Central (87,768 ewes and 298,605 litters), were analysed using SAS and Asreml software. For singular traits, the genetic parameters and genetic values were estimated according to the models routinely used in meat sheep: a two traits model for litter size after natural and hormonal induced oestrus and a direct and maternal effects model for pre-weaning weight (weight of the lambs at 30 days of age). For the composite trait, we first computed the sum of the weights of lambs per litter, pre-corrected or not by the sex in two situations. The first situation included only litters with no lamb dead before weaning. The second situation included litters with and without dead lambs. The genetic parameters and genetic values were then estimated using different models. The routinely used maternal index, computed from a linear combination of EBVs for singular traits, was compared to the EBVs for the composite trait. Correlation coefficients between “singular” and “composite” EBV have been calculated in the two situations.