Application of single-step GBLUP in Italian Comisana sheep

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Comisana is a dairy sheep breed reared in central and southern Italian regions used to produce PDO cheeses. Since 2000 a nucleus flock has been established at the breeders association experimental station aiming at improving both milk yield and composition using pedigree-based EBVs and fitting a lactation model. Recently, within the national CHEESR project, ewes of the experimental station were genotyped (Illumina OvineSNP50 Beadchip) and a repeated test-day model was implemented using both pedigree-based (TD-PBLUP) or single-step genomic best linear unbiased prediction (TD-ssGBLUP). The main objective of this study was to compare results from TD-PBLUP and TD-ssGBLUP. Data consisted of daily milk production and weekly fat and protein contents for 1138 Comisana sheep, 50K SNP genotypes for 309 animals and 2062 animals in the pedigree. Overall, a total of 169 individual – dam pairs were available. After a quality check 45,343 SNPs were retained. A multiple-trait repeatability test-day model was fitted including year of birth, month of calving, class of days in milk as fixed effects, and flock-test-date, permanent environmental and additive genetic as random effects. Phenotypes of 100 ewes (50 with genotypes) were masked to create a validation group. Heritability ranged from 0.09 (fat content) to 0.33 (daily milk yield). The average accuracy of TD-PBLUP and TD-ssGBLUP EBVs for the validation group was 0.43 and 0.45 for milk yield, 0.48 for fat content and 0.62 for protein content. When considering only ewes with genotypes the average accuracy of TD-ssGBLUP was higher than that of TD-PBLUP only for milk yield (0.40 vs. 0.45) while for protein and fat content did not change being 0.60 and 0.48, respectively. Results from the current research confirm the usefulness of a single-step approach but they depend on the trait and its heritability, the percentage of genotyped individuals and the population structure. The upcoming inclusion of ram genotypes is expected to increase the accuracy of the TD-ssGBLUP EBVs.