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ABSTRACT: The aims of the present study were to compare estimated breeding values (EBV) for milk yield using different testing schemes with a test-day animal model and to evaluate the effect of different testing schemes on the ranking of top sheep. Alternative recording schemes that use less information than that currently obtained with a monthly test-day schedule were employed to estimate breeding values. A random regression animal mixed model that used a spline function of days in milk was fitted. EBVs obtained with alternative recording schemes showed different degrees of Spearman correlation with EBVs obtained using the monthly recording scheme. These correlations ranged from 0.77 to 0.92. A reduction in accuracy and intensity of selection could be anticipated if these alternative schemes are used; more research in this area is needed to reduce the costs of test-day recording.

Key words: Test-Days, Genetic Evaluation, Recording Schemes.

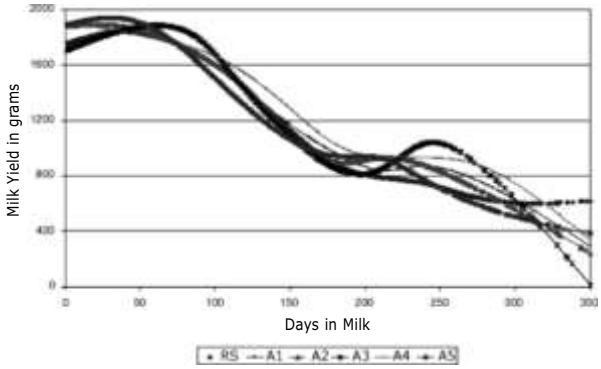
INTRODUCTION – In dairy sheep, as in dairy cattle, genetic evaluation of milk production traits can be based on either cumulative lactation or individual test-day records. The latter, which has a number of well-documented advantages (e.g. Misztal, 2006, Samoré *et al*., 2001; Schaeffer, 2004; White *et al.*, 1999), has become the basic state of the art in dairy genetic evaluation. By using test-days, records can be considered without any modification, i.e., records are considered directly in analysis and no assumption about the length of the lactation has to be made (Visscher and Goddard, 1995). In Sicilian dairy sheep, the production period affects management decisions such as culling and mating, and strongly influences ranking of animals having different numbers of lactation and lambing in different seasons. Consequently, for genetic evaluation based on total lactation animal models, adjustment coefficients for environmental factors are needed. However, the estimation of these coefficients could be of poor exactitude; this could be overcome by using a test-day model. In sheep, the International Committee for Animal Recording system (ICAR, 2003) has officially defined several milk-recording methods. In Italy, testing plans that are based on collecting milk two times within a 24 h period every four weeks (A4 methods) were standard. Nowadays in dairy sheep, however, test-day records are collected monthly but under an alternate morning/evening system. This alternate system was implemented because of the steady increase in recording cost per sheep observed in the last few decades. Furthermore, additional modifications to the testing schemes have been proposed to reduce the costs of milk recording. Actually, in dairy sheep, the cost for milk recording is three times bigger than the cost in dairy cows. The purposes of the present study were: i) to compare estimated breeding values (EBVs) for milk yield using different testing schemes with a test-day animal model; ii) to evaluate the effect of different testing schemes on the ranking of top sheep.

MATERIAL AND METHODS – *Data*. First-lactation Valle del Belice ewes that belonged to 15 Sicilian flocks were selected for this study. These ewes were under a test-day control made by the University of Palermo between 1994 and 2005, and were between 12- and 24-month-old at first lambing. To have the same ewes through different

testing schemes, it was requested that a ewe had at least six test-day records to be included in the dataset. With this restriction, 659 first-lactation Valle del Belice ewes were selected for the statistical analysis. The pedigree file that included a total of 1051 individuals was extracted from a pedigree records provided by the ASSONAPA. The response variable was the daily milk production, measured in grams, recorded in test-days within a year after lambing. *Testing Schemes*. Six different recording schemes were compared; the reference scheme (**RS**) considered all data obtained from ewes in the present recording system in which ewes in lactation were tested every month. There were five alternative schemes: **A1** considered information coming from odd months (January, …, November); **A2** from even months (February, …, December); **A3** considered every other two months information starting from January (January, April, July, and October); **A4** similar to A3 but starting from February, and **A5** as the previous two schemes but starting from March. *Statistical Analysis*. The ASReml software (Gilmour *et al.,* 2002) was used to carry out the statistical analyses. A random regression animal mixed model was used to fit the test-day data. In the model, the number of offspring (one or more than one), the age at first lambing (12-15; 16-18; 19-21; and 22-24 mo), and a cubic spline function of days in milk (DIM) with 11 knots (1, 30, 60, 90, 120, 150, 180, 210, 240, 270, and 350) were fitted as fixed effects; while flock-year-season effect (15 flocks, 11 years and two seasons: January-June and July-December, a total of 97 levels), a cubic function (with the same 11 knots as before) of the individual permanent environmental effect within lactation (659 levels), and additive genetic effect (1051 levels) were fitted as random for each testing scheme. Spearman correlations between estimated breeding values (EBVs) of RS and EBVs from each alternative scheme (A1 to A5) were estimated. Parameters for the model were estimated based on the dataset available for each scheme.

RESULTS AND CONCLUSIONS – For all schemes used, means of milk yield across DIM are shown in Figure 1. As it can be seen, when more information was used, A1 and A2, the curves approached the one of RS. The Spearman rank correlations between EBVs of RS and EBVs from alternative schemes were 0.92; 0.88; 0.77; 0.81; and 0.80, respectively. These coefficients were related to the loss of information as some test-days were dropped from the analyses under alternative schemes.

Figure 1. Means of milk yield across DIM for the reference scheme (RS) and alternative schemes (A1, …, A5).



The average number of test-days per ewe was equal to 7.2 for RS; while it was about 3.6 for A1 and A2, and it was 2.4 for A3, A3, and A5. This seems to suggest that if fewer test-days per ewe per year are going to be taken, these averages should be higher and that some effort should be put in trying to obtain more observations per ewe per lactation. Another way of thinking about these Spearman correlation coefficients is to observe the dispersion that the highest ranked individuals will suffer if less information is taken to estimate breeding values. For example, the first ten ewes ranked in RS were spread among the first 30 ewes ranked in A1 and A2; while ewes placed in the first 30 spots in RS were spread among the first 100 in A1 and A2 schemes. Although the correlation coefficients for schemes A1 and A2 seemed to be high; the consequence of moving the test-day schedule to one of these schemes (A1 or A2) will produce a decrease in genetic response to selection due to the loss of intensity and accuracy associated. For example, if the first 100 ewes were selected in A1 and A2, the selection differential would have been 14% and

27% lower than the one that would have been obtained in RS. Consequently, before given any recommendation in this regard, further research should be done in particular using simulation and an economic approach to enlighten better the consequences of a change in the scheme of test-day collection.

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