

Modeling Lactation Curves Using Daily Yield and Milking Interval to Identify Efficient Cows in Automatic Milking Systems: A Case Study in Taiwan

Yeh Yi-Hsin^[1], Kuo Ya-Hsin^[1], Chen Yueh-Tung^[1], Shiao Jen-Wen^[1], Tu Po-An^[1], Huang Jeng-Fang^[1]

[1] Taiwan Livestock Research Institute (TLRI), Ministry of Agriculture (MOA)

In automatic milking systems (AMS), cows milk voluntarily, resulting in variable milking intervals (MI) that introduce new parameters for evaluating lactation curves. This study aimed to model lactation curves based on daily milk yield (DMY) and milking interval data, and to explore their use in identifying “efficient” dairy cows within AMS herds.

This study analyzed a total of 541,810 automated milking records from five different farms. Cows were categorized into groups based on the medians of DMY and milking interval. Subsequently, an Incomplete Gamma Function combined with the Wood model was employed to fit the lactation curves. Analysis of Variance (ANOVA) was then used to evaluate the significant effects of different efficiency groups on parameters such as production at peak of lactation (Ppeak), days to peak (Dpeak) and 305-day cumulative milk yield (305-d MY). While AMS settings may vary across farms, this study employed the within-farm median as the classification threshold for MI and DMY to ensure that all comparisons were conducted within a consistent managerial context. Furthermore, the inclusion of a random cow effect (u) in the model accounted for individual random deviations. Combined with the stratified analysis of primiparous and multiparous cows, the potential biases arising from differing equipment configurations have been statistically mitigated.

Results showed that cows were classified into groups using medians of DMY and MI. In terms of herd composition, the proportion of cows classified as high DMY/long MI was 34.0% among multiparous cows and 34.8% among primiparous cows, whereas low DMY/short MI cows accounted for only 8.4% and 8.2%, respectively. The findings of this study suggest that DMY and MI may serve as useful indicators for assessing milking efficiency in AMS-managed herds. Adjusting the herd composition—specifically by focusing on the patterns associated with high DMY/long MI and low DMY/short MI—could potentially enhance AMS operational efficiency. By monitoring these metrics, farms may be able to refine herd management strategies to support improved system performance and equipment utilization.