International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2017; 2(3): 27-29

www.veterinarypaper.com
Received: 16-03-2017
Accepted: 18-04-2017

Aphzal Mohammed
The University of Trinidad and Tobago, Faculty of Biosciences Agriculture and Food Technologies ECIAF Centeno, off Arima, Trinidad and Tobago

Angelisah Khan
The University of Trinidad and Tobago, Faculty of Biosciences Agriculture and Food Technologies ECIAF Centeno, off Arima, Trinidad and Tobago

Puran Bridgemohan
The University of Trinidad and Tobago, Faculty of Biosciences Agriculture and Food Technologies ECIAF Centeno, off Arima, Trinidad and Tobago

Andell Edwards
The University of Trinidad and Tobago, Faculty of Biosciences Agriculture and Food Technologies ECIAF Centeno, off Arima, Trinidad and Tobago

Correspondence
Aphzal Mohammed
The University of Trinidad and Tobago, Faculty of Biosciences Agriculture and Food Technologies ECIAF Centeno, off Arima, Trinidad and Tobago

Weekly milk yields analysis using a polynomial quadratic model for two Holstein cows over five lactations reared under a semi intensive management system

Aphzal Mohammed, Angelisah Khan, Puran Bridgemohan and Andell Edwards

Abstract
Analysis of milk yields of individual cows over successive lactations can reflect both the genetic potential for milk yields over time and can indicate though not specifically, management factors that may optimize milk production. Successive milk yields for five lactations from parturition from two cows were analyzed using a quadratic regression model to determine in which of the five lactations were milk yield optimized. The regression analysis demonstrated that over the five year period, the milk yields of both cows attained a curvilinear relationship synonymous with an ideal lactation curve at lactation five. The interaction of milk yields with weeks into lactations was evident for lactations 2, 3, 4, and 5 for cow one but absent for cow two, though evident in the latter for overall milk yield. Both cows showed an even milk yields in other lactations, despite minor elevations in milk yields. Modeling of milk yields of Caribbean adapted Holstein breeds of cows is demonstrative of genetic variation of milk yields in cows or individual cow milk yield differences.

Keywords: weekly milk yield, quadratic regression, woods lactation curve, fifth lactation

Introduction
Milk yields in tropical dairy breeds of cattle are influenced by several factors such as breed, age at first calving, stage of lactation, pregnancy, climatic variables, and frequency of milking (Panchev *et al*, 201;Angel *et al*; 2013; Aslam *et al*; 2014;) [6, 7, 1]. Daily or weekly milk yields plotted against time after parturition in cows is called a lactation curve (Wood, 1967) [9].The standard lactation curve reflects an increasing milk yield at an increasing rate until peak milk yield declining thereafter at a slower rate until the end of lactation. Lactation curve modeling provides summary information about cows needing culling and potential milking strategies to optimize performance of individual cows or on a herd basis. Lactation curve modeling is useful for management and making breeding decisions for a dairy enterprise and associated with year of calving, parity, age and season of calving (Wood, 1967; Olori *et al*; 1999) [4,9].
Various linear and regression models have been used to fit the lactation curves mainly in temperate breeds of cattle. These models include the Quadratic model*:* $Y_t = a + bt - ct^2$; and*;* Gamma-type function $Y_t = at^b e^{-ct}$ and the mixed logarithmic function $Y_{t=} = a + bt\ 1/2 + c\ log\ t = e_t$. In these equations, Y_t = the average daily yield on the tth test day of lactation, a = the initial milk yield after calving, b = the ascending slope parameter up to the peak yield, c = the descending slope parameter, t = the length of time since calving, and e_t = the residual error (Wood, 1967; Quinn *et al*; 2005; Wasike *et al*; 2011) [9, 8].
The purpose of this study was to analyze via a quadratic model, the milk yields for two cows over five lactations in which lactation number and milk yields was investigated concurrently with the interaction of milk yields with weeks into lactation.

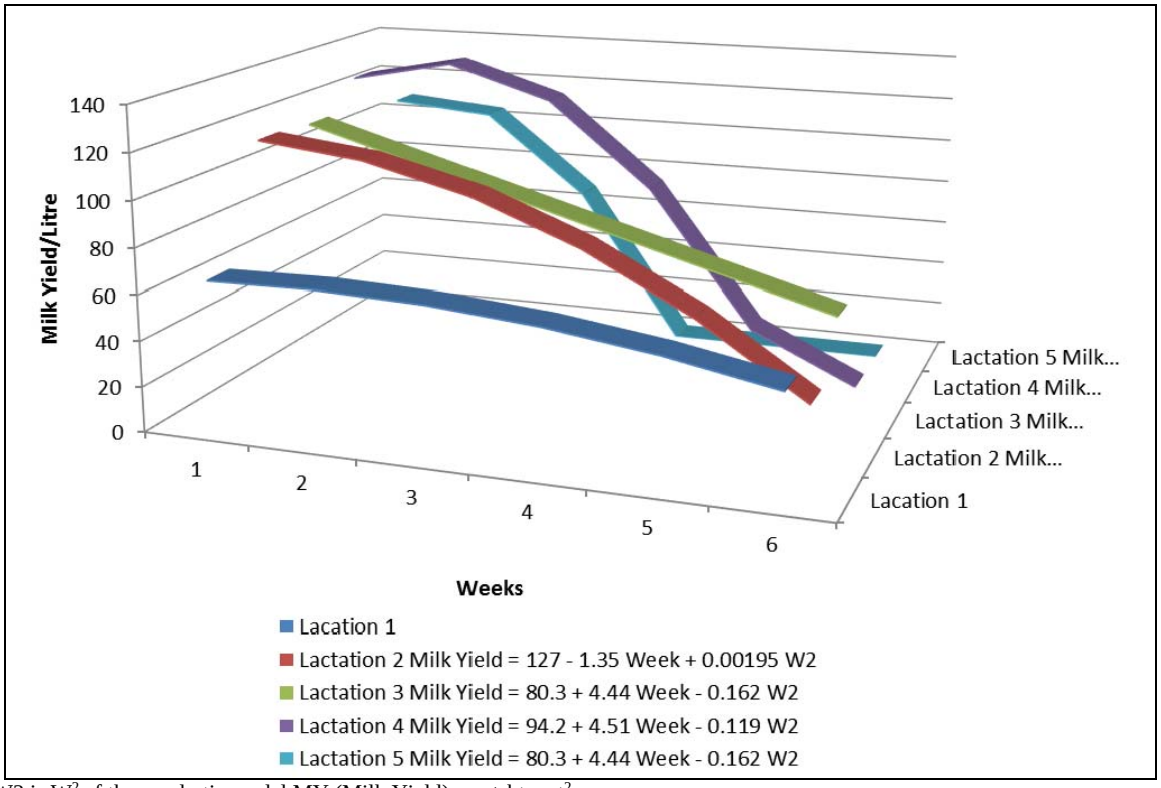
Materials and methods
The present dairy herd at the Eastern Caribbean Institute of Agriculture and Forestry (ECIAF) comprise 28 milking cows at variable stages of lactation; six dry pregnant cows and 40 non

bred heifers. The ECIAF Dairy milking herd, is derived mainly from imported Holstein cattle and is managed under a semi-intensive management system where animals were fed a 12 percent crude protein all-purpose dairy ration including chopped forages mainly of bamboo grass (*Paspalum fasiculatum*); elephant grass (*Penessetum purpureum*), tanner grass (*Brachiara radicans*) including tropical kudzu (*Puereria phasioloides*). At morning, animals were gathered from pastures and drawn into milking sanctions where they are milked using a semi-automatic system and milked again around midday. Average daily milk yield ranges from 4 to 12 kg per da**y.**

The two data used for this study was of known birth dates, age at first calving, parity number and treated annually for subclinical mastitis. Cow one maintained milk yields within the range of 48 to 52 weeks over the five year lactation cycles. Cow two maintained milk yields between 54 and 68 weeks. Weekly milky yields were extracted for milking records kept at the farm. Polynomial quadratic regression models of the type MY (Weekly Milk Yield)= a + bt – ct^2were developed over time using Excel function and Mintab software release 2011.

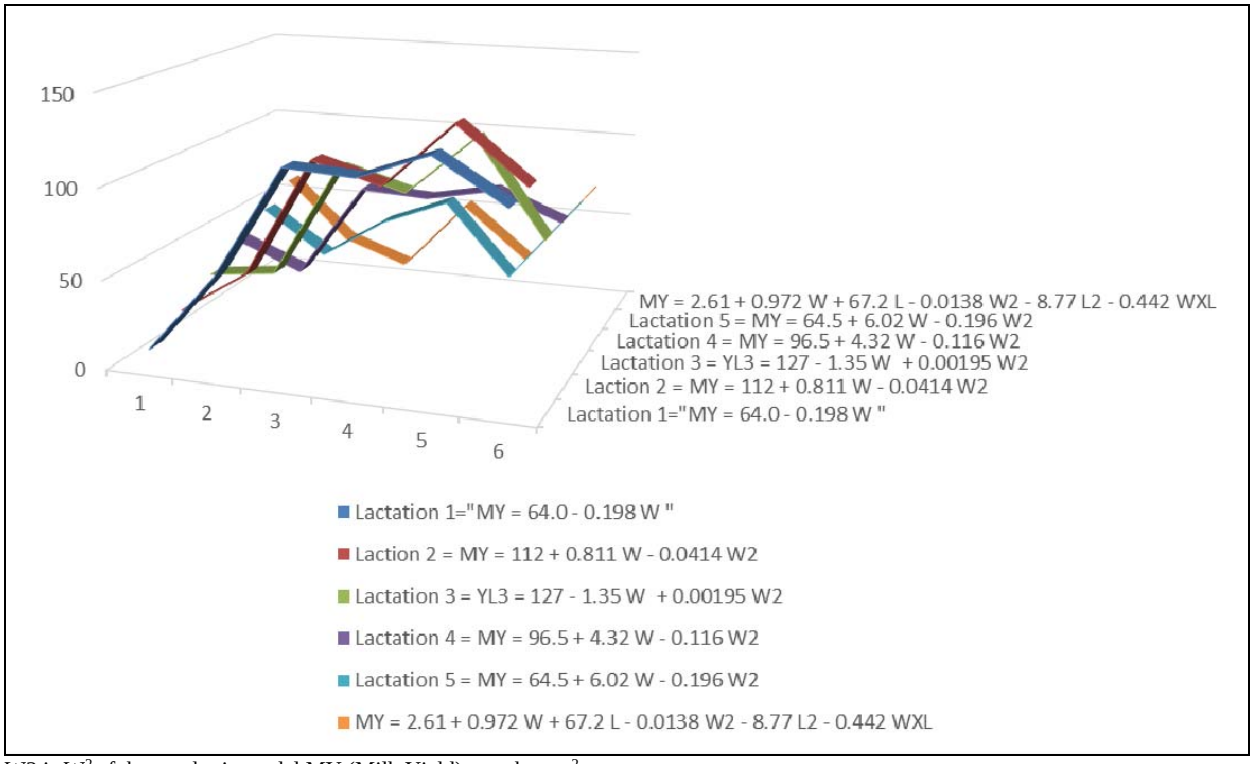
Results and Discussion

The regression analysis demonstrated that over the five year period, the milk yields of both cows attained a curvilinear relationship synonymous with an ideal lactation curve at lactation five (Figure 1 and Figure 2). The curvilinear relationship reflected Woods (1967) [9] standard lactation curve and has also been similarly reported for Karan Fries cows of Karnal India (Jingar *et al* (2014) [3]. The interaction of milk yields with weeks into lactations was evident for lactations 2, 3, 4, and 5 for cow one but absent for cow two, though evident in the latter for overall milk yield. Residuals square (R^2) increased from 57 to 81 from lactations one to five for cow 2 including R^2 of 41 to 61 from lactations 2 to 5 of cow one. These finding are analogous to findings up to of increasing milk yields up to lactation three in Turkish Holstein cows using various modifications of Woods gamma function and exponential and mixed models (Omur and Bulent, 2008) [5]. The peaking of lactation milk yields in the 5^{th} lactation in both cows and reflecting the best fit of Woods lactation curve might be indicative of maximum milk secretory tissue in the fifth compared to earlier lactation numbers (Jingar *et al*; 2014) [3]. Lactation curve modeling provides summary information about cows needing culling and potential milking strategies to optimize performance of individual cows or on a herd basis. Lactation curve modeling is useful for management and making breeding decisions and simulating a dairy enterprise (Olori *et al*., 1999) [4] pertaining to year of calving, parity, age and season of calving (Wood, 1967; Olori *et al*; 1999) [9, 5].



W2 is W^2 of the quadratic model MY (Milk Yield) = a + bt – ct^2

Fig 1: Milk Yield MY for Cow 1 five sucessive lactations



W2 is W^2 of the quadratic model MY (Milk Yield)= $a + bt - ct^2$

Fig 2: MY for Cow Two for five sucessive lactations and overall MY

Conclusion

The typical lactation curve reflecting an increasing milk yield at an increasing rate but declining thereafter for the remaining cycle was evident in the fifth lactation for both cows. Milk yields reflected by lactation curve modeling provides summary information about cows needing culling and potential milking strategies to optimize performance of individual cows or on a herd basis.

References

1. Aslam N, Muhammad A, Ahamd Battie J, Muhammad I Z, Bangulzai N, Muhammad F *et al*. Evaluation of different milking practices for optimum production performance in Sahiwal Cows. J. Anim. Sci Tech. 2014; 56:13
2. Dongre V, Singh G, Ghandi RS, Singh A. Comparison of different lactation curve models in Sahiwal cows. Turk. J. Vet. Anim. Sci. 2012; 36(6):723-726.doi:10.3906/vet-1107-24
3. Jingar S, Mehla RK, Singh M, Roy AK. Lactation Curve Pattern and Prediction of Milk Production Performance in Crossbred Cows. J. Vet. Med. 2014, 6. Article ID 814768, http://dx.doi.org/10.1155/2014/814768
4. Olori VE, Brotherstone S, Hill WG, Mcguirk BJ. Fit of standard models of the lactation curve to weekly records of milk production of cows in a single herd. Livest. Prod. Sci. 1999; 58:55-63.
5. Ömur K, Bulent E. Comparison of different lactation curve models in Holstein cows raised on a farm in the south-eastern Anatolia region Arch. Tierz., Dummerstorf. 2008; 51**(**4):329-337
6. Penchev P, Boichev M, IlievaY, Peeva TZ. Effect of different factors on lactation curve in buffalo cows Slov. J Anim. Sci. 2011; 44(3):103-110.
7. Quinn N, Killen L, Buckley L. Empirical algebraic modeling of lactation curves using Irish data. Irish J Agric Fd res. 2005; 44:1-13.
8. Ángel RU, Renee Carlos CRC, Jose Rios GR, Vincente Eliezer VM, Juvencio LL. Effects of Breed, Calving Season and Parity on Milk Yield, Body Weight and Efficiency of Dairy Cows under Subtropical Conditions. Int. J. Anim. Vet. Adv. 2013; 5(6):226-232.
9. Wasike CB, Kahi AK, Peters KJ. Modelling of lactation curves of dairy cows based on monthly test day milk yield records under inconsistent milk recording scenarios Animal. 2011; 5(11):1780-1790.
10. Wood PDP. Algebraic model of the lactation curve in cattle. Nature (Lond). 1967; 216:164-165.