Introducing a sinusoidal equation to describe lactation curves for cumulative milk yield and composition in Holstein cows

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SUPPLEMENTARY FILE

Table S1. Mathematical functions and their properties used in this study

Function	Functional form†	Time at inflexion point	Yield at inflexion point
Linear	$y = y_0 + kt$	Not applicable	Not applicable
Richards	$y = \frac{y_0\, y_f}{\left[y_0^n + \left(y_f^n - y_0^n\right)\exp\left(-ct\right)\right]^{1/n}}$	$\frac{1}{c}\ln\left(\frac{y_f^n - y_0^n}{n y_0^n}\right)$	$\frac{y_f}{\left(n+1\right)^{1/n}}$
Morgan	$y = \frac{y_0 K^n + y_f t^n}{K^n + t^n}$	$K\left[\frac{n-1}{n+1}\right]^{\frac{1}{n}}$	$\frac{\left[\left(1+\frac{1}{n}\right)y_0 + \left(1-\frac{1}{n}\right)y_f\right]}{2}$
Sinusoidal	$y = y^* + a\sin\left(\frac{2\pi t}{b} + \theta\right)$	$\frac{b}{2\pi}\left(2\pi - \theta\right)$	y^*

† y = cumulative milk yield and composition, y_0 = initial yield, y_f = asymptotic yield, t = days in milk; k is the slope; c, K and n are parameters that define the position, scale and shape of the cumulative lactation curve. For the sinusoidal, a is the amplitude, y^* is the vertical shift and θ is the phase shift. This sinusoidal equation is periodic with period b

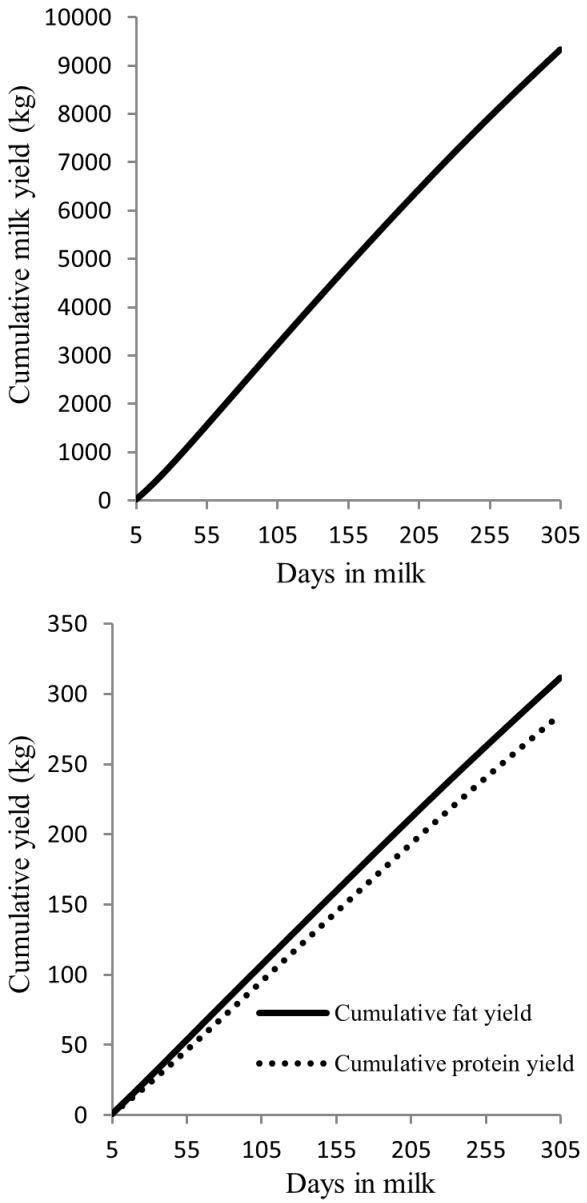

Figure S1. Observed cumulative milk, fat and protein yields in Holstein cows

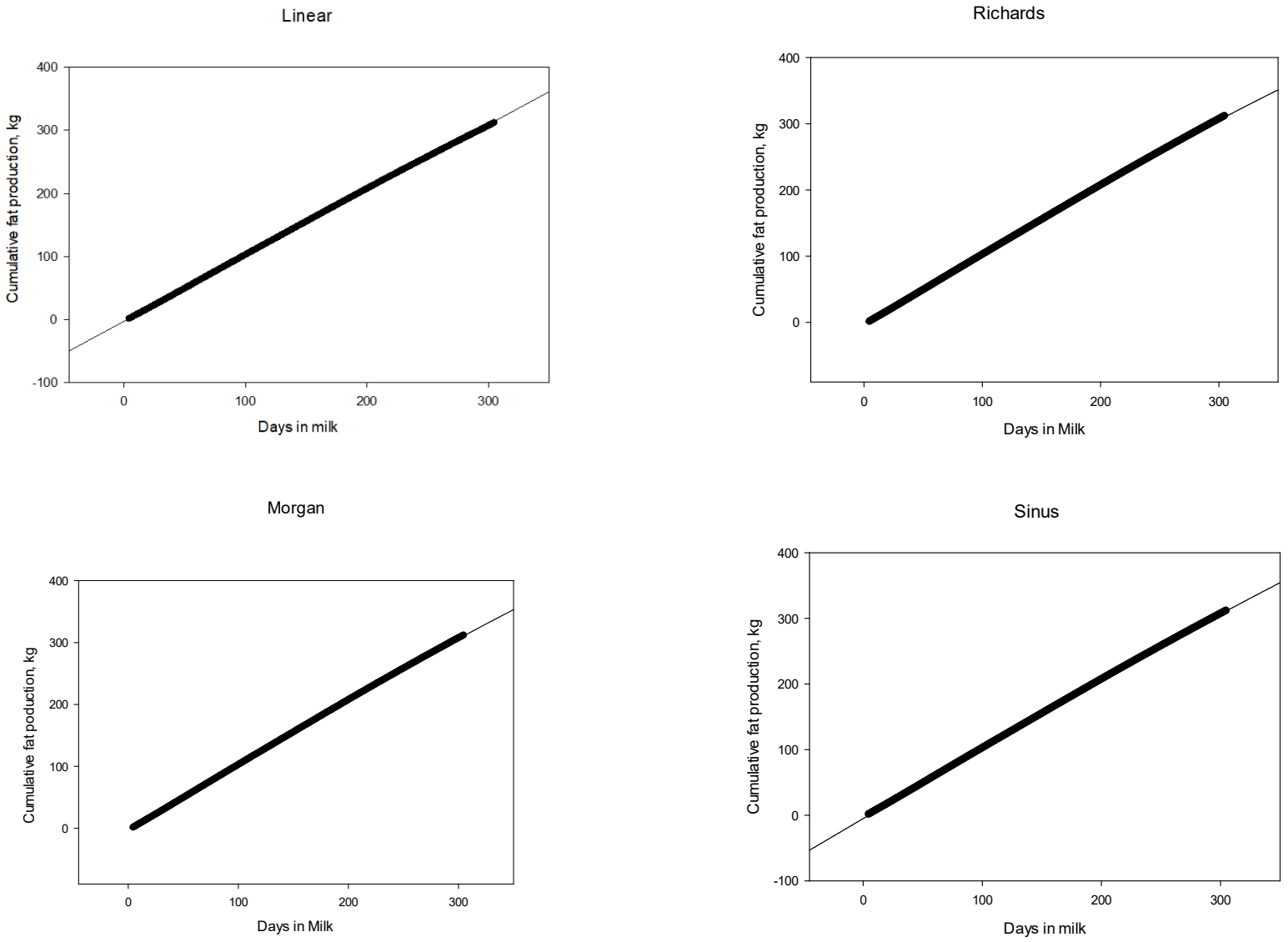

Figure S2. Predicted lactation curves for cumulative fat yield obtained with different growth equations in Holstein cows

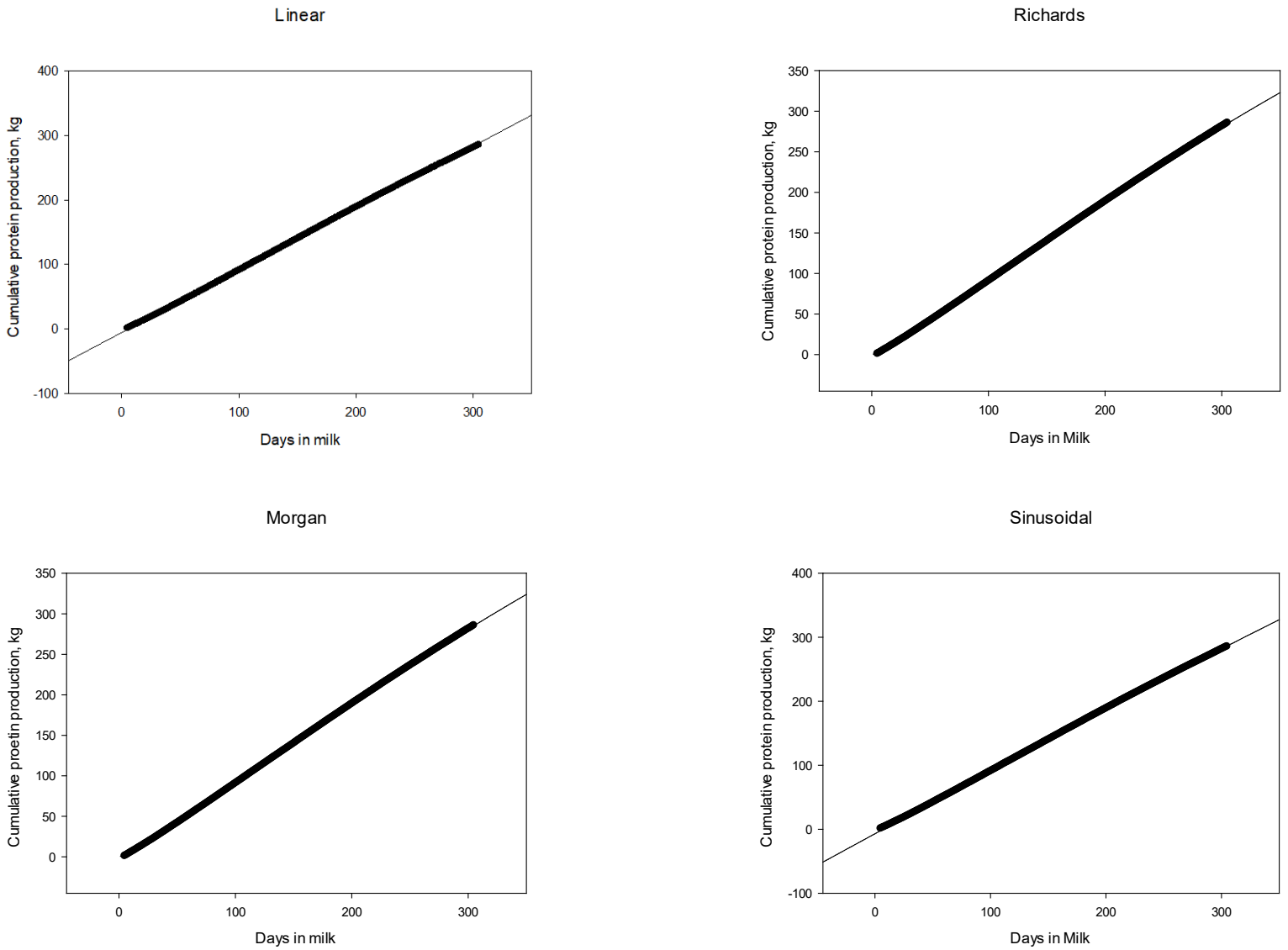

Figure S3. Predicted cumulative lactation curves for protein yield obtained with different growth equations in Holstein cows