Body Weight and Condition of Kentucky Thoroughbred Mares and Their Foals as Influenced by Month of Foaling, Season, and Gender

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Abstract

Thoroughbred mares (n=3909) and their foals born in central Kentucky were studied to assess the influence of month of birth, season, and gender on body weight, condition score, and daily weight gain. Month of birth affected growth of suckling foals, as winter-born foals were smaller at birth and grew slower during the first two months compared with spring-born foals. Mare weight change and body condition score appeared to be related to seasonal and management factors, as winter-foaling mares lost weight, showing lower body weights and lower body condition scores post-foaling than spring-foaling mares. Later in lactation when pasture availability increased in the spring, winter-foaling mares gained more weight and supported faster growth rates in their foals than later-foaling mares. Faster growth rates exhibited by winter foals at 3 to 4 months of age may be due to greater milk production, greater pasture intake by the foals, or a combination of both.

INTRODUCTION

In central Kentucky, Thoroughbred foals are born primarily in the winter and early spring. They typically remain with their dams for 4 to 5 months before being weaned in late summer and early fall. During the first few months, foals grow very rapidly, quadrupling their body weights by 5 months of age. During this time, foals derive the energy, protein, and minerals necessary to support rapid growth from a combination of mare milk, pasture, and supplemental grain. Pasture availability changes markedly between the winter and spring, so the availability of nutrients to both the lactating mare and her foal change drastically depending on the foal's month of birth.

Hintz et al. (1979) reported that Canadian Thoroughbred foals born in January, February, and March were smaller than foals born in April or May. These differences in weight persisted throughout all ages studied. In an earlier study from Kentucky (Pagan et al., 1996), Thoroughbred foals born in January, February, and March were smaller than foals born in April and May, but these differences disappeared by 6 months of age. In the UK, Thoroughbred foals born in January were smaller than foals born in March and April (Jones and Hollands, 2005). However, month of birth did not affect growth rate up until 200 days of age. Therefore, it appears that the location and season of year affect how suckling foals grow. None of these studies evaluated the effect of season on changes in body weight or body condition in the lactating mare. This paper reports on how the body weight and condition of a large number of Kentucky Thoroughbred mares and their foals are affected by month of foaling, season, and gender.

Materials and Method

Thoroughbred mares (n=3909) and their foals (1958 fillies, 1951 colts) born in central Kentucky during the years 1996-2005 were weighed monthly using a portable electronic scale (Equimetrics, Inc., Redfield, Arkansas). Data were collected as part of a larger study on Thoroughbred growth and only data up until weaning are reported in this paper. Body condition score (BCS) was measured in the mares and their foals using a scoring system of 1 through 9 to estimate fat deposition and was based on the system developed by Henneke et al. (1981). Wither height was also measured in the foals.

The foal population was represented by approximately 480 stallions and was raised on 50 commercial and private farms in central Kentucky. The data set consisted of foals born in January (n=354; 9.0%), February (n=998; 25.5%), March (n=1073; 27.5%), April (n=977; 25.0%), and May (n=507; 13.0%).

Average daily gain (ADG) in kg/d was calculated using the following formula.

$$ADG = \frac{(\text{body weight - previous body weight})}{(\text{date - previous weigh date})}$$

Mares were also categorized as being in either a positive energy balance (gaining weight, therefore positive ADG) or negative energy balance (losing weight, therefore negative ADG) postpartum. All mare and foal data for the 10 seasons were initially analyzed separately, but as there were no significant differences for any parameter between the 10 seasons ($p>0.05$), data were combined for further analysis.

The data were split into foal-age categories: 1-15 days (7 days), 16-45 days (1 month), 46-75 days (2 months), 76-105 days (3 months), 106-135 days, (4 months), and 136-165 days (5 months). Splits were chosen such that the relationship between foal age and foal weight was approximately linear and to ensure that the vast majority of the foals were measured only once per age category. A linear regression model with foal age or month of lactation as the explanatory variable and various response variables (foal age in days, gender, month of birth, weigh month, mare weight, mare ADG, mare BCS, and mare energy balance) was used to predict the response variable and provide a confidence interval for the mean response at a specified foal age within each foal-age category. When gender was being considered, it was included as an explanatory variable. When a significant ($p<0.05$) main effect or interaction was found, multiple comparisons were made ($P<0.05$) using the Tukey-Kramer test (NCSS software package, NCSS, Kaysville, Utah).

Results are expressed as mean and 95% confidence interval and significance is reported at the 5% level.

Results and Discussion

Foals

Colts were between 1.7 and 3.0 kg heavier and 0.6 and 1.3 cm taller than fillies ($p < 0.05$) throughout the study. Fillies and colts exhibited similar BCS from birth to 7 days of age ($p > 0.05$); however, at 1 month of age fillies were fatter than colts ($p < 0.05$) and remained so until the end of the study (Table 1 and Figure 1).

Table 1. Body weight, height, and BCS ± 95% confidence intervals of Kentucky fillies and colts.

Days	Body weight (kg)			Height (cm)			BCS		
	Colts	Fillies	p	Colts	Fillies	p	Colts	Fillies	p
1	57.24 ± 1.04	55.12 ± 1.02	<0.05	103.20 ± 0.44	102.19 ± 0.43	<0.05	5.21 ± 0.03	5.20 ± 0.0	3n/s
7	67.28 ± 0.71	65.16 ± 0.69	<0.01	105.60 ± 0.30	104.59 ± 0.29	<0.01	5.39 ± 0.02	5.38 ± 0.02	n/s
30	100.46 ± 0.61	98.75 ± 0.60	<0.01	112.98 ± 0.19	112.42 ± 0.18	<0.01	5.65 ± 0.02	5.68 ± 0.02	<0.05
60	137.81 ± 0.75	135.16 ± 0.74	<0.01	120.38 ± 0.19	119.65 ± 0.19	<0.01	5.66 ± 0.02	5.73 ± 0.02	<0.01
90	171.83 ± 0.88	168.94 ± 0.88	<0.01	126.02 ± 0.20	125.04 ± 0.20	<0.01	5.62 ± 0.02	5.71 ± 0.02	<0.01
120	202.21 ± 1.06	199.38 ± 1.04	<0.01	130.25 ± 0.21	129.54 ± 0.21	<0.01	5.56 ± 0.02	5.65 ± 0.02	<0.01
150	230.56 ± 1.61	227.59 ± 1.59	<0.01	133.90 ± 0.29	133.09 ± 0.29	<0.01	5.55 ± 0.02	5.63 ± 0.02	<0.01

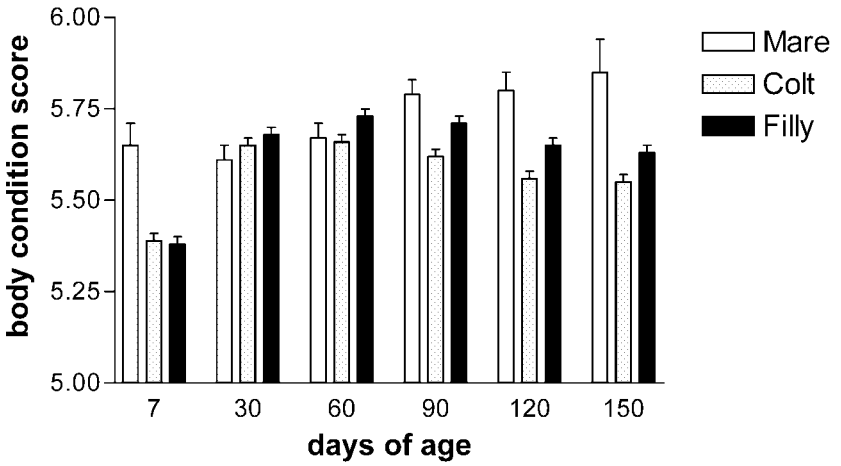

Figure 1. Body condition score ± 95% confidence intervals of Kentucky mares, fillies and colts.

January, February, and March foals had lower body weights than April or May foals during the first month of age. January and February foals remained lighter than foals born in March, April, and May until 3 months of age, and January foals remained lighter than all other foals until 4 months of age (Table 2). By 150 days of age, there was no difference in body weight between birth months.

Table 2. Foal body weight (kg) ± 95% confidence interval. Differing superscripts within rows indicate significant differences ($p < 0.05$).

Days	January	February	March	April	May
1	53.69 ± 3.67^{a}	54.86 ± 1.57^{a}	55.21 ± 1.91^{a}	57.76 ± 2.11^{ab}	60.17 ± 2.60^{b}
7	62.86 ± 1.99^{a}	64.36 ± 0.88^{a}	65.71 ± 0.84^{a}	68.18 ± 1.16^{b}	69.96 ± 1.43^{b}
30	93.50 ± 1.37^{a}	96.27 ± 0.80^{b}	100.80 ± 0.78^{c}	102.74 ± 0.84^{d}	102.11 ± 1.18^{d}
60	128.48 ± 1.75^{a}	133.72 ± 1.05^{b}	138.90 ± 0.96^{c}	138.82 ± 0.99^{c}	137.31 ± 1.62^{c}
90	163.85 ± 2.24^{a}	169.03 ± 1.18^{b}	172.61 ± 1.12^{c}	171.26 ± 1.28^{bc}	170.92 ± 1.70^{bc}
120	195.66 ± 2.53^{a}	199.46 ± 1.31^{ab}	201.98 ± 1.47^{b}	202.24 ± 1.50^{b}	202.55 ± 2.32^{b}
150	226.00 ± 3.07^{a}	228.74 ± 1.83^{a}	230.63 ± 2.24^{a}	230.92 ± 3.31^{a}	227.11 ± 4.18^{a}

January and February foals had lower ADG than March, April, and May foals at 7 days and 1 month of age. January foals had greater ADG than all foals at 3 months of age coinciding with rapid spring pasture growth beginning in April. May foals had the lowest ADG of all foals at 2, 3, and 4 months, which coincides with July, August, and September when late summer pasture is losing its quality, suggesting a seasonal effect on foal ADG (Figure 2).

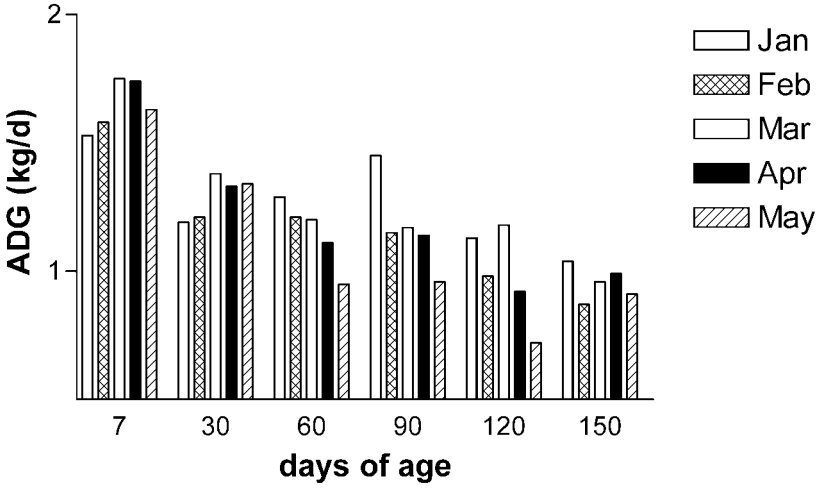

Figure 2. ADG (kg/d) of Kentucky foals separated by month of birth.

Month of birth had no effect on foal BCS at 7 days as well as 4 and 5 months of age. In all foals BCS was lowest at 7 days and increased between 7 and 30 days. May foals had lower BCS than all other foals at 1 and 2 months of age. January and February foals had significantly greater BCS than March, April, and May foals at 3 months (Table 3 and Figure 3).

Table 3. BCS (scale 1-9) ± 95% confidence interval of Kentucky foals born in January, February, March, April, and May. Differing superscripts within a row indicate significant differences ($p < 0.05$).

Days	January	February	March	April	May
7	5.39 ± 0.06^{a}	5.36 ± 0.03^{a}	5.39 ± 0.03^{a}	5.41 ± 0.03^{a}	5.37 ± 0.04^{a}
30	5.68 ± 0.04^{a}	5.65 ± 0.02^{ab}	5.67 ± 0.02^{a}	5.69 ± 0.02^{a}	5.61 ± 0.03^{b}
60	5.74 ± 0.04^{a}	5.71 ± 0.03^{a}	5.73 ± 0.02^{a}	5.68 ± 0.02^{b}	5.63 ± 0.03^{c}
90	5.72 ± 0.05^{a}	5.73 ± 0.03^{a}	5.66 ± 0.02^{b}	5.62 ± 0.02^{b}	5.60 ± 0.04^{b}
120	5.64 ± 0.04^{a}	5.61 ± 0.03^{a}	5.59 ± 0.02^{a}	5.59 ± 0.03^{a}	5.60 ± 0.05^{a}
150	5.61 ± 0.04^{a}	5.59 ± 0.03^{a}	5.57 ± 0.03^{a}	5.58 ± 0.05^{a}	5.66 ± 0.07^{a}

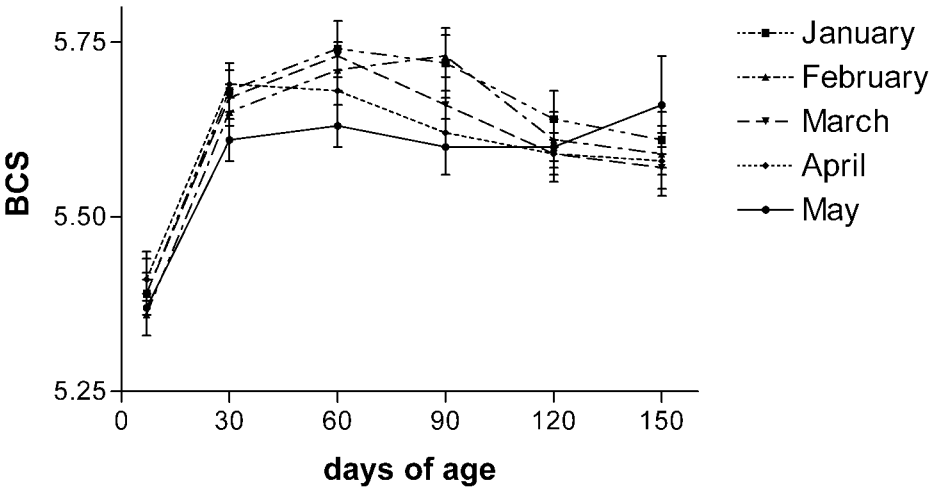

Figure 3. BCS (scale 1-9) ± 95% confidence interval of Kentucky foals separated by month of birth.

Mares

Winter-foaling mares (January and February) had lower body weights in the first 2 months postpartum than mares which foaled in March, April, or May. By months 4 and 5 of lactation, there was no difference in mare body weight between any of the groups (Figure 4).

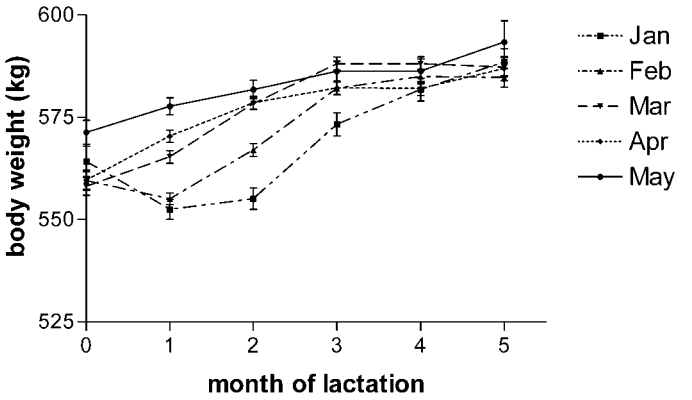

Figure 4. Mare body weight (kg) ± 95% confidence interval in relation to month of lactation.

Winter-foaling mares showed negative daily weight change in the first month postpartum compared with mares which foaled in spring (March, April, and May). January-foaling mares had the lowest daily weight change during month 2 and the highest daily weight change during months 4 and 5 compared to all other mares, and during month 3 of lactation, January- and February-foaling mares exhibited greater daily weight change than all other mares (Figure 5).

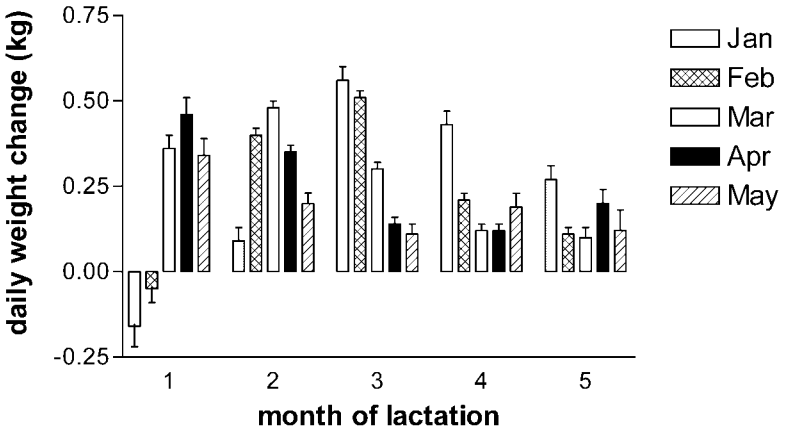

Figure 5. Daily weight change (kg/d) ± 95% confidence interval of Kentucky mares in relation to month of lactation.

Mare body weight, daily weight change, and BCS increased in the spring (March through June) in all mares regardless of stage of lactation (Figures 6, 7, and 8). Mares that foaled in the winter months showed a negative daily weight change during January and February, which then increased to approximately 0.5 kg/d in March, where it remained positive until the completion of the study (Figure 7). Changes in mare body weight and BCS appeared to be related to seasonal and management factors. Winter-foaling mares that showed decreased body weight, negative daily weight gain, and lower BCS after foaling are likely to spend more time indoors with restricted access to pasture until the spring.

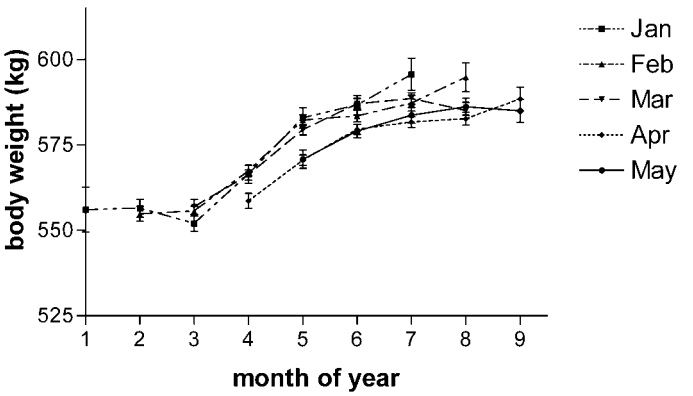

Figure 6. Body weight (kg) ± 95% confidence intervals of Kentucky mares in relation to month of the year (1 represents January, 2 represents February, etc.).

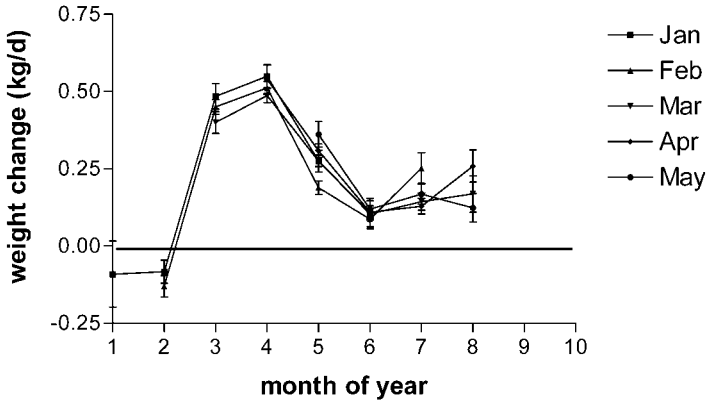

Figure 7. Daily weight change (kg/d) ± 95% confidence intervals of Kentucky mares in relation to month of the year (1 represents January, 2 represents February, etc.).

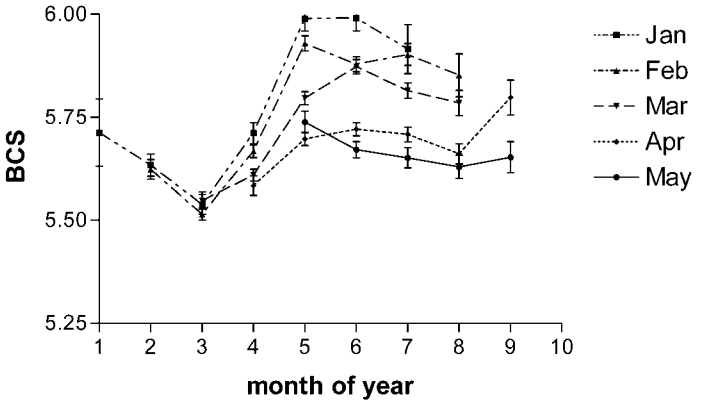

Figure 8. Body condition score (scale 1-9) ± 95% confidence intervals of Kentucky mares in relation to month of the year (1 represents January, 2 represents February, etc.).

Relationships between mare and foal data

Foal body weight was positively correlated to mare body weight ($p < 0.05$), foal ADG was positively associated with mare ADG ($p < 0.05$), and foal BCS was positively related to mare BCS during months 1-5. These relationships indicate that heavier mares produce heavier foals, faster-growing foals are from mares that are gaining weight, and fatter foals are produced from fatter mares. There was a positive relationship between foal BCS and mare daily weight change at 2 and 3 months (peak lactation), indicating that mares that are gaining weight during the first 3 months of lactation have fatter foals.

Regardless of month of birth, mares that exhibited a negative energy balance postpartum (losing weight or negative daily weight change) had foals that did not gain as much weight as mares that were in a positive energy balance at any age ($p < 0.05$).

These data clearly demonstrate that season of the year affects growth in suckling foals. Foals born in January and February were smaller at birth and grew slower during the first two months than foals born later in the year. January- and February-foaling mares tended to lose weight in early lactation, suggesting that their caloric intakes were insufficient to meet their energy requirement for early lactation. Later in lactation when there was access to adequate pasture, these early-foaling mares gained more weight and supported faster growth rates in their foals than later-foaling mares. It is unclear whether the faster growth rates in these 3- to 4-month-old foals was due to greater milk production, greater pasture consumption by the foals, or a combination of both factors.

In Kentucky, growth rate of suckling foals was affected by birth month and season of year. Foals born in the winter grew slower during the first two months, but compensated by growing faster later in lactation so that the net result was that by 5 months of age there was no difference between body weights in any of the groups. This is different than in Canada (Hintz et al., 1979), where foals born early in the

year remained smaller throughout their yearling year, or in the UK (Jones and Hollands, 2005), where growth rate was not different between birth months for the first 200 days of age. In Canada, pasture availability in the spring may not have been enough to allow for compensatory weight gain in early-born foals. In the UK, perhaps winter pasture availability was sufficient to meet mare energy requirements and support foal growth.

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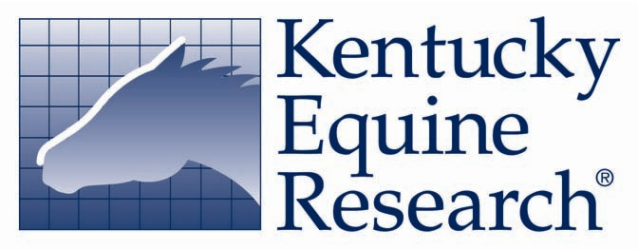

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