Chapter 4. Dietary Starch and Sugar Versus Fat and Fiber: Growth and Development of Foals II.

Comparision of Growth in 1994 and 1995 Thoroughbred Foals

ABSTRACT

Hydrolyzable carbohydrate content of horse diets may become excessive when rapidly growing pastures are supplemented with traditional grain concentrates. The substitution of fat and fiber for corn and molasses was explored in a companion paper. Growth and development of foals were examined in terms of body weight and body condition score, wither and hip heights, lengths of body, forearm and cannon bones, girth and circumferences of the physis and fetlocks. Data from twenty foals born in 1994 was reported in a companion paper and was compared with data from twenty foals born in 1995. The spring slump in growth observed in the 1994 foals was not as evident in the 1995 foals. Growth equations derived from 1994 data reasonably predicted growth of the 1995 foals.

Key Words: Rapidly Fermentable Carbohydrate, Fat, Fiber, Growth.

Introduction

Previous work in this laboratory indicated a slump in yearling growth rates, as shown by body weight and condition scores, corresponding with rapid growth of spring pasture (Hoffman et al., 1996). This spring slump may have been attributed to excess

hydrolyzable carbohydrate, associated with the supplementation of rapidly growing pasture with a corn and molasses based concentrate. The slump in growth was not observed in the fat and fiber supplemented yearlings. Our objectives were to compare growth and development of foals fed pasture and supplements rich in starch and sugar or in fat and fiber, and to compare growth rates of 1994 foals with 1995 foals.

Materials and Methods

Thirty Thoroughbred mares and forty foals were kept on bluegrass clover pasture at the Virginia Tech Middleburg Agricultural Research and Extension (MARE) Center. The mares were paired by age, breeding date and sire of the foal and randomly assigned into two groups. Twenty mares were used in 1994, and ten of these were replaced (due to age or reproductive inefficiency) in 1995.

In each year, ten mares were supplemented with a corn and molasses based concentrate (SS), and ten a corn oil and fiber (beet pulp, soybean hulls, oat straw) supplement (FF). The concentrates were formulated to be isoenergetic and isonitrogenous, with mineral contents balanced to complement the pasture and meet or exceed current recommendations (NRC, 1989).

The mares and foals were fed in pans on the ground so that both had access to the supplement. The supplements were fed in varying amounts with goals of a 1:2 supplement:forage ratio and a goal of body condition scores maintained between 5 and 6. *Ad libitum* access to a mixed grass legume hay was provided during the fall and winter months when deemed necessary, as based on visual assessment of pasture

quality. White salt was provided free choice throughout the year. The foals were weaned between 5 and 7 mo of age and maintained on their respective supplements. Anthelmintic, vaccination, and hoof trimming schedules routine to the Virginia Tech MARE Center were followed (Ley et al., 1992).

Growth rates of the foals (10 per group per year) were measured monthly by body weight, body condition score, wither and hip heights, lengths of body, forearm and cannon bones, girth, and circumferences of the physis and fetlocks. Body weight was measured using an electronic scale (Model TC-10S, TYREL Corp.), and body condition was scored using the method described by Henneke et al., (1983). All of the body condition scoring and linear measurements were done by the same individual to minimize error. Measurements were specifically defined as follows:

Wither Height: the distance from the ground to the highest point of the withers.

Hip Height: the distance from the ground to the highest point of the croup.

Body Length: the distance from the point of the shoulder to the point of the buttock.

Girth: the circumference of the girth behind the elbow and over the highest point of the withers.

Forearm: the distance from the point of the elbow to the accessory carpal bone.

Front Cannon: the distance from the accessory carpal bone to the proximal sesamoids.

Hind Cannon: the distance from the point of the hock (calcaneus) to the proximal sesamoids.

Physis: the circumference of the knee at the metaphysis of the distal radius, just above the accessory carpal bone.

Fetlock: the circumference of the fetlock at the metaphysis of the distal third metacarpal bone, just above the proximal sesamoids.

Body weights, conditions and measurement data were summarized as least squares means and standard errors and plotted over time. Analysis of variance was used to evaluate effects of diets, sampling times and their interaction (SAS, 1988). Regression equations to describe growth rates over time were fit using a graphics program (SlideWrite, 1995). Growth equations for frame size data from the 1994 foals (Chapter ##), were fit to predict the 1995 foal data using SlideWrite (1995).

Results

Body weight and body condition scores (Figures 4.1 and 4.2) were similar in both groups of 1995 foals from birth until weaning and from weaning to sale. In contrast to the foals born in 1994, there was no slump in spring growth in the SS group. Both groups experienced a slump in growth, as evidenced by body weight and condition score from February until May, and then compensated from May until sale.

Wither and hip heights, lengths of body, forearm and cannon bones, girth, and circumferences of the physis and fetlocks were similar for both groups (Figures 4.3, 4.4, 4.5 and 4.6). Comparable to the 1994 data, girth circumference reflected the changes in weight and condition in February to May, however, overall frame size was not influenced.

Growth equations for frame size data from 1994 reasonably predicted data from 1995 for wither height (SS, r = .799; FF, r = .793), hip height (SS, r = .802; FF, r = .796), body length (SS, r = .866; FF, r = .860), forearm length (SS, r = .803; FF, r = .791), front cannon (SS, r = .731; FF, r = .725), hind cannon (SS, r = .748; FF, r = .748), circumferences of physis (SS, r = .784; FF, r = .773) and fetlocks (SS, r = .777; FF, r = .770).

Shedding of the winter coat occurred approximately 2 to 3 weeks later for the yearlings on the SS diet, as compared to the FF diet, although this difference was not as evident in the 1995 foals as in those born in 1994.

Discussion

The average foaling date, weights of the mares after foaling, birth weights and sex of the foals are shown in Table 4.1. The growth rates in the 1995 foals, as evidenced by the similarity in frame size equations, were comparable to those born in 1994. The absence of the spring slump in growth, noted in 1994, may have been due to seasonal differences between years. On February 7, 1996, northern Virginia experienced an uncommonly large snowfall, amounting to a total of over 90 cm of accumulation in blizzard conditions in less than 18 h. For one week, the entire horse herd, totalling over 100 animals, was supplemented only with hay, while the MARE Center staff worked dilgently to thaw automatic waterers and bulldoze paths to the three-sided shelters. For the following two weeks, feed supplements were provided on top of the snow, until the buckets could be found. Observations made at this time also

noted that the FF supplemented yearlings were not adequately using their shelter due to its location in the pasture. As a result, they did not have access to the hay provided in the shelter, and although they were supplemented with additional hay, they did not consume it well, preferring to stand with tails to the wind, not eating.

All of the yearlings dropped in weight and condition during this time, and subjective observation indicated that the FF supplemented fared the worst. This difference, accompanied by erractic changes in weather during spring and early summer, may have caused a growth slump due to weather that masked any differences in growth due to seasonal changes in pasture composition.

Implications

Dietary carbohydrate and fat fed supplementary to pasture may influence growth of foals, but effects may be masked by seasonal variations from year to year. Growth curves were similar in foals born in consecutive years.

Table 4.1. Average foaling date, weights of the mares after foaling, birth weight and sex of the 1995 foals (mean ± SE).

Supplement	Average Foaling Date	Mare Weight, kg	Foal Weight, kg	Sex
SS	05/08/95	568 ± 11	58 ± 1.8	5 colts:5 fillies
FF	05/02/95	546 ± 7	52 ± 1.7	7 colts:3 fillies

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