Characterization of Lactation Curves for Nine Breeds of Cattle Fed Differing Rations

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Introduction

Genetic merit for milk production influences the weight of calf marketed by producers. Higher preweaning weight gains are made by calves from cows that produce high levels of milk. Lactational productivity can influence future levels of herd calf output if the expression of higher genetic potentials for milk production exceeds the nutrient availability for the production environment. For example, if the lactating female energy requirements exceed the available energy resources, then the ability to reinstall the estrous cycle may be delayed. For producers, this delay may result in younger, lighter calves in the following production cycle. Producers using restricted breeding seasons may find that the number of cows conceiving is reduced. If the producer’s management strategy includes culling of once open females, more heifers are required to be retained for replacements, thus reducing the number of young animals for sale.

Previous research has documented that differences exist among breed crosses or breeds of cattle for characteristics associated with lactation. Yield at time of peak lactation and total milk yield during the lactation period vary. Among dairy animals, research has shown that the higher producing animals tend to be in negative energy balance during the first part of the lactation cycle, i.e., in an attempt to achieve their genetic potential milk production, the cows produce more energy in milk than they can consume. Feeding strategies have been or are being developed to circumvent this problem. It is not argued here that genetic potential for milk production of beef breeds is directly comparable to dairy cattle, rather that the range in feed energy environments in which lactating beef cows produce offers a similar opportunity for a negative energy balance to occur. Current recommended feeding standards make recommendations for supplemental feeding based on level of production but ignore the possibility of breed differences.

The object of this study was to quantify breed differences for component traits describing the lactation curve among beef breeds and to characterize the response of these traits to increasing feed energy availability.

Procedure

As part of a comprehensive project to evaluate life cycle production efficiency, lactation records of mature cows representing nine cattle breeds were collected from 1987 through 1990. Breeds included were Angus, Braunvieh, Charolais, Gelbvieh, Hereford, Limousin, Red Poll, Pinzgauer, and Simmental. Sixteen cows of each breed were assigned to the study. All cows had calved a miniature breed, four cows were assigned to one of four energy intakes through 1990. Breeds included were Angus, Braunvieh, Pinzgauer, and Simmental. Sixteen cows of each breed were assigned to the study. At the initiation of the study, cow ages ranged from 5 to 8 yr. Cows were housed in open-front barns with concrete floors.

Cows received a ground alfalfa hay based diet. Composition of the diet is detailed in Table 1. Within each breed, four cows were assigned to one of four energy intake levels during the lactation period: 170, 210, 250 and 290 kcal ME/week. Each cow’s ration was determined by using the weight of the cow at the 6-7 mo of gestation of the year the cow entered the study. The ration was fed daily, with feed consumption summed and recorded weekly for each cow. Samples of feed were taken daily and composited weekly. These composite samples provided material for determination of dry matter and crude protein.

Milk yields were determined approximately five to seven times from 14 to 196 days postpartum by weigh-suckle-weigh techniques. Separation of cows and calves preceded the sampling time by 17 hr. The difference between calf weights prior to and after suckling adjusted to a 24 hr basis provided an estimate of daily milk production of the cow. Suckling continued for approximately 45-60 min following introduction of the calves to their dams. Cow lactation records with fewer than five daily samplings within a production cycle were excluded from the data set. A total of 431 lactations from 179 cows was included in the data set.

To evaluate lactation curve characteristics, individual animal observations were used to develop lactation curves for each cow. From these curves, three traits were determined: time of peak lactation yield at time of peak lactation = 210-day total yield

\[ \text{Time of peak lactation (PK), yield at time of peak lactation (PKYD), and total yield for a 30-week lactation period (TOTAL) were analyzed to determine if differences exist among breeds, level of energy intakes, and the interaction between breed and energy intake. One of the objectives of this study was to determine if the response within a breed to increased metabolizable energy (ME) availability during the lactation period for milk production characteristics differed.} \]

Results

Differences were observed among the nine breeds for PK, PKYD, and TOTAL. Increasing energy intake level increased PKYD and TOTAL but the increase in these traits decreased per unit increased energy intake. The largest increases would be realized at the lower energy intake levels.

Least squares means by breed for all traits are reported in Table 2. Estimated PK (wk) for the Hereford breed occurred earlier than for Angus, Braunvieh and Red Poll, but at a similar time postpartum as the remaining breeds. The Red Poll was similar to the Angus, Braunvieh and Gelbvieh, but differed from the remainder of breeds. The remaining breeds were intermediate and did not differ from one another for PK.

Yield at time of peak lactation was similar for Braunvieh, Gelbvieh, Pinzgauer, and Simmental. These four breeds produced more milk at PK than the British breeds (Angus and Hereford) or Limousin, and Charolais. Total yield of the breeds ranged from approximately 2600 to 4000 lb pooled over energy intake level. Braunvieh yield for a 210 day lactation period exceeded all breeds except for Gelbvieh. The Hereford and Limousin production were similar. Intake level of ME affected all the response variables (Table 3). PK was later for cows fed at 210 kcal ME/week than for cows receiving 170 kcal ME (8.3 ± .3 and 9.2 ± .3; respectively). Cows fed at the higher energy intakes differed from these levels but not from each other. Positive response to PKYD

\[ \text{Yield at time of peak lactation} = 210-day total yield} \]

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