EFFECTS OF DATE OF WEANING ON SUBSEQUENT PERFORMANCE OF BEEF COWS AND THEIR FEMALE CALVES

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1233 April/May born calves were weaned either on 30 Sept. (EW) or 31 Oct. (LW) to assess the effects of weaning date on subsequent performance of their dams and female calves. Cows in the EW group lost less weight than those in the LW group in the month of October (0.003 vs. 0.48 kg d^{-1}, $P<0.05$). Dam's breed group, year and the interaction between year and age of dam also had significant effects on weight change during October. Cows generally lost weight between weaning and the next calving and the two weaning groups were similar in body weight at calving and reproductive performance. The reproductive performance of the EW and LW female calves were also quite similar. It can be concluded that weaning April/May born calves in September rather than October would not influence the subsequent production of the dams or their female calves, but would probably reduce their maintenance requirements as they enter the cold season in better condition.

Key words: Weaning date, beef cows, reproduction, weight changes

[Effets de la date de sevrage sur le rendement subséquent des vaches de boucherie et de leurs veaux femelles.]

Titre abrégé: Effets de la date de sevrage sur le rendement des bovins de boucherie. Nous avons sevré 1 233 veaux nés en avril ou en mai le 30 septembre (EW) ou le 31 octobre (LW) afin d'évaluer les effets de la date du sevrage sur le rendement subséquent des mères et des veaux femelles. Les vaches du groupe EW ont perdu moins de poids que celles du groupe LW en octobre (0,003 comparativement à 0,48 kg j^{-1}; $P<0,05$). Le groupe de races des mères, l'année et l'interaction entre l'année et l'âge de la mère influaient également de façon significative sur le changement de poids observé en octobre. Les vaches perdaient généralement du poids entre le sevrage et la période de vêlage suivante et les deux groupes de sevrage étaient comparables quant à leur poids corporel au vêlage et à leur rendement reproducteur. Le rendement reproducteur des veaux femelles des groupes EW et LW était également passablement comparable. Nous pouvons en conclure que la décision de sevrer des veaux nés en avril et mai en septembre plutôt qu'en octobre n'influera pas sur la production subséquente des mères ni de leurs veaux femelles mais que cela réduira probablement leurs besoins d'entretien puisqu'elles entameront la saison froide en meilleure condition.

Mots clés: Date de sevrage, vaches de boucherie, reproduction, changements de poids.

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Early weaning of spring-born beef calves under certain conditions may be a feasible alternative to the traditional practice of weaning calves in late fall.

Besides providing the necessary time to precondition calves for feedlot before shipment (Basarab et al. 1986), early weaning may be beneficial by giving the cow additional opportunity to regain weight and condition before the onset of winter. The extra gain of the dam as a result of early weaning may also have significant economic value with regard to nonpregnant cows destined to be culled from the herd and shipped for slaughter.

Laster et al. (1973) reported that weaning calves at 55 d of age resulted in 17% higher conception rates compared with cows which nursed their calves during the breeding season. Bellows et al. (1974) also concluded that weaning calves several days after birth shortened the average postpartum anestrus interval to 19.6 d. Positive effects of early weaning on reproductive performance of the cows in the ensuing breeding season have also been reported by Pimental and Deschamps (1979), Suzuki (1980) and Lusby et al. (1981).

Information on the effects of date of weaning on the cow's weight and condition during gestation and her subsequent calving and breeding performance is limited. A study by Richardson et al. (1978) indicated that early weaning resulted in higher weight gain of the dam and consequently a higher incidence of dystocia compared with later weaning. Neville and McCormick (1981) also reported higher weight gain during gestation in cows whose calves were weaned early compared with those in the late-weaned group (67 vs. 230 d of age).

The first part of this study on the effects of weaning date on feedlot performance and carcass characteristics of calves has been reported (Kubisch and Makarechian 1987). The objective of this part of the study was to assess the effects of date of weaning on subsequent performance of the dams and their female calves.

MATERIALS AND METHODS

This study was conducted at the University of Alberta ranch at Kinsella, Alberta. The data were collected during 1982, 1983, 1984, 1985 and 1986. Basarab et al. (1986) used part of the data from 1982 and 1983 in their report. A total of 1233 cow-calf records from three breed groups, namely Beef Synthetic (SY, composed of Angus, Charolais and Galloway breeds), Dairy Synthetic (SD, composed of approximately 2/3 dairy breeds: Holstein, Brown Swiss and Simmental; and 1/3 beef breeds: Charolais, Angus and Galloway) and Crossbred Hereford (XH, at least 50% Hereford genotype) were used in this experiment. A detailed description of the breed groups and management of the herds has been provided by Berg et al. (1986).

Calving season extended through April and May and the calves were raised on pasture without creep feeding. The cows were classified in three age classes; 2, 3 and 4 yr and older based on their ages at calving for this study.

Within each breed group and age-of-dam class, calves were weaned randomly either at the end of September (earlier weaned, EW) or at the end of October (later weaned, LW). At the end of September, all the cows were weighed and while the EW calves were weaned from their dams, the LW calves remained with their dams on pasture until the end of October. At this time all the cows were weighed again and the LW calves were weaned from their dams. After an adjustment period of 3 wk the female calves were fed a limited daily ration of 2.27 kg grass hay and 2.27 kg grain and mineral and vitamin supplement until the following April when they were transferred to pasture. The calves consumed part of the straw which was supplied as bedding and gained on average approximately 0.25 kg d^{-1} $calf^{-1}$ in the dry lot.

During winter, the cows remained on pasture and received hay, straw and grain for approximately 2.5 mo before the start of the calving season. Supplemental feeding continued until the end of the calving season. The average daily supplemental feed consisted of 4 kg grain, 4 kg hay and 3 kg of straw cow^{-1} d^{-1}. The ration provided approximately 25 Mcal of digestible energy and 1.25 kg of crude protein cow^{-1} d^{-1}.

Calvings occurred in April and May. The first calf heifers were scored for ease of calving, and the calves and their dams were weighed within 24 h of birth. The dams were also scored for condition (from 5 to 1) after calving. Cows and virgin heifers (yearlings) from the two weaning groups were

exposed to bulls on 1st July and the breeding season was limited to 45 and 55 d for heifers and cows, respectively. In addition to birth weight, weights of the calves were recorded at weaning. Conception rate of heifers, and calving intervals of cows which remained in the herd long enough to produce their second calves after the experimental weaning, were also recorded. On average, approximately 70% of the cows remained in the herd each year. These cows were reassigned to EW or LW groups randomly.

Least squares analyses of variance for unequal subclass numbers were computed using the General Linear Model Procedure of the Statistical Analysis Sysem (Freund and Littell 1981). Weaning treatment, breed group, age of dam, year and their two-way interactions and individual variation (error) were considered in assessing the pooled data on weight changes of the dams, assuming that the observations were independent from year to year. Sex of the calf was included in the model for studying preweaning gains of calves in the following year. Whenever a source of variation proved to be significant, Student-Neuman-Keuls' multiple comparisons of means were employed as described by Steel and Torrie (1980). Categorical data were analyzed using Fisher's Exact Method as outlined by Keeping (1962).

RESULTS AND DISCUSSION

Weight Changes of Cows in the Period between the Two Weaning Dates

The average daily weight changes of the cows during the period between the two weaning dates (month of October), within breed group and year are presented in Table 1. In general, weight gain or loss during October differed between the two weaning groups within each age class ($P<0.05$); the EW dams consistently gained more (or lost less) weight than the LW group.

Comparison of the weight changes during October over the four years indicated that there was little change in body weight among cows in the EW group in this period (-0.003 kg d^{-1}), as they were no longer nursing, whereas the nursing cows in the LW group lost on average 0.48 kg d^{-1} ($P<0.05$).

Year had a significant effect on weight change during this period, reflecting differences in climatic and pasture conditions in the four years of the study. Weight losses were greater in 1984 as a result of heavy snow fall and unseasonally cold weather conditions. Considering the climatic differences and the fact that weaning dates in the present study were only one month apart, the results of the present study are in agreement with those reported by Richardson et al. (1978) and Neville and McCormick (1981).

In general, the loss in body weight during the month of October (the period between the two weaning dates) was maximum in 2-yr-olds and minimum in 3-yr-old dams (0.36, 1.13 and 0.23 kg d^{-1} for 2-yr, 3-yr and older dams respectively, $P<0.05$). However, the interaction effect of year by age of dam on weight change was also significant ($P<0.05$). The 2-yr-old dams gained less than their older herd mates in 1982, while in 1983 the 4-yr-old and older dams lost more body weight than the younger age groups

Table 1. Least squares means and standard errors of daily weight change of cows in the period between the two weaning dates (kg)

	Age of dam					
	2-yr-old		3-yr-old		4-yr-old and older	
Year	Early weaned	Late weaned	Early weaned	Late weaned	Early weaned	Late weaned
1982	0.08 ± 0.13	0.01 ± 0.12	1.48 ± 0.15	0.97 ± 0.14	1.33 ± 0.10	0.98 ± 0.09
1983	0.15 ± 0.08	−0.18 ± 0.08	0.03 ± 0.09	−0.21 ± 0.09	−0.09 ± 0.06	−0.37 ± 0.06
1984	−1.24 ± 0.14	−1.50 ± 0.14	−1.24 ± 0.18	−1.92 ± 0.16	−1.32 ± 0.09	−2.00 ± 0.13
1985	0.29 ± 0.09	−0.38 ± 0.08	0.37 ± 0.14	−0.55 ± 0.11	0.24 ± 0.08	−0.57 ± 0.06
Total	−0.15*a* ± 0.08	−0.55*b* ± 0.08	0.03*a* ± 0.10	−0.39*b* ± 0.09	0.04*a* ± 0.07	−0.46 ± 0.08

a,b Means with different letters in the same row and for the same age subclass are significantly different ($P<0.05$).

(Table 1), suggesting that the effect of age on weight change in this period depended on climatic and pasture conditions. There was no significant interaction effect of age of dam by weaning treatment on the dam's bodyweight change. Neville and McCormick (1981) reported that the difference in gain between the 2-yr-old dams whose calves were weaned early and late was greater than that of mature dams.

Analysis of the pooled data indicated that generally the loss in body weight was less in the SY cows than those in the two other breed groups in the month of October (0.15 vs. 0.29 vs. 0.27 kg d^{-1} for the SY, XH and SD breed groups, respectively). There was no significant interaction effect of breed group by weaning date on the body weight change in October.

Body Weights in Midwinter and at Calving

In order to determine how long the dams in the EW group maintained their weight advantages over those in the LW group following weaning, body weights of cows measured in January and immediately after calving in each year in the two weaning groups were compared. Comparison of the means of body weights measured in January indicated that, in general, the cows in the EW group tended to be heavier than those in the LW group, although the differences were significant for only 2 yr (Table 2). There was no significant differences between the EW and LW groups in the average weight of cows after calving and condition score at calving, indicating that the weight advantage of cows in the EW group had almost disappeared at the following calving time. However, dams whose calves were weaned earlier tended to be in better condition and except for the 1983 calving season tended to be heavier at calving than those whose calves were weaned later and the difference approached significance level in 1985 ($P=0.08$, Table 2). It is noteworthy that the 1985 calving season was preceded by harsh weather conditions in the fall of 1984 and a colder than normal winter. It is likely that under less favorable pasture and climatic

Table 2. Least squares means and standard errors of body weights of cows in the fall, mid-winter and body weights and condition scores at calving

	Years							
	1982/1983		1983/1984		1984/1985		1985/1986	
Trait	EW	LW	EW	LW	EW	LW	EW	LW
Fall wt†	511 ± 4.4	501 ± 4.2	509 ± 4.0	501 ± 3.9	492*a* ± 6.5	438*b* ± 6.1	503*a* ± 6.2	486*b* ± 5.9
Mid-winter wt‡	490 ± 4.3	478 ± 4.4	514 ± 4.6	502 ± 4.9	468*a* ± 8.4	444*a* ± 7.7	505*a* ± 7.0	485*a* ± 6.8
Calving wt	476 ± 5.9	479 ± 6.0	469 ± 5.6	455 ± 5.9	471 ± 7.8	453 ± 7.0	500 ± 8.1	493 ± 7.5
Condition score§	2.8 ± 0.04	2.7 ± 0.04	3.0 ± 0.03	2.9 ± 0.03	3.1 ± 0.07	3.0 ± 0.06	3.0 ± 0.1	2.9 ± 0.1

†Measured at the end of October.
‡Measured in January (approximately 800 cows).
§Scored at calving.
a,b Means with different letters in the same row and year are significantly different.

conditions, the positive effect of early weaning on the cow's condition would become more apparent.

Considering the average weights of the dams in the two groups at the time of late weaning (end of October) and their subsequent weights following calving within each year, there appeared to be a slight body weight loss regardless of date of weaning during this period. However, under the particular winter feeding management at the University of Alberta ranch, the LW cows were able to compensate to a large extent for their lighter fall weights which had been caused by nursing their calves longer than those in the EW group. Richardson et al. (1978) reported that cows whose calves were weaned early were heavier at calving compared with those whose calves were weaned late. However, the difference in weaning dates was much greater in their study than in the present study.

Effects of Weaning Date on the Dam's Subsequent Performance

One-month difference in weaning date had no significant influence on the subsequent reproductive performance of the cow in terms of percent calf crop or calving interval (Table 3). These results were expected since there had been no significant difference between the EW and LW groups for body weight and condition at calving. Richardson et al. (1978) reported that cows whose calves were weaned earlier were heavier at the next calving compared with the cows whose calves were weaned later, and that the weight advantage of the earlier weaned cows did not affect birth weights of the calves. Nevertheless, they found that the incidence of calving difficulty was higher among the cows whose calves had been weaned earlier.

Calving Performance of the EW and LW Heifer Calves

Subsequent reproductive performance of the EW and LW heifer calves in terms of percent calf crop were not significantly different (Table 4); however, year had a significant influence on the percent calf crop.

There was no significant difference in the incidence of calving difficulty between the two groups of heifers (30% vs. 29.8% for the EW

Table 3. Subsequent reproductive performance of the EW and LW cows

		Earlier weaned		Later weaned	
Year	Number of animals	Calf crop born (%)	Calving interval (days)	Calf crop born (%)	Calving interval
1983 breeding 1984 calving	268	82.3	368.5 ± 1.8	81.9	367.5 ± 1.8
1984 breeding 1985 calving	212	92.0	359.1 ± 2.0	90.0	360.3 ± 2.2
1985 breeding 1986 calving	110	79.7	356.6 ± 6.4	88.2	362.1 ± 6.5

Table 4. Subsequent reproductive performance of EW and LW heifer calves

Subject	Early weaned	Late weaned
Number of heifers	161	150
Calf crop born (%)	68.3	69.3
Incidence of dystocia (%)	30	29.8
Average calf birth date†	110.0 ± 1.4	110.8 ± 1.3
Average calf birth weight (kg)	33.4 ± 0.5	34.3 ± 0.5
Average calf weaning weight (kg)	181.9 ± 2.8	188.5 ± 2.6

†Day 1 = 1 January.

and LW groups, respectively). Birthweights, birthdates and weaning weights of calves born to the two groups of heifers were not affected by the date of weaning (Table 4). Richardson et al. (1978) reported similar findings. The percentages of perinatal calf mortality in the EW and LW groups were 6.4 and 3.9, respectively. Reynolds et al. (1971) and Richardson et al. (1978) reported that the early-weaned heifers had a lower perinatal calf mortality compared with the late-weaned heifers.

It is interesting to note that the cows in the LW group on average lost approximately 14 kg body weight in the month of October while their female calves gained only 6.0 kg more than the EW calves which resulted in a net negative performance value for the cows and calves in this group.

In general, the results of this study suggested that under this management system a 1-mo difference in the date of weaning would not influence the subsequent reproductive performance of the dam and her female calf. The weight advantage of cows in the EW group following weaning compared with the LW group would disappear gradually in the period between November and calving and, therefore, would have no significant influence on the dam's subsequent performance and her calf. The heavier weight of the EW cows entering winter compared with the LW group would, probably, offer greater protection from the rigours of a harsh winter, and would presumably reduce total winter feed consumption, since by the end of winter the EW cows were not significantly heavier than their LW contemporaries. Under Western Canadian conditions winter feed costs for cows are the major expense in maintaining a beef herd.

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