FACTORS INFLUENCING POSTPARTUM REPRODUCTIVE PERFORMANCE OF SANTA GERTRUDIS COWS

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Story in Brief

Ninety-eight pregnant (85 to 160 d of gestation), Santa Gertrudis females at two locations were used to determine the influence of body weight and body condition during gestation and feeding additional energy after calving on reproductive performance. Routine ranch management and feeding procedures were followed except for the feeding of a high energy diet (flushing) to one half of the cows for 28 days commencing 14 days prior to the beginning of the breeding period.

Change in body weight was related to body condition score change in Santa Gertrudis cows. Body weight change accounted for 55 percent of the variation in body condition score change from mid-late gestation to breeding. Flushing reduced body weight and body condition loss after calving but did not influence reproductive performance. Pregnancy rate and ovarian luteal activity were not influenced by weight or condition changes either before or after calving. Precalving weight change influenced the interval from calving to conception. Feeding additional energy did not influence calf weights at breeding or adjusted weaning weights.

(Key Words: Body Condition Score, Cow, Post Partum, Reproduction)

Introduction

About 25-30 percent of the beef cows in the U.S. do not wean a calf each year, primarily a result of cows not conceiving during the breeding period. Postpartum anestrus is a major factor preventing cows from becoming pregnant.

There is a close relationship between body condition score and body energy reserves, and the magnitude of change in body weight and body condition are indicators of subsequent reproductive performance in beef cows. Breed type of cattle influences reproductive and nutritional processes and the relationships between body weight and body condition and reproductive performance may differ between breeds.

The primary objective of this study was to evaluate the relationships between body weight and body condition changes in Santa Gertrudis cows and to relate these parameters to reproductive performance. A second objective was to determine if feeding additional energy after calving influenced reproductive and calf performance.

Materials and Methods

Experiment 1

Fifty-three, first-calf Santa Gertrudis heifers, approximately 3 years of age, located on the King Ranch in south Texas were used in this

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experiment. Heifers calved between December, 1983 and March, 1984 and grazed bluestem pasture. Routine herd management and feeding procedures for the ranch were followed.

Heifers were weighed and body condition score (1=thin, 9=fat) was determined at four periods during the experiment: (1) midgestation (9/20/83), (2) precalving (12/7/83), (3) breeding (4/17/84) and (4) weaning (8/21/84). At the precalving period, one group of heifers was assigned to the control treatment and the second group was designated to receive additional energy supplement (flush). From February 27 to March 26, 1984 (28 d) heifers assigned to the flushed treatment received an additional 5 kg/d (as-fed) of a 12 percent crude protein, 81 percent TDN ration.

The breeding period began March 12, 1984 and ended on August 20, 1984. Two mature Santa Gertrudis bulls of known fertility were used in each treatment group to minimize the influence of bull fertility on reproductive performance. Pregnancy status was determined by rectal palpation at weaning and the interval from calving to conception was calculated by subtracting 283 d from the 1984-1985 calving date.

One blood sample was obtained from each heifer by puncture of the tail vein near the beginning of the breeding period to determine the proportion of heifers with ovarian activity. A concentration of progesterone greater than or equal to 2 ng/ml of serum was considered to be an indicator of ovarian luteal activity. Calves were weighed and identified at birth and remained with their dams on pasture without supplemental grain.

Experiment 2

Forty-five mature, Santa Gertrudis cows located at L&L Farms, in northwest Arkansas, were used in this experiment. Cows calved between March and May 1984 and were maintained on tall fescue pasture from January until September. Cows grazed bermudagrass pasture from September until November. Herd management and feeding procedures for the ranch were followed.

Body weights and body condition scores were determined at four periods during this study: (1) late gestation (1/24/84), (2) precalving (3/9/84), (3) breeding (6/6/84) and (4) weaning (11/27/84). At the precalving period, one group of cows was assigned the control treatment and the other group was designated to receive additional energy supplement (flush). From May 17 to June 15, 1984 (28 d) cows in the flush group received an additional 5 kg/d (as-fed) of a 20 percent crude protein, 81 percent TDN ration.

The breeding period began on May 28, 1984 and ended on August 1, 1984. Cows in each group were mated to one mature Santa Gertrudis bull of known fertility. Pregnancy status was determined at weaning by rectal palpation. The interval from calving to conception was determined by subtracting 283 d from the 1985 calving date. Two blood samples were collected from each cow at an 11 d interval near the beginning of breeding to determine ovarian luteal activity.

Results and Discussion

Body weights were similar for control and flushed heifers in experiment 1 at the start of the experiment (Figure 1) and both groups of heifers were in good body condition (BCS = 6.5). Body weights of

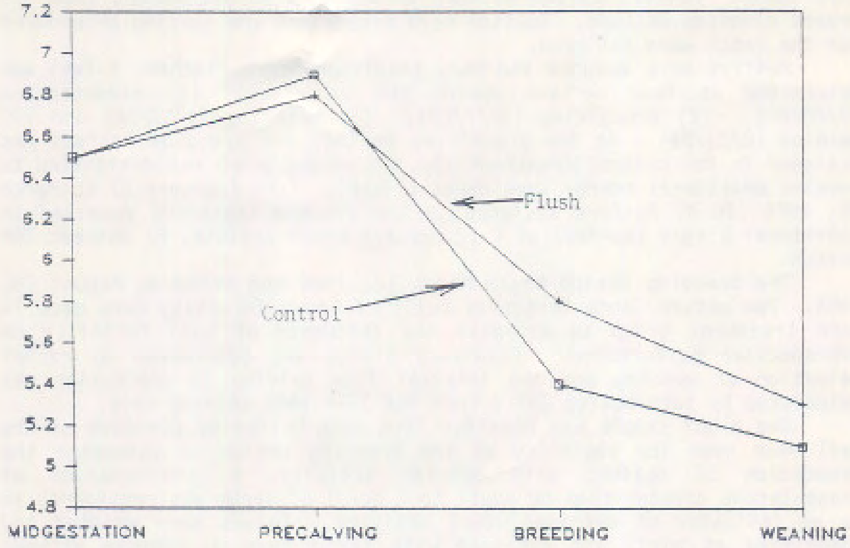

Figure 1. Body weights (kg) of Santa Gertrudis heifers (Experiment 1).

heifers were not measured at the precalving period, however the increase in body condition score for heifers in both groups (Figure 2) would suggest body weight increased from midgestation to precalving.

Short term feeding of additional energy (flushing) affected both body weight and body condition changes of the heifers. Flushed heifers lost less ($P<.009$) weight (-50 kg) compared to control heifers (-77 kg) from midgestation until breeding. Control heifers tended ($P<.13$) to be lighter (469 kg) than flushed heifers (494 kg) near the beginning of breeding.

Changes in body condition were related to weight changes from midgestation to breeding for heifers on both treatments. Flushed heifers lost less ($P<.09$) body condition (-1.0 units of BCS) compared to control heifers (-1.5 units of BCS) from precalving to breeding and BCS was greater ($P<.07$) for flushed heifers (5.8) compared to control heifers (5.4) near the beginning of breeding.

Heifers on both treatments lost body condition from breeding to weaning and condition loss was similar for control and flushed heifers. Body weights were similar for control (475 kg) and flushed heifers (486 kg) at weaning.

The breeding program at the ranch dictated which cows would be assigned to each breeding pasture and nutritional treatment for experiment 2. This assignment resulted in heavier cows on the flush treatment at the beginning of the experiment (649 kg) compared to cows on the control treatment (601 kg; Figure 3). Both groups of cows were in good body condition (BCS = 6.3; Figure 4) at the beginning of the experiment.

From late gestation to precalving, weight change was slightly greater ($P<.07$) for cows assigned to the group to be flushed after

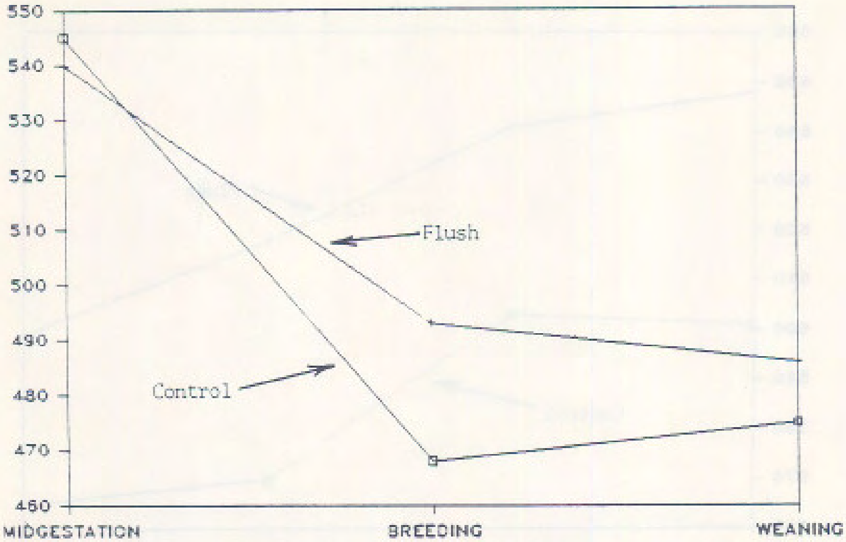

Figure 2. Body condition scores of Santa Gertrudis heifers (Experiment 1).

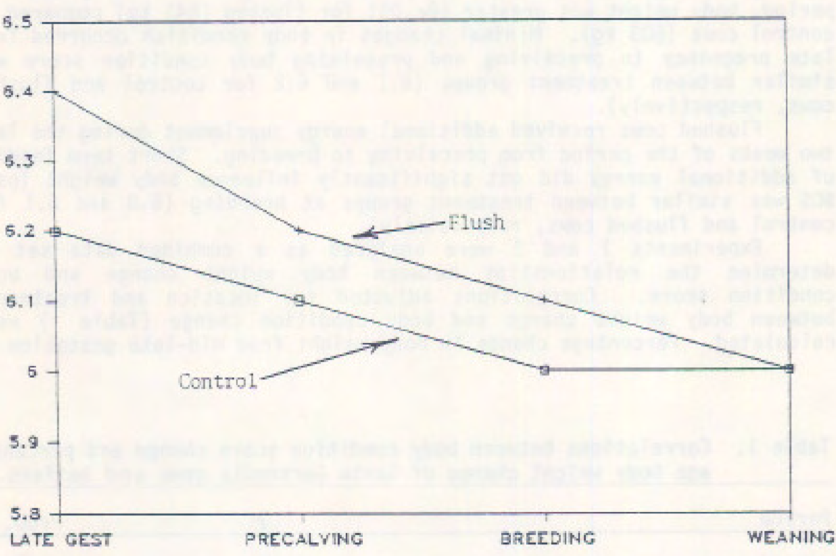

Figure 3. Body weights (kg) of Santa Gertrudis cows (Experiment 2).

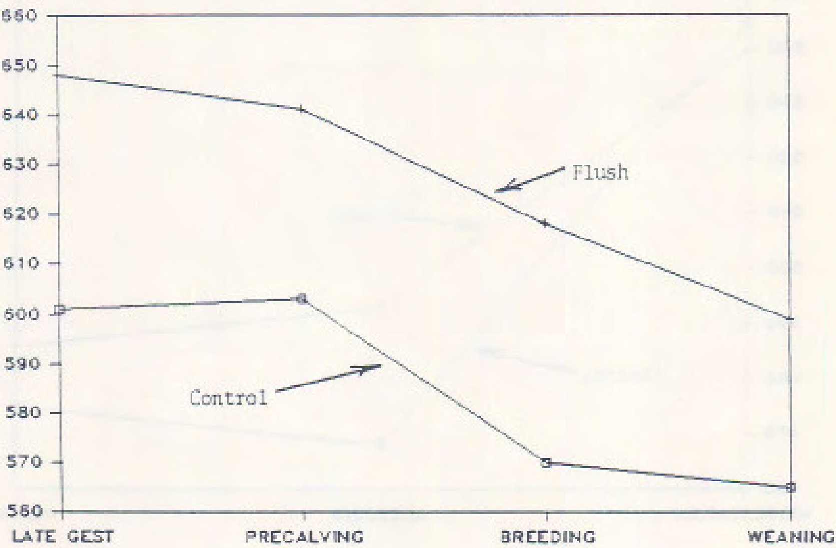

Figure 4. Body condition scores of Santa Gertrudis cows (Experiment 2).

calving (-7 kg) compared to control cows (1 kg). At the precalving period, body weight was greater ($P<.05$) for flushed (641 kg) compared to control cows (603 kg). Minimal changes in body condition occurred from late pregnancy to precalving and precalving body condition score was similar between treatment groups (6.1 and 6.2 for control and flushed cows, respectively).

Flushed cows received additional energy supplement during the last two weeks of the period from precalving to breeding. Short term feeding of additional energy did not significantly influence body weight loss. BCS was similar between treatment groups at breeding (6.0 and 6.1 for control and flushed cows, respectively).

Experiments 1 and 2 were analyzed as a combined data set to determine the relationships between body weight change and body condition score. Correlations adjusted for location and treatment, between body weight change and body condition change (Table 1) were calculated. Percentage change in body weight from mid-late gestation to

Table 1. Correlations between body condition score change and percentage body weight change of Santa Gertrudis cows and heifers.

Period	r	Prob.
Mid-late pregnancy to Breeding	.66	.0001
Breeding to Weaning	.59	.0001
Mid-late pregnancy to Weaning	.71	.0001

breeding accounted for 55 percent of the variation in body condition score change. Furthermore, each 1 unit change in body condition score could be associated with about a 13 percent change in live weight.

Reproductive Performance

Reproductive performance of heifers in experiment 1 is summarized in Table 2. All heifers were in good body condition and excellent pregnancy rates were obtained for heifers on both treatments.

The percentage of heifers with greater than 2 ng/ml of progesterone at the time of bleeding was not influenced by the flushing treatment. Likewise, absolute body weight and body condition either prepartum or near the beginning of breeding did not influence the proportion of heifers with greater than 2 ng/ml of progesterone. Based on the 1984-1985 calving dates, 91 percent and 60 percent of heifers on control and flushed treatments, respectively, had conceived by the time blood samples were taken. It appears that a high percentage of heifers on both treatments had regular ovarian cycles.

Although not significantly different between treatment groups, the interval to conception was slightly greater for flushed heifer (92.5 ± 7.0 d) compared to control heifers (78 ± 5.5 d). The primary factor influencing the interval from calving to conception between treatment groups was days postpartum of heifers at the beginning of breeding. Days postpartum were greater for flushed (54.0 ± 8.1 d) compared to control heifers (35.5 ± 11.7 d). Thus, a greater interval from calving to the beginning of breeding for the flushed compared to the control heifers is the probable cause of the greater interval from calving to conception for the flushed heifers.

The interval from calving to conception was not influenced by BCS at midgestation, precalving or near the beginning of breeding. However,

Table 2. Reproductive performance of Santa Gertrudis heifers (Experiment 1).

Item	Treatment			
	Control		Flushed	
	N[a]		N	
Percentage of heifers with greater than 2 ng/ml progesterone at time of breeding	25	72.0	27	70.3
Pregnancy Rate (%)[b]	25	100	28	96.4
Days postpartum at beginning of breeding for heifers used to determine the interval from calving to conception	12	35.5±11.7[c]	21	54.0±8.1
Interval from calving to conception	12	78.0±5.5	21	92.5±7.0

[a] Number of animals used for the observation.
[b] Determined by rectal palpation at weaning.
[c] Mean ± S.E.

change in body weight from midgestation to precalving affected ($P<.05$) the postpartum interval to conception. Regression analyses indicated that for each 10 percent loss in body weight from midgestation to breeding, the interval from calving to conception increased by 13 days.

Pregnancy rate for all heifers in this experiment was maximal. Thus, the short term feeding of additional energy did not affect the percentage of heifers which became pregnant. The lack of an effect of flushing in this study may be due to the increase in body condition from midgestation to precalving.

Pregnancy rate of heifers was not significantly influenced by body weight, weight changes, body condition and body condition changes at any time during this study. The lack of effect of these factors on pregnancy rate would likely be expected since heifers were in good to moderate body condition both precalving and at breeding.

Reproductive performance of cows in experiment 2 is presented in Table 3. The percentage of cows with ovarian luteal activity near the beginning of breeding was not influenced by treatment.

BCS and changes in BCS before and after calving did not affect the incidence of ovarian activity near the beginning of breeding. This could be expected since changes in body condition from late gestation until breeding were minimal. Ovarian luteal activity was related ($P<.07$) to weight loss from precalving to breeding and ovarian function was greater in cows that lost weight. The reason for this response is not known.

The interval to conception was slightly shorter ($P< .14$) for control cows (78 ± 5.0 d) compared to flushed cows (89.6 ± 4.5 d) but BCS and condition changes did not influence the interval. The interval from calving to conception was affected ($P<.06$) by body weight change from precalving to breeding. For each 10 percent loss in body weight from precalving to breeding, the interval to conception was increased by 16 days.

Table 3. Reproductive performance of Santa Gertrudis cows (Experiment 2).

	Treatment			
Item	Control		Flushed	
	N[a]		N	
Percentage of cows with ovarian luteal activity near the beginning of breeding[b]	17	88.2	28	82.1
Pregnancy rate (%)[c]	17	58.8	28	67.8
Pregnancy rate for cows with ovarian activity near the beginning of breeding (%)	15	66.6	23	82.6
Interval from calving to conception	12	78.5 ± 5.8[d]	19	89.6 ± 4.5

[a]Number of animals used for the observation.
[b]Ovarian activity characterized by concentration of progesterone in serum equal to or exceeding 2 ng/ml.
[c]Determined by rectal palpation at weaning.
[d]Mean $\pm$ S.E.

Pregnancy rate of cows was not influenced by treatment, however, when expressed as a percentage of cows with ovarian activity near the beginning of breeding, pregnancy rate was greater for flushed (82.6 percent) compared to control cows (66.6 percent). Body weight, body condition and changes in weight or condition did not significantly influence pregnancy rate. Cows were in good body condition prior to calving and condition change was minimal from late pregnancy to weaning. Results for both experiments 1 and 2 were similar. Minimal changes in body weight and body condition which occurred resulted in little variation in these parameters, and limited influence of the parameters on reproductive performance.

The less than optimal pregnancy rates of cows on both treatments in experiment 2 probably is related to environmental factors. Cows in this study grazed tall fescue pasture during the breeding season and early pregnancy. An endophytic fungus, which is present in a large percentage of tall fescue, results in toxins which may reduce animal performance. The presence of these compounds has been associated with elevated body temperature and reduced reproductive efficiency.

Tall fescue that is toxic, results in depressed concentration of prolactin in cattle and sheep. To determine whether the less than optimal fertility of cows in experiment 2 may be related to toxic fescue pasture, concentrations of prolactin in serum were quantified in blood samples from cows assigned to experiment 1 (King Ranch) and experiment 2 (L&L Farms). In addition, prolactin was quantified in serum samples from postpartum Angus and Hereford cows at Stillwater, Oklahoma. The samples in Oklahoma were collected during the same weeks as the samples for experiment 2 (Table 4). Concentrations of prolactin were suppressed in cows on experiment 2 that grazed fescue compared with cows in experiment 1 and cows in Oklahoma that grazed pastures composed mostly of blue stem grass. In addition, concentrations of prolactin were less in cows on experiment 2 that did not conceive compared to cows that became pregnant ($P < .10$). Cows that received the additional 5 kg of supplement daily had greater concentrations ($P < .05$) of prolactin than cows that did not receive supplement. Pregnancy rate was also greater for supplemented cows that had ovarian luteal activity at the start of breeding. These data indicate that the less than optimal fertility of cows in experiment 2 may have been related to toxic effects of the fescue pasture that they grazed.

Calf Performance

Feeding of additional energy during breeding did not influence preweaning calf growth in either experiment. In experiment 1, adjusted 205-day weaning weights (242 vs 240 kg for control and flushed calves, respectively) were not significantly different. From the beginning of breeding to weaning, calves on both treatments in experiment 2 were offered a free choice creep ration. Adjusted 205-day weaning weight (254 vs 270 kg for control and flushed calves, respectively) were not significantly different between the treatment groups. Although actual milk production was not measured, it would appear that if adequate forage is available and minimal supplement is provided, calf growth of Santa Gertrudis cows is not increased by feeding additional energy.

Table 4. Concentrations of prolactin in serum of postpartum cows.

Location	Treatment	Date Sampled	No. Cows	ng/ml
King Ranch (Expt. 1)	Pregnant	April 17	20	284±30
L&L Farms (Expt. 2)	Pregnant-Control	June 6, 18	11[b]	52±15
	Pregnant-Flush	June 6, 18	18[b]	75±10
	Non-Pregnant-Control	June 6, 18	7[b]	30±3
	Non-Pregnant-Flush	June 6, 18	11[b]	55±6
Stillwater, Oklahoma	Pregnant	June 8, 15	16[b]	88±8

[a]Samples were obtained during the breeding season and reproductive status was determined 4 to 6 months later. Flush treatment was feeding an addition 5 kg of a 20 percent protein ration daily for 4 weeks.

[b]Two samples were obtained from each cow at a 7 or 12 day interval.