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Evaluating breeding seasons for cows grazing winter range and bahiagrass

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Abstract

Florida native range is grazed in winter and cows are moved to bahiagrass (*Paspalum notatum* Flugge) pasture in March for breeding and calf rearing. Winter weight loss of cows is a major problem, and one possibility to reduce it is to alter the breeding season. This 4-year study evaluated October–February range grazing with movement of cows to bahiagrass in late February for breeding and calf rearing beginning in March (spring-bred cows) vs. December–April range grazing with movement of cows to bahiagrass in May (summer-bred cows). Spring-bred cows weighed less coming off range (439 kg) than summer-bred cows (459 kg), but spring-bred cows gained more weight on bahiagrass (38 kg) by the time calves were weaned than summer-bred cows (1 kg). At weaning, there were no differences in weights of cows. Weight loss of cows on range was related to weight going onto range in the fall (r = –0.62 and –0.49 for spring- and summer-bred cows). Declining nutritive value of bahiagrass and heavy rains in the late summer and early fall appeared to lead to the inability of summer-bred cows to regain weight on bahiagrass. In 2 years, rain interfered with range burning in October which was needed to improve the palatability and nutritive value of forages for spring-bred cows, but this appeared to have no effect on cow performance. Weaning weight of calves from the spring-bred cows (205 kg) tended to be higher than that of calves from summer-bred cows (181 kg). There were no differences in pregnancy rates (74.5%). A March–May breeding season is recommended over a May–July breeding season for cows using a combination of range and bahiagrass.

Key Words: native forages, cattle, reproduction, weight change, management

Resumen

Los pastizales nativos de Florida son apacentados en invierno y en Marzo las vacas se mueven a praderas de "Bahiagrass" para el apareamiento y la crianza de becerros. La perdida de peso de las vacas durante el invierno es un problema importante y una de las posibilidades de reducirlo es modificar la época de apareamiento. En este estudio de 4 años comparamos el apacentamiento en el pastizal de Octubre a Febrero con el movimiento de las vacas a praderas de "Bahiagrass" (*Paspalum notatum* Flugge) a fines de Febrero para el apareamiento y el inicio de la crianza de becerros en Marzo (vacas con apareamiento en primavera) contra el apacentamiento del pastizal de Diciembre a Abril con el movimiento de las vacas a las praderas de "Bahiagrass" en Mayo (vacas con apareamiento de verano). Al dejar el pastizal, las vacas apareadas en primavera pesaron menos (439 kg) que las vacas apareadas en verano (459), pero en las praderas de "Bahiagrass", en el tiempo de destetar los becerros, las vacas apareadas en primavera ganaron mas peso (38 kg) que las apareadas en verano (1 kg). Al destetar los becerros no hubo diferencias de peso en el peso de las vacas. La perdida de peso de las vacas en el pastizal se relaciono con el peso con que llegan al pastizal en el otoño (r = –0.62 y –0.49, para vacas apareadas en primavera y verano respectivamente). La disminución del valor nutritivo del "Bahiagrass" y las fuertes lluvias a fines de verano e inicios de otoño parecen conducir a la incapacidad de las vacas apareadas en verano para ganar peso en las praderas de "Bahiagrass". En 2 años, la lluvia interfirió con la quema del pastizal en Octubre, lo cual es necesario para mejorar la gustocidad y valor nutritivo de los forrajes para las vacas de apareamiento en primavera, pero esto pareció no tener efecto en el comportamiento de la vaca. El peso de destete de los becerros de vacas apareadas en primavera (205 kg) tendió a ser mayor que el de los becerros de vacas apareadas en verano (181 kg). No hubo diferencias e las tasas de preñez (74.5%). Para vacas utilizando la combinación de pastizal -"Bahiagrass" se recomienda la época de apareamiento de Marzo a Mayo en lugar de Mayo a Julio.

The nutritive value of Southeastern range forages is lowest from January to March and highest from April to June (Long et al. 1986, Kalmbacher et al. 1986). Range forages in the winter do not provide sufficient nutrition for lactating beef cows, and cows lose considerable weight and body condition and do not conceive their next calf (Kirk et al. 1945,Hughes 1974). Research has demonstrated that the reproductive performance of cows grazing range year-round can be improved by burning the range in the fall (Duval and Whitaker 1964) and supplementing the cow with cane molasses or cottonseed meal in the winter (Kirk et al. 1974).

To improve calf production further, it has become an accepted practice to utilize range in the fall and winter then move cows to tame pastures in March for breeding (Lewis and McCormick 1971). Because of the higher nutritive value of range forages during the spring (Lewis et al. 1975, Long et al. 1986, Kalmbacher et al. 1986), grazing range during this period then moving cows to tame pastures in May for breeding on tame pasture could better utilize range resources than traditional fall-winter range grazing. Also, October burning is often not possible because of late season rains and high soil moisture. December burning would provide for a more reliable source of higher quality forage for late gesta-

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tion and prepare the cow for summer breeding.

This study evaluated an October to February range grazing period with movement of cows to bahiagrass for breeding beginning 1 March vs. a December to April range grazing period with movement of cows to bahiagrass for breeding beginning 15 May.

Materials and Methods

Approximately 400 ha of south Florida flatwoods range (White 1973) at the Range Cattle Research and Education Center (REC) (27° 26' N, 81° 55' W) were divided into 16 units averaging 25 ha each. Sixteen soils were found on the area with Myakka, Ona, and Pomona fine sands (sandy, siliceous hyperthermic, Aeric [Myakka], Typic [Ona], Ultic [Pomona] Alaquods) predominating. Range was roller chopped for control of saw-palmetto (*Serenoa repens* [Bartr.] Small) and other brush in February and March 1988. Half the range was forested with longleaf (*Pinus palustris* Mill.) and slash (*P. elliotti* Engelm. var. *densa* Little & Dorman) pines, which were thinned in the summer of 1988.

One permanent transect (approximately 250 m) was established in each range unit. Fifty, 0.25 m^2 quadrats were examined in each unburned range unit in which the cows started grazing in the fall of each year (burning and grazing described below). Presence of plants growing in the 50 quadrats was recorded, and aboveground biomass of the following plant groups was clipped at the soil surface and weighed: shrubs, preferred grasses, less desirable grasses, and forbs. Grouping grasses into preferred and less desirable categories was based on earlier research (Kalmbacher et al. 1984). Grasslike plants (i.e., sedges [*Cyperus* L. spp.]) were combined with less desirable grasses. Plant components were dried in a forced-air oven at 60°C for 72 hours and reweighed to determine dry matter content.

In January 1993, 76 Brahman-crossbred cows (mostly Braford, 4 to 12 years of age) were randomly assigned to 1 of 2 breeding season herds. A spring-bred herd was exposed to 2 Braford bulls for 90 days beginning 1 March. A summer-bred herd was exposed to 2 Braford bulls for 90 days beginning 15 May. From each of the above herds, 32 pregnant cows were selected to start this study in the fall of 1993, which was continued for 4 years. A schedule of range and cattle management practices followed annually is presented in Table 1.

In October and December cows were placed on range for the spring and summer breeding season treatments, respectively. Eight cows were randomly assigned to 4 blocks (replications) in each treatment. For the spring-bred treatment 32 mature Braford cows were placed on range every year. For the summer-bred herd, 32 cows were used in the first and third years, but 28 cows (7 per subgroup) were placed on range in the second and fourth years due to the lack of cows.

Over 4 years, 19 and 17 bred, mature, pregnant Braford cows from a surplus cow herd maintained year round on bahiagrass were added to the spring- and summer-bred herds, respectively, as replacements. Due to the lack of pregnant cows and the need to maintain stocking density, 10 and 8 open cows were used in the spring-bred herd, and 8 and 6 open cows were used in the summer-bred herd in the third and fourth years, respectively. Six cows in each breeding season treatment either died (reason unknown) or were removed from the study for reasons unrelated to treatment. Five cows in the spring-bred herd and 7 cows in the summer- bred herd were palpated as pregnant but were not observed to calve.

Cows from each treatment in each block were grazed on 25 ha of unburned pine-palmetto, flatwoods range. After 2 months, cows were allowed to graze an additional 25 ha of burned range (Table 1). Range was burned in October and December for the spring and summer breeding season treatments, respectively. Range units did not receive the same grazing/burning treatments throughout the 4 years, as the 8 range units (2 units x 4 blocks) grazed by 1 treatment in 1993–94 would be grazed by cows in the other treatment in 1994-95, etc.

Two weeks before the start of each breeding season, cows were removed from range, combined as 1 group (32 or 28 cows), and grazed on two, 16-ha bahiagrass pastures (Table 1). Cows from each group remained on separate 16 ha bahiagrass pastures until placed on range in October or December, respectively, for the spring and summer breeding herds. Herds alternated bahiagrass pastures over years. Bahiagrass was fertilized annually in late February with 55 kg N/ha. Cows in each breeding season herd were exposed to 2 Braford bulls for 90 days. Bulls were semen tested annually.

Spring- and summer-bred cows were fed a cane molasses-urea supplement on range from mid-December to mid-February and from early-March to early-May (average of 68 days), respectively. This supplement contained 18% crude protein (CP) and 60% total digestible nutrients (TDN) (as-fed basis) and was formulated with 955 g molasses/kg and 45 g urea/kg. Molasses-urea was fed twice weekly on a free-choice basis in 1-m diameter open troughs at 2.3 kg/cow/day (as-fed basis). Molasses provided 414 g of CP and 1.4 kg of TDN/cow/day, which was 44% and 25%, respectively, of the requirements of lactating cows (National Research Council 1996).

For the first 68 days on bahiagrass (Table 1), cows in both breeding season herds were fed a molasses-natural protein

Table 1. Schedule for management of range and cattle for breeding season treatments.

Item	Breeding season[1]	
	Spring	Summer
Cows/treatment	32	32[2]
Cows removed from bahiagrass and placed on range	4 October	1 December
One-half of range burned	October	December
Cows given access to burned range	December	February
Began molasses-urea supplementation	9 December	1 March
Average calving date	9 January	3 April
Cows and calves removed from range and placed on bahiagrass	15 February	7 May
Began molasses-natural protein supplementation	15 February	7 May
Bulls placed with cows	1 March	15 May
Stopped molasses-natural protein supplementation	24 April	14 July
Bulls removed from cows	30 May	13 August
Calves weaned and cows pregnancy checked	24 August	17 November

[1]Breeding seasons were March–May for spring and May–July for summer.
[2]For the second and fourth years, 28 cows were placed on range due to a lack of animals.

Table 2. Monthly rainfall at the Range Cattle Research and Education Center from 1993 to 1997 compared to the 50-year monthly means.

Year	Months												
	J	F	M	A	M	J	J	A	S	O	N	D	Total
	(mm)												
1993	148	48	139	158	48	167	174	107	91	148	6	27	1261
1994	74	37	102	17	58	226	185	301	511	83	47	66	1707
1995	71	36	38	128	47	413	315	210	139	208	61	17	1683
1996	90	28	98	45	117	139	47	199	53	86	6	31	939
1997	35	20	39	217	62	116	316	138	215	60	285	219	1722
50-yr[1]	53	66	78	59	99	217	223	207	180	76	46	47	1351

[1]Kalmbacher and Linda 1994.

supplement which contained 15% CP and 63% TDN (as-fed basis). It was formulated from 860 g molasses/kg, 70 g feather meal/kg, and 70 g cottonseed meal/kg. Molasses slurry was fed to provide natural protein in place of urea during the breeding season. Molasses slurry was fed twice weekly on a free-choice basis in 1-m x 2.8-m open troughs at 2.3 kg/cow/day (as-fed basis). Cows had free-choice access to a loose mineral mixture year-round which contained 25% NaCl, 12% P, 1% Fe, 0.13% Cu, 0.03% Co, 0.05% Mn, 0.10% Zn, 0.04% I, and 0.0016% Se.

Calf date of birth, but not calf birth weight, was recorded. Cows were weighed and body condition scored before being placed on range, upon removal from range, and when calves were weaned (Table 1). Body condition scores were visual evaluations based on a range of 1 to 9, with 1 = very thin cows, 5 = cows in average condition, and 9 = very fat cows (Herd and Sprott 1986).

Calves were weighed and weaned in late-August and mid-November for the spring and summer breeding herds, respectively (Table 1). Calf weaning weights were adjusted for sex and to a mean weaning age of 230 days as follows: Adjusted weaning weight = ((actual weaning weight + (average weaning weight - average weaning weight by sex))/(calf age at weaning in days)) * 230. Cows were pregnancy checked by rectal palpation when calves were weaned.

Cow weights and body condition scores on and off range were analyzed as a split plot in time with whole plots as years and subplots as breeding seasons in 4, randomized complete blocks (SAS 1985). This model was used for range forage mass and frequency of occurrence of selected plant species. Significant year x breeding season interactions for range data were examined with the p-diff option (SAS 1985). Relationships between cow weight going onto range and weight loss on range were examined with CORR and GLM procedures (SAS 1985). Cow weights and body condition scores of cows at weaning and calf weaning weights were analyzed as a randomized complete block with years as blocks because there were no true bahiagrass replicates within years. Response variables in all analyses were means over cows in a block or quadrat in a transect. Duncan's multiple range test was used to separate means for year. The difference in pregnancy rate between breeding seasons and years was tested with the Chi-square procedure.

Results

Vegetation

Late summer and early fall rain (Table 2) made it impossible to burn range in October 1994 and 1995 for the spring-bred cows grazing range, but burning was always done in December for the summer-bred cows. When we were not able to burn in October 1994, those units were burned according to schedule which was December 1996. When we could not burn in October 1995, those units were burned after cows came off range in February 1996.

There was an average of 98 plant species encountered on the range over 4 years. Major preferred grasses were creeping bluestem [*Schizachyrium scoparium* (Michx.) Nash var. *polycladus* (Scribner & Ball)], chalky bluestem (*Andropogon capillipes* Nash.), and maidencane (*Panicum hemitomon* Schult.). The chance of finding these 3 grasses in a quadrat (4-year mean) was 36%, 22%, and 15%, respectively, and these probabilities were not affected by year, breeding season, or their interaction. Because breeding season treatments alternated over years between range units in a block, this indicates those cows from the breeding season treatments had similar grasses and would not have affected the composition of the range vegetation. Frequency of occurrence of saw-palmetto, the major shrub, was not affected by year or breeding season and averaged 40%. Broomsedge (*Andropogon virginicus* L.), wiregrass (*Aristida stricta* Michx.), and *Dichanthelium* spp. (Hitchc. & Chase) Gould were major less desirable grasses with average frequency of occurrence at 33%, 25%, and 65%, respectively. Frequency of occurrence of less desirable grasses was not affected by year or breeding season. Goldenrods (*Solidago* L. *and Eupatorium* L. spp.) were major forbs whose frequency of occurrence averaged 33%.

Forage mass of all biomass groups except forbs depended on year (Table 3), with greater mass in 1995 compared to other years. This was due to the inability to burn in October 1994. Forb biomass was not affected by year or breeding season.

Cow weights and body condition on range

Spring-bred cows weighed less coming off range than summer-bred cows, and there was an effect due to year (Table 4). Average weight of cows off range was higher in 1993–94 compared with

Table 3. Biomass of preferred and less desirable grasses, shrubs, forbs and for total biomass of herbaceous plants.

Item	Year				SE
	1993	1994	1995	1996	
	(kg/ha)				
Preferred grasses	630 b[1]	630 b	990 a	760 b	90
Less desirable grasses	660 b	660 b	1570 a	840 b	48
Forbs	320 a	460 a	370 a	440 a	70
Total grasses and forbs	1610 b	1750 b	2930 a	2040 a	205
Shrubs	1940 b	1990 b	2980 a	1770 b	265

[1]Means within a row followed by the same letter are not different (Duncan's multiple range test, P>0.05).

Table 4. Effect of breeding season on the performance of cows grazed on Florida range in winter followed by breeding and calf rearing on bahiagrass. 1994–1997.

Item	Breeding season (BS)[1]		Year				SE	Level of Probability		
	Spring	Summer	1993–94	1994–95	1995–96	1996–97		BS	Year	Year x BS
Number of cows	125	115								
Cow weight to range, kg[2]	491	487	514	464	464	513	11.9	0.72	0.09	
Cow condition to range[3]	5.6	5.3	5.8	5.1	5.0	5.8	0.2	0.26	0.09	
Cow weight off range, kg[4]	439	459	475	431	437	453	18.7	0.05	0.002	0.98
Cow condition off range[3]	4.3	4.5	4.9	3.7	4.4	4.7	0.3	0.41	0.004	0.72
Cow condition loss on range	–1.2	–0.8	–0.9	–1.4	–0.7	–1.0	0.3	0.01	0.10	0.13
Cow weight at weaning, kg[5]	475	460	459	445	486	476	12.5	0.30	0.27	
Cow weight change on bahia, kg	38	1	–11	15	52	23	13.0	0.06	0.13	
Cow condition at weaning[3]	5.4	4.6	4.6	4.2	5.9	5.3	0.5	0.24	0.26	
Cow condition change on bahia	1.1	0.2	–0.2	0.6	1.6	0.5	0.5	0.15	0.24	
Calf weaning weight, kg[6]	205	181	186	197	183	208	10.4	0.12	0.43	
Pregnancy, %	76.4	72.6	89.5	65.0	69.0	—[7]	—	0.59	0.01	

[1]Breeding seasons were March–May for spring and May–July for summer.
[2]Average date off bahiagrass was 4 Oct. for spring- and 1 Dec. summer-bred cows.
[3]Body condition scores were visual observations ranging from 1 to 9; with 1 = very thin, 5 = average, and 9 = very fat (Herd and Sprott 1986).
[4]Average date off range was 15 Feb. for spring- and 7 May for summer-bred cows.
[5]Average date at weaning was 24 Aug. for spring- and 17 Nov. for summer-bred cows.
[6]Weaning weight adjusted to 230 days of age. Actual average age of calves at weaning was 227 and 228 days for spring-bred and summer-bred cows, respectively.
[7]Data only for first 3 years. In 1996–97, summer-bred cows not exposed to bulls in order to prepare for subsequent study.

1994–95 and 1995–96 with 1996–97 being intermediate (Table 4). Breeding season had no effect on body condition scores of cows coming off range, but year had an effect (Table 4). Cows had the highest body condition scores in 1993–94 and lowest scores in 1994–95 with other years intermediate. Cow body condition loss on range was greater for the spring-bred cows than for summer-bred cows (Table 4).

There was a trend for cow weight loss on range to depend on the breeding season x year interaction (P = 0.07). This interaction occurred because spring-bred cows lost more weight on range than summer-bred cows in 1993–94 and 1996–97 with no difference between breeding seasons for intervening years (Table 5). Weight loss on range for spring-bred cows was greatest, but not different, in 1993–94 and 1996–97, with the least loss in 1995–96. For summer-bred cows, weight loss on range was greatest in 1996–97 and least in 1993–94, with intervening years not different from the extremes.

Cow weight and body condition on bahiagrass

There were no differences between breeding seasons or years for cow weights or body condition scores at weaning (Table 4). There were no differences between breeding seasons or years for cow weights or condition scores at the end of the bahiagrass grazing period when cows were returned to range. Calf weights tended (P = 0.12) to be higher for spring-bred compared with summer-bred cows. There were no differences in pregnancy rates.

Discussion

Because summer-bred cows lost less weight and were in better condition than spring-bred cows during the range grazing period, it would appear that grazing range later into the spring best utilized native forage resources. The problem was that the higher body weight and better body condition scores of cows when removed from range in May, as compared with February, were not maintained, probably due to a declining nutritive value of bahiagrass from April to November (Sumner et al 1991). As a consequence, in the cycle of a year, summer-bred cows were similar to spring-bred cows in weight and condition, yet summer-bred cows produced an average 24 kg lighter (P = 0.12) calf at weaning.

We believe declining nutritive value of bahiagrass is largely responsible for the overall poorer performance of the summer-bred cows and their calves compared with spring-bred cows. Declining nutritive value of bahiagrass in summer and the resulting poor cattle performance has been well documented (Moore et al. 1969, Prates et al. 1975). Spring-bred cows could take advantage of higher nutritive value of bahiagrass early in the growing season. While available forage is initially low (averaging about 800 kg/ha) in March to May for bahiagrass fertilized with 55 kg N/ha, it contains about 11% CP and 53% TDN (Sumner et al. 1991). From May to July, bahiagrass becomes relatively abundant, averaging 1,200 kg/ha with 9% CP and 52 % TDN (Sumner et al. 1991). From August–November, available forage is greatest, averaging 1,400 kg/ha, but CP and TDN declines to 7% and 46%, respectively (Sumner et al. 1991). The requirement of lactating cows is 10% CP and 58% TDN (National Research Council 1996). Heat, insect pests, and flooding further depress livestock performance in August and September, and the term "summer slump" is often used to describe it (Sollenberger et al. 1988, Williams et al. 1991). During all of this period, summer-bred cows were nursing calves, while

Table 5. Effects due to year x breeding season interactions for cow weight lost on range.

Item	Year			
	1993–94	1994–95	1995–96	1996–97
	(kg)			
Cow weight loss on range				
Spring breeding season[1]	–64 ab[2]	–41 bc	–28 c	–74 a
Summer breeding season	–12 b	–26 ab	–27 ab	–47 a
Probability of a difference between breeding seasons within years	0.001	0.27	0.97	0.05

[1]Breeding seasons were March–May for spring and May–July for summer.
[2]Means for years within a breeding season followed by the same letter are not different (P > 0.05).

calves from spring bred cows were weaned in late August.

In August to November 1994 and 1997, the Range Cattle REC received 942 and 698 mm of rain, respectively, well above the 509 mm 50-year mean (Table 2). Pastures were flooded and summer-bred cows lost 42 and 5 kg, respectively. Their calves were 53 and 19 kg lighter at weaning in 1994 and 1997, respectively, than calves nursed by spring-bred cows. August to November 1995 and 1996 were drier years with rainfalls of 618 and 344 mm, respectively, and summer-bred cows gained 11 and 39 kg on bahiagrass, but their calves were 5 and 14 kg lighter at weaning than calves nursed by spring-bred cows.

Although cows in both breeding season treatments lost weight on range every year (Table 5), the degree of weight change on range is not explained by the range environment. Greater weight losses for spring- compared with summer-bred cows in 1993–94 and 1996–97 do not coincide with expected differences in forage quality (lower in years when October burns were not possible for spring-bred cows), in winter rainfall (Table 2), or available biomass (Table 3). We do not have an explanation for these deviations in cow weight loss on range from anticipated results.

Weight loss of cows on range appeared to be partially explained by cow weight going onto range. Over all years, correlation coefficients for the relationship between the weight of spring-bred cows going onto range and weight loss on range was $r = -0.62$ ($P = 0.0001$, $n = 125$) compared with $r = -0.49$ ($P = 0.0001$, $n = 115$) for summer-bred cows.

Conclusions

Spring-bred cows grazing range from October to February lost more weight than summer-bred cows grazing range from December to May. While there was no difference in pregnancy rates between cows in the 2 breeding season treatments, calves nursed by spring-bred cows tended to have heavier weaning weights. The problem with summer breeding appears to be related to the low nutritive value of bahiagrass and the hot, wet conditions that face cows and calves in late summer and early fall. Calves are weaned from spring-bred cows before this time and the cows return to range, while summer-bred cows and their calves remain on bahiagrass.

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