Stair-step strategy for yearling beef heifers in Florida

Philipe Moriel – Associate Professor, Beef Cattle Nutrition and Management
UF/ IFAS – Range Cattle Research & Education Center, Ona, FL

Published in *The Florida Cattleman and Livestock Journal*, December 2022

Altering post-weaning growth has been used to increase reproductive success of *Bos taurus* heifers. For example, beef heifers were developed to achieve an even weight gain from weaning until breeding (EVENGAIN) or achieve a low weight gain from weaning until 45 days before breeding followed by a high weight gain in the final 45 days before breeding (LOW-HIGH). This strategy of low weight gain followed by high weight gain is called **Stair-Step** and is usually implemented to explore compensatory gains that occur when nutrition level is increased immediately after a period of nutrient restriction. In that study (Lynch et al., 1997), LOW-HIGH heifers had greater first-service conception rate compared to EVENGAIN heifers (71% vs. 56%). It is important to highlight that the study described above used *Bos taurus* heifers. The study described below was funded by the Florida Cattle Enhancement Board and implemented the stair-step approach in *Bos indicus* crossbred heifers (Brangus) developed in hot and humid conditions of south Florida (Table 1).

In September of each year, Brangus heifers were allocated into bahiagrass pastures. Treatments consisted of: heifers supplemented with concentrate dry matter at 1.50% of body weight from September until the start of the breeding season in December (**CON**); or stair-step heifers offered concentrate dry matter at 1.05% of body weight from September to October, and then, concentrate dry matter at 1.95% of body weight from October until the start of the breeding season in December (**SST**). So, in average, both treatments were supplemented with concentrate dry matter at 1.50% of body weight from September to December (22% crude protein and 73% total digestible nutrients).

Total supplement dry matter offered to heifers was the same between treatments. In terms of growth performance, average daily gain from September to October did not differ between treatments but was greater for SST vs. CON heifers from October to December, leading to greater overall average daily gain and greater body weight at start of estrus synchronization protocol for SST heifers compared to CON heifers. Intravaginal thermometers were inserted into heifers to determine the intravaginal temperatures every 30 min from Sep 7th to 12th (top panel in Figure 1) and Nov 6th to 12th (bottom panel in Figure 1).

In September, SST heifers had significantly lower intravaginal temperatures from 0930 h to 1800 h compared to CON heifers, which is likely a result of lower heat production in their rumen

and partially explains the lack of treatment effects on heifer average daily gain from September to October, despite the drastic differences in supplement amount offered during this period. In November, supplement amount did not affect intravaginal temperature of heifers, which likely prevented energy waste to deal with heat stress and allowed the greater average daily gain of SST heifers compared to CON heifers. Percentage of pubertal heifers at the start of the synchronization protocol and pregnancy rates to AI did not differ between treatments. However, final pregnancy rate and percentage of heifers calving within the first 21 days of the calving season were greater for SST heifers compared to CON heifers (Table 1). Therefore, the stair-step strategy successfully increased overall growth performance and enhanced the final percentage of pregnant beef heifers and percentage of heifers calving early in the calving season, without increasing the total amount of concentrate consumed. Hence, the stair-step supplementation strategy was a viable nutritional management strategy for *Bos indicus*-influenced beef heifers developed in subtropical/tropical environments.

Table 1. Growth and reproductive success of heifers grazing bahiagrass pastures and assigned to receive concentrate dry matter supplementation at 1.50% of body weight from September to December (**CON**) or concentrate dry matter supplementation at 1.05% of body weight from September to October and 1.95% of body weight from October to December (**SST**).

	Supplementation strategy			
Item	**CON**	**SST**	**SEM[1]**	***P*-value[2]**
Body weight, lb				
September	548	546	4.2	0.91
October	608	604	4.2	0.49
December (start of breeding season)	670	685	4.2	0.01
March (end of breeding season)	835	852	4.2	0.007
Average daily gain, lb/day				
September	1.23	1.17	0.06	0.35
October	1.21	1.61	0.06	<0.0001
December (start of breeding season)	1.23	1.39	0.04	0.01
March (end of breeding season)	1.50	1.52	0.04	0.74
Total concentrate offered, lb/heifer	925	934	13.4	0.66
Pubertal heifers in December, % of total	73.5	75.7	4.82	0.76
Pregnant heifers, % of total				
AI	39.1	47.1	6.11	0.36
Final	84.4	94.8	3.62	0.04
Calving within 21 days of calving season, % of total	59.2	76.4	0.06	0.05

[1]SEM = standard error of the mean, which measures how far the sample mean (average) of the data is likely to be from the true population mean, and it is calculated by the standard deviation (measure of variability relative to its mean) divided by the square root of the sample size.
[2]*P*-value = probability value, which indicates the probability that there is no statistical significance between the observed treatment means. The lower the *P*-value, the greater the statistical significance of the observed difference. A *P*-value of 0.05 or lower is considered statistically significant.

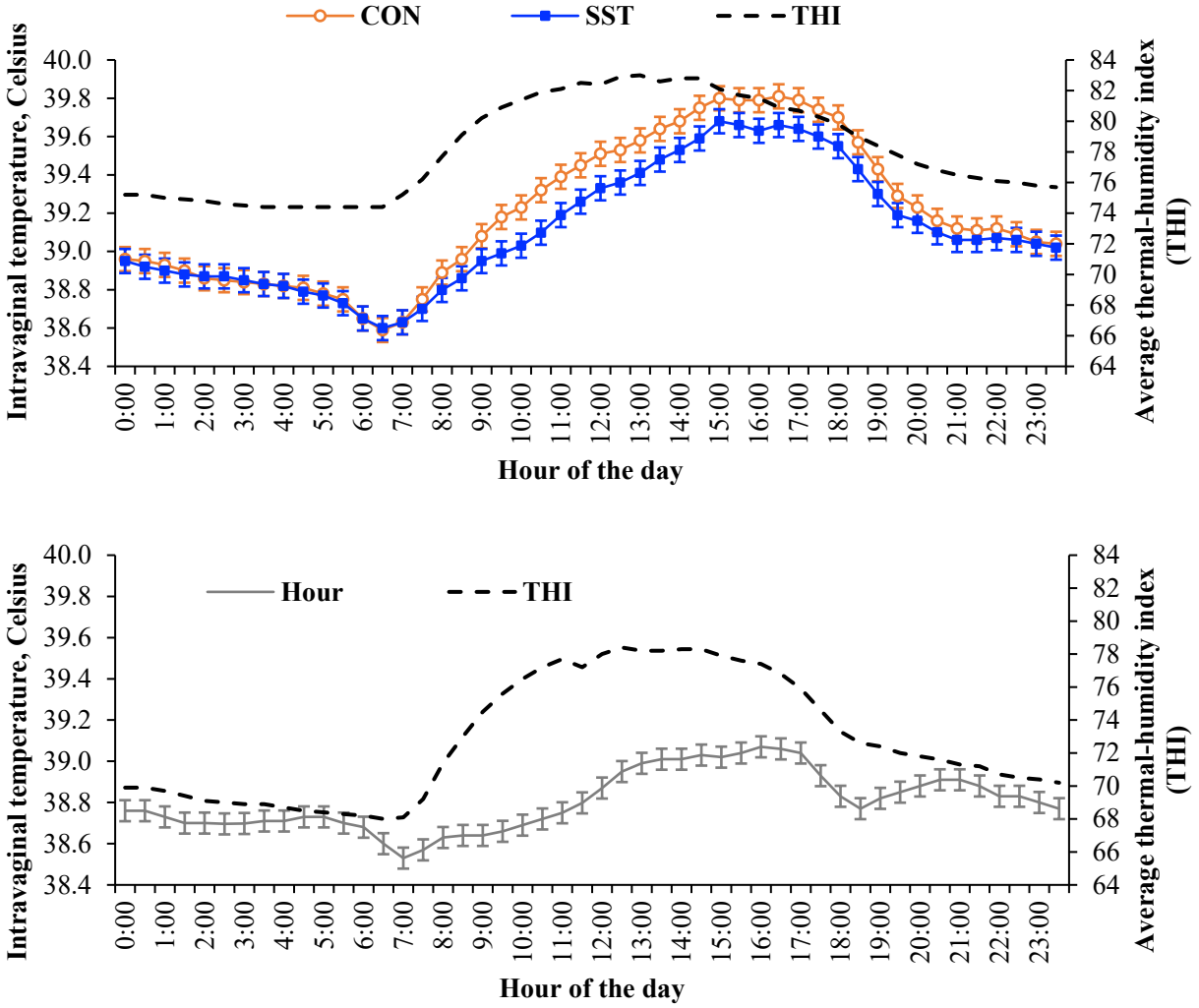

Figure 1. Intravaginal temperature and temperature humidity index (THI) in September (top panel) and November (bottom panel) of heifers assigned to receive concentrate dry matter supplementation at 1.50% of body weight from September to December (**CON**) or concentrate dry matter supplementation at 1.05% of body weight from September to October and 1.95% of body weight from October to December (**SST**).