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Post-weaning nutrition and puberty induction protocol for beef heifers in Florida

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Martin et al. (2008) J. Anim. Sci. 86:451-459

261 MARC II heifers (one quarter each Angus, Hereford, Simmental, and Gelbvieh)

INTENSIVE = Developed to achieve 55% of mature BW before a 45-day breeding season.

RELAXED = Developed to achieve 50% of mature BW before a 60-day breeding season.

Item	Intensive	Relaxed
Meadow hay	9.8 lb	12.2 lb
Protein supplement	2.92 lb	1.10 lb
Corn	1.54 lb	-
Supplement intake, % of body weight =	0.8%	0.2%

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Supplement intake, % of body weight =	0.8%	0.2%	
Item	**Intensive**	**Relaxed**	**P-value**
Prebreeding mature weight, %	56.5	50.9	<0.0001
Pubertal at start of breeding season, %	52.1	34.9	0.39
Pregnancy rate, %	89.8	87.2	0.51

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Author	Journal	Citation	Supplementation	ADG lb/day	Mature BW %	Pregnancy %
Arthington et al (2004)	Prof Anim Sci	20:282-285	6.0 lb Molasses slurry	0.97	53.7	76.3
			5.2 lb Range cubes	1.04	54.0	49.2
Cooke et al. (2007)	J Anim Sci	85:2564-2574	4.6 lb Molasses slurry	0.66	52.0	58.0
			5.0 lb Citrus pulp	0.88	53.0	60.0
Cooke et al. (2008)	J Anim Sci	86:2296-2307	5.7 lb SBH-based supp.	0.73 0.90	48.6 49.4	50.0 60.0
Cooke et al. (2009)	J Anim Sci	87:3403-3412	6.0 lb SBH-based supp.	1.10 1.28	64.0	60.0
Moriel et al. (2012)	J Anim Sci	90:2371-2380	5.0 lb SBH-based supp.	0.59	51.5	16.6
Moriel et al. (2014)	J Anim Sci	92:3096-3107	1.5% BW SBH supp.	1.67	58.9	60.0
				1.41	73.0	89.0
Martins et al. (2016)	Prof Anim Sci	32:302-308	6.0 lb Molasses slurry	0.37	50.0	49.5

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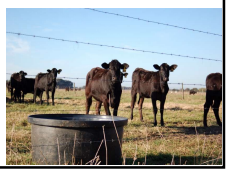
Experimental design

- Angus × Brahman crossbred heifers
  - n = 60 heifers/year; 3 years (2013 to 2016)
  - BW = 557 ± 66 lb
  - Age = 310 ± 18 d
  - 12 bahiagrass pastures (0.8 ha/pasture)



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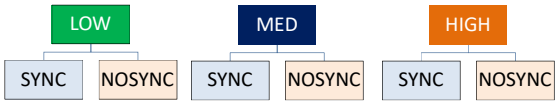
Treatments – 3 x 2 Factorial Design



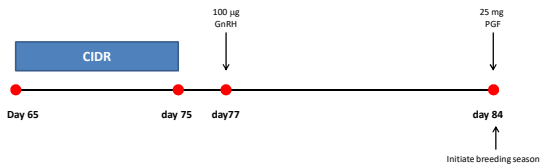
- Target gain **1.00 lb/day**
- **55%** of mature weight at breeding

- Target gain **1.61 lb/day**
- **63%** of mature weight at breeding

- Target gain **2.20 lb/day**
- **70%** of mature weight at breeding

Treatments – 3 x 2 Factorial Design

Item	Daily supplement intake LOW	MED	HIGH
Ingredient, lb/day (Dry matter)			
Molasses	1.50	2.20	3.11
Crude glycerin	1.50	2.20	3.11
Dried distillers grains	0.59	1.30	2.29
Soybean meal	0.31	0.66	1.15
Ca carbonate	0.011	0.020	0.040
Phosphoric acid	0.011	0.020	0.040
Supplement intake, lb/day	3.92	6.39	9.74
Supplement intake, % of average body weight	0.6	1.0	1.5
TDN, %	81.1	81.3	81.4
Crude Protein, %	13.2	15.4	16.8
Calcium, %	0.54	0.55	0.56
Phosphorus, %	0.36	0.40	0.43



Cost:
CIDR = $10/heifer
GnRH = $2/heifer
PGF= $2/heifer
Labor = $1/heifer/day

Total = $18/heifer

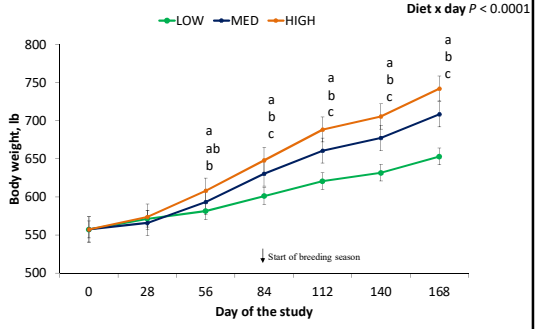
Yearling bulls from December to March

Results – Average daily gain

	Diet Low	Med	High	SEM	*P*-value Diet	Synch
ADG, lb/day						
Sep to Oct (0 to 28)	0.25[a]	0.31[a]	0.70[b]	0.110	0.02	0.82
Oct to Nov (28 to 56)	0.41[a]	1.00[b]	1.19[b]	0.101	<0.0001	0.09
Nov to Dec (56 to 84)	0.66[a]	1.31[b]	1.46[b]	0.100	<0.0001	0.78
Dec to Jan (84 to 112)	0.59[a]	0.93[b]	1.27[c]	0.108	0.001	0.43
Jan to Feb (112 to 140)	0.48[a]	0.73[b]	0.77[b]	0.009	0.10	0.83
Feb to Mar (140 to 168)	0.78[a]	1.12[b]	1.36[c]	0.088	0.002	0.95
Overall ADG	0.55[a]	0.90[b]	1.12[c]	0.044	<0.0001	0.91
Total Supp. Cost, $/head	$115	$188	$286			

[a-c] Within a row, means without a common superscript differ ($P \leq 0.05$)

Results – Body weight



[a-c] Within a day, means without a common superscript differ ($P \leq 0.05$)

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Overall ADG	0.55[a]	0.90[b]	1.12[c]	0.044	<0.0001	0.91
Target ADG	1.00	1.60	2.20			
	55.0%	56.3%	50.9%			

[a-c] Within a row, means without a common superscript differ ($P \leq 0.05$)

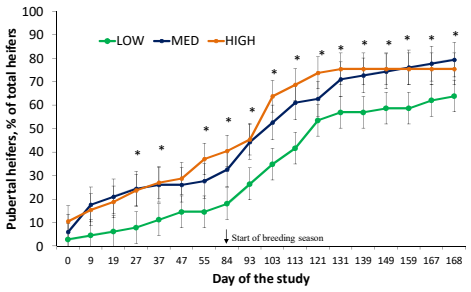
Results – Average daily gain

	Diet				P-value	
	LOW	MED	HIG	SEM	Diet	Synch
Body weight day 84, % of mature weight	53.7[a]	57.6[b]	58.6[b]	2.40	<0.0001	

[a-b] Within a row, means without a common superscript differ ($P \leq 0.05$)

Results – Puberty achievement

Diet x day $P < 0.0001$



*Within a day, MED and HIG vs. LOW ($P \leq 0.05$)

Results – Average daily gain

	Diet					P-value
	LOW	MED	HIG	SEM		Diet
Weight at puberty, lb	610[a]	650[b]	654[b]	8.4		0.006
Age at puberty, days	428[a]	404[b]	401[b]	7.0		0.01
Body weight day 84, % of mature weight	53.7[a]	57.6[b]	58.6[b]	2.40		<0.0001

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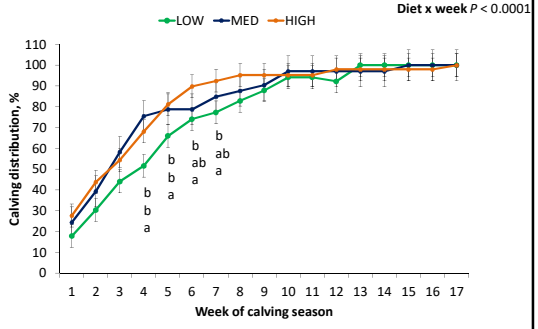
Body weight day 84, % of mature weight	53.7[a]	57.6[b]	58.6[b]	2.40		<0.0001
Pregnancy rate, %	64.2	70.8	70.3	8.56		0.68
Calving rate, %	60.7	57.0	61.9	8.46		0.85
Calving date, day of year	277	273	271	4.2		0.53
Total Supp. Cost, $/head	$115	$188	$286			

[a-b] Within a row, means without a common superscript differ ($P \leq 0.05$)

Results – Calving distribution



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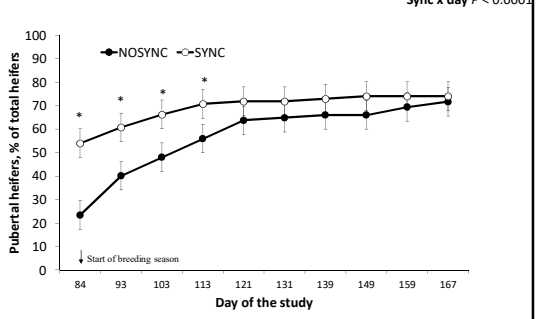
Results – Puberty achievement



*$P \leq 0.05$

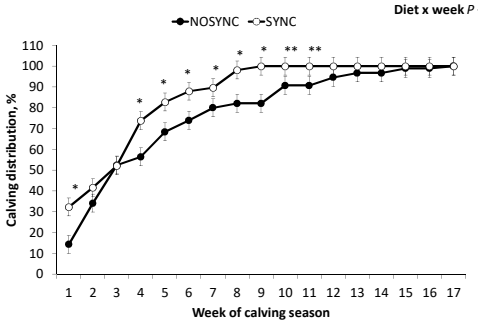
Results – Average daily gain

	Diet				Synchronization			P-value	
	LOW	MED	HIG	SEM	NOSYNC	SYNC	SEM	Diet	Synch
Weight at puberty, lb	610[a]	650[b]	654[b]	8.4	650	628	8.4	0.006	0.05
Age at puberty, days	428[a]	404[b]	401[b]	7.0	423	399	5.7	0.01	0.004
Body weight d 84, % of mature weight	53.7[a]	57.6[b]	58.6[b]	2.40	56.9	56.5	2.37	<0.0001	0.68
Pregnancy rate, %	64.2	70.8	70.3	8.56	67.5	69.3	7.80	0.68	0.79
Calving rate, %	60.7	57.0	61.9	8.46	55.6	64.1	7.68	0.85	0.24
Calving date, day of year	277	273	271	4.2	279	268	3.5	0.53	0.02

[a-b] Within a row, means without a common superscript differ ($P \leq 0.05$)

Results – Calving distribution

Diet x week $P < 0.0001$



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Pregnancy rate, %	64.2	70.8	70.3	8.56	67.5	69.3	7.80	0.68	0.79
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Calving date, day of year	277	273	271	4.2	279	268	3.5	0.53	0.02

100 heifers
Cost of SYNC = $18 x 100 = $1800

+9% calving rate = 9 calves x 80% weaning rate x 500 lb x $1.3/lb = $4680

Balance = $2880

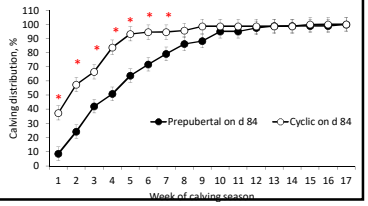
[a-b] Within a row, means without a common superscript differ ($P \leq 0.05$)

At breeding = Prepubertal vs. Cyclic heifers

Day 84 = start of breeding season

	Status at initiation of breeding season			
Item	Prepubertal	Cyclic	SEM	P-value
% mature weight day 84[1]	56.2	57.2	2.38	0.28
Age on day 84, days	307	315	4.21	0.003
Overall pregnancy[1] %	55.4	87.4	11.7	<0.0001
Overall calving[1] %	51.0	72.2	11.6	0.009
Calving date, day of year	280	265	3.6	0.004
Calf birth weight, lb	55	57	4.6	0.13

[1]Adjusted to age on day 0



*$P \leq 0.05$

Summary

- Growth rate X puberty induction protocol not detected for any variables
- Success of puberty induction did not dependent on post-weaning growth.
-Overall ADG of heifers less than the estimated by NRC (2000).

- Increasing post-weaning growth performance:
- Increased attainment of puberty
- Increased percentage of females calving early during the calving season
- No impact on pregnancy and calving rates

- Puberty induction before the initiation of breeding season:
- Increased puberty achievement
- Numerically increased overall calving percentage
- Increased percentage of heifers calving during early-calving season

Major limiting factor for reproductive success of *Bos indicus*-influenced heifers:
Late attainment of puberty

Thank you

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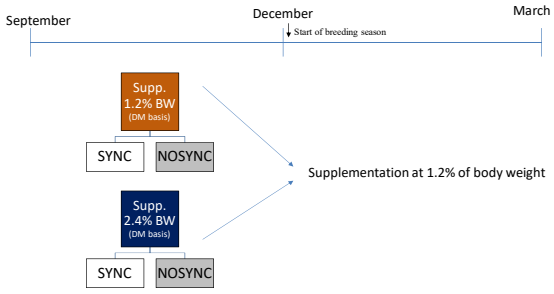
863-735-1314

2017-2018 study

- 2 years, 60 heifers/year
- 2 x 2 factorial design



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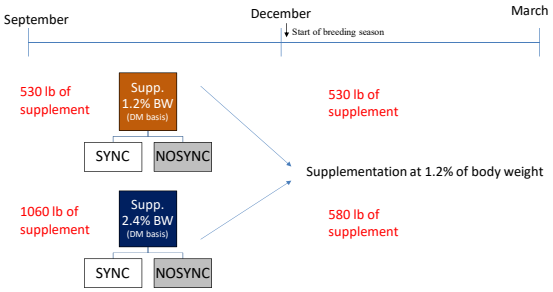

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