

Effects of plane of nutrition and age at start of nutritional treatment on body growth, onset of puberty, corpora lutea function and fertility in Boran x Friesian heifers

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The objective was to determine the effects of plane of nutrition and age at the start of nutritional treatment on body growth, reproductive development and function in Boran x Friesian heifers. Heifers (n = 47) were divided into early or late age groups with mean (\pm SEM) age and body weight 6.7 \pm 0.52 and 12.4 \pm 0.64 months and 96.9 \pm 3.4 and 122.5 \pm 3.5 kg, respectively. Within age group, heifers were allocated to a high (HPN) or a low (LPN) plane nutrition based on body weight, kept in group pens and provided with grass hay, water and mineral licks *ad libitum*. Heifers on HPN and LPN were fed concentrate until first conception at a rate of 1.60 and 0.70 % of body weight. Concentrate intake was determined daily. Heifers were continuously observed and teaser bulls assisted in oestrus detection. Ovaries were examined per rectum once a week for cyclic activity and blood samples were collected twice weekly until pregnancy was established for determination of plasma progesterone concentrations. Puberty was determined using combined data from observation, rectal palpation and plasma progesterone concentrations.

Heifers on HPN had higher supplementary diet intake (3.3 \pm 0.13 vs 1.4 \pm 0.13 kg/day) and faster growth rate (ADG) to puberty (440 \pm 16.7 vs 333 \pm 17.1 g/day ; P<0.001) than those on LPN. Age at the start of supplementary feeding did not influence both feed intake and growth rate. Puberty occurred earlier (P<0.01) in heifers on HPN than on LPN. Between 13 and

20 months of age, 46 and 5 % of the heifers on HPN and on LPN attained puberty. Body condition score at puberty was better (P<0.01) in heifers reared on HPN than on LPN. There were no differences between treatment groups in body weight, withers height, heart girth and pelvic area at puberty. Body weight at puberty was correlated with withers height (0.82) and heart girth (0.90) at puberty. Plasma progesterone profiles revealed that non-puberal oestrus and ovulations without oestrus were observed in 24.6 and 35.4 % of the heifers before the onset of puberty without any influence of plane of nutrition. Pregnancy to first service was higher (P>0.05) in heifers reared on HPN than on LPN (40.0 vs 26.5 %) and in heifers which started nutritional treatment early than late (38.8 vs 27.5 %). Embryonic mortality occurred in 24 and 39 % of the heifers reared on HPN and LPN (P<0.01) and in 27 and 32 % of the heifers which started nutritional treatment at an early than at late age. Heifers reared on HPN conceived about six months earlier (P<0.01) than those on LPN, but without any difference in body weight at first conception. Results from this study showed that plane of nutrition during the pre-conception period influences body growth and reproductive development and functions in heifers. Early first calving in heifers could ensure an earlier economic return to smallholder dairy producers in tropical environments. However, the effect of early calving on lactation performance and postpartum reproduction has to be evaluated.

Variables	High plane nutrition		Low plane nutrition		SEM
	Early	Late	Early	Late	
ADG, g/d	430.1 ^a	449.0 ^a	334.3 ^b	332.1 ^b	22.61
Pubertal traits					
Age, mo	24.5 ^a	24.8 ^a	26.7 ^a	30.0 ^b	11.53
Body weight, kg	278.9 ^a	284.6 ^a	276.9 ^a	284.9 ^a	11.54
Body condition score,	5.9 ^a	6.8 ^a	4.7 ^b	6.1 ^a	0.30
Conception					
Age, mo	25.6 ^a	28.3 ^a	30.8 ^b	34.6 ^b	2.01
Body weight, kg	290.9 ^a	332.0 ^a	304.6 ^a	323.1 ^a	14.32
Pregnancy to 1st AI, %	54.6 ^a	25.0 ^b	23.1 ^b	30.0 ^b	
Embryonic mortality, %	15.4 ^a	33.3 ^b	38.5 ^b	40.0 ^b	

Within a row, figures followed by different superscripts differ (P<0.05).