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Effect of Season, Birth Weight and Weaning Weight on the onset of Puberty of Primiparous Friesian X Bunaji Heifers

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Target Audience: Dairy farmers, Animal Scientists

Abstract

A study was conducted to determine the effect of season, birth weight and weaning weight on the onset of puberty of 31 crossbred (Friesian & Bunaji) calves born from 1999 to 2005. The parameters considered were season of birth, birth weight, weaning weight body weight from 12-27 month of age and age and weight at puberty. Birth weight and weaning weight of the calves were grouped into intervals and its effects were studied on both the age and weight at puberty. Season showed a significant (P<0.05) effect on birth weight, weaning weight and age at puberty with late rainy season having the highest birth weight and weaning weight. The result showed that birth weight and weaning weight had a significant (P<0.05) influence on age and weight at puberty while weaning weight only significantly influenced weight at puberty. It can be concluded that season of birth significantly influenced birth weight, weaning weight and age at puberty while birth weight and weaning weight showed significant effect on age and weight at puberty.

Keywords: Season, Birth weight, Weaning weight, Puberty, Primiparous, Friesian x Bunaji heifers.

Description of Problem

Puberty is a gradual quantitative phenomenon rather than an acute and qualitative endocrinological event. It occurs when the gonads begin to secrete sufficient steroids to accelerate the growth of the genital organs and the development of reproductive secondary sexual characteristics. Age at puberty is a major determinant of lifetime reproductive efficiency of beef cows; however, the cost of achieving this varies among breeds and among heifers within the same breeds (1).

Early attainment of puberty is one of the important traits in achieving optimum reproductive performance of cattle (2). Research conducted during the past 20 years had documented the major endocrine events leading to first ovulation in heifers. The most critical event being the prepubertal increase in Luteinizing Hormone (LH) secretion and environment influences timing of puberty onset of beef heifers. Nutrition and

season are two of the better defined variables that have been studied. Age at puberty is inversely related to plane of nutrition (2, 3, 4).

The effect of nutrition on sexual maturation involves effects on timing of the prepubertal increase in LH secretion and seems to involve the LH pulse generating system located in the hypothalamus. Seasonal conditions of early (birth to 6 months of age) and late (6 to 12 months of age) postnatal periods also influence timing of onset of puberty in heifers.

An inadequately fed female animal grows slowly and hence the onset of her oestrus cycle is delayed. Very large numbers of tropical cattle subsist on a low level of nutrient intake for long periods during the year. As a consequence, the first effective heat period of heifers are often delayed until they are 2 years or older. The environmental factors such as seasons, temperature, humidity and length of day light affect the reproductive performance of cattle.

This study therefore, is aimed at determine the effect of season, birth weight, weaning weight and growth rate on the age and weight at puberty of primiparous Friesian x Bunaji heifers.

Materials and Methods

Location of Study

The study was conducted on the dairy herd of National Animal Production Research Institute (NAPRI), Shika, Ahmadu Bello University Zaria. National Animal Production Research Institute is situated at 20.96km along Zaria to Sokoto road, on $7^{o}30^{1}$ and $11^{o}20^{1}$N at an attitude of 640m above sea level and lies within the northern guinea savanna with annual rainfall of about 1086mm, which falls generally between May and October.

During the wet season, relative humidity and daily temperature average 72% and 25^{o}C respectively. Following the rainy season is a period of dry, cool weather "Harmattan" which marks the onset of dry season. This extends from mid-October to January. The dry seasons last from November to May and are characterized by very hot weather conditions. At this period, daily temperature range from 21^{o}C to 31^{o}C while relative humidity is about 21%.

Experimental Animals

Data were collected on 31 Crossbred (Friesian x Bunaji) heifers born from 1999 to 2005, they include calving date, birth weight, weaning weight, age at puberty and weight at puberty.

The calves were reared on concrete floor in group line and raised by bucket feeding system, sometime suckling is also allowed. During this time, the calves were allowed to suckle from their dams for 4 to 5 days post partum, after which they were separated. They were then fed fresh whole milk from an open bucket base on their body weight until 3 months of age or when they weigh between 60-70kg. The calves also received

concentrates diet and good quality roughages. The concentrate mixture composed of Cotton Seed Cake, Maize, Maize bran, Wheat bran, Bone Meal and common Salt. Hay and Mineral salt lick were also given until the calves attained 6 months of age after which they join the yearling herd.

Routine deworming of the calves was carried out at the beginning and end of each wet season. The calves were sprayed twice a week against ectoparasites during the wet season and once weekly during the dry season. The calves were also vaccinated against contagious bovine pleuro pneumonia and brucellosis.

All data collected were subjected to the analysis of variance using the General Linear Model (5). The significant means were separated using the Duncan Multiple Range Test (DMRT).

Result and Discussion

The effect of season on birth weight, weaning weight, age at puberty and growth rate is shown in Table 1. The result showed significant ($P<0.05$) differences in mean birth weight, weaning weight and age at puberty between seasons. The season of birth show a significant ($P<0.05$) difference on age at puberty with late dry season (Feb to April) having the highest mean of 42.67 months, early rainy season having the least age at 29.6 months. Late rainy season (Aug to October) had the highest mean for both birth and weaning weights. The least birth weight was recorded in late dry season while early dry season had the lowest weaning weight. The significant ($P<0.05$) effect of season on birth weight recorded in this study is attributed to abundant feed resources available to the dams before and during calving, this has been reported by many workers (6, 7). The significant effect of season on birth weight and weaning weight observed in this work agrees with earlier report of (8).

Season of birth had no significant ($P>0.05$) effect on age at puberty even though there was a significant difference on age at puberty across the seasons. Table 2 shows the effect of birth weight on age at puberty and weight at puberty. The birth weight showed a significant ($P<0.05$) effect on age and weight at puberty.

Table1. Effect of Season on birth weight, weaning weight and growth rate of primiparous Friesian x Bunaji heifers

Season of birth	Birth weight (Kg)	Weaning Weight (kg)	Age at puberty (months)	Growth rate (g)
Early rainy season (May-June-July)	16.3[ab]	66.67[ab]	29.6[c]	0.58
Late rainy season (Aug.-Sept-Oct)	18.0[a]	72.56[a]	32.33[b]	0.64
Early dry season (Nov-Dec-Jan)	16.71[ab]	56.29[b]	29.43[c]	0.50
Late dry season (Feb-Mar-April)	13.67[b]	68.17[ab]	42.67[a]	0.60
SEM	0.68	2.27	1.71	0.18

[a,b,c] Means on the same column with different superscripts are significantly different (P<0.05)

Age at puberty was significantly (P<0.05) affected by birth weight. The birth weight range of 12-14kg and 21-23kg were significantly higher than other birth weight groups. The highest weight at puberty (322.50kg) was observed from heifers with the highest birth weight (24-26kg) while the lowest weight at puberty (243.15kg) was recorded from heifers with low birth weight (12-14kg). This implies that the growth rate of calves during pre-weaning periods of life is positively related to their birth weight, the heavier the calves' birth weight, the faster will be their rate of gain especially at pre-weaning periods (9), 10 however, added that plane of nutrition also had a positive effect.

Table 2. Effect of Birth Weight on the age at Puberty and Weight at Puberty of primiparous Friesian x Bunaji heifers

Group interval of birth weight: kg	Number of Animal	Age of puberty: mean (months)	Weight of Puberty(kg)
(12-14)	5	36.23[a]	243.15[b]
(15-17)	7	29.11[b]	265.11[ab]
(18-20)	6	26.40[b]	275.20[ab]
(21-23)	6	36.67[a]	271.33[ab]
(24-26)	7	27.0[b]	322.50[a]
SEM		1.657	7.652

[a,b] Means on the same column with different superscripts are significantly different (P<0.05)

Table 3 indicates the effect of weaning weight on age and weight at puberty. Weaning weight had no significant (P>0.05) effect on age at puberty, although the weaning weight group of 40-49kg recorded a higher age at puberty (42.00 months) while 80-89kg weaning weight had the least age at puberty (28.00 months). This did not agree with earlier reports which indicated that there is a strong relationship between weaning weight and age at puberty (1). Weight at puberty was significantly (P<0.05) higher for heifers weaned at 70-79kg and 80-89kg compared to those weaned at 30-39kg. Weight at puberty of weaning weight groups of 40-49kg, 50-59kg and 60-69kg were similar. This is in agreement with earlier studies that pre-weaning and post-weaning average daily gain have a significant effect on age at puberty and weight at puberty (7, 11).

Table 3. Effect of weaning weight on age at puberty and weight at puberty of Primiparous Friesian x Bunaji heifers.

Intervals of weaning weight (Kg)	Number of Animals	Age at puberty (months)	Weight at puberty (Kg)
30-39	4	31.00	190.00^{b}
40-49	8	42.00	231.00^{ab}
50-59	3	30.75	240.50^{ab}
60-69	5	31.67	267.56^{ab}
70-79	5	32.01	274.08^{a}
80.-89	6	28.00	294.00^{a}
SEM		1.84	7.59

^{a,b} Means on the same column with different superscripts are significantly different (P<0.05)

Conclusion and Application

1. Age at puberty is a major determinant of lifetime reproductive efficiency of cows.
2. The major factors affecting the onset of puberty are body weight and growth rate rather than age.
3. This study has shown that Season, birth weight and weaning weight have significant effect on the onset of puberty of primiparous Friesian x Bunaji heifers.

References

1. Szabo, F. and Nazy, D. (2009). The effect of breed, age of dam, year of birth, season of birth and sex on weaning weight of beef calves. *Dairy Science 22:333*
2. Alberro M.(1990), Comparative performance of F1 Friesian x Zebu Heifers in Ethiopia. J. *Anim. Prod. 37:247-252*

3. Ingallis, J.E., Rothlis, P and Koch, R.M. (2001). Effect of heterosis on age and weight at puberty of beef heifers. *Trop. Anim. Prod. Invest.* 7:207-213.

4. Roy I., Nelms, O.H and Borgar, J.K. (2002). Pre weaning and post weaning growth and puberty of heifers. *J. Agric. Ed. Chem.* 38:24-29.

5. SAS (2002), Statistical Analysis System Users guide 8th *Edition, SAS Institute, Inc, Carry, NC, USA*

6. Steve B (1999). Management of heifers for productivity and Cost control. *J. Anim. Sc. 21:18 - 20*

7. Laster D.B; Glimp H.A and Gregory K.E (2000). Age and Weight at puberty and

conception in different breed and breed crosses of Beef Heifers. *J. Anim. Sci. 34:1031-1036*

8. Szabo F. Nagy L. Dakay I. Marton D. Torok M. Bene S. (2003) Environmental effects of Pre-weaning Performance Traits of Devon Cattle in Rio Grande do Sul. *Animal Production 38:23*

9. Powell S.E. and Aberle E.D.1999. Effects of Birth weight on growth and carcass composition of swine. *World Animal Review 45:56-58*

10. Macneil M.D and Unick J.J (2002). Characteristics of line 1 Hereford female resulting

from selection by independent culling level for below average birth weight and high yearling weight. *Journal of Experimental Agriculture . iv :186-196*

11. Wolfe M.W. Stumph T.T., and Wolfe M.L. (2003) The effects of selection for growth traits in bovine females. *J. Anim. Sci. 68(6):1595-1606*