**REPRODUCTIVE BEHAVIOR OF BOS INDICUS FEMALES IN A SUBLTROPICAL ENVIRONMENT. II. GESTATION LENGTH IN BRAHMAN CATTLE**

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Bos indicus cattle have been under improved management for a relatively short period of time and data on the length of gestation for cows of this species are rare. Such data apparently are lacking for the American Brahman in the Gulf Coast area.

Workers from India, the Philippines and East Africa (Littlewood, 1937; Sarao and Manresa, 1941; Anantakrishnan et al., 1952; Lazarus and Anantakrishnan, 1952; Hutchison and Macfarlane, 1958) reported that the average gestation periods for different Bos indicus breeds range between 282 and 289 days. Reports from Brazil (Veiga et al., 1946; Briquet and De Abreu, 1949), Honduras (Haines, 1961) and South Africa (Joubert and Bonsma, 1959; Van Graan and Joubert, 1961) reflected slightly longer intervals for Zebu populations or new breeds based on Zebu foundation stock. They reported gestation periods averaging 291 to 295 days for different Bos indicus breeds. Thus, there is an indication that calves of many Bos indicus breeds are carried in utero longer than Bos taurus calves, for which Lush (1945) reported an average gestation period of 282 days.

The purpose of this study was to obtain information on the distribution of gestation length in Brahman cattle at two ranches in South Florida as well as to determine how much of the variation was caused by location, sex and sire effects.

**Materials and Methods**

This study was based on breeding and calving records for the years 1949 through 1961, and 1956 through 1961, respectively, from two registered Brahman herds kept under good management in south Florida. During the breeding and calving season the one-sire breeding herds were observed once daily by ranch personnel. Observations on breeding dates, estrous behavior and birth dates of calves were recorded. Sire and sex of each calf were known. When two or more breeding dates were listed, only the last two were considered for this study. The gestation period was calculated from the date of breeding and calving. For 255 calves, two breeding dates were recorded, and only that gestation period which was closest to the expected mean was considered. Forty-seven gestation periods were excluded because they did not fall within the empirically possible range of 250 to 371 days. A total of 1,323 observations were included (figure 1). Only 1,048 gestation periods falling in the range of 271 to 310 days were subjected to a statistical analysis. After excluding 29 gestation periods resulting from sires which were not represented by four or more calves or both sexes, 1,019 observations remained to be analyzed for location, sex and sire effects. A total of 514 male and 505 female calves were sired by 40 different bulls. Adjustment was made for disproportionate subclass numbers according to the method given by Goulden (1952). The following model was used employing an electronic computer program:

\[ Y_{ijk} = \mu + F_i + S_j + (FS)_{ij} + E_{ijk} \]

Where \( Y_{ijk} \) is the gestation period corresponding to the \( k \)th calf in the \( ij \)th subclass, \( \mu \) is the population mean, \( F_i \) is the effect of the \( i \)th sire, \( S_j \) is the effect of the \( j \)th sex, \( (FS)_{ij} \) is the interaction of the \( i \)th sire and the \( j \)th sex, \( E_{ijk} \) is the individual effect on the \( k \)th interval in the \( ij \)th subclass; \( i = 1, \ldots, 40, \) and \( j = 1, 2 \).

**Results and Discussion**

Based on observations made once a day under field conditions, the data recorded includes errors which evolve from the following sources: (1) Estrus may have been observed after conception took place in a few cows, resulting in a calculated gestation period which was shorter than the real one. (2)
Conception may have occurred one or more cycles after the last recorded breeding date, resulting in a calculated gestation period being longer than actual gestation. (3) The calf was not found at the day of birth, thereby causing a slight increase in the calculated period above its real value. (4) Errors concerning animal identification.

Under the conditions in which these data were recorded it appears that the last two sources of error are of minor importance. Error (1) and especially error (2) definitely affected these data. Cows show signs of estrus after conception as reported by Hutchinson and Macfarlane (1958), who found that 7.2% of 209 Zebu cows were mounted or bred by bulls after they had conceived. This phenomenon has also been mentioned by Brakel et al. (1952) and Knapp et al. (1940) for Bos taurus cattle. Errors evolving from these facts would partly explain the values in the lower range.

It appears from figure 1 that these data include a number of gestation periods which resulted from unobserved service after the date used for calculating length of gestation. There is a second peak in the frequency distribution approximately the length of one cycle beyond the modal length. The frequency distribution shows that the range for 1323 gestation periods was 240 to 371 days, which is in the neighborhood of the range given by Van Graan and Joubert (1961) for Africander. They found 477 gestation periods resulting from artificial insemination to range from 247 to 358 days, averaging 291 days. These data, however, showed an unrealistic number of periods beyond the mode of 291 days. This was concluded to be caused by the second source of error. Assuming 20 days to be the average estrous cycle, 79% of all gestation periods were distributed within a range of two cycles (271 to 310 days) centered around the mode. The mean of these 1048 periods was 292.7 days. The range of one cycle around the mode (281 to 300 days) included 888 periods (67.1%) and had a mean of 291.7 days. Although exact parameters cannot be derived from these data, the average gestation period for this population appears to be between 291
and 293 days. These results compare well to other reports on the length of gestation in *Bos indicus* cattle.

Briquet and De Abreu (1949) reported a mean length of 292.0±1.0 days for gestation periods of Nellore, Gir and Guzerat in Brazil. Haines (1961) found 40 Nellore and Guzerat calves to be carried in utero an average of 292.9 days. Veiga et al. (1946) calculated a value of 291.4±0.5 days for 254 Brazilian Nellore pregnancies. Workers in South Africa (Joubert and Bonsma, 1959; Van Graan and Joubert, 1961) found mean values for Africander of 295.0±0.3 and 291.1±0.4 days, respectively.

Such values are considerably higher than those found for African Zebus by Hutchinson and Macfarlane (1958) averaging 282.7 days. For Red Sindhi and other Indian breeds, values of 283 to 287 have been reported by Littlewood (1937), Anantakrishnan et al. (1952), and Singh and Ray (1961).

Wheat and Riggs (1952) found that Brahman bulls, when bred to Hereford cows, sired calves which were carried in utero longer than purebred Hereford calves. Breeds of the *Bos taurus* species have been reported to have mean gestation periods ranging from 278 to 289 days with significant breed differences (Knott, 1932; Knapp et al., 1940; Rife et al., 1943; Palm, 1944; Livesay and Bee, 1945; Lush, 1945; Jafar et al., 1950; Brakel et al., 1952; Burris and Blunn, 1952; Wheat and Riggs, 1952; Rice et al., 1954; Wheat and Riggs, 1958). Ahmed and Tantawy (1956) reported mean gestation periods of 289.8 days for male calves and 288.3 days for female calves carried by Egyptian cows.

The variance analysis for location effects failed to show significant differences between ranches. The data were therefore pooled when analyzed for sire and sex effects. The adjusted mean squares for sire and sex are reported in table 1. Sire and sex both had a significant influence on gestation length.

On the average, the 514 male calves were carried in utero 1.9 days longer than the 505 female calves. These results are in agreement with findings by Littlewood (1937), Lazarus and Anantakrishnan (1952), Hutchinson and Macfarlane (1958), Joubert and Bonsma (1959), Haines (1961) and Singh and Ray (1961) who also found male Zebu calves to be carried in utero longer than females. Briquet and De Abreu (1949) did not find significant differences due to sex. For *Bos taurus* breeds, Long et al. (1948) reported significant sex differences, while Wheat and Riggs (1952), Dessouky and Rakha (1961) and Lasley et al. (1961) could not detect any significant sex differences in gestation periods.

There were 40 sire groups with 4 to 90 calves each. Group means ranged from 285.8 days (4 observations) to 297.7 days (10 observations). Van Graan and Joubert (1961) found some sire differences for gestation periods in Africander cattle, while data reported by Briquet and De Abreu (1949) for Zebu cattle did not show that sire effects contributed markedly to the total variance. Sire differences within a breed were reported for gestation periods of *Bos taurus* breeds by Wheat and Riggs (1952), Rice et al. (1954), and Lasley et al. (1961). Work reported in the literature, as well as our results, indicate that the genotype of the calf contributes significantly to the variation in the length of gestation period.

### Summary

Dates of breeding and birth dates of Brahman calves were obtained from two ranches in south Florida. The length of 1323 gestation periods was calculated. Errors due to the nature of this field study are discussed. The mean gestation length of 1048 gestation periods which were between 271 and 310 days was 292.8 days.

The frequency distribution for the length of gestation periods is reported as well as the results of a variance analysis for location, sire and sex effects. While there was no difference between locations, sex and sire differences contributed significantly to the total variance, showing that the genotype of the calf affects the length of time it is carried in utero.

The results are discussed in relation to the literature for *Bos indicus* and *Bos taurus* cattle.

### Literature Cited


Anantakrishnan, C. P., A. J. Lazarus and M. Ç.
Littlewood, R. W. 1937. Weight of calves and period of gestation in some Indian breeds of cattle. Agriculture and Livestock in India 7:61.