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Non-Genetic Factors Influence on Intercalving Period in Female Water

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ABSTRACT

Non-genetic factors influence upon the intercalving period in female water buffaloes were evaluated by studying 740 calving out of 210 animals registered at Maraguán Livestock Genetic Enterprise in Camagüey province, Cuba. The variables offspring sex, herd, calving number, calving season, and calving year were performed a multivariate analysis of variance using the statistical package SPSS. Non-genetic factors significantly influenced ($P < 0,01$) the intercalving period reaching a mean value of 389,2 ± 6,3 days; besides, it showed a negative trend for the years 2007 and 2010.

Key Words: water buffalo, intercalving period, non-genetic factors

INTRODUCTION

The water buffalo and its two types, swamp and river, was introduced in Cuba in the 1980s. It has spread throughout the country due to their adaptability to different environments (Méndez, Bueno, Betancourt and Almaguer, 2010).

In 1986 buffalo dairies were set up in the province of Camagüey, each included 30 cows with a bull for mating. The species slowly developed, still with rudimentary techniques. Revenue from buffalo milk and beef sales are now used for developing buffalo exploitation (Fundora, 2008; Delgado, 2009).

Many works carried out in the country and Latinamerica corroborate the influence of the herd, number of deliveries, offspring gender and year of delivery on buffalo reproductive behavior. Buffalo in Cuba have the capacity to reproduce all year, with the best results observed in winter (Fundora and González 2001; Amorin and Fraga, 2010; Ceró, González, Ortega and Viamontes, 2011).

The aim of this paper is to assess the influence of some nongenetic factors on the interval beteween deliveries in river buffalo, at the Maraguan Genetic Center in the province of Camagüey, Cuba.

MATERIALS AND METHODS

The research was developed at Rancho Alegre Farm. Data from 740 deliveries of 210 buffalo cows in seven dairies between 2007 and 2009 were used. The samples belonged to Maraguan Genetic Center in Jimaguayú municipality, east of Camagüey City. To the north, it has borders with Samaraguacan River; to the south, with Carretera Central; to the east, with road to Cuarto Anillo Road; and west, with road to Amistad Cubano Bulgara Dam.

The main goal was milk and beef production. The farm has 230 ha (Table 1), with two or three enclosures per dairy, and some areas are covered with undesirable species like marabú (*Dichrostachys cinerea*), aroma (*Acacia farnesiana*) and caguaso (*Paspalum virgatum*). Native Texan (*Paspalum notatum*) and Camagueyan (*Bothriochloa pertusa)* grasslands are predominant, with espartillo *(Sporobolus indicus);* along with kingrass (*Pennisetum* sp), guinea (*Panicum maximun*), star (*Cynodon nlemfuensis*) and sugar cane (*Sacharum officinarum*). Tree species like algarroba, (*Samanea saman*), pinnon (*Glyricidia sepium*), guazuma (*Guazuma ulmifolia*), leucaena (*Leucaena leucocephala*), ceyba (*Ceiba pentandra*), mango (*Manquifera indica*), ateje (*Cordia colococca*), cedar (*Cedrela odorata*), jaguey (*Ficus sp*) and royal palm (*Roistonea regia*), are also present.

According to the Cuban classification, the soils are fersialitic (CITMA, 2003). Water is supplied to animals through windmills, wells, ponds, and cylindrical tanks with a trough around them. In the area, the anual mean humidity is 84 %, with mean temperature values of 24-29 ºC. The mean rainfall values are 1120 mm .

Grazing takes place all year on the buffalo farms, with occasional supply of feed concentrate. Direct mating is carried out (one bull per thirty cows), and natural calf raising, weaning at 6-8 months old.

Hand milking is performed once a day, early in the morning (4-6 am) in the presence of the calf. A quarter milk is left for the calf after milking. The herds then go grazing between 9 and 11 am for breastfeeding. The offspring is taken from their mothers around 11:30 and is sometimes given Norgold in shade stalls, depending on the supplies. Mothers remain grazing all afternoon and evening, until the next milking.

At birth, the calf´s navels are treated with disinfecting solution at 2 % for ten days. If the umbilical cord remains after treatment, it is cut around 10 cm from the navel and disinfected. Though rustic, buffalo may suffer from omphalitis and omphalophlebitis. Between days four and five after birth, buffalo calves are treated for parasitic infestations. According to regulations, a clip is inserted in each ear, to both male and female calves. Clips can be used in case red-hot iron marker is unavailable. The calf stays with its mother until 10 days old, so it can get all required colostrum.

The data to compile the information and study the intervals between deliveries (IPP) were collected from each animal´s control card, based on the number of deliveries.

To estimate IPP and the effect on nongenetic factors involved, SPSS statistics software (2006), version 15, was used. Basic statigraphs calculation and variable normality analysis were performed through the Kolmogorov-Smirnov test.

To analyze variance equality the Levene test was applied; to prove the influence on nongenetic factors a multiple linear variance analysis was performed.

The mathematical model applied was,

$Yijklmn = \mu + Si + Rj + Nk + El + Am + e_{ijklmn}$

where:

Yijklmn: dependent variable for IPP, corresponding to i^{th} subclass.

μ: general constant.

Si: constant effect of offspring gender (i = 1,2).

Rj: constant effect of herd (j = 1…..7)

Nk: constant effect of the number of deliveries (k = 1…4).

El: constant effect of the delivery season (l = 1,2).

Am: constant effect of delivery year (m = 1…..4)

eijklmn: experiental error.

RESULTS AND DISCUSSION

Table 1 shows a quite uniform distribution of observations regarding the variation sources used in the mathematical model.

Table 2 shows significant IPP for all variation sources. The result of 389.2 days is consistent with the results achieved in Asia and Latin America, by Janakiraman (1982), who reported values of 365-426 day; and Baruselli (2000), with 375.6-410 days. In Cuba Mitat (2007) has reported 370-390 days, at Los Naranjos Enterprise in Havana. Padrón (2010) has reported values for 367.3-416 days on El Cangre Enterprise in Havana, with grazing and nutrition conditions similar to our study.

Some researchers, like Lundstrom *et al.* (1982) in Sri Lanka, and Osmán (1985) in Egypt, have reported values for 530, 538 and 525 days, respectively. These results are not close to this study, because the tenance, handling and nutrition conditions are different under extensive management.

In Table 3 the significant influence of offspring gender on the feature studied can be observed. Méndez and Fraga (2010), in Cuba, reported that sex of the offspring had a significant influence on birth weight.

Scannone (2006) on researching buffalo cows found no significant influence. Soysal and Kok (2004), and Herrera *et al.* (2006) have claimed that the sex of the fetus did not affect the duration of gestation.

The results of this paper lead to the conclusion that IPP lengthening is linked to to calf weight and sex. It has been identified as one of the most important problems during parturition. Though some authors have stated that dystocia rarely appears in buffalo, bull calves need 20-60 % more time of labor than heifer calves do, as males are gestated longer. As a result, their weight is greater and dystocia percentages are directly proportional to greater body weight at birth.

The herd effect (Table 4) had a significant influence on the feature studied. The result was similar to Mitat (2008), who confirmed that herds have a significant influence on the interval between deliveries. The enterprise and province were the sources with the highest variations in the feature, mainly determined by herd ownership, handling and nutrition.

Crespo *et al.* (2010), Fraga and Ramos (2010), and Suárez *et al.* (2011) have demonstrated that the herd effect is determining in reproductive behavior, due to variations in nutrition, handling and weather conditions in each region.

In Table 5 young buffalo cows with one or two deliveries are shown to have unfavorable values for the feature studied, in comparison with older cows with more than three parturitions. This result is similar to Cero (2011) in Camagüey for 359.7 days. The values achieved were higher than the ones corroborated at the farm in the study. The number of deliveries was regarded as significant in terms of reproductive behaviors.

These results have been corroborated by Crudelli (2004), who stated that a progressive decline in IPP is produced in relatoin with the number of deliveries. Also, young buffalo cows had longer delivery intervals, since, they still mature for five or six years; they are not fully sexually mature and their reproductive capacity is not completely developed.

The differences observed for the interval values in the rainy season compared with the dry season (Table 6) will depend on the availability of green pastures in the rainy season; when the quality and quantity of pasture per hectare is increased, and so is animal nutrition. Moreover, the reproductive efficiency indicators are improved (Méndez y Fraga, 2010).

Cuba has significant differences between the rainy and dry seasons in terms of IPP (368.8 and 414.1 days, respectively), very similar to the population studied, and higher than Cordero *et al.* (2010) (473.6 and 419.8 days for the rainy and dry seasons, respectively).

These differences are given by the availability, quality and access to pasture, which favor nutritional improvement. Mitad (2002) —cited by García *et al*. (2010)— considered that buffalo cows with parturition in the dry season have greater IPP, as a result of unfavorable nutritional and climatic factors.

Table 7 shows that the year of delivery differs significantly from the study years, and a great difference is observed for interval between deliveries. These values are similar to Ramírez (2009) and Ceró *et al*. (2011) in Cuba. All this points to the fact that the year of delivery was significant for reproductive features.

These results are corroborated by García *et al. (*2010) and Suárez *et al.* (2011), who observed that all years do not have the same behavior in terms of weather conditions, personnel involved, the availability of feed and animal handling in tropical and subtropical regions.

CONCLUSIONS

When studying interdelivery conditions, genetic and nongenetic factors should be taken into account. The behavior of Cuban river buffalo cow is similar to the rest of their species in Latin America.

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Table 1. Distribution of observation per effect in the mathematical model used

Identification		Number of observations
Total		740
Offspring sex	Male	418
	Female	322
Number of deliveries	1	216
	2	195
	3	167
	4	162
Seaon of delivery	Dry (1)	311
	Rainy (2)	429
Year of delivery	2007	155
	2008	197
	2009	207
	2010	183
Herds	1	107
	2	104
	3	105
	4	105
	5	107
	6	106
	7	106

Table 2. Mean and standard error for the feature studied. Variance analysis

Variation sources	IPP(days)
Offspring sex	**
Herds	**
Number of deliveries	**
Season of delivery	**
Year of delivery	**
X ± ES	389.2 ± 6.31
R^2 (%)	93.0

** equal to (P < 0.01)

Table 3. IPP behavior of offspring sex

Offspring sex	IPP (days)
Male	390.6 ± 1.2 a
Female	388.3 ± 1.1 b

Different letters mean a significant difference (P < 0.01)

Table 4. IPP behavior of herds

Herds	IPP (days)
	X±ES
1	421. 2 ± 17.6 a
2	367.5 ± 13.6 b
3	375.3 ± 11.2 b
4	383.3 ± 10.9 b
5	401.4 ± 11.1 a
6	380.9 ± 10.4 ab
7	396.7 ± 12.4 a

Different letters mean a significant difference (P < 0.01)

Table 5. IPP behavior of the number of deliveries

Number of deliveries	IPP (days)
1	426.2 ± 7.5 a
2	421.8 ± 7.9 a
3	403.2 ± 12.2 b
4	394.1 ± 10.1 b

Different letters mean significant differences (P < 0.01)

Table 6. IPP behavior of the season of delivery

Season of delivery	IPP (days)
Dry	402.3 ± 9.7 a
Rainy	377.4 ± 6.4 b

Different letters mean significan differences (P < 0.01)

Table 7. IPP behavior of the years of delivery

Year of delivery	IPP (days)
2007	343.1 ± 12.3 a
2008	365.5 ± 10.4 b
2009	411.3 ± 9.1 c
2010	439.6 ± 8.6 d

Different letters mean significant differences (P < 0.01)