

Influence Factors of the Postpartum Cyclicities of the Local Cows at Mandelia Cattle Farm in the Sahelian Zone of Chad

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Abstract

This study aimed to identify the main influence factors of the postpartum cyclicities in the local cows. Plasma was obtained from blood taken every 3 days from calving to 60 days in postpartum from January 30th to March 3rd, 2013. Nine hundred blood sample tubes were collected from 45 local cow breeds and were used for the plasma progesterone determination. The different progesterone profiles have made it to relate the postpartum cyclicity recovery, suckling, and heat detection. Most cows were in anestrus during the study. However, the resumption of ovarian activity was at 13.75 ± 7.57 days postpartum. Similarly, the level of progesterone varied with suckling, parity, and post-calving complications. Suckling and post-calving complications were the main factors in delaying the postpartum cyclical recovery. A deep investigation into cyclical profiles for a whole year will help to better appreciate the relationship between the various factors, and the actual reproductive performances. The result will guide us to improve future investigations of cattle breeding performances in Chad.

Keywords: Chad, Cyclicity, Influence Factors, Local Cows, Postpartum Plasma Progesterone,

Introduction

Breeding behavior in a herd is an indispensable tool for improving the numerical productivity of animals and also of milk production. However, reproduction control requires knowledge of the different physiological states of females (Thimonier, 2000). Heat detection, a key step in cattle breeding, depending on the ovarian activity recovery, the level of heat expression by the cows, and the practices implemented by the farmer to detect them (Debieerre 2008, Chanvallon *et al.*, 2012). Several factors such as: suckling, climate, negative energy balance, breeding behavior, and postpartum cow health management increase the risk of anestrus (Derivaux *et al.*, 1984; Maikanti, 1995; Gekara and Renita, 2012; Miroud *et al.*, 2012; Gowda *et al.*, 2016; Khan *et al.*, 2016). The risk of cows' anestrus often results in a cessation of ovarian activities or silent heat (Khan *et al.*, 2016, Gekara and Marshall, 2012). The calving interval of Chadian cattle is 16 months on average with an open day of 196 days (Tellah *et al.*, 2015ab). However, in Europe, the open day varies from 30 to 110 days for suckling cows (Derivaux *et al.*, 1984; Hanzen, 1986). The significant economic losses attributable to the anestrus must be corrected if adequate provisions are provided regarding the control of the resumption of postpartum sexual activity in cattle. In addition, the information derived from herd observation is often incomplete and less accurate in assessing the actual reproductive performance of cattle (Nabila *et al.*, 2014; Tellah *et al.*, 2015b). Therefore, the use of progesterone test is an investigative tool for the resumption of immediate postpartum sexual activity in cows (Nabila *et al.*, 2014). Thus, the cycle resumption characterization of post-partum Chadian cattle, by the determination of the plasma progesterone, contributing to improve their reproductive performances.

This study aimed to identify the main factor influences of the postpartum cyclicities in the local cows.

Materials and Methods

Study Area

The study was carried out at a National Cattle Farm located in Mandelia city. This farm has a cattle herd of more than 300 local cattle breeds and crossbreeds (resulting from artificial insemination). Mandelia city is the capital of the Province of Chari Baguirimi. It is located in the Sahelian area between 11°43'45" North latitude and between 15°14'45" East longitude. It is located about 45 km southwest of N'Djamena city, the capital of Chad. The province of Chari Baguirimi has two seasons: a dry season (October to May) and a rainy season (June to September). The isohyet varies between 200 and 600 mm of rain per year. The temperature varies from 29°C (December to February) to 45°C (March-April).

Data Collection

Forty-five (45) local cattle breeds (15 Arab, 15 Kuri, and 15 Bororo) are calved 1 to 3 times, 4 to 9 old years, 25 each of which were suckling and 20 non-suckling, were followed by calving to 60 post-calving days. These cows were chosen at random for calving. Primiparous cows accounted for 44.44% and multiparous 56.56%. The basic ration consisted of natural pasture and the animals are taken there every morning by cattlemen. Reproduction is essentially by artificial insemination but failing by natural service.

Nine hundred (900) blood tube samples were taken through the jugular vein every 3 days (20 samples in each monitored cow) from January 30th to March 3rd, 2013 during the morning milking. Blood was collected by using Monovette® tubes with anticoagulants. The tubes were carefully identified (by cow number, calving dates, and operations of all seances) throughout the sampling period. These tubes were kept under cold conditions (in a cooler containing ice) until they were sent to the laboratory to be centrifuged at 3000 rpm for 15 minutes. Then, the plasma is collected under sterile conditions into properly identified plastic vials to be stored at 20°C before being sent to France for a progesterone test. The assay was made by radioimmunoassay from plasma in the hormone laboratory (Maisons Alfort-France).

Data on pathologies (retained placenta and metritis), reproduction (calving date, calf viability, parity, return to heat date), and flesh condition at calving (body condition score) were recorded. The heat return was followed by the cattlemen, twice a day in the morning (7:30 am) and the evening (5:30 pm) milking. These follow-ups consisted of direct observation of the heat behaviors by agreeing to be ridden by bulls or other congeners. The cervical mucus secretion in these cows has been a supplement to heat diagnosis.

Data Analysis

The data were entered in Excel and XLSTAT software (6.1.9.) was used for the analysis including descriptive statistics (frequencies, means, and standard deviations). The reference values used to determine the level of cyclicity of the cows monitored were those of Nabila *et al.* (2014) in which $P4 > 0.5$ ng/ml indicates a resumption of ovarian activity (luteal activity) and $P4 \geq 1$ ng/ml, when the cow is cycled. The variation of different parameters such as the time of the resumption of ovarian activity, the progesterone means level, the progesterone profiles of cows, and the heat expressed percentage were compared between dry cows (stillborn calves at calving) and lactating. The cyclicity curves (progesterone profile) of the cows were established with the mean progesterone values. Only the suckling status factor was used to plot the curves. The analysis of variances (ANOVA) was done using the Newman-Keuls test at the 5% threshold.

Results and Discussion

Plasma Progesterone Level

The mean of plasma progesterone level was 0.94 ± 0.21 ng / mL and ranged from < 0.5 ng / mL to 7.5 ng / mL. Primiparous had the lowest rate of 0.81 ng / mL compared to multiparous (1.11 ng / ml) but this difference was not significant ($p > 0.05$). This observation was consistent with that of Gowda *et al.* (2016), which also doesn't have the parity effect on the progesterone level in the same circumstances. The progesterone baseline level was close to that reported by Algeria (Miroud *et al.*, 2012). The level was weak and then did not permit the suckling cows to resume their sexual activity until 60 days postpartum. The low level of progesterone in these local postpartum cows could be justified by the inhibition of the circulating sex hormone rate in postpartum in tropical. Some factors were involved in this sex hormone inhibition: suckling, calving complications, and poor food management of herds (Kaewlamun, 2010; Gekara and Marshall, 2012; Djokovic *et al.*, 2015).

Progesterone Cycle Profiles and the Cyclicity Recovery in Local Cows

Two cyclicity profiles were established in the study (Figure 1).

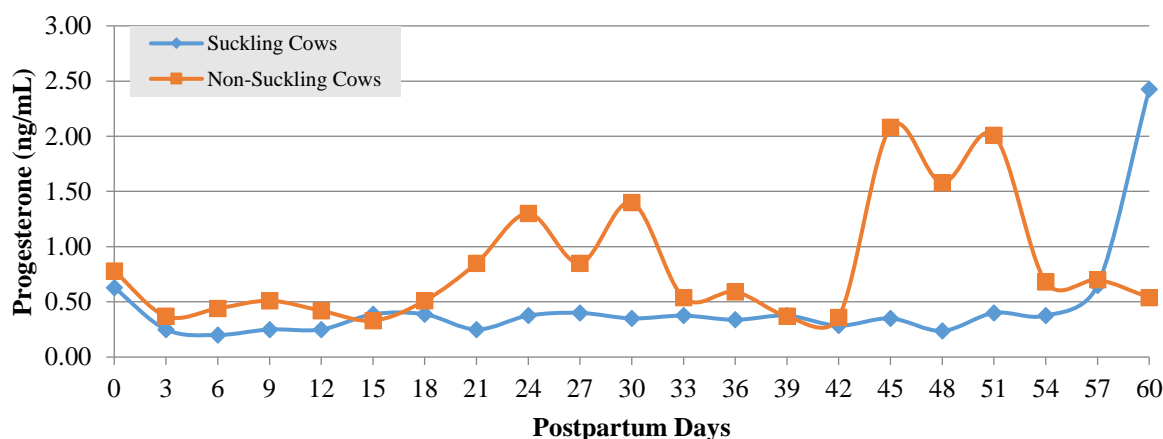


Fig 1: Cyclicity profiles of local cows at Mandelia cattle farm (Chari Baguirimi Province) in Chad

Non-suckling cows were normally cycled, but suckling cows weren't. Then suckling effect was decisive on the cyclicity profile.

The normal pattern in non-suckling cows showed a succession of luteal phases and heat periods. The progesterone profile was normal in non-suckling, but they did not express the heat. These can be attributed either to the device's inefficiency in detecting the heat of the Zebu silent heat in tropical areas or to the less rigorous monitoring of heat from the farms. This progesterone profile indicates that the first heat, although silent, occurred 24 days after calving. This term was not different from the observations of others authors (Derivaux *et al.* (1984), Berges *et al.*, 1991) who indicated that in cows, estrus can reappear 23 days after calving. In addition, the climate combined effects, negative energy balance, and poor postpartum cow breeding behavior increase the frequency of silent heat (Gekara and Renita, 2012; Miroud *et al.*, 2012; Gowda *et al.*, 2016; Khan *et al.*, 2016).

In contrast, in suckling cows, the progesterone level elevation at the 60th day postpartum indicated that the cycle can't be recovery before this term. This term in first postpartum ovulation was no different from 55.2 ± 26 days for local cows reported in Cameroon (Bayemi *et al.*, 2007). This explains the fact that follicular waves are subjected to optimal hormonal impregnations at ovulation only around 47 days after calving (Fulminet, 2011). Derivaux *et al.* (1984) reported results indicating that cycle resumption in suckling cows is late (40 and 45 days after parturition). This cyclicity term is justified by a time token in the formation of the dominant follicle following the lack of FSH secretion (Ledoux *et al.*, 2007). On the other hand, in Holstein-Friesian cows, the activity recovery rate is the highest in the first two months (Shankare Gowda *et al.*, 2016).

Factors Influencing the Resumption of Ovarian Activity

The resumption of ovarian activity was at 13.75 ± 7.57 days postpartum. It varied according to suckling status, parity, and postpartum complications (Table 1).

Table 1: Variation in the Time of Resumption of Ovarian Activity According to the Different Parameters in Cows at the Cattle Farm of Mandelia

Parameters	Modalities	Time (days)
Suckling	Yes	17.00 ^a
	No	10.50 ^b
Parity	Multiparous	10.00 ^a
	Primiparous	17.25 ^b
Calving	Normal	9.75 ^a
	Stillborn/placenta Retained	17.50 ^b

The different letters between the limits of the same parameter indicate that the difference is significant ($p < 0.05$).

The resumption of ovarian activity was shorter ($p < 0.05$) in non-suckling cows and uncomplicated calving, but increased with the complication severity ($p < 0.05$). This result justifies the fact that suckling and calving complications are the causes of LH discharge inhibition, whereas, without the discharge of this hormone, the resumption of ovarian activity will not have a venue. This is in agreement with the observations of Lamb *et al.* (1999) who indicate that non-lactating and normal calving favor the early discharge of LH, then the resumption of cyclicity in the cow. However, this term of resumption of ovarian activity was shorter than those reported in Senegal in which the cyclic ovarian activity is recovered between days 36 and 48 postpartum (MBaye and NDiaye, 1992) and in Algeria (Miroud *et al.*, 2012). This is because the duration of the blood sample is used to control the slightest change in the level of progesterone if the sample is taken for one week or ten days. In contrast, cows suckling their calf got a later positive progesterone assay interval than the cows that had stillborn calves at calving ($p < 0.05$). Although a late resumption of ovarian activity was reported in suckling cows, the progesterone level remained below the threshold for cycle resumption. This cyclical inactivity was in agreement with the observations of other authors (Derivaux *et al.*, 1984; Berges *et al.*, 1991; Debierre, 2008) which indicate that suckling inhibits the discharge of LH postpartum, but without this pituitary hormone, the resumption of ovarian activity is impossible.

Thus, all suckling cows were in anestrus for two months postpartum while most non-suckling cows (80%) were cycled and the remaining 20% (non-cycled) had retained placenta. The cyclicity recovery rate in dry cows wasn't very different from that reported in New Caledonia of 74% heat detected in tropical cows in the first 42 days postpartum and all (100%) at 63 days postpartum (Berges *et al.*, 1991). The suckling cow anestrus during the first two months postpartum was in agreement with observations by Hanzen (1986) who reported 30-110 days at postpartum anestrus, and those of Disenhaus *et al.* (2008). Suckling is the main factor in inhibiting the hypothalamic-pituitary-gonadal axis. It increases the duration of postpartum anestrus in Zebu cows (Mukasa-Mugerwa *et al.*, 1991). This is why postpartum anestrus is long in suckling cows than in dairy cows. Suckling has an inhibitory effect on the release of LH and GnRH discharge, without which the resumption of cyclic activity after calving is not possible (Derivaux *et al.*, 1984; Garcia-Winder *et al.*, 1984; Hanzen, 1986). Dry cows immediately after calving had a lower anestrus rate than those suckling their calf (Ducrot *et al.*, 1995). Thus, cows that suckle twice a day or those permanently suckle their calf, remain for a long time in anovulatory anestrus after calving (Lamb *et al.*, 1999). On the other hand, those who suckle once a day are less affected by this phenomenon (Drion *et al.*, 1996; Picard-

Hagen and Gayraud, 2011). In addition, the calf's contact with its mother induces postpartum anovulation in its mother, which remains in postpartum anestrus for a long time (Lamb *et al.*, 1999).

Conclusion

The study provided the knowledge base on the resumption characteristics of cattle postpartum cyclicity in Chad. The relationship between normal postpartum progesterone profile and suckling has been identified. Then the dry cows after calving from calf-free calves resume their cycle after one calving cycle. However, this cycle recovery was silent (without detectable heat events) and suckling cows didn't resume their cycle for two months postpartum. Therefore, suckling and calving complications are the main factors in delaying the postpartum cyclical recovery of local cows in Chad. Extensive investigations into postpartum cyclicity profiles of local cows in all months of the year will help to better appreciate the relationship between these factors and the actual reproductive performance of these cattle. The results we will guide to improve our future investigations of the breeding performances of Chadian cattle.

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Contribution by Authors

All the authors contributed equally to writing the manuscript. The final manuscript was read by all others and consented to publication.

Conflict of Interests

There is no conflict of interest.

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