International Journal of Zoology and Applied Biosciences **ISSN: 2455-9571**
Volume 8, Issue 5, pp: 47-51, 2023
https://doi.org/10.55126/ijzab.2023.v08.i05.007
http://www.ijzab.com

Research Article

STUDY OF REPRODUCTIVE PARAMETERS OF INSEMINATED AND STATIONS REARED FEMALE CATTLE IN TOGO

[1*]Paguindame DJABANGOU, [1, 4]Wéré PITALA, [2]Binamlé BAGNA,[3]Némè Hélène BALI and [1]Abalo Essosimna KULO

[1]High School of Agronomy (ESA), University of Lomé, 01 P.O.Box1515, Lomé 01, Togo.
[2]Togolese Institute of Agronomic Research; Agronomic Research Center-Forest Zone (ITRA/CRAF), Avétonou Station, P.O. Box 90, Kpalimé, Togo.
[3]National Office of Slaughterhouses and Cold Store (ONAF), P.O.Box9105, Lomé, Togo.
[4]Regional Center of Excellence on Avian Sciences (CERSA) – University of Lomé, 01 P.O.Box1515, Lomé 01, Togo.

Article History: Received 06th September 2023; Accepted 23rd October 2023; Published 31st October 2023

ABSTRACT

The poor reproductive abilities of most tropical cattle are an obstacle to improving cattle production through artificial insemination (AI). The aim of this study was to determine the reproductive parameters of 23 cows and heifers reared on stations in Togo after an AI campaign. These females were inseminated following a hormonal heat synchronization protocol using Prid® Delta. Pregnancy and calving were monitored to assess reproductive parameters. Results showed a calving rate of 52.27% and a fertility rate of 47.73%. These rates varied significantly ($p<0.05$) according to parity, breed and body condition score. In addition, mean gestation period, mean age at first calving, calving interval -1st heats and calving interval - AI were respectively 9.38 ± 0.29 months, 3.57 ± 1.19 years, 45.90 ± 13.36 days and 5.04 ± 0.45 months. Comparative analysis of these parameters showed significant variations ($p<0.05$) in relation to female breed and parity. Reproduction parameters are of considerable importance in the valorization of local cattle through artificial insemination.

Keywords: Artificial insemination, Calving, Fertility, West Africa, Cows.

INTRODUCTION

Livestock farming is one of Togo's key development sectors, accounting for 16.56% of agricultural Gross Domestic Product (GDP) and 6.73% of national GDP (FAO, 2017). Thus, economic, social and cultural importance is attached to livestock products. Livestock, particularly cattle, are the only sources of milk production (FAO, 2017). Cattle farming contribute 27% of milk requirements (FAO, 2013). This coverage rate is due to low milk performance (1 to 4 liters/cow/day) and the lack of control over reproduction parameters in bred cows (Kulo and Kossivi, 2012; Kotoe *et al.*, 2019). These cows cannot produce milk without reproducing due to the physiological interactions between lactation and reproduction (Achemaoui and Bendahmane, 2016). Reproductive efficiency in cattle is based on cow performance, including age at first calving, calving interval and fertile service (Tella *et al.*, 2015a and b). However, cows bred in Togo calve for the first time between 4 and 5 years of age and have a calving interval of 14 -15 months (Seme, 2017). These low performances can delay calving regularity and the rapid diffusion of genetic progress through artificial insemination (AI). In addition, there are no data on the post-calving reproductive performance of cows inseminated at stations in Togo. The aim of this study was to determine the reproductive parameters before and after calving in female cattle inseminated in stations in Togo.

MATERIAL AND METHODS

Experimental site

The present study was carried out at three (03) cattle breeding stations in Togo (Figure 1). These were the

*Corresponding Author: Paguindame DJABANGOU, High School of Agronomy, University of Lomé, 01 P.O. Box 1515, Lomé 01, Togo, Email: djabangoupierre@gmail.com.

Alternate Training Institute for Development (IFAD of Barkoissi), the Tchitchao Agronomic Experiment Station (SEAT) and the Avétonou Research Station of the Forest Zone Agronomic Research Center (CRAF) of the Togolese Agronomic Research Institute (ITRA). These stations have female cattle of local breeds, forage plots and are involved in the production and processing of local cow's milk. The Avétonou station enjoys a sub-equatorial climate with two rainy seasons: the first from March to July, the second from September to October. SEAT and IFAD-Barkoissi enjoy a sub-Sahelian climate, with one rainy season (May to October) and a dry season the rest of the year. Average annual rainfall is 1,100 mm (Avétonou station), 776.7 mm (SEAT) and 709.8 mm (IFAD). Average temperatures are 28.6°C, 27.3°C and 27.3°C at these respective stations (FAO, 2013).

Characteristics of study females

The study involved twenty-three (23) calvings from 44 cows and heifers of local breeds (Borgou, Goudali, Somba and White fulani). These female cattle were inseminated following a hormonal heat synchronization protocol using Prid® Delta. Seeds from bulls of exotic breeds (Brune des Alpes, Holstein, Montbéliarde and Tarentaise) were used for AI.

Calving preparation and management of pregnant females

Pregnant females due for calving were separated from the rest of the herd and housed in maternity barns. These barns were sprayed two (02) days with Vectocid (Deltamethrin 50g) prior to their introduction to control ticks, tsetse flies, fly larvae and other biting and blood-sucking insects. Maintenance inside the barn was carried out every morning and afternoon as soon as the animals left for grazing. Pregnant females were kept on *Panicum maximum* forage plots for eight (08) hours a day, and supplemented with lickstones on their return from grazing until calving. Water was provided ad libitum.

Calving equipment and management

All calving equipment (calving machine, gans, ropes, bottles, lubricants, oxytocin, etc.) was prepared and stored in a warehouse. Pregnant females were monitored as calving approached, in order to intervene in the event of dystocia. After calving, the calf's nostrils were cleaned to facilitate breathing, and expelled placentas were buried.

Post-calving cow monitoring and data collection

The herds at the various stations were monitored by their technicians, supported by the herdsmen after calving. A data collection sheet was provided to record the dates of heat returns. Three (3) months after calving, technical visits were organized at the said stations to assess the possibilities of returning the calved cows to reproduction. During these visits, the monitoring sheets made available to them were reviewed and the data extracted for statistical analysis.

Parameters studied

On the basis of inseminated and calved females, the following parameters were studied:

$$\text{Calving rate (CR)} = \frac{\text{number of calving}}{\text{number of females inseminated}} \times 100 \quad (1)$$

$$\text{Fertility rate (FR)} = \frac{\text{number of calves born alive}}{\text{number of females inseminated}} \times 100 \quad (2)$$

Gestation period (GP): the number of days or months between the AI dates and farrowing;
Age at first calving (AFC): the number of months, days or years at which inseminated heifers calved for the first time. Data for this parameter were calculated from information collected from herdsmen and teething examinations;
Calving interval – 1stheats: number of days between calving dates and first observed heats;
Calving - AI interval: the number of days or months between calving and AI. It was calculated for IFAD-Barkoissi and ITRA/CRAF cattle.

Statistical data analysis

Data were entered using Excel 2016 spreadsheet software and exported to SPSS 21 for statistical analysis. Results were tabulated and expressed as percentage (%) and mean ± standard error. Differences were considered significant at the 5% level.

RESULTS AND DISCUSSION

The 44 cows and heifers inseminated during the experiment, 23 farrowings were recorded, representing a calving rate of 52.27% (Table 1). Two (02) stillbirths were recorded, giving an overall fertility rate of 47.73%. These rates varied significantly ($p<0.05$) according to parity, breed of female, body condition score (BCS) and breed of AI sire (Table 1). Gestation duration averaged 9.38 ± 0.29 months or 284.95 ± 9.21 days. No significant differences ($p> 0.05$) in gestation length were observed in relation to female parity; fetal sex and AI sire genetics (Table 2). Mean age at first calving, calving interval – 1st heats and mean calving interval -IA were 3.57 ± 1.19 years, 45.90 ± 13.36 days and 5.04 ± 0.45 months respectively (Table 2). These parameters were significantly influenced ($p < 0.05$) by the breed of the study females (Table 2).

The calving rate in this study is close to the 53.33% rate obtained by Seme (2017) in zebu and taurine females inseminated in stations in Togo. It is higher than the rate of 34.6% observed in Gobra zebus and F1 crosses during AI companions in traditional environments in the Thiès region of Senegal (Kouamo *et al*., 2014). This rate was influenced by the parity and breed of the females in line with the results found by Seme (2017). However, it is significantly high in females with a body condition score (BCS) of 4. This is explained by the fact that these BCS=4 females maintain their BCS until calving and have the ability to carry a gestation to term and calve normally (Kouamo *et*

al., 2014). The fertility rate found is lower than the 51.45% rate reported for cattle breeds by Seme (2017) in southern Togo. It is also lower than the fecundity of the Borgou breed (64%) obtained by Toko *et al.* (2016) in Benin and that of 83.20% recorded in the N'Dama breed in Côte d'Ivoire (Sokouri *et al.*, 2010). The gestation period in this experiment is in line with that of 285 days found in the *Bos taurus* species (Messine *et al.*, 2007). However, it is longer than the 281 ± 4.24 days obtained by Seme (2017) in cattle inseminated in Togo. On the other hand, it is lower than the average duration of 293 ± 2 days and 288.2 ± 6.8 days obtained respectively in Gobra zebus and N'dama bulls (Bouyer, 2006). No significant differences ($p > 0.05$) in gestation length were observed in relation to fetal sex, cow and AI sire genetics contrary to the work of Pitala *et al.* (2014).

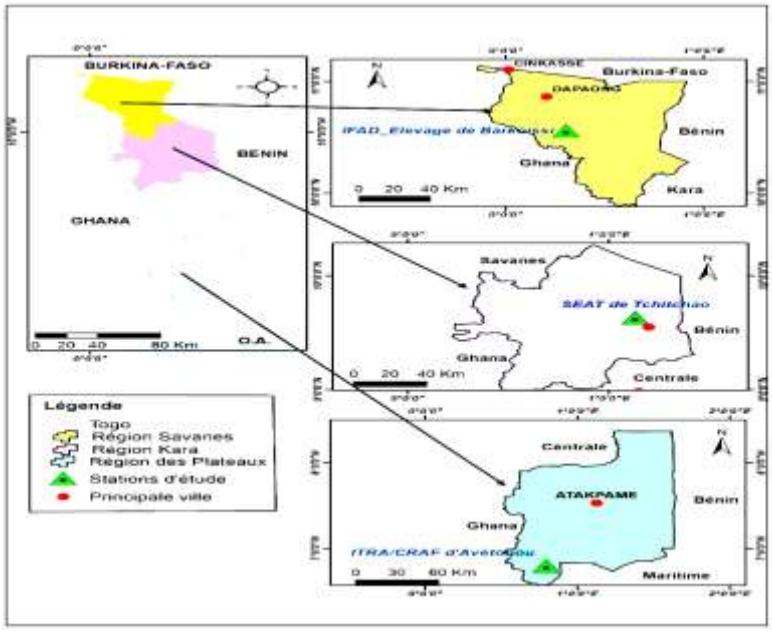

Figure 1. Map of Togo showing the location of study stations.

Table 1. Calving and fertility rates after insemination by influencing factors.

Factors		Calving		Fertility	
		Workforce	CR (%)	Live Calves	FR (%)
Stations	IFAD	11	78,57^{a} (11/14)	10	71,43^{a} (10/14)
	SEAT	2	28,57^{b} (2/7)	2	28,57^{b} (2/7)
	ITRA /CRAF	10	43,44^{c} (10/23)	9	39,13^{c} (9/23)
Parity	Heifers	14	41,18^{a} (14/34)	13	38,24^{a} (13/34)
	Cows	9	90^{b} (9/10)	8	80^{b} (8/10)
Local breeds	Borgou	6	85,71^{a} (6/7)	5	71,43^{a} (5/7)
	Goudali	11	55^{a} (11/20)	11	55^{a} (11/20)
	Somba	0	0^{c} (0/1)	0	0^{c} (0/1)
	White fulani	6	37,5^{b} (6/16)	5	31,25^{b} (5/16)
BCS	3	11	37,93^{a} (11/29)	10	34,48^{a} (10/29)
	4	12	80^{b} (12/15)	11	73,33^{b} (11/15)
Bull seeds	Alpine Brown	6	60^{a} (6/10)	5	50^{a} (5/10)
	Holstein	1	14,29^{b} (1/7)	1	14,29^{b} (1/7)
	Montbéliarde	10	58,82^{a} (10/17)	10	58,82^{a} (10/17)
	Tarentaise	6	60^{a} (6/10)	5	50^{a} (5/10)
Total		23	52,27 (23/44)	21	47,73 (21/44)

Values in the same column indexed by different letters are significantly different ($p \leq 0.05$).

Table 2. Reproduction parameters of cattle inseminated at stations in Togo.

Parameters		Mean ± Standard deviation
Gestation period (GP)(months)	Heifers	9,42 ± 0,33[a]
	Cows	9,37 ± 0,20[a]
	Calves (n=10)	9,36 ± 0,24[a]
	Velles (n=11)	9,40 ± 0,29[a]
	Alpine Brown	9,44 ± 0,40[a]
	Holstein	9,03 ± 0,00[a]
	Montbeliarde	9,31 ± 0,20[a]
	Tarentaise	9,41 ± 0,15[a]
Average		9,38 ± 0,29
Age at First Calving (AFC) (years)	Borgou	5,79 ± 0,00[a]
	Goudali	3,57 ± 1,19[b]
	White Fulani	3,77 ± 0,01[b]
Average		3,57 ± 1,19
Calving interval – 1st heats (days)	Primipares	46,26 ± 14,00[a]
	Multiparious	51,83 ± 8,26[b]
	Borgou	54,11 ± 8,00[a]
	Goudali	45,90 ± 13,36[b]
	White Fulani	41,00 ± 16,61[b]
Average		45,90 ± 13,36
Calving - AI interval (months)	IFAD-Barkoissi	4,47 ± 0,16[a]
	ITRA/CRAF	5,35 ± 0,43[b]
Average		5,04 ± 0,45

Values in the same column indexed by different letters are significantly different ($p \leq 0.05$).

The age at first calving of inseminated heifers is similar to those obtained by Sokouri *et al.* (2010) in local breeds in Côte d'Ivoire, Gbangboche and Alkoiret (2011) in Borgou and N'Dama breeds in Benin, Gbodjo *et al.,* (2013) in crossbred breeds, and Tellah *et al.,* (2015a) in cattle breeds in Chad. On the other hand, it is higher than 1090.2 ± 180.59 days obtained by Seme (2017) in female cattle inseminated in stations in Togo. This could be explained, on the one hand, by the reproductive management of heifers applied at the stations (separated from bulls) and, on the other hand, by the long waiting period (around 1 year) for heifers selected to start the AI program. Variation in age at first calving according to breed showed that Goudali and White Fulani are more precocious than Borgou. This result corroborates those obtained by Kouamo *et al.* (2017) for zebus in Cameroon. The calving – 1st heats interval observed is longer than the average duration of 40 days reported by Ponsart *et al.* (2006) for cyclic females in regular heat. This interval is lower than the 86.8 ± 48 days observed by Haou *et al.* (2021) in dairy cows in northeastern Algeria. Nevertheless, the interval found is within the 30-60 days of post partum anoestrus observed in tropical cattle (Kumar et al., 2021). In addition, AI calves were regularly suckled by their mothers. Permanent suckling delays the recovery of cyclist in cows (Garba *et al.*, 2014). The interval between calving and AI is long compared to the 106-day duration of Achemaoui and Bendahmane (2016) in dairy cattle from the wilaya of Sidi Bel Abbés in Algeria. This interval is beyond the 50-90 day period recommended for the return to breeding of cows after calving (IMV Technologie, 2021).

CONCLUSION

This study examined the reproductive parameters of cattle during the artificial insemination campaign at stations in Togo. The results show that inseminated cows have good reproductive aptitudes, favouring the regular implementation of AI. Breed and parity are factors that can influence age at first calving, as well as the calving – 1st heats interval. Consequently, proper feeding of cows after calving and organization of reproduction in the 90 days following farrowing will improve reproduction parameters.

ACKNOWLEDGEMENTS

The authors of this article would like to thank the International Atomic Energy Agency (IAEA) and the project for the promotion of bovine milk production through artificial insemination in Togo for their financial and material support; the Directors, Technicians and Herdsmen of the various stations for their frank collaboration in carrying out this study.

REFERENCES

Achemaoui A. and Bendahmane M. (2016). Analysis of reproduction parameters in a private dairy cattle farm in the wilaya of Sidi Bel Abbés. Revue " Nature & Technologie ". *B-Sciences Agronomiques et Biologiques*, n° 14, p.20-22.

Bouyer B. (2006). Assessment and analysis of the use of artificial insemination in genetic improvement programs for dairy breeds in Sudano-Sahelian Africa. *Thesis in Veterinary Medicine. Lyon, France,* p.105.

Chabi Toko R., Adégbidi A., Lebailly P. (2016). Demography and zootechnical performance of traditional cattle farming in Northern Benin. *Revue D'élevage et de Médecine Vétérinaire Des Pays Tropicaux, 69(1),* 33-39.

Dao D. (2013). Study on the formulation of a detailed action program for the development of the dairy sector in the UEMOA zone.Final report, DSAME and CIRAD. P.22.*DOI:* http://dx.doi.org/10.4314/jab.v110i1.12.

FAO. (2013). Fourth National Census of Agriculture 2011-2014. Final document, p.51.

FAO. (2017). Review of the livestock/meat & milk sectors and the policies that influence them in Togo. National report, Lomé. p.81.

Garba M. M., Issa M., Okouyi M.W.M., Marichatou H., Kamga-Waladjo A.R. and Hanzen C. (2014). Zebu breeding characteristics and performance: the case of Niger. *RASPA 136 Vol.12 N°3-4.*

Gbangboche A.B. and Alkoiret T.I. (2011). Reproduction and milk production of Borgou and N'Dama cattle in Benin. *Journal of Applied Biosciences*. 46, 3185-3194.

Gbodjo Z.L., Sokouri D.P., N'goran K.E. and Soro B. (2013). Reproductive performance and milk production of hybrid cattle reared on "Projet Laitier Sud" farms in Côte d'Ivoire. *Journal of Animal Plant Sciences,* 19: 2948-2960.

Haou A., Miroud K., Gherissi D.E. (2021). Impact of herd characteristics and breeding practices on the reproductive performance of dairy cows in Northeastern Algeria. *Revue D'élevage et de Médecine Vétérinaire Des Pays Tropicaux, 74 (4),* 183-191, DOI: 10.19182/remvt.36798.

IMV technologie (2021): Use the actual cycle of your cows to improve your results.https://www.web-agri.fr/publi-informations-insemination-et-echographie-etapes-clefs-dune-reproduction-op/article/729900/sappuyer-sur-le-cycle-reel-de-ses-vaches-pour ameliorersesresultats#:~:text=Pour%20abaisser%20l'intervalle%20v%C3%AAlage,et%20retrouv%C3%A9%20un%20cycle%20r%C3%A9gulier (Accessed August 23, 2023).

Kotoe M. D., Seme K., Kossoga K. A., KoumessI K. L., Pitala W., Lombo Y., and Kpemoua K. (2019). Evaluation of calving periods of local cows in the Maritime and Plateaux regions of South Togo. *International Journal of Innovations in Biological and Chemical Sciences. 13(4), 2112-2120.*

Kouamo J., Alloya S., Habumuremyi S., Ouedraogo G.A. and Sawadogo G.J. (2014). Evaluation of the reproductive performance of Gobra zebu females and F1 crosses after artificial insemination in a traditional environment in the Thiès region of Senegal. *Tropicultura*, 32, 2, 80-89.

Kouamo J., Teitsa Zangue C., Fambo Nono S.M., Mfopit Y.M. (2017). Reproductive and milk production performance of White Fulani and Red Fulani cows on small traditional farms in the North Cameroon region. *La Revue Marocaine des Sciences Agronomiques et Vétérinaires*, *6* (3), 294-299.

Kulo E.A. and Kossivi M.A. (2012). Filière du lait frais de vache dans la ville de Lomé. *Journal de la Recherche Scientifique de l'Université de Lomé. Vol. 14 No. 2 (2012): Series A.*

Kuma S. A., Champak B., Kumar M. D., Anupam C. (2021). Effect of pre and postpartum alpha-tocopherol supplementation on body condition and some udder health parameters of jersey crossbred cows at tropical lower gangetic region. *Journal of Animal Research.* DOI: 10.30954/2277-940X.05.2020.4. Vol.N°10:697-703. 8

Messine O., Schwalbach L.J.M., Mbah D.A. and Ebangi A.L. (2007). Non-genetic factors affecting gestation length and postpartum intervals in gudali zebu cattle of the Adamawa highlands of Cameroon, *Tropicultura*, 25(3), 129-133.

Pitala W., Zongo M. and Boly H. (2014). Application of ultrasound to the reproduction of African zebus. *Editions Universitaires Européennes*, 104p.

Ponsart C., Freret S., Humblot P. Charbonnier G., Dubois P. (2006). *Bulletin Technology Insights Animale*, 120, 28-36

Seme K. (2017). Improvement of bovine fertility by artificial insemination in southern Togo. PhD thesis, University of Lomé, Togo, p.161.

Sokouri D.P., Yapi-Gnaore C.V., N'guetta A.S.P., Loukou N.E., Kouao B.J., Toure G., Kouassi A., Sangare A. (2010). Reproductive performance of local cattle breeds in Côte d'Ivoire. *Journal of Applied Biosciences,* 36, 2353- 2359.

Tellah M., Mbaindingatoloum F.M., Mopate L.Y., Boly H. (2015b). Age at first calving and calving interval of four cattle breeds in the peri-urban area of N'Djaména, Chad. *Afrique Science,* 11, 229 - 240.

Tellah M., Zeuh V., Mopaté L.Y., Mbaïndingatoloum F.M., Boly H. (2015a). Reproductive parameters of Kouri cows in LacTchad. *Journal of Applied Biosciences,* 90: 8387- 8396.