ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 8, Issue, 2, pp. 15475-15477, February, 2017

International Journal of Recent Scientific Research

Research Article

EFFECT OF PROSTAGLANDIN $F_{2\alpha}$ AND PROGESTERONE-RELEASING DEVICE CIDR® ON ESTRUS SYNCHRONIZATION IN FRIESIAN X INDIGENOUS CROSSBRED COWS IN MAZABUKA DISTRICT, ZAMBIA

Kavwanga E. Sikazwe Yambayamba[1]* and Yvonne Mwanza[2]

[1]School of Agriculture and Natural Resources, Mulungushi University,
P.O. Box 80415, Kabwe, Zambia
[2]Kariba Harvest Limited, P.O. Box 173, Siavonga

ARTICLE INFO

Article History:

Received 05th November, 2016
Received in revised form 08th December, 2016
Accepted 10th January, 2017
Published online 28st February, 2017

Key Words:

Estrus synchronization. Crossbred cows. Smallholder dairy production. Zambia

ABSTRACT

Forty Friesian x Indigenous crossbred non-lactating cows in Mazabuka were used to investigate response to estrus synchronization using prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$ONLY) or a combination of prostaglandin $F_{2\alpha}$ and progesterone-releasing device CIDR® ($PGF_{2\alpha}$+CIDR). Twenty cows were randomly allotted to each treatment. On day 0, the $PGF_{2\alpha}$ONLY cows were injected with 2ml of the prostaglandin, and repeated on day 11. The $PGF_{2\alpha}$+CIDR cows were inserted with the vaginal implant CIDR on day 0, and then injected with 2 ml of prostaglandin on day 7. On day 8, the CIDR devices were removed from the cows. Time taken to respond to treatment was monitored in all cows. The numerical value for Estrus Response was higher in $PGF_{2\alpha}$+CIDR cows (55%) than in $PGF_{2\alpha}$ONLY (35%) cows. There was, however, no significant difference (P>0.05) in the Response Time between the two treatments although it was numerically shorter in $PGF_{2\alpha}$+CIDR cows (91.6±2.9 hrs) than in $PGF_{2\alpha}$ONLY cows (98.0±6.9 hrs). It is recommended that smallholder dairy producers in Mazabuka consider adopting the two-drug combination rather than $PGF_{2\alpha}$ only for estrus synchronization. However, this must be in combination with good animal nutrition. Further research isrecommended to investigate factors for enhanced effectiveness of estrus synchronization.

INTRODUCTION

Smallholder dairy farming in Zambia has increased steadily since the early 1980s (Pandey and Muliokela, 2006); this can largely be attributed to the crossbreeding programme between Friesian bulls and indigenous cows to upgrade the local herd for increased milk production. However, many smallholder producers in the country have not caught up with the current trends and technologies for increased efficiency in the dairy business (Simoongwe, Personal Communication, 2014). Partly, this is due to inadequate exposure to new technologies or simply lack of evidence-based information on such technologies. Estrus synchronization for increased reproductive efficiency through artificial insemination (AI) is one such technology where there is a gap.

Estrus synchronization protocols vary greatly, ranging from use of the luteolytic agents only (Gebrehiwot *et al*., 2015) through use of combinations of luteolytic agents and other substances (Xu and Burton, 2000; Lamb *et al*., 2001). While estrus synchronization has been used widely in pure dairy cows, the technology has not been used widely in crossbred cows reared by smallholder producers in Zambia. This is largely due to scanty information about the technology's effectiveness and benefits to the farmer. Further, there is information gap about the available protocols that could be appropriate to the Zambian smallholder producer.

The objective of this study was therefore to determine the effects of two protocols: prostaglandin only and prostaglandin plus progesterone, on estrus synchronization in crossbred cows on smallholder dairy farms inthe District of Mazabuka, Zambia.

MATERIALS AND METHODS

Study area and experimental design

The study was conducted in Mazabuka District in the same areas as in the previous study (Yambayamba and Mwanza, 2016). Forty Friesian x Indigenous crossbred non-lactating multiparous cows, all belonging to smallholder producers were used in the study involving two treatments. The study was conducted in the rainy season months of January and February when there was adequate pasture for cattle. Targeted sampling was done in order to select an equal number of cows from each

*Corresponding author: *Kavwanga E. Sikazwe Yambayamba*
School of Agriculture and Natural Resources, Mulungushi University, P.O. Box 80415, Kabwe, Zambia

location and also to ensure that the cows were similar in body condition [3.0-4.0 using the scale by Rodenburg (2004)]. Pregnancy diagnosis was done by experienced technicians to ensure that only empty cows were used in the study. Twenty cows were randomly allotted to each treatment as follows: 1: Administer Prostaglandin $F_{2\alpha}$ only ($PGF_{2\alpha}$ONLY); 2: Administer Prostaglandin $F_{2\alpha}$and progesterone-releasing device CIDR®($PGF_{2\alpha}$+CIDR).

Estrus synchronization

On day 0, the $PGF_{2\alpha}$ONLY cows were injected intramuscularly with 2 ml of $PGF_{2\alpha}$ and continuously observed for estrus. On day 11, the injection was repeated in the cows that did not respond to the first injection. The $PGF_{2\alpha}$+CIDR cows were inserted with the vaginal implant CIDR on day 0, and then injected with 2 ml of $PGF_{2\alpha}$on day 7. On day 8, the CIDR devices were removed and the cows were then observed for estrus. The time taken for cows to respond to the treatments was also recorded.

Data collection and statistical analysis

Genstat (version 13.1) (2010) was used for data analysis. The number of cows that responded to treatment was computed as a percentage (Estrus Response) of the total number of cows in each respective treatment. Response Time (hours) for each treatment was statistically analyzed and the means were separated using the *t-test*.

RESULTS AND DISCUSSION

The numerical value of the Estrus Response (%) was higher in $PGF_{2\alpha}$+CIDR cows than in $PGF_{2\alpha}$ONLY cows (Table 1).

Table 1 Mean Estrus Response (%) of crossbred cows synchronized with either $PGF_{2\alpha}$ or a combination of $PGF_{2\alpha}$and CIDR

Treatment	No. of cows	No. of responsive cows	% Response
$PGF_{2\alpha}$ONLY	20	7	35
$PGF_{2\alpha}$+CIDR	20	11	55

These results are consistent with findings in pure dairy cows. Saldarriaga *et al*. (2007) who compared the efficiency of prostaglandin treatment alone with the combined progestin-prostaglandin treatment in dairy cows found that the latter was more effective than the former during the first 96 hours after the end of the treatment. Similarly, Gyawu *et al*. (1991) observed that the progestin-prostaglandin combination was more effective in synchronizing ovulation compared with prostaglandin alone. Various studies have reported high response rates in dairy cows when $PGF_{2\alpha}$ is used in combination with other substances. For example, Dailey *et al*. (1986) administered $PGF_{2\alpha}$ and estradiol benzoate to lactating cows and reported an increased proportion of cows in estrus (66.9%) compared to the control. Xu and Burton (2000) also reported estrus synchronization rates of 92.8% in lactating cows following administration of GnRH, CIDR and $PGF_{2\alpha}$. In Bangladesh, Rahman *et al*. (2014) reported 100% estrus response in crossbred cows (Holstein x Local) following injection with GnRH and $PGF_{2\alpha}$ and flushing with high energy feed.

According to Busch *et al*.(2010), the improved synchrony of estrus and ovulation for cows treated with CIDR appears to be associated with an increased response to GnRH and more effective control of the emerging follicular wave resulting from pre-synchronization with long-term CIDR treatment before GnRH and $PGF_{2\alpha}$. Measurable differences in the resulting synchrony of estrus after treatment suggest that these differences occur as a consequence of these improvements in synchrony of estrus and ovulation when comparing the two protocols.

It is, however, to be noted that while the present study showed that a combination of progesterone and prostaglandin resulted in a numerically higher Estrus Response (55%), it was lower than values reported by other workers. This could be explained from the point of poor nutrition as most smallholder producers do not provide feed supplementation. Thus, although the study was conducted during the rainy season, the animals still needed to be supplemented with high-energy concentrates in order to effectively respond to estrus synchronization.

With regard to Response Time, there was no significant difference ($P>0.05$) between the $PGF_{2\alpha}$+CIDR cows (91.6±2.9 hrs) and the $PGF_{2\alpha}$ONLY cows (98.0±6.9 hrs) although numerically, the former exhibited a shorter Response Time (Table 2).

Table 2 Mean Response Time(hours) in crossbred cows synchronized with either $PGF_{2\alpha}$ or a combination of $PGF_{2\alpha}$ and CIDR

Treatment	No. of responsive cows	Response Time ± SE	P
$PGF_{2\alpha}$ONLY	7	91.6±2.9	0.41
$PGF_{2\alpha}$+CIDR	11	98.0±6.9	

The prolonged Response Time in both treatments are not in agreement with numerous studies in which cows and heifers have been given prostaglandin only or a combination with progesterone or other agents. Lamb *et al*. (2001) noted that the average interval from injection of prostaglandin to estrus was usually 60 to 72 hours. Kebede *et al*. (2013) reported an average of 51 hours following administration of $PGF_{2\alpha}$ in local cows. Lemaster *et al*. (2001) who administered $PGF_{2\alpha}$ in combination with GnRH to crossbred postpartum cows observed that estrus occurred within 48-72 hours. As in the case of estrus response, the long time-intervals in the present study may be explained from the perspective of the level of management and nutrition of animals among smallholder dairy producers in the study area.

It is recommended that smallholder dairy producers in Zambia consider adopting a combination of prostaglandin and progesterone for estrus synchronization. However, good results can only be achieved if the estrus synchronization is done in combination with good management and improved nutrition of animals. Further research is recommended to investigate the factors that may improve the effectiveness of estrus synchronization in the crossbred cows on the smallholder dairy farms.

Acknowledgements

We thank the smallholder dairy producers in the study area for their cooperation in conducting this research. Thanks are also

due to National Artificial Insemination Centre for the technical support. Dr. Davis Lungu and Mr. Martin Sampa are acknowledged for help with statistical analysis. Financial assistance was provided by the Ministry of Agriculture and Livestockthrough the Department of Livestock Development.

References

Busch, D.C., Mallory, D.A., Wilson, D.J., Ellersieck, M.R., Smith M.F. and Patterson D.J. 2010. Comparison of long term progestin-based estrus synchronisation protocols in beef heifers. *Journal of Animal Science*, 88, 3568-3578

Dailey, R.A., Price, J.C., Simmons, K.R., Meisterling, E.M. Quinn, P.A. andWashburn, S.P. 1986.Synchronization of Estrus in Dairy Cows with Prostaglandin $F_2\alpha$ and Estradiol Benzoate. *Journal of Dairy Science*, 69, 1110-1114

Gebrehiwot, G., Gebrekidan, B., and Weldegebriall, B. 2015. The effect of one shot prostaglandin on estrus synchronization of Local and Holstein Friesian cattle in and around WukroKilteAwulaelo District, Northern Ethiopia. *Journal of Biology, Agriculture and Healthcare*, 5, 99-105

GenStat Release 13.1. 2010. VSN International Ltd.

Gyawu, P., Ducker, M.J., Pope, G.S., Saunders, R.W. and Wilson, G.D.A. 1991.The value of progesterone, oestradiol benzoate and cloprostenol in controlling the timing of oestrus and ovulation in dairy cows and allowing successful fixed-time insemination. *British Veterinary Journal*, 147, 171–182

Kebede, A., Zeleke, G., Ferede, Y., Abate, T. and Tegegne, A. 2013. Prostaglandin ($PGF2_\alpha$) based oestrous synchronization in postpartum local cows and heifers in Bahir Dar Milkshed. *International Journal of Pharma Medicine and Biological Sciences*, 2, 37-43

Lamb G.C., Stevenson J.S., Kesler D.J., Garverick H.A., Brown D.R. and Salfen, B.E. 2001. Inclusion of an intravaginal progesterone insert plus GnRH and prostaglandin F2alpha for ovulation control in postpartum suckled beef cows. *Journal of Animal Science,* 79, 2253–2259

Lemaster, J.W., Yelich, J.V., Keupfer, J.R., Fullenwider, J.K., Barnett, C.L., Fanning, M.D. and Seph, J.F. 2001. Effectiveness of cattle of GnRH plus prostaglandin $F_{2\alpha}$ for estrus synchronisation in cattle of *Bosindicus* breeding. *Journal of Animal Science*, 39, 309-316

Pandey, G.S. and Muliokela, S.W. 2006. Smallholder Dairy Farming: A tool for HIV/AIDS mitigation and food in-security. Africa Forum Workshop, 9th May 2006, Pamodzi Hotel, Lusaka, Zambia

Rahman, M.S., Khan, M.K.I. and Bilkis, T. 2014. Effect of flushed feeding and age on estrus synchronization and conception rate of Holstein × Local Crossbred cows after using analogue GnRH and Prostaglandin F2α hormone. *Iranian Journal of Applied Animal Science*, 4, 493-497

Rodenburg J. 2004. Body Condition Scoring of dairy cattle. Ministry of Agricultural, Food and Rural Affairs factsheet. Ontario. ISSN 1198-712X. Retrieved September 5, 2016, from http://www.omafra.gov.on.ca/english/livestock/dairy/facts/00-109.htm

Saldarriaga, P.J., Cooper, D.A., Cartmill, J.A., Zuluaga, J.F., Stanko, R.L. and Williams, G.L. 2007. Ovarian, hormonal, and reproductive events associated with synchronization of ovulation and timed appointment breeding of *Bosindicus*-influenced cattle using intravaginal progesterone, gonadotropin-releasing hormone and prostaglandin $F_{2\alpha}$. *Journal of Animal Science,* 85, 151-162

Xu, Z.Z. and Burton, L.J. 2000. Estrus Synchronization of Lactating Dairy Cows with GnRH, Progesterone, and Prostaglandin $F_{2\alpha}$, *Journal of Dairy Science*, 83, 471-476

Yambayamba, K.E.S. and Mwanza, Y. 2016. Effect of Prostaglandin F2α on Estrus Synchronization in Crossbred and Indigenous Cows on Smallholder Dairy Farms in Mazabuka, Zambia. *International Journal of Research Studies in Agricultural Sciences* 2(7): 10-13. http://dx.doi.org/10.20431/2454-6224.0207002

****

How to cite this article:

Kavwanga E. Sikazwe Yambayamba and Yvonne Mwanza.2017, Effect of Prostaglandin F2α And Progesterone-Releasing Device Cidr® On Estrus synchronization in friesian x indigenous crossbred cows in Mazabuka district, zambia. *Int J Recent Sci Res.* 8(2), pp. 15475-15477.