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PGF2α (250 mcg d-cloprostenol) Effectiveness of two Schemes for Estrus Induction in Brahman Bovine Females with Lasting Anestrus

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ABSTRACT

The reproductive behavior of Brahman breeding cows subject to estrus induction was assessed, at the "Rancho Bonito Farm", Gamelotal area, Lara State, Venezuela. The experiment lasted 90 days, and was based on two estrus induction schemes (Progesterone + Estradiol Benzoate and Progesterone + PMSG). Following 72 h of treatment, 62.5 % of the cows that received P_4 + PMSG were fertilized; whereas the P_4 + BE treatment induced fertilization of 25 % ($P < 0.05$). During the 90 days, 93.7 % of the cows that received P_4 + PMSG, and 75 % under the P_4 + BE treatment, were fertilized, which demonstrated the effectiveness of the schemes.

Key words: *estrus, pregnancy, Brahman*

INTRODUCTION

Estrus detection in *Bos indicus* cows is difficult because of the large number of factors inciding on anestrus post-calving, estrus occurrence at night, and short estrus duration, which makes artificial insemination difficult (Baruselli *et al.*, 2004). Moreover, when the animals are subjected to severe nutritional restrictions, the follicle developed does not develop into an emergency state (Wiltbank *et al.*, 2002).

Faure and Morales (2003) on the causes of anestrus, pointed out that several factors —including undernourishment— may have a direct influence on the ovarian or hypophyseal levels, leading to alterations that produce little follicle development, and efficient production of steroid hormones which are unable to induce estrus.

One of the most widespread methods is estrous cycle manipulation, which makes possible efficient use of artificial insemination (AI), a challenge for veterinarian medicine (Belacuba, 2006).

According to Ashwood (2012), the estrous cycle of *Bos indicus* females ranges between 17 and 24 days. Within that setting, there are several factors effecting on duration, such as season, nutrition, diseases, age, and the cow´s reproductive state. The cycles are longer and estrus incidence is greater during periods of environmental and nutritional stress that occur in tropical and subtropical climates. That explains, somehow, the variation in pregnancy rates of Brahman females from one season to another: 76 % in spring, and 58 % in the fall (Ríos *et al.* 1996).

About the past, present and future of Brahman cows in Venezuela, Atencio (2007) praised this breed´s value. The pregnancy percentages increased between 1996 and 2002, but decreased between 2003 and 2006. Late sexual maturation was considered a weakness; thus justifying the use of biotechnologies, like strategic artificial insemination for reproductive and genetic breeding.

Induction and synchronization schemes use is common practice in Cuba; according to Pedroso, Roller, Davis and Gutiérrez (2005), they help improve the efficiency of artificial insemination services, reduce the anestrus post calving, improve technical efficiency of AI, and planning calving for the most suitable season.

The aim of this study was to assess the effectiveness of progesterone/PMSG and estradiol Benzoate combinations to induce estrus in Brahman cows, suffering long anestrus.

MATERIALS AND METHODS

Research was conducted on Rancho Bonito, Gamelotal, municipality of Sarare, State of Lara, Bolivarian Republic of Venezuela. Gamelotal is a settlement located about 5.75 km from Sarare (municipality of Simon Planas), 327 m above sea level.

The edafoclimatic features of the area have been stated by Rosales *et al.* (2014), with a humid pe-

riod between April 20 and October 25 (188 days long); and a period of grass growing, between April 4 and November 25 (235 days).

Forty-eight Brahman breeding anestrus females, weighing 380-420 kg, mean body condition scoring 5 in the 1-9 scale for beef cattle (Flores *et al.*, 2007; Kabaleski, 2013), in traditional breeding systems, weaning at 8 months, were used. The animals were distributed at random in three groups, with 16 females in each. Group 1 received three applications of progesterone (P_4) intramuscularly every 72 h, in 60; 90 and 90 mg doses. Seventy-two hours after the last application of P_4, 1 000 UI of PMSG was applied intramuscularly. Group 2 received the same P_4 treatment as the previous group, but it received 1 mg Estradiol Benzoate (BE) ®Virbac intramuscularly, instead. No treatment was applied to group 3 (witness). The experiment lasted 90 days.

Estrus detection was done visually, and artificial insemination was made with the a.m.-p.m. method, used by the technician. The pregnancy diagnostic test was made 60 days after service, by rectal palpation.

Estrus occurrence and the pregnancy rate were assessed for each group. The data were analyzed by X^2 (Square Chi), using (StatSoft 2009) 8.1.

RESULTS AND DISCUSSION

Table 1 shows the results of the different schemes for estrus induction. Estrus occurrence was similar in the two groups that received the hormone therapy 72 h after treatment; however, the pregnancy rate was significantly higher ($P < 0.05$) in the animals that received P_4 + PMSG (62.5 %).

The results achieved for estrus induction are similar to reports by Pedroso and Bonachea (1993); Pedroso and Roller (1997); Pursley *et al.* (1997a) and Pursley *et al.* (1997b), using similar schemes for estrus induction.

A review of the literature related to post-calving estrus synchronization methods for cattle, Odde (1990), concluded that in most papers, over 90 % of the treated animals had estrus, with 33-68 % pregnancy. Many anestrus cows had estrus after the treatment, but fertility was lower than in cows with normal cycles.

In other papers, Faure *et al.* (1981); Plasse (1994); Pedroso and Roller (1998), on dairy cows and heifers with different doses of PMSG, noted its effectiveness to induce estrus and pregnancy.

Follicular regression is another benefit of Estradiol with progestin in short protocols, prior to the occurrence of a new follicular wave (Bo *et al.*, 1995). The mechanism includes suppression of circulating concentrations of FSH. Short-term Estradiol treatments, such as 17β estradiol, in cows treated with progestin is followed by the occurrence of a new wave, 3-5 days later, regardless of the estrous cycle status during the treatment.

P_4 combinations with low dose of Estradiol benzoate have a favorable influence on follicular wave development, which are able to maintain stability of follicular development and estrus triggering (Faure *et al.*, 1996), resulting in satisfactory ovulation rates (Ayres *et al.*, 2008). Furthermore, both Estradiol benzoate and Estradiol cypionate were effective in synchronizing protocols for *Bos indicus* fertilization in lactating cows (Sales *et al.*, 2012).

Peralta-Torres *et al.* (2010) noted that the use of Estradiol cypionate and Estradiol benzoate in cows and heifers have the similar favorable effect on estrus occurrence rates, but not on pregnancy rates. Estradiol concentrations of endogenous and exogenous sources may play a significant role in sperm transportation, and sperm viability to ovulation and fertilization (Sá Filho *et al.*, 2011).

Table 2 shows estrus occurrence and pregnancy rates for the experimental period. Cows in the two groups had estrus, with pregnancy rates significantly higher ($P < 0.05$) than the witness group, with only for cows in estrus, and three of them were fertilized. Although no significant differences were observed for the total pregnancies in the two treatments, the P_4 + PMSG group had three more pregnant cows.

These results coincide with Bavera (2005), who claimed that the treatments have induced estrus in 72 % of cows in the first five days, and 84 % in 30 days of mating, leading to estrus induced fertility of 60 % and 72 %. However, in this paper, control duration lasted 90 days. This research favored the effectiveness of PMSG to treat anestrus post-calving, with the application of P_4 plus a 10 mg Estradiol benzoate capsule, until the seventh day, followed by a 500 UI PMSG injection intramuscularly. The principles of this scheme are the same used in the experiment, and the results are similar; therefore, these treatments were effec-

tive to cope with prolonged anestrus in breeding Brahman cows.

This response is induced if the follicular and luteal phases are controlled together, so estrus and ovulation are synchronized, and fertility is achieved normally (Gregory *et al.*, 2009). The luteal phase is controlled with P_4; and follicular development and ovulation induction, by using estradiol or GnRH (Alberio and Butler 2001). On that premise, the protocols for anestrus treatment are based on hormone combinations. Estradiol administration at the beginning of P_4 treatments induces a new follicular wave and positive begetting percentages (McDougall *et al.*, 2005; Ross *et al*. 2004).

CONCLUSIONS

Progesterone combinations using PMSG and Estradiol benzoate were effective for estrus induction in breeding Brahman cows with prolonged anestrus, for which positive pregnancy rates were achieved 90 days following treatment.

REFERENCES

ALBERIO, R. H.; y BUTLER, H. (2001). Sincronización de los celos en hembras receptoras. En *Biotecnología de la reproducción*. Argentina: Ed. Palma G. A., Editorial Balcarce.

ASHWOOD, A. (2012). Reproduction-Oestrus & Puberty. *Brahman News*, *174* (3), 1-10.

ATENCIO, A. (2007). *Brahman en Venezuela: pasado, presente y futuro*. XI Seminario Manejo y utilización de pastos y forrajes en sistemas de producción, Venezuela.

AYRES, H.; MARTINS, C. M.; FERREIRA, R. M.; DOMÍNGUEZ, J. H.; SOUZA, A. H.; MELLO, J. E.; VALENTIN, R.; SANTOS, I. C. C. y BARUSELLI, P. S. (2008). Effect of Timing of Estradiol Benzoate Administration upon Synchronization of Ovulation in Suckling a Nelore Cows (*Bos indicus*) Treated with a Progesterone-Releasing Intravaginal Device. *Animal Reproduction Science*, *109*, 77-87.

BARUSELLI, P. S.; REIS, E. L.; MARQUES, M. O.; NASSER, L. F. y BOB, G. A. (2004). The Use of Hormonal Treatments to Improve Reproductive Performance of Anestrous Beef Cattle in Tropical Climates. *Anim. Reprod. Sci.*, *82/83*, 479-486.

BAVERA, G. A. (2005). *Ciclo estral*. Retrieved on April 5, 2014, from http//www.produccion-animal.com.ar.

BECALUBA, F. (2006). *Métodos de sincronización de celos en bovinos*. Retrieved on April 5, 2014, from http//www.produccion-animal.com.ar.

BO, G. A.; ADAMS, G. P.; PIERSON, R. A. y MAPLETOFT, R. J. (1995). Exogenous Control of Follicular wave Emergence in Cattle. *Theriogenology*, *43*, 31-40.

FAURE, R.; ALFONSO, J. C.; FERNÁNDEZ, O.; y GONZÁLEZ, F. (1981). *Inducción del celo con benzoato de estradiol y propionato de testosterona en novillas anéstricas*. Second Scientific Seminar CENSA, Havana, Cuba.

FAURE, R.; FERNÁNDEZ, O.; ALONSO, J. C.; y GIL, A. (1996). Concentraciones de progesterona sérica e inducción de estro fértil con la inyección de dosis bajas de esta hormona en novillas anéstricas. *Rev. Salud. Anim.*, *18* (1), 49-55.

FAURE, R. y MORALES, C. (2003). La pubertad de la hembra bovina. I. Aspectos fisiológicos. Artículo reseña. *Rev. Salud Anim.*, *25* (1), 13-19.

FLORES, R.; LOOPER, M. L.; RORIE, R. W.; LAMB, M. A.; REITER, S. T.; HALLFORD, D. M.; KREIDER, D. L. y ROSENKRANS, C. F. (2007). Influence of Body Condition and Bovine Somatotropin on Estrous Behavior, Reproductive Performance, and Concentrations of Serum Somatotropin and Plasma Fatty Acids in Postpartum Brahman-influenced Cows. *J. Anim. Sci.*, *85*, 1318-1329.

GREGORY, R. M.; MELO, L.; BESKOW, A.; MATTOS, R. C.; JOBIM, M. I. M. y GREGORY, J. W. (2009). *Dinâmica follicular e uso de hormonoterapias na regulação do ciclo estral na vaca*. Congresso Brasileiro de Reprodução Animal, Belo Horizonte.

KABALESKI, C.D. (2013). *Condición corporal en ganado de carne*. Retrieved on April 5, 2014, from http//www.produccion-animal.com.ar.

MCDOUGALL, S.; COMPTON, C. W. R.; HANLON, D. W.; DAVIDSON, P. J.; SULLIVAN, D. J.; GORE, A. H. y ANNISS, F. M. (2005). Reproductive Performance in Anestrous Dairy Cows Following Treatment with Two Protocols and Two Doses of Progesterone. *Theriogenology*, *63*, 1529-1548.

ODDE, K. G. (1990). A Review Synchronization of Estrus in Postpartum Cattle. *J. Anim. Sci.*, *8*, 817-830.

PEDROSO, R.; ROLLER, F; DAVIS, M. y GUTIÉRREZ, M. (2005). *Mejoramiento de la productividad del ganado bovino mediante el uso de la terapéutica hormonal en Cuba*. III International COnference on Animal Breeding, 7-11 November, Ciudad de La Habana, Cuba.

PEDROSO, R.; y BONACHEA, SARA (1993). Aplicación de métodos biotécnicos para mejorar la fertilidad del bovino en clima subtropical. *Rev. Cub. Repr. Anim.*, *16*, 61-74.

PEDROSO, R. y ROLLER, FELICIA (1997). Tecnologías para la regulación del ciclo estral, la superovulación y el diagnóstico precoz de la gestación en el ganado bovino. *Rev. Cub. Repr. Anim.*, *23*, 1-23.

PEDROSO, R. y ROLLER, FELICIA (1998). Métodos biotécnicos y estrategias de nutrición y manejo reproductivo para mejorar la fertilidad post-parto de vacas en clima subtropical. *Rev. Cub. Reprod. Anim.*, *24* (1), 79-90.

PERALTA, J. A.; AKÉ, J. R.; CENTURIÓN, F. G. y MAGAÑA J. G. (2010). Comparación del cipionato de estradiol vs Benzoato de Estradiol sobre la respuesta a estro y tasa de gestación en protocolos de sincronización con CIDR en novillas y vacas *Bos indicus*. *Universidad y Ciencia, Trópico Húmedo*, *26* (2), 163-169.

PLASSE, D. (1994). *Factores que influyen en la eficiencia reproductiva del bovino de carne en América Latina Tropical, estrategias para mejorarla*. International Seminar on Animal Reproduction, Cartagena, Colombia.

PURSLEY, J. R.; KOSOROK, M. R.; WILTBANK, M. C. (1997a). Reproductive Management of Lactating Dairy Cows using Synchronization of Ovulation. *J. Dairy Sci.*, *80*, 301-306.

PURSLEY, J. R.; WILTBANK, M. C.; STEVENSON, J. S.; OTTOBRE, J. S.; GARVERICK, H. A. y ANDERSON, L. L. (1997b). Pregnancy Rates per Artificial Insemination for Cows and Heifers Inseminated at a Synchronized Ovulation or Synchronized Estrus. *J. Dairy Sci.*, *80*, 295-300.

RÍOS, A; VEGA, V; MONTAÑO, M; LAGUNES, J y ROSETE, J. (1996). Comportamiento reproductivo de vacas Brahman, Indobrasil y sus cruzas F_1 Angus, Charolais, Hereford y Pardo suizo x Cebú y pesos al destete de sus cruzas. *Tec. Pecu. Mex.*, *34* (1), 20-28.

ROSALES, C.; FAJARDO, H.; GUEVARA, R.; y BERTOT, J. A. (2014). Indicadores reproductivos en hembras bovinas Gyr lechero en el Centro Técnico Productivo Socialista Florentino, Estado Barinas. *Journal Granma Ciencia*, *18* (2).

ROSS, P.; ALLER, J.; BUTLER, H.; CALLEJAS, S.; y ALBEIRO, R. (2004). Estradiol Benzoate Given 0 or 24 h After the End of a Progestagen Treatment in Postpartum Suckled Beef Cows. *Theriogenology*, *62*, 265-273.

SÁ FILHO, M. F.; SANTOS, J. E. P.; FERREIRA, R. M.; SALES, J. N. S. y BARUSELLI, P.S. (2011). Importance of Estrus on Pregnancy per Insemination in Suckled *Bos indicus* Cows Submitted to Estradiol/Progesterone-Based Timed Insemination Protocols. *Theriogenology*, *76*, 455-463

SALES, J. N. S.; CARVALHO, J. B. P.; MAIO, J. R. G., CREPALDI, G. A.; SOUZA, J. C.; CIPRIANO, R. S.; NOGUEIRA, G. P.; JACOMINI, J. O. y BARUSELLI, P. S. (2012). Effects of two Estradiol Esters (Benzoate and Cypionate) on the Induction of Synchronized Ovulations in *Bos indicus* Cows Submitted to a Timed Artificial Insemination Protocol, *Theriogenology*, *78*, 510-516.

StatSoft. (2009). Statistica. Versión 8.1.

WILTBANK, M. C.; GUMEN, A. y SARTORI, S. (2002). Physiological Classification of Anovulatory Conditions in Cattle. *Theriogenology*, (57), 21-52.

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Table 1. Estrus occurrence and pregnancy rates 72 h following treatment

Treatments	Estrus females	Pregnant animals (Pregnancy rates)
P_4 + PMSG (n=16)	14 (87.5 %)	10^a (62.5 %)
P_4 + BE (n=16)	15 (93.7 %)	4^b (25 %)
Witness (n=16)	0	0
Significance	NS	$P < 0.05$

Table 2. Estrus occurrence and pregnancy rates up to the third artificial insemination round

Treatments	Estrus Occurrence	Pregnant animals (pregnancy rates)		
		Second estrus	Third estrus	Total
P_4 + PMSG	16^a (100 %)	3 (18.7 %)	2 (12.5 %)	15^a (93.7 %)
P_4 + BE	16^a (100 %)	6 (37.5 %)	2 (12.5 %)	12^a (75 %)
Witness	4^b (25 %)	1 (6.2 %)	---	3^b (18.7 %)
Significance	$P < 0.05$	NS	NS	$P < 0.05$