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Effects of $PGF2_{\alpha}$ and GnRH on Reproductive Performance of Cattle and Buffaloes in Thailand and Philippines

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Effects of using GnRH and $PGF2_{\alpha}$ on reproductive performance of dairy cattle's (cows and heifer) in Northeastern part of Thailand and on cattle (Beef cattle) and buffaloes (dual purpose) breed in the Philippines were made. Cloprostenol ($PGF2_{\alpha}$) are used in both countries. The improvements are observed on all animals. The reproduction in cows and heifer in Thailand and buffaloes in Beef cattle in the Philippines were observed. The estrous signs, conception rate and pregnancy rates and the cost were determined. The first study was in Thailand. A total of 390 heads were used. There were 82 cows and 62 heads of cattle in Thailand and 160 buffaloes and 36 cattle with lutalyze and 45 buffaloes and 5 cattle in the Philippines for cloprostenol.

Base on the results of the two studies, dairy cows and heifers responded positively to the GnRH and $PGF2_{\alpha}$ injection, resulting in higher incidence of estrus. Synchronization of estrus and ovulation by obsync protocols could improve percent non-return to estrus and conception rate of dairy cattle. The hormone ensured the onset of estrus and ovulation in lactating dairy cows and mature heifers. The pregnancy rate of dairy cows and heifer was increased by synchronization of estrus and ovulation. These findings may encourage farm holders to practice synchronized estrus and ovulation in the small farm level.

The result showed that there was no significant change in the reproductive performance of buffaloes using lutalyze or cloprostenol, similarly, dairy cows and heifer in Thailand do not showed significant differences in their estrus and conception rate. The use of $PGF2_{\alpha}$ and GnRH in Thailand are almost the same. Prostaglandin $F2_{\alpha}$ is just enough and necessary to get the reproductive performance of cattle and buffaloes in the Philippines and in Thailand. Environmental condition does not affect their performance. The cost is likely to be used by the AI technicians in the fields.

For Artificial Insemination, it is thus recommended to apply the hormone using the $PGF2_{\alpha}$. It is noteworthy to know that the price is cheaper. It is easier to apply under field conditions; however, the technical knowledge of the AI technician in ovarian palpation is necessary.

Introduction

Importance of the Study

In Thailand and Philippines various combinations of synthetic hormones have been used in inducing ovarian activity, postpartum and

increasing conception rates. The responses were variable, indicating that physiological effects of hormones may be influenced by age, nutritional status of the cow, body condition and seasonal variations. Elevated temperature has a depressing effect on ovarian functions and fertility rate. However, hormonal studies have established that the secretion and release of pituitary hormones are under the influence of hypothalamic hormones. The gonadotrophin releasing hormone (GnRH) is known to be directly responsible for the synthesis and release of FSH and LH of the pituitary. Potent preparations of GnRH or its analogs are now available in the market. This hormone is most effective in a pulsatile manner than in a continuous manner. Since pulsatile secretion is not practical, the bolus injection method of administrating GnRH is preferred, using 100-500 mg, or equivalent doses of its analogs, or double bolus injections given at 12 - 24 hrs apart (Abeygunawardena, 1999). The effectiveness of the treatment depends on the status of the ovary at the time of administration and the stage of anestrus. Thus, it is apparent that GnRH influences the secretion of pituitary hormones that initiate postpartum development, maturation and eventual ovulation of matured follicles (McLeod and Phillips, 1998 and Ginther *et al.*, 1999).

The synchronization systems currently used in the reproductive management of dairy cattle involve hormonal treatments, which may influence the inter-estrous interval in normally cycling cows. Progesterone or potent progesterone analogues are used in combination with a luteolytic agent involving an estrogen or synthetic prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$). The estrogen is administered at the start of the progesterone treatment, whereas the prostaglandin is injected close to or at the end of the treatment. Two injections of synthetic $PGF_{2\alpha}$ may be given at 10 - 14 days interval. Synthetic $PGF_{2\alpha}$ with brand names Lutalyse®, Prostavet®, Prosolvin®, estroPLAN® and Estrumate® is at present used primarily for its luteolytic effects. It causes rapid regression of a functional corpus luteum (CL), with a resultant decrease in progesterone secretion. Luteolysis is followed by ovarian follicular development and a return to estrus with normal ovulation, which occur 2 - 4 days after luteolysis in cattle.

Statement of the Problem

Synchronization of estrus in lactating dairy cows has been limited to the use of prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) or its analogs at any point in the estrous cycle, so that they will exhibit estrus and be inseminated at the same time. Wattiaux (1995) reported that cows with CL, heat occurs 2 - 7 days after prostaglandin injection. The number of days between injection and estrus varies with the stage of follicular growth at the time of injection. Pursley et al., (1997) claimed,

however, that estrus is not synchronized precisely because $PGF_{2\alpha}$ does not synchronize follicular growth but only regulates the life span of the CL. Hence, they developed a new method, so-called Ovsynch, to synchronize ovulation with the combined use of GnRH and $PGF_{2\alpha}$. This method synchronized ovulation within an 8-hr period from 24 - 48 hrs after the 2nd injection of GnRH. This treatment protocol has made estrus synchronization possible even without the actual detection of estrus. Therefore, it is important to know whether conception and pregnancy rates can be increased by: 1) timed AI simultaneous with the 2nd injection of GnRH, or 2) timed AI 24 hrs after the 2nd injection of GnRH. The insemination protocol for estrus synchronization of lactating dairy cows and sexually mature heifers. Background information on synchronization of estrus and ovulation has been obtained from studies in temperate zones. It is equally important to determine whether or not the new methods will hold true with crossbred dairy animals raised in the Northeastern part of Thailand (Jamsawat, 1990).

Scope and Limitation of the Study

In Thailand it is focused mainly on the effects of GnRH and $PGF_{2\alpha}$ on the reproductive performance of dairy cattle raised in the northeastern part of Thailand which aimed to improve the reproductive performance by the use of hormones: for estrus synchronization, induction of ovulation and conception rate. The number of dairy cattle used in this study was 82 lactating dairy cows and 62 dairy heifers. In the Philippines, treated of $FGF2_{\alpha}$ is normally used in buffaloes and cattle. The use of cloprostenol is a new hormone that is introduce for estrus in buffaloes and cattle. This will be the emphasis of this study.

Objectives of the Study

General Objective

The primary objective of this research is to improve the present level of reproductive performance of crossbred dairy cows (cattle and buffaloes) and heifers raised with the use of hormones.

Specific Objectives

1. To determine the incidence of estrus following the injection of GnRH and $PGF_{2\alpha}$ in lactating cows and heifers and with syncromate (cloprostanol) in the reproduction of buffaloes and cattle.

2. To identify the manifestation of estrus signs in crossbred dairy cows and heifers in Thailand and buffaloes and cattle in the Philippines during which the initiation of a timed artificial insemination (TAI) would improve pregnancy rates.
3. To determine the presence or absence of Graafian follicle and CL after the initiation of an insemination protocol, using GnRH and $PGF_{2\alpha}$ at designated stages of the estrous cycle in Thailand.
4. To determine the conception and pregnancy rates of crossbred dairy cows and heifers in Thailand and calves of buffaloes and cattle in the Philippines after hormone treatment.
5. To determine the cost of the hormones.

Materials and Methods

We have selected artificial insemination technician who are conducting estrus synchronization in the villages. They are given PGF2 alpha for injection to selected buffaloes in the villages. Breedable cattle and buffaloes are selected and were given the hormone. Each animal are given PGF2 alpha (cloprostenol and lutalyze) every after each animal to prevent selection of each animal per hormone in both cattle and buffaloes. After 45 to 60 days, the animals are diagnosed for pregnancies and wait to the animal to give calves. Each result was analyzed for T test.

A total of 390 heads are used. The first group of 50 (45 buffaloes and 5 cattle) given estrumate (cloprostenol), the 196 heads of 160 buffaloe and 36 cattle were given Lutalyze in the Philippines and the 82 heads of lactating dairy herd were in Thailand and given estrumate (Cloprostenol) and GnRH (Buserelin, 0.01 mg) and 62 heads in Thailand for PGF2A and GnRH.

Statistical design and analysis

Data collected were analyzed by Chi square and T-test in the Philippines and in Thailand was by Chi-square test analysis for factorial in CRD. Any significance were by DMRT.

Results and Discussion

The response of the animals, cattle and carabaos, after the injection of cloprostenol, to effect estrus is controlled by hormone after the 72-96 hours interval and has different time of estruses. In cattle, estrus was first detected at 72 hours after injection. The animals showed different signs of estrus, like

swelling of the vulva, frequent mucus discharge, urination, bellowing, switching of tail, mounting and allowing to be mounted. The said duration was observed 14-18 hours. The ovaries have already ovulated after 92 hours.

In buffaloes, the first sign was detected after 72 hours after injection. Ovaries was showing a size of 10 nanometer. Only 30% of injected animals showed estrus (pro-estrus), mucus discharged was clear and watery. But on the 92-96 hours, the animal shows standing heat. The animal shows all the clinical symptoms of estrus like reddening of the vulva with good mucus discharge and mounting of other animals. The ovaries showed a 15-20 mm of graafian follicle.

Table 1: Performance of Animals treated with different Hormones, PGF2-Alpha

Hormone /PGF2-Alpha	**Province/ Town Barangay**	**Number of Animals used**	**Breed of Animals**	**Range of Ages**	**Date of ES/AI**	**Return Estrus After 21 days**	**Response to Monitoring after Delivery**	**Calves Born, Second AI on 21 days after treatment**
1.Synchoromate (Cloprostenol)	Gerona 17 Paniqui 10 Mayantoc 15 VBAIT	45	Philippine Carabao	5-17	April-May 2011	15 heads	Calf Drop Return to heat 18 (Buffalo) 40%	10 (66.2%)
		5 (Mayantoc)	Cattle	3-15	April-May 2011	0	5 (Cattle) 100%	0
2. Lutalyze	Talavera 47 VBAIT	47 (Buffalo)	S.Buffalo & CB	3-12	March-May 2011	22 heads	25 (Buffalo) 53.19%	not monitored
		36 (Cattle)	Cattle	3-12	March-May 2011	26 heads	10 (Cattle) 27.77%	not monitored
	Tarlac City VBAIT	113 (Buffalo)	S.Buffalo & CB	3-15	April-May 2011	not monitored	49 (Calves) 43.30%	not monitored

Table 1 presents the performance of animals treated with different hormones like Synchoromate (cloprostenol) and lutalyze to buffaloes and cattle in Nueva Ecija and Tarlac. There are about forty five buffaloes and five cattle that were treated with cloprostenol in Tarlac and 160 buffaloes and 36 cattle in Nueva Ecija and Tarlac were treated with lutalyze. The age ranges from 3 to 17 years. The date of treatment was during summer, April to May of 2013. During summer the buffalo are difficult to be bred by their natural estrus, thus they were estrus synchorized.

The responses of the buffaloes and cattle to monitoring after the first AI or 21 days thereafter are shown in table 1. Those that do not come into heat give calves and those that come into heat are inseminated again. Others are monitored and the others are not.

There are 15 heads for carabaos in Gerona, Paniqui, and Mayantoc were inseminated for the second time and 10 cows of 15 cows, delivered a calf and those that do not come into heat after the first service 18 cows give birth or 40%. When those that calves after second service on the 21st day got or was 66.2%. On the other hand, there are only 5 heads of cattle that were treated and all of them give birth to calves or 100%, after the first service or after synchorinization with cloprostenol.

These treatments for cloprostenol were similarly done in Tarlac and Nueva Ecija with lutalyze hormone. Lutalyze was commonly use in the center for quite a long time. Buffaloes synchronized with lutalyze in Tarlac are 113 buffaloes, and 47 buffaloes and 36 heads of cattle in Nueva Ecija. The buffaloes in Nueva Ecija show that 22 heads come into heat on 21st day and 10 heads of cattle. There was no monitoring in Tarlac province on the 21st day. The number of cows that give birth was 53.19% for buffalo and 27.77% in cattle. In Tarlac, 43.3% give birth out of 113 buffaloes. The cows that were inseminated on the 21st day may produce calves but were not monitored We are expecting higher percentage that get pregnant and delivered calves.

Table 2: Effect of hormone treatment on some sign of estrus and pregnancy rate in cows (%)

Sign of estrus	**1**	**2**	**3**	**mean**
1. Presence of mucus	41.67	57.69	48.88	45.78
2. Swelling	79.17	84.66	81.88	81.71
3. Redness	97.17	92.31	93.75	89.02
Response after 21 days				
1. Non return to estrus	50.00	51.69	31.25	45.12
2. Conception rate	33.33	30.77	18.75	26.83

3. Pregnancy rate	83.33	57.69	68.75	69.51

Table 3: Effects of hormone treatment on some signs of estrus in heifers (%)

Sign of estrus	**13-18 mos.**	**19-24 mos.**	**mean**
1. Presence of mucus	26.47	21.43	24.19
2. Swelling	79.41	89.29	83.87
3. Redness	82.35	60.71	72.58
Response after 21 days			
1. Non return to estrus	50.00	42.86	46.77
2. Conception rate	20.59	32.14	25.81

Table 4: Cost of hormones/head of cows and heifers.

Hormones	**COST Baht/Pesos**
A1 = PGF2α and times AI	= 300/450
A2 = GnRH + PGF2α; 2nd doze GnRH+AI	= 675/1012.5
A3 = GnRH + PGF2α; time/AI+ GnRH+AI	= 675/1012.5

Table 2 and 3 presents the effect of hormone treatment in some signs of estrus and pregnancy rate in cows and heifers. This has been conducted in north east, Thailand. There are eighty two heads of crossbred Holstein-Friesian cows and sixty two heads of crossbred Holstein-Friesian heifers that were used in two separate experiments to determine the effects of three hormone treatment protocols on their reproductive performance. The study was set as a 3 x 2 factorial experiment in completely randomized design. All pertinent data were treated statistically following the method of Chi-square analysis and Bonferronis' Test for significance of treatment means.

Hormone treatments caused the cows to respond by showing mucus discharge, 48.78 percent; swelling of vulva, 81.71 percent; redness of vulva 89.02 percent and uterine tone from slightly hard, 20.73 percent, hard, 37.80 percent and very hard.

Treatments did not show any significant difference among cows as regards percent non-return to estrus and conception rate, although control cows gave higher percentage units for these performance traits. The conception rates were 40 percent, 28.13 percent and 12 percent on Treatments 1, 2 and 3 respectively.

Body condition score of dairy heifers did not differ significantly prior to hormone treatments. However, most heifers were rated with scores of 2.5 (30.65%) and 3.0 (48.39%).

Hormone regimen appeared to have influenced the manifestation of estrus sign. More heifers had swelling of vulva, 83.87 percent; redness of vulva, 72.58 percent and mucus discharge, 24.19 percent. There was also significant interaction between age levels and method of hormone treatment as shown

As with dairy heifers, treatments had no significant effect in percent non-return to estrus, but 46.77 percent of the treatments did not return to estrus. Similarly, conception or pregnancy rate at first service among heifers was 25.80 percent.

Based on the results of this study, it is safe to conclude that any of the hormone treatment protocols may be applied to lactating dairy cows and heifers without adverse effects on their reproductive performance, particularly non-return to estrus, conception or pregnancy rates. A distinct advantage of hormone treatments 1 or 2 is that rigid observation of estrus signs under field or confinement conditions can be dispensed with by the animal breeder or AI technician.

It was conducted that based on the results of the two studies. Dairy cows and heifers responded positively to the GnRH and $PGF_{2\alpha}$ injection resulting in higher incidence of estrus. Synchronization of estrus and ovulation by Ovsynch protocols could improve percent non-return to estrus and conception rate of dairy cattle. There is follicular development or the growth of a new follicular wave in ovaries of cows and heifers after hormone treatment protocols. The hormone ensured the onset of estrus and ovulation in lactating dairy cows and mature heifers. The pregnancy rate of dairy cows and heifers was increased by synchronization of estrus and ovulation. This finding may encourage farm holders to practice synchronized estrus and ovulation in the small farm level.

The recommendation was Ovsynch protocols can be used to improve the reproductive performance, particularly in lactating dairy cows as well as in heifers. Hormone preparations are now available in the market, which enable technicians or the veterinarians to serve the farmers. The results indicate comparable effects of the three hormone treatments in terms of percent conception rate. For AI, it is thus recommended to apply the hormone used in Treatment 1, which used only $PGF_{2\alpha.}$ It is noteworthy to know that the price of this hormone is cheaper than the hormones used in Treatments 2 and 3. Also, administration of one hormone is an easier procedure to apply under field conditions; however, the technical knowledge of the AI technician in ovarian palpation is necessary.

Conclusion and Recommendations

The prostaglandin F2 alpha (PGF2α) is available for synchronization of estrous among cows (Cattle and Buffaloes) synchronization of estrous is provided to buffaloes that are monthly silent heater and were distributed to farmers. Synchronization of ovulation in Thailand is included in the studies. The result shows that there was no significant change in the reproductive performance of buffaloes using with lutalyze or cloprostenol. Similarly, dairy cows and heifer in Thailand do not show significant differences in their estrus and conception rate. The use of PGF2α and GnRH in Thailand are not the same. PGF2α alone is enough to get reproductive performance of cattle and buffaloes in the Philippines and in Thailand. Environmental condition does not affect their performance. The cost is likely to be used by the AI technicians in the field.

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