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Reproductive performance of buffalo-cows with various synchronization protocols in kampar regency of Riau province

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Reproductive performance of buffalo-cows with various synchronization protocols in kampar regency of Riau province

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Abstract. The aim of this research was to compare two estrus synchronization treatments with no estrus synchronization on estrous performance, pregnancy rate and calving rate in buffalo-cows in Kampar district. A total of 60 buffalo-cows from farming communities in the villages of Tanjung, Taratak, and Salo, Kampar Regency. Variations of the estrous sync protocol included $PGF_{2\alpha}$-$PGF_{2\alpha}$ and GnRH-$PGF_{2\alpha}$ administered as treatments. The controls used were without the use of hormonal sync protocol. The parameters observed were the intensity of estrous, estrous percentage, onset of estrous, duration of estrous, pregnancy percentage, calving rate, duration of pregnancy, and birth weight. The results showed that there were differences [$p <0.05$] estrous intensity, estrous percentage [100%], estrous velocity [30.8 hours to 2.5 hours], and duration of estrous [18.6 hours to 6.5 hours]. This study concluded that the synchronization protocols of the combination of GnRH and $PGF_{2\alpha}$ in post-partum buffalo-cows in Kampar Regency resulted in high estrous intensity, faster estrous appearance, and faster estrous duration.

1. Introduction

The reproduction process in female buffalo is slow, marked by the delay of puberty. This can be seen from the age of first birth in female buffalo, at the age of 3.5 ± 0.6 years [1]. Some of the contributing factors are related to environment, nutrition, and management practices carried out by farmers [2]. The main obstacles inhibiting female buffaloes from mating are the difficulty of arousal detection because the symptoms of arousal are generally unclear or displayed by silent heat [3]. Nanda *et al.* [2] stated that the difficulty of detection of arousal in buffalo is caused by breeders who still apply an extensive system in the raising of buffaloes and the habit of wallowing of buffalo.

Literature investigating used to administer gonadotropin-releasing hormone [GnRH] and prostaglandin [$PGF_{2\alpha}$.] in synchronizing estrous in cattle and buffaloes [4]. Although many studies have been carried out with PGF2α alone [5] or in combination with GnRH on buffalo-cows [6], on Ongole-cattle [7], protocols using estradiol, prostaglandin, GnRH, and eCG improve the pregnancy rates in female buffaloes Southern Brazil [8]. The detection of estrous cycle includes characteristics, percentage and speed of estrous appearance using hormonal synchronization already performed on overseas buffalo, including thes Mediterranean buffalo [9] and Egyptian buffalo [10]. The detection of estrous naturally has never carried out in local buffalo Riau Province. Behavioral research at the time of estrous is needed to detect estrous because the success of artificial insemination is determined by timely mating. The aims of the present study were to compare synchronization methods [synchronized using double $PGF_{2\alpha}$ injections, synchronized using GnRH and $PGF_{2\alpha}$ and without hormonal synchronization] including the characteristic, percentage and onset of estrous to facilitate artificial insemination [AI] and improve conception rate and calving rate among Kampar buffalo cows.

2. Materials and methods

A total of 60 female buffaloes that had given birth, originating from farm communities in the village of Salo, Taratak and Tanjung, were gathered in this study. The buffalo-cows were divided into 3 groups after rectal palpation to determine pregnancy. The buffalos, as experimental animals, were placed in cages in groups belonging to the Kampar Government at night and released in the morning on the grass field around the cage. Buffalos-cows are selected based on reproductive health status, no reproductive tract disorder, not pregnant and having corpus luteal.

Block design according to three treatments was applied in this study. Each treatment consisted of 20 buffalo-cows as replications, weighing 225-325 kg each having already given birth previously. The buffaloes in the first group were injected with 5 ml of $PGF_{2\alpha}$ on the first day of the study, continued with 5 ml of $PGF_{2\alpha}$ injection on the eleventh day. Two days after the 2nd $PGF_{2\alpha}$ injection, observations were made [Figure 1]. The second group was injected with 3 ml of GnRH on the first day of the study, followed seven days later by injection of 2.5 ml of PGF2α [Figure 2]. The third group controls [without hormonal treatment]. Estrous observation in the first group was performed on day 2 after $PGF_{2\alpha}$ injections. The estrous observation in the second group was performed on the 2nd day after the 2nd $PGF_{2\alpha}$ injection. Estrous observation in the third group was conducted for 21 days during the estrous period. The buffaloes showing signs of estrous were artificially inseminated with frozen semen from the Artificial Insemination Center of Banjarmasin Region on the day when estrous was identified. The frozen semen volume used was twice the amount of 0.25 ml/straw.

The variables measured in this study were: 1) the intensity of estrous, such as the level of estrous behaviour activity that emerged after the injection of hormones that can be distinguished from a. High intensity: when buffaloes show all estrous symptoms, such as swelling, reddening and warming of the vulva and being silent when climbed. b. Medium intensity: when buffaloes show all estrous symptoms except for silent behaviour when climbed. c. Low intensity: when buffaloes show only a small proportion of estrous symptoms; 2) the onset of estrous (the intervals between $PGF_{2\alpha}$ injections and the appearance of estrous marked by appearance of mucus discharge); 3) the duration of estrous {time interval between first appearance of estrous with end of estrous cycle characterized by absence of mucus discharge hanging on the lip of the vulva (hour); 4) estrous percentage; 5) pregnancy rate (number of pregnant buffaloes after checking with rectal palpation at 3rd month after artificial insemination, divided by inseminated number of buffaloes); 6) length of pregnancy (age of pregnancy counted from the early insemination until the birth of the baby buffalo); 7) birth rate {number of buffaloes born divided by number of pregnant buffaloes}.The diversity of data collected was analyzed by randomized block design [11], the differences in mean scores were tested by Duncan ranged-test.

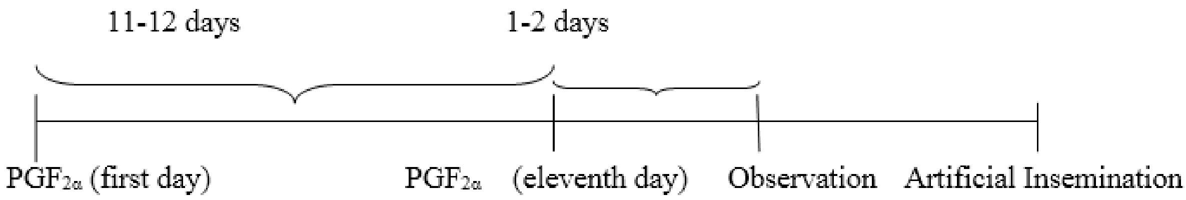

Figure 1. Chart of estrous synchronization using $PGF_{2\alpha}$- $PGF_{2\alpha}$

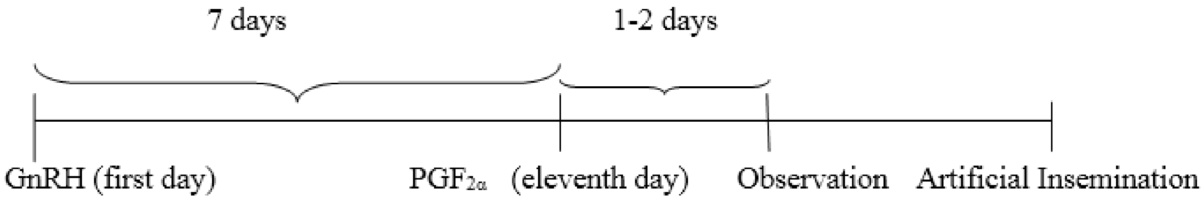

Figure 2. Chart of estrous synchronization usingGnRH- PG

3. Result and discussion

3.1 Estrous intensity
The use of GnRH and $PGF_{2\alpha}$ hormones resulted in higher estrous intensity [70%, high] when compared to the estrous intensity of buffalo-cow which received double $PGF_{2\alpha}$ hormones [60%, moderate] and to the estrous intensity of buffalo-cow which did not get hormonal synchronization [30%, low] [Table 1].

Tabel 1. Estrous intensity, onset of estrous, estrous duration and estrous percentage in buffalo-cows

Treatments	Estrous Intensity	Onset of Estrous (hour)	Estrous Duration (hour)	Estrous Percentage (%)
$PGF_{2\alpha}$- $PGF_{2\alpha}$	Moderate (60%)	$39.05^{a} \pm 10.4$	$29.9^{a} \pm 2.16$	100
GnRH- $PGF_{2\alpha}$	High (70%)	$30.80^{b} \pm 2.5$	$18.6^{b} \pm 6.5$	100
Without Hormone	Low(30%)	**0^{c}**	$15.80^{c} \pm 2.5$	70

Note: Different superscripts in the same column show very significant differences [P <0.01].

The use of GnRH superior to synchronization will facilitate the work of $PGF_{2\alpha}$ in the lysis of the corpus lutein, so the intensity of estrous buffalo is seen more clearly [Table 2]. Metwelly and El-Bawab [12] reported that the use of GnRH in the already-breeding buffaloes would affect the cyclic reshaping of the ovary so that the addition of $PGF_{2\alpha}$after ward will be able to lysis of the corpus lutein immediately. Gordon [13] reported that the addition of $PGF_{2\alpha}$after use of GnRH will be able to reduce the progesterone concentration. In line with the report proposed by Yendraliza *et al.* [6] that the use of GnRH with $PGF_{2\alpha}$ will clarify estrous on buffalo. This is further added by Paul and Prakash [14] that GnRH will follicle growth there by multi plying the formed corpus lutein. It is characterized by low estrogen produced by follicles that serve to elicit estrous traits [15]. Danell [16] and Ty *et al.* [17] reported that the population of ovarian follicles in buffaloes was only half of the follicular population in cattle. Rajamahendra and Sianangama [18] reported that blood gonadotropin levels in-estrous buffalo were also lower than cattle. Yendraliza *et al.* [1] added that the buffalo Kampar progesterone level when estrous was very low.

3.2 The onset of estrous
The combination of GnRH and $PGF_{2\alpha}$ in buffalo-cow in Kampar regency gave rise to faster estrous [30.80 h ± 2.5] when compared to the combination of $PGF_{2\alpha}$ and $PGF_{2\alpha}$ [39.05 h ± 10.4]. This difference may be caused by individual response will affect the performance of the synchronization protocol against the target organ [19]. These differences in follicular or luteal conditions will vary the timing of the occurrence of estrous so that $PGF_{2\alpha}$ will efficiently induce autolysis [20]. The onset of estrous in buffalo in Kampar using GnRH and $PGF_{2\alpha}$ is different from that of Kajaysri *et al.* [21] which stated that various CIDR-$PGF_{2\alpha}$-based protocols with GnRH or PMSG with or without HCG applications were equally effective in improving ovulation rates in postpartum anoestrous buffaloes. Haider *et al.* [22] stated differently about the use of double $PGF_{2\alpha}$ and GnRH-$PGF_{2\alpha}$ results to 75 h.

3.3. Duration of estrous

The estrous duration of female buffaloes synchronized with combination of GnRH and $PGF_{2\alpha}$ in Kampar regency was shorter [18.6 h ± 6.5] compared to the estrous duration of buffalo-cow that received double $PGF_{2\alpha}$ injections [29.9 h± 2.16], or buffalo-cow that did not get hormonal synchronization [15.80h ± 2.5]. This is a sign ofestrous behaviour that is not significantly different between buffalo-cow given hormone and buffalo-cow that are not given hormone [Table 2]. The estrous duration of buffalo-cow in this study was lower than that of Ahmed *et al*. [23] [20 up to 21 days] in recurrent mating cattle. This may be attributed to various factors including adverse environmental conditions, nutrition, and irregularities in the secretion of ovarian steroid hormones [2].

Tabel 2. Changes in behaviour, vulva and mucous secretions of female buffalos in Kampar Regency

Treatments	Behavioural Changes	Mucous Secretion	Appearance of Vulva
$PGF_{2\alpha}$- $PGF_{2\alpha}$ (n=20)	Moderate	Seen	swollen, redness, warm
GnRH- $PGF_{2\alpha}$(n=20)	High	Seen very clear	swollen, redness, warm
Without Hormone(n=20)	Low	Seen vague	swollen, redness, warm

The observations of Arya and Madan [24], Jainudeen [25] showed that the signs of estrous in the buffalo were characterized by the clear mucus discharge from the vulva, swollen vulva, anxiety, mutual uplift, searching for male buffalo, decreased appetite, raising the tail during vulva palpation, frequent urination and lowing.

3.4 Pregnancy rate

The combination of GnRH and $PGF_{2\alpha}$ in buffalo-cows in Kampar regency resulted in higher pregnancy rates [85%] when compared to buffalo-cows that received $PGF_{2\alpha}$ double injections [70%] and buffalo-cow that did not get hormonal synchronization [40%]. This is probably due to the high estrous intensity in buffalo-cows given the combination of GnRH and $PGF_{2\alpha}$ when compared to buffalo-cows that only received $PGF_{2\alpha}$ double injections and without hormonal synchronization. This outcome is in line with Yendraliza *et al.* [6] which stated the combination of GnRH [dose of 250 μg] with 12.5 μg $PGF_{2\alpha}$ produced 75% of pregnancy rate on buffaloes that have given birth. The percentage of pregnancies from synchronized buffalo-cows in Kampar district is higher than from buffalo-cows [53%] [26] [27] and female Murrah buffalo 55% [28]. Biradar *et al.* [29] reported that the pregnancy rate of buffaloes with recurrent mating problems using GnRH and $PgF_{2\alpha}$ was 50%. This difference is probably caused by the different types of buffalo and the type of hormone used. Different hormonal protocols give satisfactory pregnancy rates, which are comparable to those achieved in animals inseminated at natural estrous [30].

Tabel 3. Pregnancy number, duration of pregnancy and birth rate of female buffalos in Kampar regency

Treatments	Pregnancy Rate (%)	Duration of pregnancy (day)	Calving Rate (%)	Birth Weight (kg)
$PGF_{2\alpha}$- $PGF_{2\alpha}$ (N=20)	**14/20**=70 ^{a}%	351.05 ± 8.4	**16/20**=80. 61^{a} %	**(N= 16)** 27.62±4.3
GnRH- $PGF_{2\alpha}$(N=20)	**17/20**=85 ^{b}%	349.53 ± 2.5	**19/20**=95. 38^{b} %	**(N=19)** 27.82±5.5
Without Hormone(N=20)	**8/20**=40 ^{c}%	354.81 ± 2.3	**18/20**=90 ^{b}%	**(N=18)** 27.32±2.7

3.5 Duration of pregnancy

The pregnancy duration of female buffaloes in Kampar district not different but numerically different which received a combination of GnRH and $PGF_{2\alpha}$ was shorter [349.53 days] when compared to the long pregnancy of buffalo-cow that received $PGF_{2\alpha}$ double injections [351.05 days] and buffalo-cow that did not get hormonal sync [354.81 days]. The difference in the duration of pregnancy may be due to maternal, environmental and fetal factors [20]. Furthermore, Jaenudeen and Hafez [20] suggested that large fetuses affected the length of pregnancy in terms of initiation of birth.

3.6 Calving rate

The calving rate of buffaloes in Kampar district with different types of synchronization protocols resulted in different birth rates [Table 3]. The differences may be caused by the different number of pregnant buffalo-cows. The birth rate of buffaloes in this study is higher than the birth rate of Doroncanga buffalos in Tambora Island, NTB [41.67%] [31]. This difference in pregnancy ratesuggests a number of differences in livestock, age, and maintenance [32]. However, some buffaloes do not respond to treatment, especially during low breeding season [33].

3.7 Birth weight

The mean value of birth weight among the off springs born to buffaloes receiving hormone synchronization in Kampar district was no different in comparison to the birth weight of offspring's from the buffalos that did not get hormonal synchronization [Table 3]. Jaenudeen and Hafez [20] suggested that long pregnancy was affected by the sex of the foetus, adrenal gland and pituitary and fetal size. The large foetus can also be interpreted as the birth weight of the foetus at birth. Furthermore, factors that may affect the child sex ratios include the selection, season, age and parity of female and male breeds used [34]; vaginal pH [20]; feed or parent nutrients [35] and time of artificial insemination [36].

4. Conclusions

The use of GnRH-$PGF_{2\alpha}$synchronization protocols in female buffaloes that gave birth resulted in high intensity of estrous, earlier estrous start, longer duration of estrous when compared to the buffalos receiving $PGF_{2\alpha}$-$PGF_{2\alpha}$treatments and those without the use of hormones.

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