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Research Article

Efficacy of Two Estrus Synchronization Methods in Indonesian Aceh Cattle

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ABSTRACT

There was no report yet on the effective methods of estrus synchronization in Aceh cattle. The aim of this study was to determine percentage and intensity of estrus, pregnancy, relationship between intensity of estrus and percentage of pregnancy resulted from artificial insemination artificial insemination in Indonesian aceh cattle induced by two estrus synchronization methods. Group I (K1, n=5), were synchronized with double injection using prostaglandin ($PGF_2\alpha$) 5 ml intramuscularly with interval 10 days, whereas Group II (K2, n=5) synchronized using CIDR-B inserted into vagina during 7 days and followed by injection of $PGF_2\alpha$ 5 ml intramuscularly on day 6. The cattle were inseminated 12 hours after the signs of estrus appearance using frozen semen fertile. Intensity of estrus was performed using score in a scale 0 to 5. Percentage of estrus, intensity of estrus, and pregnancy percentage of cattle in K1 vs K2 respectively 80.0 vs 80.0%; 4.2±0.84 vs 4.4±0.90, dan 100.0 vs 100.0%. The relationship between the intensity of estrus and conception rates show significant correlation with coefficient correlation 0.832.

Key words: Efficacy, Estrus synchronization, Indonesian aceh cattle

INTRODUCTION

Calving interval is a basic indication to determine the efficiency of reproduction on a cattle farm. The optimal interval of calving is 365 days, thus the cow should be pregnant within 85 days postpartum to achieve this interval. Determining optimal time for insemination is a major step to improve efficiency reproduction, based on accuracy of estrus detection (Lyimo *et al*., 2000). The accuration of estrus and pregnancy have an economic value. Kafi *et al*. (2007) reported the economic impact of the accuracy detection of estrus in dairy cows Shiraz.

High conception rates were achieved when the intensity or symptoms of estrus is observed precisely (Stevenson *et al*. 1983). Several studies were showed that low insemination progress due to the low intensity of estrus (Situmorang and Siregar, 1997; Ramana *et al*., 2013). Experience on estrus intensity is very important to predict the appropriate time for artificial insemination and to get the high conception rate (Ramana *et al*, 2013). In order to solve the difficulties on estrus detection, synchronization technology has been developed to control estrus. The aim of estrus synchronization is to synchronize the reproductive condition of livestock. Estrus synchronization is the act of causing estrus, followed by fertile ovulation on a group or individual animals with the primary purpose to generate the conception or pregnancy. Optimum conception or pregnancy is the purpose of the application of estrus synchronization (Salverson and Perry, 2007).

The assessment of the intensity of estrus was required to increase the implementation of reproduction technologies in Aceh cattle. The observations of the intensity of estrus through clinical symptoms have been conducted on Japanese Black Cows (Chao *et al*., 2010), Bali Timor cattle (Kune and Solihati, 2007), hybrid Ongole (PO) (Listiani, 2005), beef cattle (Kune and Najamudin, 2002), and local goat (Ismail, 2009). Data on the intensity of estrus and its relation to the effective method of estrus synchronization in Aceh cattle has not been reported yet. The aim of this study was to determine percentage and intensity of estrus, pregnancy, and relationship between intensity of estrus and percentage of pregnancy artificial insemination results in Indonesian Aceh cattle induced by two estrus synchronization methods.

MATERIALS AND METHODS

This study used Aceh cattle with the aged of 5-8 years old, weight of 150-250 kg, has more than two regular cycles, and >90 days post-partum. Cattle used

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were clinically healthy and have good criteria of body condition score. They were fed with forage twice a day and drinking water ad libitum. The cattle were grouped into two groups. Group I (K1, n=5), estrus synchronized using PGF2 about 5 ml intramuscularly (Lutalyse™, Pharmacia & Upjohn Company, Pfizer Inc.) double injection pattern with intervals of 10 days, whereas Group II (K2, n=5), synchronized using CIDR-B (Eazi-Breed ™, InterAg, Hamilton, New Zealand) and inserted into vagina within 7 days follow the injection of PGF2 5 ml im. on day 6 since insertion of CIDR (Zaabel *et al*., 2009).

Estrus detection

Estrus observations as response of synchronization after the last of administrate synchronized preparations. The observation was conducted twice a day (08:00 and 16:00 pm) for approximately 2 hours. Cattle with primary and secondary signs of estrus as standing heat, climb the other cattle, restless, red and swollen of vulva, cervix mucus secretion, and decreased appetite, were scoring on a scale of 0-5 (5= excellent: standing, mounting another cow, restless, red and swollen of vulva, cervix mucus secretion, and decreased appetite; 4= good (standing , mounting another cow, red and swollen of vulva and cervix mucus discharge; 3= normal: red and swollen of vulva, cervix mucus discharge, and decreased appetite; 2= fair: red and swollen of vulva and decreased appetite; and 1= poor; decreased appetite; and 0 = estrus) as criteria set by Sonmez *et al*. (2005).

Artificial insemination and pregnancy detection

Cattle were inseminated with good quality of frozen semen, which was examined microscopically before insemination. Then the pregnancy examination was one on day 90 post-insemination by rectal palpation techniques.

Data analysis

Data of estrus and pregnancy percentages were reported descriptively, whereas the intensity of estrus was analyzed using t-test. The relationship between estrus scores and conception rates was analyzed using regression and correlation as reported previously by Sudjana (2003).

RESULTS

Results are summarized in Table 1. Percentage of estrous that was similar between K1 (80%) and K2 (80%). Synchronized all cattle show oestrus symptoms at 1-3 days after treatment. The signs of oestrus were appearance according to the symptoms reported by Sonmez *et al*. (2005) about the signs primary and secondary oestrus. Percentage of pregnancy that was similar between K1 (100%) and K2 (100%). Intensity of oestrus tends to be higher in K1 than K2, although statistically was not significantly different (P>0.05). The relationship between the intensity of oestrus with pregnancy rate was significantly correlation (P>0.05) with a correlation coefficient of 0.832.

DISCUSSION

The results of two oestrus synchronization methods which use in this study have same oestrus response that was 100% (Table 1). These results were relatively same compared to other report using PGF2α to induce oestrus. According to Hyland *et al*. (2009), Listiani (2005), and Skarzynski *et al*. (2009) reported oestrus responses with PGF2α were very high, reaching 100% in Holstein cows, PO, and beef cattle. Mukasa-Mugerwa *et al*. (1989) stated that the spontaneous oestrus after PGF2α administration showed cattle corpus luteum has been functioning normally. Muljono (1982) reinforced that the administration of prostaglandin were effective if given in the mid-luteal phase, the current phase corpus luteum secretes the hormone progesterone. In this phase, the corpus luteum was very sensitive to prostaglandins, corpus luteum will regress and followed by oestrus. The high oestrus response in this research shows that giving injection twice with 10 days interval was effective to synchronize oestrus in Aceh cattle. Interval injection 10 days of PGF2α in this research were determined based on differences of cycle length and follicular dynamics Aceh cattle than other cattle (unpublished data). Ciptadi *et al*. (2012) reported in the response of oestrus in Madura cattle increase on different body condition score (BCS) that injected with PGF2α twice than with a single injection of PGF2α. Ikhar *et al*. (2013) also reported the similar results. Oestrus response on the first PGF2α injection was 77.7% and increased to 100% in second injection. Giving double PGF2α injection serves to overcome the weaknesses of its hormone that only effective in luteal phase (Plumb, 1999).

Table 1: Oestrus performance of cattle induced with prostaglandin (PGF2α) and combination of progesterone and prostaglandins (CIDR + PGF2α)

No	Oestrus performance	Group	
		K1 ($PGF_2\alpha$)	K2 (CIDR+$PGF_2\alpha$)
1	Percentage of oestrus (%)	100	100
2	The intensity of oestrus	4.2±0.84[a]	4.4±0.90[a]
3	Percentage of pregnancy (%)	80	80

[a]Same superscript in the same row differ not significant (P>0.05).

The first injection work to herding cattle entered the luteal phase and the second injection oestrus response will be high (Siregar and Hamdan, 2007). In this research, oestrus was only observed after second PGF2α injection so that response of the first oestrus after PGF2α injection cannot reported. Although the response of oestrus after PGF2α injection of several studies reported relatively high, the Aral and Colak (2004) have different report. The oestrus response of Brown Swiss cattle after PGF2α injection at interval 11 days only 15.4%. The difference response likely due to using differences breed and age of animals.

Oestrus response in the synchronized group with combination of CIDR and hormone prostaglandin (K2) also reached 100%. These results appropriated with Kune reports (1998), which obtained the percentage of oestrus 100% from 13 cows that induced by progesterone implant and injection of PGF2α. Oestrus response after treatment with combine CIDR-B and PGF2α in this research was higher than other researcher report. CIDR-B for oestrus synchronization was used in Holstein cattle in Japan by Vargas *et al*. (1994), resulted in oestrus response of 90.7%. It was show injection of PGF2α during the day before revocation of CIDR-B influence the increasing

incidence of standing oestrus. Malik *et al*. (2012) reported in pascapartus beef cattle on three groups of different mating time were treated with CIDR-B have estrous response between 75-77%. PGF2α injection at the time of CIDR-B removal have function to lyse remaining corpus luteum, it minimizes the levels of progesterone after CIDR-B removed, so the response of oestrus and ovulation increase (Putro, 2008).

Both synchronization methods of oestrus in this study were show the same ability to induce oestrus in Aceh cattle. It was appropriate with Malik *et al*. (2011) report, obtained an insignificant percentage of oestrus in cattle which have resynchronization with prostaglandins and progesterone. The different results obtained by Tada *et al*. (2010), the oestrus percentage were higher in cattle that induced by prostaglandin compared by progesterone group with percentage of oestrus respectively 85 and 67%.

Conception rates of local cattle which have oestrus induced by PGF2α in this study were 80%. These results were similar with Nurhayu (2010) by injection PGF2α twice with 11 days interval in cattle, producing 80% conception rate. Ikhar (2013) have different results which obtained conception rate 40% in group of cattle that inseminated after synchronized with injection of PGF2α twice with interval 11 days. The other similar conception rate was indicated by group that induced oestrus with combination of CIDR-B + PGF2α which amounted to 80%. These results were slightly higher than the Solihati report (1998) that synchronize oestrus in dairy cattle FH using intravaginal progesterone with estrogen and injection 15 mg PGF2α intramuscularly, producing conception rate up to 77.8%. Utilization of CIDR-B in tropical beef cattle proved effective in oestrus synchronize and the success of insemination (Kune and Najamuddin, 2002). Furthermore, Larson *et al*. (1995) state that progesterone supplementation increase the pregnancy rate from 35% to be 48% with insertion of CIDR-B, starting from day 3 to day 10 after insemination.

The basic principle of estrus synchronization is controlling luteal phase of the estrus cycle through the administration of prostaglandin F2 alpha (PGF2α) (Brito *et al*., 2002) or the use of progesterone (De Rensis *et al*., 2005). The weakness of PGF2α hormones is only effective if there is a corpus luteum on the ovary (Brito *et al*., 2002), and its response varies depend on stage of the cycle when estrus has been synchronized (De Rensis and Lo'pez-Gaitus, 2007). Progesterone is more applicable due to this hormone is not depend on the phase of female estrus cycle, but in the other hand, the fertility decline caused by the extension of the life span of the dominant follicle and ovulation of subfertil oocytes on cattle (Beal *et al*., 1988). The use of progesterone in controlled intravaginal device releasing (CIDR) for estrus synchronization needs 15-17 days (Adam *et al*., 2001) or 7-14 days (Zaabel *et al*., 2009), whereas PGF2α usually inject twice with the interval of 11 days (Siregar *et al*., 2001). Slenning and Farver (1990) reported that the use of PGF2α decrease the accuracy of estrus detection and increase the proportion of false negative detection by 61% compared to control. Lokhande *et al*. (1983) reported the percentage of estrus detected cattle using progesterone and PGF2α are 70 and 44%, respectively. Zeuh *et al*. (2014) stated that the fertility of cattle in Chad increase when estrus was synchronized by the combination of PGF2α and other hormones compared to single dose of PGF2α (66.66 vs. 29.41%). The double injection of PGF2α showed a high percentage of estrus, although fertility will increase if combined with GnRH (Ikhar *et al*. 2013).

High conception rates in both groups probably due to implementation of timely insemination, because the intensity of oestrus in both treatment very clear, so the inseminator can the appropriate time at which to inseminate. In this study, 83.2% pregnancy was determined by the intensity of oestrus. Different result was reported by Siregar (2008), pregnancy was determined only approximately 55.3% by the intensity of oestrus. These results were lower because the experimental animals that used were buffaloes. Reproductive genetic in buffaloes were lower than cattle as well as the number of ovarian follicles population that produces estrogen to manifest oestrus symptoms in buffaloes only fifth from the population of follicles in cattle (Ty *et al*., 1999).

Increasing intensity of oestrus in both groups were due to the work of each of the hormonal preparations that causing oestrus symptoms. Kune (1998) stated that the administration of PGF2α will suppress the concentration of progesterone in blood, so that the ratio between concentration of estrogen and progesterone increased and livestock will exhibit oestrus behavior. Oestrus induction with CIDR-B can make oestrus symptoms become more obvious too (Dobson and Komonpatan, 1996). It can happen because at the time of the revocation of CIDR-B progesterone implants decrease drastically the concentration of progesterone in the blood so it make the effect of negative feedback was lost, resulting the rebound effect phenomenon, that was secreted gonadotropin hormone (FSH and LH) in large quantities that synthesized and deposited during the CIDR-B progesterone implanted. Gonadotropin hormone will stimulate folliculogenesis that forming mature follicles, and then these follicles synthesize estrogen and secreted into blood circulation, resulting in female animals into oestrus (Rizal and Herdis, 2008). In general, this study have limitations due to the minimum number of samples were used.

Estrus intensity is a major factor in accuracy detection of estrus, its different in each breed and individual animals. Orihuela (2000) reported that several factors affect the intensity of estrus as social interaction, management, environment, nutrition, age, presence of males, and genetics. One of management factors influence in the intensity of estrus is the use of hormones in estrus synchronization. Jiménez *et al*. (2011) reported that *Bos indicus* cattle tend to exhibit low intensity and short duration of estrus compared to other cattle breeds. Galina and Orihuela (2007) and Bo *et al*. (2003) stated that estrus detection will be difficult to detect in cattle with low intensity of estrus. Inaccuracy of estrus detection causes the failure of mating in animals.

Conclusion

Synchronization method that used PGF2α alone or combination with CIDR-B produces the same effectiveness for synchronizing oestrus in Indonesian aceh cattle.

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