Estrus and pregnancy rate of Simmental-Ongole Crossbred and Ongole Grade heifer after being synchronized and inseminated

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ABSTRAK

Penelitian ini bertujuan untuk mengkaji hasil sinkronisasi estrus dan inseminasi buatan pada sapi dara peranakan Ongole dan peranakan Simental-Ongole. Materi yang digunakan adalah 19 ekor sapi peranakan Ongole (PO) dan 18 ekor sapi hasil silangan Simental-Ongole (SSO). Materi ditentukan secara *purposive sampling* dengan spesifikasi gigi seri sudah tanggal (poel) dan belum pernah bunting. Materi diidentifikasi kenormalan organ reproduksinya dengan metode palpasi rektal, kemudian disinkronisasi berahi menggunakan 50 mg *medroxy progesterone acetat* dalam spon vagina, dan sapi dara yang mengalami berahi selanjutnya diinseminasi menggunakan semen beku. Parameter penelitian adalah jumlah sapi dara yang mempunyai alat reproduksi normal atau abnormal, mengalami berahi dan bunting. Analisis data menggunakan analisis deskriptif. Hasil penelitian menunjukkan bahwa sapi PO dan sapi SSO yang mempunyai organ reproduksi abnormal masing-masing satu ekor (5.56%) dan 7 ekor (36.84%). Respon sinkronisasi berahi sapi dara yang mempunyai organ reproduksi nomal dan abnormal pada sapi PO masing-masing 94.17% dan 100%, sedangkan pada sapi PSO 100% dan 42.86%, sedangkan hasil kebuntingan pada sapi PO 70.59 dan 0.00%, sedangkan pada sapi SSO 50.00 dan 0.00%. Kesimpulan dari penelitian ini adalah jumlah sapi PSO yang memiliki ketidaknormalan organ reproduksi lebih banyak dibandingkan sapi PO. Sinkronisasi berahi menggunakan 50 mg *medroxy progesterone acetat* dalam spon vagina dapat meningkatkan jumlah berahi dan kebuntingan pada sapi dara yang mempunyai organ reproduksi normal.

Kata kunci: sapi dara,sapi peranakan, berahi, bunting

ABSTRACT

The aim of the study was to examine the synchronization of estrus and artificial insemination in heifers of Ongole grade and Simental-Ongole grade. The research used 19 Ongole Grade (OG) and 18 Simental-Ongole Crossbred (SOC) heifers. This research applied purposive sampling to determine the research population. The criteria to select the population were heifers which have in mature body. The normality of heifer's reproductive organs were identified by performing rectal palpation, then 50 mg of *medroxy progesterone acetate* on vaginal sponge was used to synchronized estrus. The estrus heifer was inseminated using frozen semen. The observed parameters were the number of heifers with normal and abnormal reproductive organs, estrus sign and pregnancy. Data were analyzed descriptively. This study showed that OG and SOC with abnormal reproductive organs was 1 heifer (5.56%) and 7 heifers (36.84%), respectively. The responses of estrus synchronization in heifers with normal and abnormal reproductive organs were 94.17% and 100% in OG, and 100% and 42.86% in SOC. Meanwhile, the pregnancy rate was 70.59 and 0% in OG, and 50.00 and 0% in SOC. In conclusion, the number of SOC heifers with abnormal reproductive organs is higher than OG. Estrus synchronization using 50 mg

medroxy progesterone acetate increase the amount of estrus and pregnancy in heifers with normal reproductive organs.

INTRODUCTION

Mating is the process of generating offspring from male and female animals. The bull produces and ejaculates sperm while the cow produces ova, pregnant, partus, and nourishing the offspring. In cattle breeding, the female should have normal reproductive organs and physiology. The activity of reproductive organs affected to the rate of pregnancy (Geres *et al.,* 2011).

Heifers are essential in cattle breeding because they will be cows that reproduce in a long term (Diskin and Kenny, 2014). Therefore, heifer should be carefully selected. Reproductive performance of heifers is strongly influenced by genetic, conditions of weaning time, and the growth starting from weaning to puberty (Pereira *et al.,* 2017). Genetic factors and poor growth can lead to organ abnormalities and physiology disorders of reproduction. The abnormality reproductive organ and physiological disorders are factors causing infertility and sterility in cow buffalo (Azawi *et al.,* 2008). Abnormalities of reproductive tract and ovaries are factors causing infertility in goats, reaching 91.3% (Mushonga *et al.,* 2017).

Farmers in Sukoharjo villages district still apply traditional method in raising their cattle with low knowledge on reproduction aspects. Low succesfull rate of cattle production will contributes to food security and household income (Nyamushamba *et al.,* 2017). Livestock breeding programs that correlate positively to their benefits are conventionally selected based on fertility (Gizaw *et al.,* 2010). The selection of cow based on reproductive organs was done by rectal palpation in order to determine normality of ovaries, uterus, cervix and vagina. The abnormalities in the reproductive organs occurred in womb or uterus, cervix, ovary, oviduct and vagina with the percentage of 70.8%, 64.6%, 60.0%, 49.2% and 38.5% respectively (Kunbhar *et al., 2003*). The efforts to improve reproduction quality of the herds based on genetic is necessary. Superior genetic identification in livestock populations can be used in the selection process. Reproduction organ abnormality identification will continuously contribute quantitavely and qualitatively to improve genetic quality (Haskell *et al.,* 2014).

Synchronization is an attempt to make estrus in a livestock population appearing simultaneously (Khumran *et al.,* 2012). Estrus synchronization makes estrus detection and artificial insemination (AI) efficient. In AI program, estrus detection and insemination are performed during 3-5 days (Khumran *et al.,* 2012*)* and in average insemination was done on 60 hours after the medication is stopped (Echternkamp and Thallman, 2011; Mallory *et al.,* 2011). The use of progesterone in estrus synchronization can increase the size of follicles which positively correlate to the quality of the ovum (Pfeifer *et al.,* 2012). The use of controlled internal drug release (CIDR), Ovsynch and Norgestomet ear implant protocols resulted in 100% estrus with conception rates reach 60%, 50%, and 50%, and the overall of three cycles as 80%, 80%, and 70%. (Dhami *et al.,* 2015).

Intra vaginal progesterone implants that were sanitized in lactating primaparous and multiparous of Holstein cows, affected reproductive variables, such as timing and synchronization of follicular wave emergence, and size of the ovulatory follicle (Melo *et al.,* 2018). Response of estrus synchronization using 50 mg *medroxy progesterone acetate* in heifers and cows were 91.67% and 65.79% (Sutiyono *et al.,* 2014). Estrus synchronization using progesterone in CIDR followed by artificial insemination in beef cows can increase pregnancy by 7.1% (Stevenson *et al.,* 2015). On other hand, some case found that heifer with mature body did not come to the estrus cycle because of the reason of bad management and physiological disorder (Sutiyono *et al.,* 2017). Therefore, need to do the research effect of estrus synchronization used *Medroxy Progesterone Acetate* (MPA) to the estrus performance and pregnancy. The aim of this research was to examine the synchronization of estrus and artificial insemination in heifers of Ongole Grade and Simental-Ongole Crossbred.

MATERIALS AND METHODS

This research was conducted in Polokarto, Mojolaban and Nguter District, Sukoharjo Regency. The materials used were 18 Ongole

Grade (OG) and 19 Simmental-Ongole Crossbred (SOC) heifers. The materials were selected using purposive sampling by selecting the heifers which mature body.

Materials (OG and SOC) were identified as having normal or abnormal reproductive organs used rectal palpation for observation of the cow. The number of OG and SOC having normal and abnormal reproductive was 17 and 1; 12 and 7, respectively. The heifers were synchronized with 50 mg *medroxy progesterone acetate*. Medroxy progesterone acetate was applied using vaginal sponge for 17 days. On the day-18, the vaginal sponge was removed. Estrus was observed three times a day (8:00 am to 09:00 am; 12:00 noon to 01:00 pm; and 04:00 pm to 05:00 pm). Heifers that responded to the synchronization were inseminated using frozen semen of pure simmental bull.

Parameters observed in this study were the normality of reproductive organ, the rate of estrus and pregnancy. Here is the method to determine abnormality in reproduction, estrus and pregnancy in heifers:
a. Reproductive organ disorders were abnormalities in ovaries, uterus (corpus and cornua), cervix and vagina, which were determined by rectal palpation.
b. Estrus of the heifers was determined using an indicator of uterine tension (recommended by Inseminator), vocalization, redness vulva and mucous discharge.
c. Pregnant cow was determined based on the rectal palpation diagnosis 4 months after AI.

Data Analysis

The data of the number of heifers with normal and abnormal reproductive organs, estrous and pregnancy were analyzed descriptively (Abebe *et al.*, 2000).

RESULTS AND DISCUSSION

Reproductive Organs

Female reproductive organs have a very important role in the success of generating offspring. Female reproductive organs produce ova and reproductive hormones, copulation, sperm duct, the site of fertilization, fetal growth and birth canal. Abnormality in female reproductive organs can cause infertility or sterility. Normality and abnormality of reproductive organs through rectal palpation of OG and SOC heifers are presented in Table 1.

Table 1 shows that the number of OG heifers was only one (5.56%) which was abnormal cervix. Meanwhile, SOC had 7 abnormal reproductive organs (36.84%) which were in ovary, uterus or womb, vagina and cervix 3, 2, 1 and 1 respectively. Abnormalities in the ovary were undeveloped follicle and one follicle was small in size. The uterus was asymmetric, and the cornua was twisted. The cervix was small in size and the vagina was narrower. The percentage of abnormal reproductive organs in SOC (36.84%), higher than OG (5.56%). The high percentage of reproductive organ abnormalities in SOC can be affected by genetic and nutritional factors. Abnormal reproductive organs can be caused by abnormal growth and by the interaction of genes from both parents (Connell *et al.*, 2013). Abnormalities in SOC reproductive organs were the result of interactions between of *Bos taurus* and *Bos indicus* gene. The differences shown in

Table 1. Appearance of Reproductive Organs Ongole Grade and Simmental-Ongole Crossbred, Different Age-Based Dental Series Release (GSR)

GSL	Ongole Grade			Simmental-Ongole Crossbred		
	Sample (n)	Normal	Abnormal	Sample (n)	Normal	Abnormal
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1	11	11	0	9	5	4
2	3	2	1	6	3	3
3	0	0	0	0	0	0
4	4	4	0	1	1	0
Total	18	17	1	19	12	7
%	100	94.44	5.56	100	63.16	36.84

genetic characteristics between *Bos taurus* and *Bos indicus* as well as some of their physiological and behavioral differences (Nogueira, 2004). The quality of feed given by local farmer was generally low (Nyamushamba *et al.,* 2017), and low quality feed given during the growth, since weaning period, tends to be the cause of abnormalities in reproductive organ (Izquierdo, 2016). Abnormalities in reproductive organs of female animals can occur in the ovary, oviduct, uterine, vaginal and cervix.

Response of Estrus Synchronization and Artificial Insemination

Estrus synchronization is a reproductive technology to make a herd of cows in estrus simultaneously for the efficiency of AI. Another benefit of estrus synchronization is to produce heifers with similar body weight, therefore it will be easier to manage. The result of estrus synchronization and AI in OG and SOC which had normal and abnormal reproductive organs is shown in Table 2.

The Estrus

Table 2 shows that OG and SOC having normal reproductive organs responded to estrus syncronized were 16 (94.17%) and 12 (100%), respectively, while they having abnormal reproductive organs were 1 (100%) and 3 (42.86%), respectively. The heifers which had abnormal reproductive organs still responded to synchronization only if they still had an active ovary. Basically, estrus syncronization works by using progesterone to inhibit the production of the Follicle Stimulation Hormone (FSH), thus, after the treatment is stopped, the follicle is no longer growing. Graafian follicle growth was followed by egg cell maturation process (Khumran *et al.,* 2012).

The response of estrus sync process using progesterone was influenced by body condition, nutrition and ovaries activity. The reproductive disorders of heifers and cows tended to be caused by body conditions, which are reflected in the body condition score (BCS) which is 1-3 with maximum score 9 (Sutiyono *et al.,* 2018). Nutritional supplementation given significantly affected the condition of the body and the quality of cell produced so that it can be repaired the reproduction process (Marume *et al.,* 2014). Nutritional deficiency affected hypothalamus to produce Gonodotrophin releasing hormone (GnRH) and Pituitary gland for the production of FSH and LH low so that ovary activity lasts longer (Pradhan and Nakagoshi, 2008 and Bindari *et al.,* 2013). Teshome *et al.* (2016) stated that the failure of ovulation was caused by neuroendocrine disorders in the hypothalamus, pituitary and ovary. Good quality feed given to weaning calves will lead to a good performance of reproductive organ for breeding (Izquierdo, 2016). Meanwhile imperfect growth due to genetic interaction and nutritional deficiency will lead to deformity and reproductive organ activity disorders (Patel *et al.,* 2012).

The Pregnancy

Table 2 shows that pregnant heifers having normal and abnormal reproductive organs in OG were 70.59 and 0%, respectively, while in SOC were 50 and 0%, respectively. The percentage of pregnant heifers with normal reproductive organs was high. It was because both groups of heifers had no history of reproductive physiological abnormalities. Synchronization using progestagen was useful to increase progesterone concentration in blood during luteal phase. This can provide bigger ovulatory follicle which positively correlates to the success of pregnancy

Table 2. Number of Heifers Estrus and Pregnant from Heifer Having Normal and Abnormal Reproductive Organ

Parameters	Ongole Grade				Simmental-Ongole Crossbred			
	Normal (n=17)		Abnormal (n=1)		Normal (n=12)		Abnormal (n=7)	
	Head	%	Head	%	Head	%	Head	%
Estrus	16	94.17	1	100	12	100	3	42.86
Pregnant	12	70.59	0.00	0.00	6	50.00	0.00	0.00

(Echternkamp and Thallman, 2011; Mallory *et al.,* 2011). The provision of balanced nutrition significantly affects body condition and the quality of genital cells produced. Thus, this increases pregnancy (Marume *et al.,* 2014). Estrus synchronization in cattle using controlled internal drug release (CIDR) containing 1.38 g progesterone resulted in 44.4% of pregnancy after AI (Beuchat *et al.,* 2012).

The failure of pregnancy in heifers having normal reproductive organs can be influenced by management of local farmer, hormonal disturbances, reproductive organ infections and low sperm quality. But, in this research the quality of semen is good with 70% motility and 12% abnormality. This quality is fulfill the standarization of semen (Samsudewa *et al*., 2018). Repeated breeding caused by raising management, storage of hormone and infections of reproductive organs in cattle were 1.70, 18.03 and 14.75% respectively (Singh *et al.,* 2008). Nutritional deficiency will decrease the activity of reproductive organs resulting in failure in pregnancy (Geres *et al.,* 2011). The high rate of pregnancy failure in SOC (50%), may be caused by physiological disorders (failure or fertilization and implantation). In this research the cow with abnormalities reproductive organ was not successfull to be pregnant (0%). According to Nogueira (2004), the strains formed from Bos taurus and Bos indicus can cause physiological or reproductive organ abnormalities. The failure of pregnancy in heifers is likely due to nutritional deficiency. Nutritional deficiency in heifer is the cause of delayed puberty. Meanwhile in cows, the causes are fertilization failure and embryo death in early pregnancy (Izquierdo, 2016)

Table 2 shows that all SOC and OG having abnormal reproductive organs were not pregnant. Normal reproductive organs highly support the process of pregnancy (Geres *et al.,* 2011), and high rate of abnormalities in reproductive organs of female herds indicates that the fertility of the herd was low (Patel *et al.,* 2012). Abnormalities of female reproductive organs in ovaries, uterus, cervix, oviduct, and vagina occur mostly in growth period due to genetic and environmental factors that adversely affect reproductive process (Connell *et al.,* 2013). Abnormality in ovary causes the ova produced to have low quality. In fallopian tube, it causes fertility failure. Abnormality in uterus causes sperms to fail to reach the site of fertilization. In cervix and vagina, it causes difficulty in mating and performing artificial insemination. Ovary abnormalities are the main factors causing the failure of ova production, whereas the failure of implantation and pregnancy was caused by endometrial disorder (Connell *et al.,* 2013).

CONCLUSION

The number of Simmental-Ongole Crosbred having abnormal reproductive organs was higher than Ongole Grade. Estrus synchronization using progesterone improved reproduction performance of heifers which have normal reproductive organs, but not in heifers which have abnormal reproductive organs. In breeding process, heifers should be selected carefully, and the breeder should make sure that the selected heifers have normal reproductive organs in order to reproduce successfully.

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