Global Veterinaria 12 (4): 504-507, 2014
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2014.12.04.82358

Induction of Estrus in Etawa Crossbred Goat by $PGF_{2\alpha}$ Injection to Ensures Successfull Artificial Insemination

Trinil Susilawati, Kuswati, Hari Dwi Utami, Febi Dwi Rosanti and Yunus Dwi Atmojo

Faculty of Animal Husbandry, Brawijaya University,
Jl. Veteran, Malang, East Java-Indonesia 65145

Abstract: Goat farming has a great role in generating household income. Ampel Gading Sub-district of Malang regency has great Etawa Crossbred goat (CR) population to meet the demand from many areas of Indonesia and even foreign countries such as Malaysia. Since many goats have gone from this area, it may require a technology to improve breeding method to sustain its goat population. Therefore, this study aimed to investigate the effect of single-dose and double-dose of hormone PGF2α to improve estrus quality and increase pregnancy success rate in the CR at Ampel Gading Sub-District, Malang Regency. Seventy three CR doe were divided into three groups, i.e. group 1 Consited of 20 goats without hormone treatment, group 2 consisted of 33 goats and group 3consisted of 20 goats injected with hormone PGF2α each with single- and multiple-doses to synchronize estrus. Pregnancy evaluation was observed by non-return rate to estrous method (NRR). Results showed a single dose of PGF2α induced estrus in goats (96.97%) in 17 hours after injection. However, the high rate of estrus did not conceived in goats after given artificial insemination. The success rate of pregnancy in goats without treatment was higher (90%) compared to those with hormone treatment either single dose (87.87%)or double doses (75%).

Key words: Cross-Bred Etawa Goat · Estrous Synchronization · PGF2α · Pregnancy Doe · NRR

INTRODUCTION

East Java has the second largest goat population in Indonesia (2.739.727 heads) in 2008, but the numbers are likely decline in 2012 [1]. Nevertheless, Malang Regency is considered as seventh rank, which has population about 130.776 goats. So that Malang is big supplier of goat for various regions in Indonesia and even foreign countries such as Malaysia. Therefore, the government and farmers have to maintain the population of goats in this area by conducting good management of livestock breeding through improving the quality of the diet with supplementation elements [2] to improve the quality of animal health [3], preventing the dieases primarily from Hydatidosis [4]. The otherside, these attempts are proposed to develop goat breeding stock in order to avoid the negative impacts of up-grading selection through artificial inseminantion (AI) technique.

Estrous can be synchronized by using progesterone, estrogen and PGF2α hormones (PGF2α). PGF2α hormone stimulates growth and maturation of follicle, followed by estrous and ovulation [5]. Injecting PGF2α hormone induced estrous synchronization in goat [6]. Morover application PGF2α hormone twice a day in goat stimulate estrous in the following day after injection [7]. The purpose of study was to examine the effect of PGF2α hormone in single and double dose injections on the estrous intensity and succesful pregnancy of Etawa Crossbred Goat.

MATERIALS AND METHODS

Goat Selection: Etawa Crossbred doe were selected under some conditions, namely they: (i) at no morethan 2 year old, (ii) have given birth once to twice, (iii) were fed by *leguminosa* forage in individual pen, (iv) were not in

Corresponding Author: Trinil Susilawati; Faculty of Animal Husbandry, Brawijaya University, Jl. Veteran, Malang, East Java-Indonesia 65145.

pregnancy and (v) were not mating before start of experiment. 73 doe in this reseach were divided into three groups, i.e. group 1included 20 doe without the injection of PGF2α hormone; group 2 included 33 heads and group 3 included 20 heads of estrous doe with the injection of single and double doses of PGF2α hormone respectively [8].

Estrous Synchronization and Detection: Estrous Synchronization was initiated by intra muscular injection of 2ml PGF2α hormone (*Noroprost*®) in the neck region of goat [9]. According to Jainudeen and Hafez [10], Estrous is detected. The quality of Estrous was categorized into good (+++), medium (++) and poor (+).

Artificial Insemination: Artificial insemination (AI) was carried out when female goat had estrous. It was done by frozen semen of Etawa buck (Atyar 2006, 28 straw, AI centre in Singosari, Indonesia). Before it was used for AI, the Frozen semen straw was thawed at 37°C for 45 seconds [7].

Pregnancy Evaluation: Pregnancy was evaluated by non-return rate (NRR) to estrous method [10]. Pregnancy occurs when female goat does not have estrous in the next cycle or on day 17-21 after AI [6][7]. Threfore, pregnancy was evaluated in the first, second and third cycle or NRR_{17}, NRR_{34} and NRR_{51}, respectively.

RESULTS

Success of Estrous Synchronization: PGF-2α hormone injection was able to synchronize estrous in most doe (62.26%). Estrous was indicated within 96.97% of doe during 17 hours after injection of PGF2α hormone, whereas 36.36% of them had good quality of estrous (+++) and 60.61% of them had medium quality of estrous (++). Only one doe had indicated estrous with medium quality (++) in 64 hours after the injection of PGF2α hormone as shown in Table 1.

Table 1: Doe's Estrous Quality after single injection of PGF2α hormone

Interval between injection and Estrous.	Quality	Number of Estrous Doe (n= 33 heads) Heads	(%)
17 Hours	+++(1)	12	36.36
	++(2)	20	60.61
64 hours	++(2)	1	3.03
	Total	33	100

Note:(1)Red and swollen vulva,more mucous

(2)Somewhat red and swollen vulva, less mucous

Table 2: Doe's Estrous Quality after double injections of PGF-2α hormone

Interval between injection and Estrous.	Estrous Quality	Number of Estrous Doe (n = 20 heads) Heads	(%)
17 Hours	+++(1)	14	70
64 Hours	++(2)	6	30
	Total	20	100

Note: (1)Red and swollen vulva,more mucous

(2)Somewhat red and swollen vulva, less mucous

Double injections of PGF-2α hormone were carried out for 20 doe and resulted estrous for all doe. The doe with estrous signal after 17 hours and 64 hours were 14 heads with good estrous quality (+++) and 6 heads with medium estrous quality (++), respectively (Table 2).

Sucessful Pregnancy with Estrous Synchronization: Artificial Insemination for 20 doe without estrous synchronization had resulted 19 heads of NRR_{17} (95%) and decreased in 18 heads of NRR_{34} and NRR_{51} (90%). The treatment using single dose of PGF2α hormone for 33 female goats has been successful in AI with 30 heads of NRR17(90.91%) and had dropped to 29 heads of NRR_{34} and NRR_{51}(87.87%).The similar treatment with double doses for 20 doe had been successful in AI with18 heads of NRR_{17}(90%) and went down to 17 heads ofNRR_{34}(85%) and 15 heads of NRR_{51}(75%) as shown in Table 3.

Table 3: Number of Pregnancy after Artificial Insemination

Treatment	Sample (Heads)	NRR_{17} Heads	%	NRR_{34} Heads	%	NRR_{51} Heads	%
Without Synchronization	20	19	95	18	90	18	90
Synchronization With single dose of PGF2α	33	30	90.91	29	87.87	29	87.87
Synchronization With Double doses of PGF2α	20	18	90	17	85	15	75

DISCUSSIONS

Succesful in Synchronization Based on Emerging Estrous: Injecting single dose of PGF2α hormone for 53 female goats had yielded 33 heads with estrous signs(62.26%). The finding is similar to Geisart and Malayer [11] that female goats exhibited estrous symtopms within 96 hours post injection of single doses of PGF2α hormone because they were in luteal phase (diestrous). However, 20 female goats have not shown estrous signs maybe in the follicular phase.

Female goats with estrous signs within 17 hours after PGF2α hormone injection had higher quality (+++) than those with estrous signal emerging in 63 hours (++). Good estrous quality (+++) refers to redand swollen vulva, with more mucous. The medium estrous quality (++) consists of somewhat redand swollen vulva, withless mucous. According to Hafez and Hafez [12] estrous signal is caused by the decrease of progesteron hormone and the increase of estrogen hormone. The existence of PGF2α hormone will dissolve corpus luteum; thus, decrease progesteron hormone. Female goats with double doses of PGF2α hormone injection signed estrous for all of them as they were already in lutheal phase. As PGF2α hormone was added, corpus lutheum had deteriorated and led to the decreaseofprogesteronehormone and the increase of estrogen hormone. Therefore, estrous signal appeared. Estrous quaility is influenced by hormone condition determined by animal physiology based on feed consumption [13].

Success in Artificial Insemination after Estrous Synchronization: Artificial Insemination has yielded more pregnancy in untreated doe than doe treated with PGF2α hormone for synchronizing estrous. The number of pregnant doe treated with single dose was higher than those with double doses. This finding is similar to Bowen [6] that estrous synchronization with PGF2α hormone indicates lower pregnancy rate than that without treatment.

Likewise, pregnancy evaluation with non-return to estrous or Non-Return Rate (NRR) is discovered in line with the research finding of Jainudeen and Hafez [10]. It is found that female doe without estrous signal in the following cycle will conceive succesfully. This is because progesteronehormone can hamper the estrous signal during pregnancy period. The pregnant doe can also be observed when buck hasnot taken a ride in female goat on day 17-21 [6,7]. Thus, pregnancy evaluation is carried out in first, second and third cycle or NRR_{17}, NRR_{34} and NRR_{51}. When pregnancy is on the day 12-16, the conceptus produces protein that inhibits PGF2α production with disecretion on the day 14-16 within normal endometrium cycle, and PGF2α concentration is low on the day 12-16 of pregnancy [11].

NRR analysis found that NRR_{17}, NRR_{34} and NRR_{51} were decreased because of pregnancy failure or estrous detection fault. Likewise, Jainudeen and Hafez [10] have discovered that pregnant goat in NRR_{17} has repeated mating (Repeat-breeder) because of embryo death, abortion and fetal mummification. Less accuracy in estrous detection may become a factor that has an impact on pregnancy failure. Embryo death is mostly caused by doe's physiology. As mentioned by Jainudeen and Hafez [9] that the life of fetus is influenced by doe's physiology, feed from doe, as well as progesteron hormone produced from corpus lutheum and placenta. Estrous detection and feeding for doe were simultaneously carried out in the morning or afternoon. As doe signed *pro-estrus* in the afternoon, the insemination would be executed in the following day. The average estous of goat was 3.5 hours.

The successful level in pregnancy indicated higher (19 heads or 95%) for doe without estrous synchronization treatment compared to those with single dose (29 heads, 87.87%) or double dose (15 heads, 75%) treatments. The evidence depicted that estrous synchronization withPGF2α hormone in goats had negative impact in oocyt quality produced from uterus. Moreover, the number of pregnant doe decreased inNRR_{17}, NRR_{34} and NRR_{51} because of the early death of fetus. Similarly, Jainudeen and Hafez [9] have found that the embryo death can be observed from the repeating estrous signal after pregnancy occurs. Fetal death is due to many factors namely, low oocyt quality, unsupported uterus physiology, feeding, retained placenta [14] and infection with *Toxoplasma gondii* [15].

CONCLUSION

Estrous Synchronization with a single dose of PGF2α hormone injection has yielded estous up to 96.97%, followed by Pregnancy up to 87.87% on day 51 after administering Artificial Insemination. Since the pregnancy success is still lower than the control group, the future study to determine the effective dose of PGF2α hormone to improve the pregnancy is still very promising to be explored.

ACKNOWLEDGMENTS

We would like thank to General Directorate of Higher Education, Ministry of Education and Culture, Republic of Indonesia for providing the research fund.

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