

## Effects of Timed Artificial Insemination Following Oestrous Synchronization on Pregnancy Rate of Dairy Cattle in the tropics

Haytham H. Abdelwahid<sup>\*1</sup>, Alrasheed A. Abdallah<sup>2</sup>, Rajaa M. Mohammed<sup>2</sup>, Egbal S. Abu Shulukh<sup>3</sup> and Abdelbasit B. Habib<sup>4</sup>

<sup>\*1</sup>Department of Animal Breeding and reproductive technologies, College of Animal Production, University of Bahri, Sudan

<sup>2</sup>Department of Dairy production, College of Animal Production, University of Bahri, Sudan

<sup>3</sup>Department of meat production, College of Animal Production, University of Bahri, Sudan

<sup>4</sup>Department of Poultry Production, College of Animal Production, University of Bahri, Sudan

Received 14 Dec 2018, Accepted 16 Feb 2019, Available online 19 Feb 2019, Vol.7 (Jan/Feb 2019 issue)

### Abstract

The uses of oestrous synchronization and Artificial Insemination (AI) protocols is beneficial to many farmers since it reduces the time and labour required for oestrous detection. It also minimizes the frequency of animal handling. The objectives of this study were to evaluate oestrous response and pregnancy rate resulting from timed artificial insemination following oestrous synchronization at University of Bahri dairy farm, North Khartoum, Sudan. Fifteen hybrid dairy cows were used in this experiment. Oestrous synchronization was carried out using prostaglandin follicle hormone (PgF2) and gonadotropin releasing hormone (GnRH). Each cow was given 2.5ml of GnRH and PgF2 intramuscular injection, then artificially inseminated after 18 hours from the last injection of GnRH. The percentages of oestrous response following the synchronization was 100%. The observation of pregnant cows after timed artificial insemination was only six cows represented pregnancy rate of 40%. Timed AI is efficient method and the conception rate could be enhanced if the heat stress is avoided.

**Keywords:** Pregnancy Rate (Pr), Heat Detection Rate (Hdr), Service, Fertility Rate.

### Introduction

No profit will be gained for both dairy and beef farm without pregnant cow. In theory, the process is easy; observe the cows and breed them at standing heat. However, in reality the process is challenge and more complicated especially with large herds and busy employee. Maximum fertility occurs when cows are bred near the end of standing heat. Fertility decreases slightly when cows are bred a few hours before or after this target, and decreased markedly when breeding occurs more than 12 hours away from the end of standing heat (Kubkomawa, 2018). Thus, numerous approaches have been developed to increase the likelihood of opportunities for successful breeding of cows in heat.

The oestrous synchronization is the manipulation of the reproductive process, so that the female can be bred with normal fertility during short predefined interval (Stevenson, 2001). These control facilities breeding in two important ways: it reduces the labour of detecting oestrous, and it allows the producer to schedule the breeding. Although the total amount of labour involved

with insemination may be not reduced, it is concentrated into short period. Other advantage of oestrous synchronization include, creating more uniform calf crop, enabling more cows to be artificially inseminated to genetically superior bull and reducing the length of the breeding season (Stevenson, 2001). In order to maximize the total production, the cows must be artificial inseminated at 80-90 days from the calving, so we can obtain mean interval of 12.5 – 13 months between the calving (Pacala *et al.*, 2004). The efficient detection of the cows in heat has great impact on conception rate. The increases of the mean of milk production and the inefficient heat detection have led to reduction of conception rate almost 1% every year (Lucy *et al.*, 2001). Also the manipulation of sperm in female genital tract and the insufficient intake of dry matter, have led to reduction of the conception rate in the dairy cows (Staples *et al.*, 1990).

Dairy farm at College of Animal Production, University of Bahri in Sudan was suffered from zero conception rates when they used artificial insemination, although all cows are healthy. Other farms around Khartoum state also suffering the same problem. Therefore, they use bulls for natural service, however it is likely that the genetics merits of such bulls may be often leave much to be

\*Corresponding author's ORCID ID: 0000-0002-5636-5207

DOI: <https://doi.org/10.14741/ijmcr/v.7.1.10>

desired and there is cost of keeping the bulls in the farms. The low conception rates in the dairy herd lead to low production of offspring, which mean few replacement heifers and bulls, which lead to greater economic losses. Therefore, the objectives of study were to evaluate the oestrous response resulting from timed artificial insemination following oestrous synchronization in dairy cattle and to measure the pregnancy rate resulting from timed artificial insemination.

**Materials and method**

*Animals*

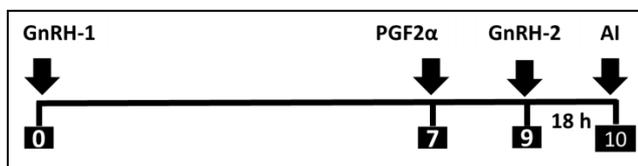
The experiment was conducted at Dairy farm of College of Animal Production, University of Bahri, which located in AL-Kadro area in Northern Khartoum, Sudan. A total of 15 hybrid cows (Kenana X Friesian) with different Age ( 2 – 8 years) were used in this study (Table 1), all cows were healthy and not pregnant and raised under the similar conditions and supplemented with commercial concentrate.

**Table 1.** ID number and age of cows used in the study

No	Cow ID	Age / year
1	23	2
2	24	2
3	26	2
4	28	3
5	31	3.5
6	30	4
7	27	4
8	34	4
9	3	5
10	21	5
11	25	5
12	18	6
13	20	7
14	8	8
15	19	8

**Hormones used in this study**

The Gonadotropin-releasing hormone (GnRH) in form of Receptal, Prostaglandin follicle hormone (PgF2α) in form of Estrumate and vitamin (AD3E) which enhance the action of hormones were used as shown in Fig 1.



**Fig. 1.** Protocol that used in this study

Day 0: Injection of 2.5ml GnRH (receptal) + 7ml (AD3E), day 7: Injection of 2.5ml PgF2α (Estrumate), day 9: Repeat

injection of 2.5ml of Receptal, then after 18 h Artificial insemination.

**Statistical analysis**

The proportion of cows that showed estrous after injection of GnRH, PgF2as protocol as well as pregnancy rate was analyzed by descriptive statistics as percentage (%).

**Results and discussion**

All the cows (15) were on heat after oestrous synchronization representing 100% (Table 2). This means the protocol and hormones used in this study were efficient. Malik *et al.*, (2012) obtained similar percentage. Regarding the conception rate, only six cows out of 15 were pregnant after AI representing a conception rate of 40 % (Table 2).The conception rate in this study was higher after TAI than the previous study (0%), but still not optimal, and higher than 26.6% which was reported by Chebel *et al.*, (2004) who used 100 cows. However, it lower than 51.5% which was reported by Taponen (2009). There are many factors, which affect the conception rate in cattle, which probably lead to low conception rate in this study, such as heat stress and age of cow. Cows have more susceptible to the negative effects of heat stress on the reproductive performance. Exposure to heat stress from 20 to 50 days prior to AI was associated with reduced conception rate (Chebel *et al.*, 2004). In addition, cows exposed to temperature above 26°C have elevated respiration rate and rectal temperature, and this may result in impaired metabolism and reproductive performance (Kadzere *et al.*, 2002). Moreover, cows exposed to heat stress during the summer have lower quality oocyte, and this effect is carried out through the autumn (Roth *et al.*, 2001). Heat stress not only affects quality of oocytes, but also increases the number of degenerate the granulosa cell, compromises stroidogenesis, and might reduce the progesterone production by corpus luteum formed after the ovulation of the compromised follicle, therefore reduce the conception rate (Hansen and Arel@chiga, 1999). High producing cows has less than optimal thermoregulation because of increased heat production from high feed intake and milk production (Kadzere *et al.*, 2002). Collectively these factors of heat stress could have contributed to the negative effect of heat stress on conception rate of dairy cows observed in this study especially this study was conducted in the summer season (April 2016). Lower conception rate in this study might be also due to age factor, as there were only 6 cows were pregnant, three cows among them in their first lactation and three cows in their second and third lactation. In generally the conception rate is lower in

older cows (7 and 8 years); the study in Virginia (Galloway, 1994) suggested that the conception rate were 10% higher in virgin heifer and 10% lower in fourth lactation and older cows.

**Table 2.** Percentages of estrous response and pregnancy rates after timed AI

Total sample	No. of cows on heat	Estrous response %	No. of pregnant cows	Pregnancy %
15	15	100	6	40

### Conclusion and recommendations

The protocol of oestrous synchronization used in this study was efficient. Timed AI following the oestrous synchronization increase the possibility of pregnancy rate rather than natural insemination if there is proper protocol and heat stress is avoided.

It recommended to use small age cow (less than 7) when using timed Artificial Insemination and conduct such experiment in winter to avoid heat stress.

### Acknowledgments

The Authors wish to thank the administration of the College of Animal Production University of Bahri for the funding this work.

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