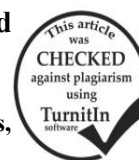


Effect of Heat Stress on Conception Rate and Estrus Behavior of Baladi and Crossbred Cows in the Hot Season in Upper Egypt

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ABSTRACT

The current work was planned to study the effect of heat stress during the hot season on conception rate and estrus behavior of Baladi and crossbred cows. The cows were observed after month during the post-partum period. The cows divided into two groups, the first group treatment with spraying by water from one day at mating extended to seven days post-mating and the second group as control. The rectal temperature was recorded daily by digital thermometer onset day of mating till seven days post-mating. The present results demonstrated that mean rectal temperature at service and during the next seven days after service were of Baladi and crossbred cows that sprayed by water was lower (38.75 ± 0.15 and 38.77 ± 0.15 °C) than control group (39.18 ± 0.26 and 39.54 ± 0.24 °C) ($P < 0.05$) respectively. The overall conception rate of Baladi cows was higher 42.5% compared to crossbred cows 35% during the hot months. Conception rate in Baladi and crossbred cows was higher in cows that sprayed by water (60 and 50%) than control group (25 and 20%) respectively. The occurrence rate (%) of heat signs (vaginal mucus discharge and mounting behavior) was more frequent in Baladi cows (45 and 50%) than crossbred cows (40 and 35%) respectively, but the difference was not significant ($P < 0.05$). Concentrations of progesterone at estrus was higher (0.323 ± 0.091 and 0.301 ± 0.053 ng/ml) in pregnant than non-pregnant cows (0.247 ± 0.042 and 0.211 ± 0.031 ng/ml) in two breeds Baladi and crossbred cows ($P < 0.05$) respectively. The present results clarified that treatment of the cows by spraying by water from the first day at mating till seven days post-mating lead to improve conception rate during the hot season. Therefore, this study recommends spraying water on cows before and after the mating period directly (body cooling) to improve fertility during the hot season under climatic conditions of Aswan Governorate.

Keywords: Rectal temperature, hot season, cows, conception rate, water spraying

INTRODUCTION

Concerning of global warming had been increased since the last 10 years. The global warming will lead to increase the heat stress of the livestock and influence on all physiological process finally negative impact on productive and reproductive performance. Many researches White *et al.* (2002); Collier *et al.* (2006) and Ferreira *et al.* (2011) concerned by study the adverse effect of heat stress in cows on reproductive performance. Conception rate considered one of important reproductive parameters which used in order to measure the reproductive performance of cows. Flamenbaum and Ezra (2006) and Nabenishi *et al.* (2011) recorded that lower conception rate during the hot season compared with cool season. In India, Khan *et al.* (2013) found that heat stress was one of the major causes for impaired in a pregnancy rates of crossbred cows. In Brazil, De Souza *et al.* (2016) found that there is relationship between rectal temperature at insemination and conception rate in crossbred dairy cows. In Egypt, El-Wishy (2013) El-Tarabany and El-Bayoumi (2015) reported that lower conception rate of Holstein cows when the cows exposure to high THI. Heat stress effect on embryo development in cows El-Sayed *et al.* (2006); Ferreira *et al.* (2011) and Pavani *et al.* (2015) found that during the hot season less quality of oocytes and lowest tendency to undergo embryo developmental phases. Negative effect of high ambient temperature and high temperature humidity index (THI) on heat expression in cow was demonstrated by Peralta *et al.* (2005) and Roelofs *et al.* (2010). In Australia similar trend reported by Morton *et al.* (2007) and Jordan (2003) who found that cows exposure to heat stress have impaired duration and intensity of heat and decline embryonic development. Aswan governorate located in the hot area south of Egypt and record highest

air ambient temperature reached to above (40 °C) compared with all another governorates in Egypt. In light of the previous facts beside that no investigations about the effect of heat stress during the hot months on conception rate and how use some methods in order to lightening the harm effects on animals. For that the present study was designed.

MATERIALS AND METHODS

Location of farm and climatic conditions:

The study carried out in farm of animal that located in Nassr El-Nuba, Aswan governorate. The animals reared in semi shaded farm. The weather of Aswan is high ambient temperature and decline of relative humidity especially during the hot season. The table (1) showed the mean of the ambient temperature, relative humidity and temperature humidity index during the hot months (experimental period). Temperature humidity index (THI) was calculated using the formula purposed by Garcia-Ispierito *et al.* (2007):

$$THI = [0.8 \times T_{max} + (RH \text{ min } (\%)/100) \times (T_{max} - 14.4) + 46.4]$$

Table 1. Mean of the ambient temperature (°C), relative humidity (%) and temperature humidity index during the hot season.

Hot seasons	Average Ambient temperature (°C)		Average Relative Humidity (RH %)		THI
	Min	Max	Min	Max	
	May	23.1	41.2	8	
June	25.3	41.3	7	16	81.24
July	26.2	41.3	9	18	81.87
August	26.0	41.0	9	20	81.59
September	24.2	39.4	10	22	80.42

Experimental animals and feeding:

Total number of 80 Baladi and crossbred cows (Baladi x Friesian) (n= 40 cows for each) were used in the current investigation. The cows ranged between 2nd and 5th parity. Body weight at mating was (300 - 400 kg) in Baladi cows and (350 - 450 kg) for crossbred cows. Animals were live in traditional farms as semi-shaded yards. Concentrate feed mixture, darawa (green fodder) and hay wheat offered to the cows during the hot season.

Design of the experiment:

Baladi and crossbred cows (n=80 cows) (n= 40 cows for each breed) were divided into two groups (n=

20 cows for each breed). The first group (n=20) treated with spraying by water (by hose) from the first day of service till seven days after service and the second group as control (n=20) in two breeds Baladi and crossbred cows. Rectal temperature was recorded daily by digital thermometer onset the day of mating until seven days after service at (2:00 to 5:00 p.m.) when cows are most likely to be experiencing elevated body temperature Bewley *et al.* (2008). Table (2) showed the classification of zones based on THI values in cattle with THI model according to Armstrong (1994).

Table 2 .Classification of zones based on THI values in cattle with THI model Armstrong (1994).

THI	Stress level	Symptoms in cattle
<72	None	Optimum productive and reproductive performance
72-78	mild	Dairy cows seek for shade, increase in respiration rate and dilation of blood vessels
79-88	Moderate	Increase in respiration rate and saliva secretion. Reduction in feed intake and water consumption.
89-98	Severe	Body temperature is increased and reproductive performances are severely affected in cattle There is rapid increase in respiration and excessive saliva production. The reproductive performances in animals are significantly decreased
>98	Danger	Heat stress is extreme and cows may die

Detection of heat and pregnancy diagnosis:

Diurnal visual observation of cows was conformed. Vaginal mucus discharge, standing behavior and mounting behavior this is the main signs of heat in cows that depended on during the experiment. Natural mating by bull was used in the experimental cows. According to Arthur (1964) pregnancy was diagnosed applying rectal palpation sixty days (without any heat signs) after mating.

Calculation of conception rate:

Conception rate calculated as the percentage of cows which pregnant throughout 90 days post-partum from the following method:

$$\text{Conception rate} = \frac{\text{Number of cows pregnant}}{\text{Number of cows mating}} \times 100$$

Blood samples and analysis:

Blood samples (10 ml) were collected in the morning at day of mating and 21 post-mating in heparinized tubes from the jugular vein. Samples were centrifuged at 3000 rpm for 20 minutes for plasma harvesting. Plasma was separated and stored at -18 °C until time of progesterone hormone determination using radioimmunoassay technique.

Statistical analysis:

The statistical design was included one factor (effect of treatment with spraying by water on conception rate) the analysis confirmed by SAS (2002). The following model was used:

$$Y_{ij} = \mu + S_i + e_{ij}$$

Where:

Y_{ij} = the observation trait

μ = overall mean

S_i = effect of treatment with spraying by water (non-spraying =1 and spraying =2)

e_{ij} = experimental error

Duncan's Multiple Range test (Duncan, 1955) was used to test the significance of difference between means. Chi Square was performed.

RESULTS AND DISSCUSSION

Effect of heat stress on conception rate of Baladi and crossbred cows

The overall conception rate of Baladi cows is presented in table (3). Lower conception rate was recorded in Baladi cows during the experimental period 42.5%. Higher conception rate was observed in the cows that sprayed by water before and during the next seven days after service. There was a positive effect of spraying of water on conception rate of cows (60 vs. 25%, control) table (3). Spraying of water lead to decline the body temperature (rectal temperature) in cows and maintenance in normal range during the hot season may be good reflection on physiological process, feed intake and energy balance. Jahn *et al.* (2002) reported that increase air ambient temperatures were positive relationship with rectal temperature in dairy cows that exposed to direct solar radiation. The present results are agreement with that reported by Barkawi *et al.* (2001) and Barkawi *et al.* (2006) who found that conception rate was lower during the hot season (66.7, 65.1%) compared with (87.5, 69.9%) in the cold season in Baladi cows respectively. Similar trend was observed by Zahed *et al.* (2001) who found that conception rate of Baladi cattle in the cold season was higher (65.5%) than in the hot season (63.8%).

Lower conception rate was observed in crossbred cows compared with Baladi cows table (3). There is a positive impact of spraying by water on conception rate of crossbred cows (50 vs. 20%, control) table (3). Spraying the crossbred cows by water contributed to decreasing the body temperature (rectal temperature) and sustainability around the normal limits. The current result agree with that reported by De Souza *et al.*

(2016) who found that cows that served in the early morning had lower rectal temperature (38.96°C) and conception rate was (32.86%) compared with that cows mated in the afternoon rectal temperature was (39.60°C) and conception rate was 26%. Also, the results are agreement with that recorded by Folman *et al.* (1979) and Ron *et al.* (1984) who found that conception rate was lower during the hot season (22, 24 %) compared with the cool season (80, 52%) respectively. Similar trend was reported by Ono *et al.* (2016) who found that pregnancy rates were lower in summer 17.1 % than in winter 40.9 % in cows. Demétrio *et al.* (2007) and Beltran and Vasconcelos (2008) reported that there was a relation between decline in pregnancy rate and rectal temperature in cows. Khalil *et al.* (2010) reported that crossbred cows are less heat tolerant compared to Baladi cows under heat stress in Egypt conditions. Al-Katanani *et al.* (1999) found that increase the ambient temperature 10 days before estrus are associated with low fertility and increment pregnancy loss in dairy cattle. Similar findings were reported by Garcia-Ispuerto *et al.* (2006) who found that about 10 % of pregnancies during early pregnancy were loss in cows.

Most of researchers demonstrated that positive association between increment of air temperature and elevation of body temperature of cows (rectal and vaginal temperature) Sartori *et al.* (2002) ; West (2003) and Kendall *et al.* (2007). Thatcher *et al.* (2010) reported that the main causes of heat stress in dairy cows are increase environmental temperature, solar radiation, and relative humidity. The present results demonstrated lower conception rate during the hot months in two breeds Baladi and their cross cows that reared in Aswan governorate in Upper Egypt (42.5 and 35%) respectively. The obtained results were agrees with that reported by Nabenishi *et al.* (2011) who found that conception rate of dairy cows during the warm months (July to September) was lower 29.5% compared to 38.2% during the cold months (October to June). Similar trend was reported by Flamenbaum and Ezra (2006) who observed that conception rates of high and low producing cows were lower during the summer season (19, 25%) as compared to (39, 40%) in winter season respectively. Higher pregnancy rates in Holstein cows were observed during the cool months (September to November) 32% but lowest value recorded in the hot months 24% Oseni *et al.* (2004). Wide variation in pregnancy rates in cows was showed in hot and cold season (27.7 vs. 68.5%) respectively Ahmadi and Ghaisari (2007). Recently, Khan *et al.* (2013) reported that pregnancy rates in dairy cows reared in temperature neutral zone were higher by about 12% than cows reared in heat stress zone. Cavestany *et al.* (1985) and De Rensis *et al.* (2002) found that the percentage of decline in conception rates in cows during the warm months ranged between 20 and 30% comparison to the cool months.

During the experimental period that extended during the hot months (May to September) the THI (temperature humidity index) was ranged between (80.4

and 81.8) table (1). According Armstrong (1994) the cows suffer from heat stress, the main important symptoms of heat stress on cows are: increase in respiration rate and saliva secretion, reduction in feed intake and water consumption and body temperature is increased and reproductive performances are severely affected in cattle. The current results agreement with that reported by El-Wishy (2013) who found that sharp less in conception rate of cows during the interval from May to July under the climatic conditions of Egypt when the THI (temperature humidity index) increased from 69 to 74. Similar findings observed by El-Tarabany and El-Bayoumi (2015) reported that the conception rate of Holstein cows decline from 35.8% to 16.1% when the THI increased from (70 to 80) in Egypt. Garcia-Ispuerto *et al.* (2007) found that when the THI more than 80 on three days before service the conception rate was decline from 30.6% to 23% in Holstein cows in North-Eastern Spain. Similar trend was observed by Amundson *et al.* (2006) who found decline in conception rate when the THI higher than 73 in Nebraska, USA. Pavani *et al.* (2015) reported that in cows when the THI during the hot season (June to September) was 71.7 the conception rate was 40.2% but conception rate was higher 63.8%, when the THI 62.8 during the cool season. Higher embryos development showed during the cold season 53.8% compared to hot season 36.3%. Morton *et al.* (2007) and Schuller *et al.* (2014) reported that the conception rates in dairy cows decreased when the THI increased more than 72- 73.

Calculated of normal body temperature of the cow is about (38.5 – 38.6°C) (101.3- 101.5°F) Sartori *et al.* (2002). There is positive association between environmental temperature and rectal temperature in non-lactating heifers and lactating cows in Wisconsin. Mean rectal temperature at and during the next seven days after service was 38.75 ° C in cows sprayed by water compared to 39.18 ° C in control cows. Hansen (2008) reported that conception rate decreased when rectal temperatures increased above > 102.2 ° F (39.0°C) as afternoon. Gwazdauskas *et al.* (1973) found that 12.8% decrease in conception rate when uterine temperature elevated 0.5°C more than normal range in cows. Continuance spraying of the water on the cows during the next seven days after service was responsible for decline the rectal temperature in cows. Synchronized lower rectal temperature in cows sprayed by water with higher conception rate compared to control cows table (3). The present results were correspond with that reported by Vasconcelos *et al.* (2006) who found that rectal temperature was negatively correlated with the probability of cows becoming pregnant after artificial insemination and embryo transfer. Similar findings were reported by Morton *et al.* (2007) who found that heat stress 3-5 weeks pre service and one week post service was conjugated with reduction in conception rate in cows. Thatcher *et al.* (2010) found decline in the pregnancy rate, because the oocyte and sperm is more sensitive at the time of insemination and the early developing embryo to increase of body temperature for

a short period of time. When uterine temperature at the day post insemination is higher 0.5 °C (0.9 °F) than 38.3 °C (100.9 °F), the conception rate is lowered by about 7%. For this 38.8 °C (101.8 °F) uterine temperature was may be conjugated with decline in conception rate of cows. Schuller *et al.* (2014) reported that lower conception rate around 1 to 21 day pre- mating when the dairy cows exposed to heat stress.

Decline of conception rate during the hot season in two breeds that presented in table (3) may be due to during the hot season nuclear maturation of oocytes is stopped in early phases of meiotic maturation Maya Soriano *et al.* (2013). Similar observed was reported by El-Sayed *et al.* (2006) and Ferreira *et al.* (2011) showed that oocytes during the hot seasons had lowest tendency to undergo embryo developmental phases, also deterioration of oocytes quality while the hot months, trigger to meiotic stop of oocytes at anaphase and telophase. Pavani *et al.* (2015) reported that cows exposed to heat stress during the hot season affect on physiological responses of dam on follicular and oocyte quality to cause decrease in embryo development. Biggers *et al.* (1987) reported that heat stress lead to reduction in embryo growth up to day 17 which is a serious time for production of interferon-tau from the embryos. Suitable amounts of interferon-tau are important to reduction pulsatile secretion of prostaglandin F2α to stop corpus luteum regression and persistency of pregnancy. Similar findings were reported by Putney *et al.* (1988) who found that heat stress decline protein synthesis and secretion of interferon-tau by 71 % in embryos. Also, endometrial secretion of PG F2α and embryo secretion of PG E2 is higher in heat stress by 72 %. Rocha *et al.* (1998); Al-Katanani *et al.* (2002) and Ferreira *et al.* (2011)

reported that oocytes incubated during the hot seasons showed decline tendency to development to blastocyst phase after in vitro fertilization compared to oocytes incubated during winter. In addition Ealy *et al.* (1993) reported that heat stress on day one post- breeding decline development of embryo.

Showed from the present results higher conception rate of Baladi cows compared to crossbred under the hot season conditions and response to treatment with water was better in Baladi cows table (3). The present results may be reflecting that Baladi cows were more adapted to the environmental conditions in Upper Egypt than crossbred cows. The results agreement with that reported by Hansen (2007) who found that *Bos-indicus* embryos are low adversely affected by increased temperature in culture than Holstein embryos (*Bos- taurus*). Embryos that produced by insemination of Holstein breeds oocytes with Angus breeds semen less thermotolerant than embryos produced by insemination of Brahman oocytes with Angus semen. Pszczola *et al.* (2009) demonstrated that decline heat tolerance may be one of the causes for the impaired reproductive performance of dairy cows. Amundson *et al.* (2006) found that negative correlation between THI and pregnancy rate of *Bos taurus* crossbred cows.

There was improvement in conception rate in cows that sprayed by water during the next seven days after service in two breeds compared with control group table (3). Showed decline in rectal temperature of cows that sprayed by water during the next seven days after service compared with control group table (3). Berman and Wolfenson (1992) found that improvement in conception rates in cows when used the cooling system with sprinkling during the heat stress period.

Table 3. Mean ± SE of rectal temperature at and during seven next days after service and conception rate of Baladi and crossbred cows.

Treatment	Breed	Rectal temperature at service	Rectal temperature during the next seven days after service	Rectal temperature at service and during the next seven days after service	Conception Rate (%) ¹
Cows sprayed by water	Baladi	39.12±0.26	38.69± 0.15	38.75±0.15 ^a	60 ^a
Control		39.43±0.13	38.83± 0.24	39.18± 0.26 ^b	25 ^b
Overall mean					
Cows sprayed by water	crossbred	39.26± 0.19	38.73± 0.14	38.77± 0.13 ^a	50 ^a
Control		39.61± 0.15	39.46± 0.24	39.54± 0.24 ^b	20 ^b
Overall mean					

^{a, b}: values within the same column having different superscripts are different at (*P* < 0.05).

Estrus behavior of Baladi and crossbred cows during the hot season

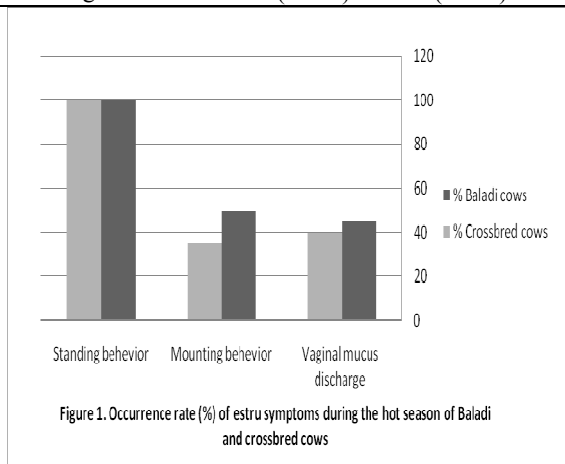
The occurrence rate (%) of estrus symptoms during the hot months in two breeds were lower frequency figure (1). Vaginal mucus discharge and mounting behavior there were more frequent in Baladi cows than crossbred cows table (4). The current results correspond with that reported by Peralta *et al.* (2005) and Roelofs *et al.* (2010) who found that negative effect of high ambient temperature and high temperature humidity index (THI) on heat expression in cows. Similar findings were reported by Badinga *et al.* (1993) showed that heat stress destroyed ovarian follicles and

causes a decline synthesis of estradiol. This decline in estradiol synthesis leads to impaired expression of estrus, ovulation, and the corpus luteum development. Lower estradiol concentrations cause to decline estrus duration and intensity, and increment incidence of anestrus Wolfenson *et al.* (1988). Heat stress decrease oestradiol levels at pro-oestrus (Gwazdauskas *et al.*, 1981) and manifestation of heat behavior (Abilay *et al.*, 1975) and this decline percentage of cows are detected in heat (Thatcher and Collier, 1986). Nebel *et al.* (1997) reported that dairy cows in the hot season had about one-half the number of mounts per estrus corresponds with cows in the winter season. White *et al.* (2002)

found that heat expression/detection rate was lesser in hot months when the air ambient temperature was around at 27.6 °C than that in cool months when the air ambient temperature was 5.8 °C. Low feed intake appears during heat stress cause to negative energy balance in cows lead to decrease LH secretion and increased anovulation cases. De la sota *et al.* (1998) and Dobson and Smith (2000) reported that low oestradiol secretion from the dominant follicles lead to indigent expression of heat with reduce of heat detection rate. Thatcher and Collier (1986) found that the intensity of heat expression is increment when heat stressed cows are cooled. Morton *et al* (2007) and Jordan (2003) in Australia, demonstrated that the cows exposure to heat stress have reduced duration and intensity of heat, altered follicular development, and decline embryonic development. Hansen and Arechiga (1999) and De Rensis and Scaramuzzi (2003) reported that motor activity and other symptoms of heat are decreased and the incidence of anoestrus and quiet ovulation are increased by heat stress in hot season. The intensity of heat was more frequent in Baladi cows than crossbred cows figure (1). Regardless of sparing by water the present results may be due to the different of breeds and appears adaptation of Baladi cows to the climatic conditions in Upper Egypt than crossbred cows. The current results agrees with that reported by Pszczola *et al.* (2009) who found that decrease heat tolerance may be one of the causes for the impaired reproductive performance of cows. Amundson *et al.* (2006) reported a negative relation between THI and pregnancy rate of crossbred cows.

Table 4. Occurrence rate (%) of estrus symptoms during the hot months of Baladi and crossbred cows.

Estrus symptoms	Breed	
	Baladi	Crossbred
No. of cases	20	20
Vaginal mucus discharge	(9/20) 45	(8/20) 40
Mounting behavior	(10/20) 50	(7/20) 35
Standing behavior	(20/20)100	(20/20)100



Concentrations (ng/ml) of progesterone at estrus and 21 day post-mating of Baladi and crossbred cows

Showned higher concentrations of progesterone at estrus in pregnant cows than non-pregnant in the two breeds Baladi and crossbred cows (P <0.05) table (5). The present result was agreement with that reported by Waldman *et al.* (2001) in Norway who found that a strong inverse associated between the probability of non- return and the concentration of progesterone at the time of artificial insemination in cows. Similar finding reported by Busch *et al.* (2008) observed that pregnant cows had higher progesterone concentration onset on d 10 post- insemination compared to non pregnant cow. Concentrations of progesterone on 21 day post-mating was higher in Baladi cows than crossbred figure (2), this may be explain why conception rate was higher in Baladi than crossbred cows. The current result agrees with that reported by Lemley *et al.* (2010) showed that increase progesterone was associated with elevated pregnancy retention and progress in embryonic development. Also, Rivera *et al.* (2011) found that less embryo quality of cows due to impaired progesterone levels during follicle growth. Cerri *et al.* (2011) demonstrated that higher concentration of progesterone pre and post- insemination are associated with improved fertility. Progesterone alters ovarian and uterine function by direct or indirect effect fertilization and early stages of embryo development. Alnimer *et al.* (2002) observed that progesterone concentrations in luteal phase of heat in cold season are higher than in hot season. In addition, Torres-Junior *et al.* (2008) reported that progesterone concentrations in blood were modified according to changes of environmental temperatures, heat stress fluctuated progesterone metabolism, this affect on follicles and development of corpus luteum. West (2003) showed that progesterone concentrations were altered when the cows exposure to heat stress conditions may be due to the blood flow might fluctuate to peripheral tissues for cooling purposes and consequently decline hepatic catabolism of progesterone. Hahn *et al.* (2003) found that the decrease in conception rate in hot season is due to the combined effects of environmental heat, which produces a modification in the synthesis of sexual hormones.

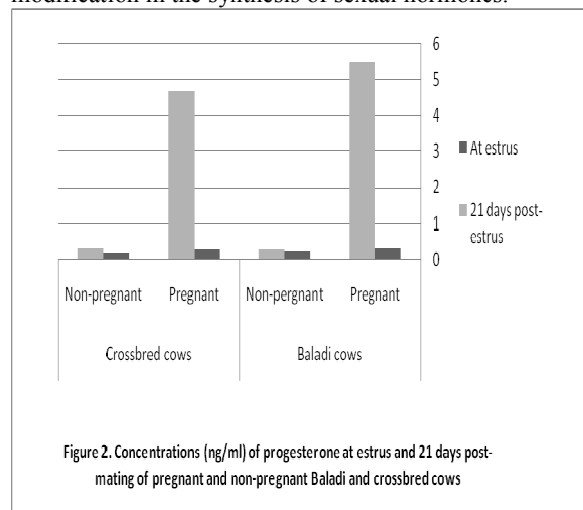


Figure 2. Concentrations (ng/ml) of progesterone at estrus and 21 days post-mating of pregnant and non-pregnant Baladi and crossbred cows

Table 5 . Concentrations (ng/ml) of progesterone at estrus and 21 day post-mating of Baladi and crossbred cows.

Time	Baladi cows		crossbred cows	
	Pregnant	Non-pregnant	Pregnant	Non-pregnant
At estrus	0.323±0.091 ^a	0.247±0.042 ^b	0.301±0.053 ^a	0.211±0.031 ^b
21 day post-mating	5.512±0.122 ^a	0.301±0.012	4.722±0.211 ^b	0.311±0.022

^{a,b}: values within the same row having different superscripts are different at ($P < 0.05$).

CONCLUSION

The present results demonstrated that treatment of the cows by spraying by water from the first day at mating till seven days post-mating lead to improve conception rate during the hot season. Therefore, this study recommends spraying water on cows before and after the mating period directly (body cooling) to improve fertility during the hot season under climatic conditions of Aswan Governorate.

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تأثير الاجهاد الحرارى على معدل الاخصاب وسلوك الشيعاء فى الأبقار البلدية والخليطة فى الموسم الحار فى صعيد مصر احمد إسماعيل ضممرانى قسم الإنتاج الحيوانى، كلية الزراعة والموارد الطبيعية، جامعة أسوان، مصر

تم اجراء هذا العمل لدراسة تأثير الإجهاد الحراري أثناء الموسم الحار على معدل الإخصاب وسلوك الشيعاء فى الأبقار البلدية والخليطة. تم ملاحظة الأبقار بعد مرور شهر من الولادة. تم تقسيم الأبقار إلى مجموعتين، الأولى تم معاملةها بالرش بالماء ابتداء من يوم التلقيح لمدة سبعة أيام بعد التلقيح. وكانت المجموعة الأخرى كمنترول. تم تسجيل درجة حرارة المستقيم يوميا باستخدام الترمومتر الرقمي ابتداء من يوم التلقيح حتى سبعة أيام بعد التلقيح. أظهرت النتائج الحالية أن متوسط درجة حرارة المستقيم عند التلقيح وخلال الأيام السبعة التالية للتلقيح كانت فى الأبقار البلدية و الخليطة التي رشت بالماء كانت اقل (0.15 ± 38.75 , 0.13 ± 38.77 درجة مئوية) من مجموعة الكمنترول (0.26 ± 39.18 , 0.24 ± 39.54 درجة مئوية) على التوالي ($P < 0.05$). كان المتوسط العام لمعدل الإخصاب أعلى 2.5% فى الأبقار البلدية بالمقارنة بالأبقار الخليطة 3.5% خلال الموسم الحار. كان معدل الإخصاب فى الأبقار البلدية والخليطة أعلى فى الأبقار التي تم معاملةها بالرش بالماء (60.6%) عن مجموعة الكمنترول (20.25%) على التوالي ($P < 0.05$). كان معدل تكرار ظهور علامات الشيعاء (إفراز المخاط من المهبل، وسلوك الوثب) أعلى فى الأبقار البلدية (50.45%) عنه فى الأبقار الخليطة (35.40%) ولكن الفرق غير معنوى ($P < 0.05$). كانت تركيزات هرمون البروجسترون عند الشيعاء أعلى معنويا فى الأبقار البلدية والخليطة التي حملت (0.323 ± 0.091 , 0.053 ± 0.301 نانوجرام/مليجرام) على التوالي. أظهرت النتائج الحالية أن معاملة الأبقار بالرش بالماء من اليوم الأول عند التلقيح حتى سبعة أيام بعد التلقيح تؤدي إلى تحسين معدل الاخصاب خلال الأشهر الحارة. لذلك توصي هذه الدراسة برش الماء على الأبقار قبل وبعد التلقيح مباشرة لتحسين الخصوبة خلال الموسم الحار تحت الظروف المناخية لمحافظة أسوان.