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EFFECT OF FLUSHING SYSTEM ON OVULATION RATE, CONCEPTION RATE, LITTER SIZE AND OVA WASTAGE OF ZARAIBI GOATS

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SUMMARY

Twenty eight Zaraibi does were divided according to parity,live body weight,litter size and milk production during the previous season into four groups (7 does each). One group was raised without flushing (G1,control). The other three groups were flushed (120% of NRC recommended allowances) either during one week (G2), two weeks (G3) premating or during two weeks premating and the first two weeks of the mating season (G4). The effects of flushing system on ovulation rate, conception rate, littre size and ova wastage of Zaraibi goats were studied. Averages of ovulation rate were 2.57, 3.14, 3.42 and 4.0 for G1,G2,G3 and G4, respectively. There was tendency for G2,G3 and G4,which received flushing to produce about 37% higher ovulation rate compared to the control (G1). Does in G4 recorded higher ovulation rate by 27.4 and 16.6% than those in G2 and G3, respectively. Average values of litter size were 2.20,2.25,2.40 and 2.57 for G1,G2,G3 and G4, respectively. The flushed groups produced about 9% higher litter size than those in the control group. Ova wastage was the smallest in G1 (0.37) and increased progressively with the increase in ovulation rate to reach a maximum (1.43) in G4. Ova wastage was higher (50.2%) with does which had ovulation rate ≥ 5. Whereas, it was lower (0.16.7,24.1 and 36.1%) for does having ovulation rate between 1 and 4,respectively. Overall mean of conception rate was 75%. All does in G4 conceived, while conception rate values were 71.4, 57.1 and 71.4 in G1, G2 and G3,respectively. Flushing system had no significant effect on plasma progesterone during the first 28 days after mating in the four experimental groups. In conclusion, the present results revealed the beneficial effect of flushing system pre and during mating season to obtain high ovulation and conception rates as well as litter size in Zaraibi goats.

Keywords: Zaraibi goats, flushing, ovulation rate, conception rate, litter size, ova wastage

INTRODUCTION

Zaraibi goats are considered to be of high genetic potentiality as a prolific breed compared with other goats raised in Egypt. Moreover, it is belived that the genetic potential of Zaraibi goats may be higher than that has been established and expressed. Therefore, they should be properly fed and managed to allow them to express their full genetic potential (Aboul Naga *et al*., 1993). Ovulation rate sets the upper limit to

the number of offsprings produced per pregnancy and the litter size is a major determinant of the biological efficiency of meat production from small ruminants (Hanrahan,1987). Level of feeding is believed to play an important role in determining the ovulation of goats (Chaniago,1989). However, information of the role of nutrition in the control of ovulation rate in Zaraibi goats is still scarce compared to sheep. Variation in the response to flushing may be related to some factors including flushing period length, magnitude of increase in the level of nutrients and the level of both energy and protein. Therefore, the present study aimed at investigating the effect of flushing system during pre-mating and mating periods on ovulation rate, conception rate, litter size and ova wastage of Zaraibi goats.

MATERIALS AND METHODS

This study was carried out at El-Serw Experimental Station of the Animal Production Research Institute, Ministry of Agriculture, in cooperation with Animal Production Department, Faculty of Agriculture, Mansoura University.

Twenty eight Zaraibi does were divided according to parity, live body weight, litter size and milk production during the previuos season into four similar groups, 7 does each. All does received the standard feeding level (100 % of NRC, 1981, recommended nutrients allowances). The dietary treatment started two weeks before mating and continued for two weeks during mating season. Does in the 1st group (control) were raised without flushing (G1). The second group received supplementary feeding equal to 20% over the NRC (flushing) for one week pre-mating (G2). Does in G3 received 20% over the NRC allowances for two weeks pre-mating, while the 4th group was given 120% of the NRC allwoances for two weeks pre-mating as well as the first two weeks of the mating season (G4). Does were loose-housed in semi-open yards. Drinking water and mineral blocks were freely available. Feed allowances were offered twice daily. All does were fed on concentrate feed mixture (CFM) containing 13% crude protein with berseem hay. Yellow corn was used with CFM to adjust the nutritional recuirements of both energy and protein. During the breeding season, does of each group were allowed to run with vasectomized buck to detect oestrous daily at 7 am and 3 pm for 30 minutes. Those which stood for mounting were mated to a fertile buck. Ovulation rate (OR) was measured as the number of *Corpora lutea* (CL) by laparoscopy following the procedure described by Oldham and Lindsay (1980). Laparoscopy was performed once during the period from day 5 to 12 after mating. At the following kidding season, litter size (LS) was recorded, ova wastage (OW) was calculated as the difference between ovulation rate and litter size for does that kidded after about 150 days following the mating. Conception rate (CR) was also calculated. Blood samples were collected from all does twice weekly before morning feeding and centrifuged. Blood plasma was kept at -20^{o}C until analyzed for plasma progesterone (P_4) concentration using radioimmunoassay (RIA) procedure (DPC, Diagnostic Products Corporation,USA). Data were statistically analyzed using the SAS (1994) state packages. Comparison among treatment means were performed using Duncan Multiple Range Test (Duncan,1955).

RESULTS AND DISCUSSION

Average ovulation rate in Zaraibi goats in the present study was 3.29 (Table 1). This finding is close to the obtained OR for the same breed by El-Nakhla *et al.* (2000) who reported average OR of 2.76 and 3.16 in two September mating seasons. The OR obtained in the present study is higher (≤ 2.0) than those reported by several authors for several tropical and sub tropical goat breeds (Trejo and Perez, 1987; Sah and Rigor,1988; Agrawal *et al*., 1992). This indicated the potentiality of Zaraibi does as a prolific goat breed. The average OR of G2, G3 and G4, which received flushing was about 37% higher than the control. Differences among groups were not significant, possibly due to the high individual variation within groups, due to the small number of does used. Chemineau (1986) and Chaniago (1989) concluded that supplementary feeding during the pre-mating and mating periods can increase ovulation rate of goats.

Table 1. Means ± SE of ovulation rate and litter size in Zaraibi goats as affected by flushing system during pre-mating and mating period

Group	Ovulation rate (OR)	Litter size (LS)
G1	2.57 ± 0.75	2.20 ± 0.32
G2	3.14 ± 0.75	2.25 ± 0.35
G3	3.43 ± 0.75	2.40 ± 0.32
G4	4.00 ± 0.75	2.57 ± 0.27
Overall mean	**3.29 ± 0.75**	**2.36 ± 0.32**

The present results (Table 2) indicate that about 75.12 % of does had OR more than 2.0, while about 33.21 % of the does had OR ≥ 5.0, respectively. Such values are close to the values recorded for the same breed by El-Nakhla *et al.* (2000). The observed OR in the present study along with the high individual variation reflect good possibility for improving further the prolificacy of this breed through the selection for OR. Hanrahan (1987) pointed out that rate of genetic improvement of litter size can be doubled when OR is used as a selection criterion. Average value of litter size in the present study (Table 1) was 2.36 which is similar to the values obtained for the same breed by Aboul-Ela *et al.* (1988) and El-Nakhla *et al*. (2000). Average values of LS obtained herein is higher than those observed for several tropical and subtropical goat breeds reported by several authors (Eliso *et al*., 1987; Jiang Ying and Wang, 1987 and Wilson *et al.*, 1989). About 47% of Zaraibi does in the present study (Table 2) had LS more than 2.0, which re-emphasizes the potentiality for improving flock offtake through selection. Does in G4 had about 17% higher LS than the control group, while does in G3 and G2 had only 9.0 and 2% higher LS than the control group, respectively (Table 2). In general, flushing for two weeks pre-mating as well as two weeks during mating period seems to be the best applied system to obtain high values of ovulation rate and litter size in Zaraibi goats. Also, the foregoing results illustrate the potentiality of Zaraibi goats as a prolific breed and flushing led to increase ovulation rate and litter size. It is clear that ova wastage was the smallest in G1(0.37) and increased progressively with the increase in OR to reach a maximum of 1.34 in G4.

Table 2. Frequency distribution of ovulation rate and litter size of Zaraibi goats as affected by flushing system during pre-mating and mating period

Group	% of does							
	Ovulation rate					Litter size		
	1	2	3	4	≥ 5	1	2	3
G1	0.0	40.0	0.0	20.0	40.0	0.0	80.0	20.0
G2	28.57	0.0	42.86	14.29	14.29	25.0	25.0	50.0
G3	0.0	16.67	16.67	16.67	50.0	20.0	20.0	60.0
G4	0.0	14.29	42.86	14.29	28.57	0.0	42.86	57.14
Overall mean	7.14	17.74	25.30	16.31	33.21	11.25	41.96	46.79

Data in (Table 3) indicate that ova wastage (OW) was higher (50.2%) with does had OR ≥5, whereas it was lower (0,16.7,24.1 and 36.1%) for does of OR between 1 and 4, respectively. Values of OW herein are comparable to those reported by other authors pointing out that prenatal losses are of large magnitude and increases with the increase in OR (Willingham *et al*., 1986 and Bradford *et al*., 1989). The increase in OW at higher OR may be related to a limitation of uterine capacity and its physiological development to support the increasing number of embryos that it carries. The relationship between OW and OR was almost linear with the increase in wastage percent, being dramatic at CL number of 5 or more.This implies that prolificacy is not solely an ovary related trait but rather a function of ovary/uterus integrated performance supported by a potentially general physiological status of animal to cope with physiological cost of multiple birth.

Table 3. Frequency distribution of ova wastage in does conceived as affected by flushing system during pre-mating and mating period

	Group	% of does				
		Ovulation rate				
		1	2	3	4	≥ 5
	G1	-	0	-	50	50
Ova	G2	0	-	16.7	-	57.1
wastage	G3	-	50	33.3	33.3	40
	G4	-	0	22.2	25	53.6
Overall mean		0	16.7	24.1	36.1	50.2

Changes in the plasma progesterone levels along the experimental period for individual does indicated that 7 does out of 28 did not conceive. Overall mean of conception rate (CR) was 75%, where all does in G4 were conceived, while CR was 71.4, 57.1 and 71.4 in G1, G2 and G3, respectively. It is obviously clear that flushing system had no significant effect on plasma progesterone concentration (Fig.1). The high level of P_4 in G4 might be attributed to the higher OR in G4 compared to the other groups. Abecia *et al.* (1997) suggested that neither dietary energy nor protein are able to modify pregnancy rate or progesterone level in ovarian and uterine veins eight days after mating in ewes. Ovulation rate had a highly significant ($P \leq 0.05$) effect on plasma P_4 concentration from day 10 to 28, but it had no significant effect at 0, 3 and 7 days of estrous cycle (Fig.2). Figure (3) shows that does conceived had

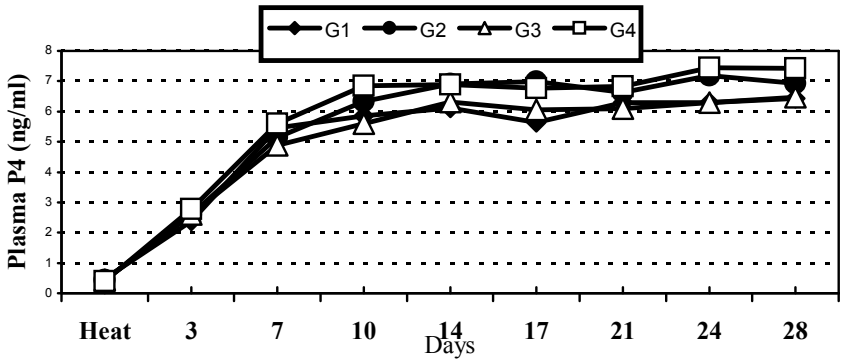

Figure 1. Plasma progesterone (P_4) concentration during 28 days starting from the mating day as affected by flushing systems in the pregnant goats

significantly ($P<0.01$) higher plasma P_4 level compared with unconceived does at days 7, 10, 14, 17 and 21 of estrous cycle. Plasma P_4 level during the estrous cycle of unconceived does was <0.5 ng/ml at day 0, it started to increase at day 3 to reach a maximum at days 7-10 and declined rapidly at day 14 to reach a minimum value at day 17, whereas it increased markedly in does which conceived after day 7 (Fig.3). In this respect, Abd El-Rehim (1997) reported that the mean concentration of plasma P_4 during pregnancy was found to be higher in the ewes carrying twins than those carrying singles (11.76 vs 8.39 ng/ml).

From this study, it could be concluded that Zaraibi goats are considered to have high potentiality as a prolific breed. Increasing feeding level may allow the treated does to express their maximal genetic potential and consequently improving reproductive performance.

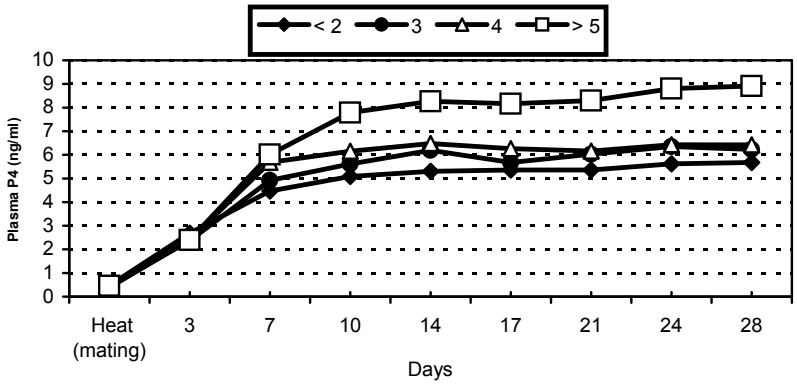

Figure 2. Plasma progesterone (P_4) concentration during 28 days starting from the mating day as affected by ovulation rates in the pregnant goats

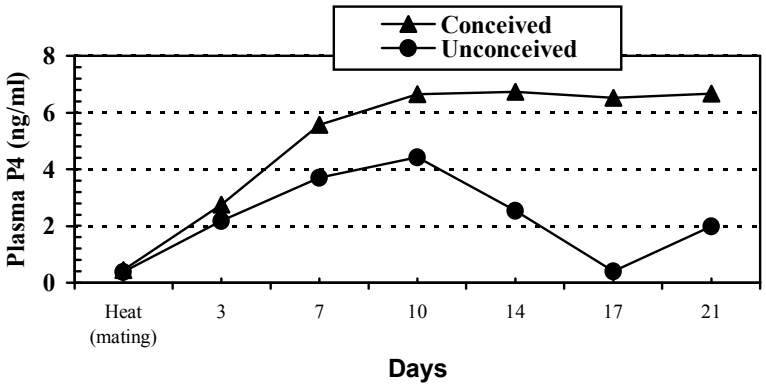

Figure 3. Plasma progesterone (P_4) concentration during the estrous cycle of does conceived and un-conceived

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تأثير الدفع الغذائي على معدل التبويض ، معدل الحمل، عدد المواليد والفقد في البويضات في الماعز الزرايبى

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أجرى هذا البحث في محطة بحوث السرو التابعة لمعهد بحوث الإنتاج الحيوانى. استخدم فيه ثمانية وعشرين عنزة زرايبى قسمت إلى أربعة مجموعات، كانت المجموعة الأولى بدون دفع غذائى، وأعطيت المجموعات الثلث الأخرى دفعا غذائيا(١٢٠% من المقررات الغذائية الموصى بها دوليا للماعز (NRC) لمدة أسبوع (المجموعة الثانية) أو أسبوعين (المجموعة الثالثة) قبل موسم التلقيح أو لمدة أسبوعين قبل موسم التلقيح وفي أول أسبوعين في موسم التلقيح (المجموعة الرابعة) . وكان الهدف هو دراسة تأثير نظام الدفع الغذائي علي معدل التبويض ومعدل الحمل وعدد المواليد والفقد في البويضات في الماعز الزرايبي. كان معدل التبويض ٢.٥٧ ، ٣.١٤ ، ٣.٤٢ ، ٤.٠ في المجموعة الأولي والثانية والثالثة والرابعة علي التوالي. ارتفع معدل التبويض بحوالي ٣٧% في مجموعات الدفع الغذائي الثلاثة مقارنة بالمجموعة القياسية. و كان أعلي معدل تبويض في المجموعة الرابعة. كان متوسط عدد المواليد ٢.٢ ،٢.٢٥ ، ٢.٤ ، ٢.٥٧ في المجموعة الأولي والثانية والثالثة والرابعة علي التوالي. أعطت مجموعات الدفع الغذائي زيادة في عدد المواليد زيادة بحوالي ٩% مقارنة بالمجموعة القياسية. كانت المجموعة القياسية الأقل في فقد البويضات (٠.٣٧) بينما كانت أعلي فقد في البويضات في المجموعة الرابعة (١.٤٣) وذلك لزيادة معدل التبويض في تلك المجموعة . كان معدل الحمل ٧١.٤ ، ٥٧.١ ، ٧١.٤ ، ١٠٠% في المجموعات الأولي والثانية والثالثة والرابعة علي التوالي. لم يكن هناك تأثير معنوي لنظام الدفع الغذائي علي تركيز هرمون البروجسترون في البلازما أثناء أول ٢٨ يوم بعد التلقيح في مجموعات الدراسة الأربعة . نستخلص من النتائج السابقة أن هناك تأثير إيجابي لنظام الدفع الغذائي قبل وأثناء موسم التلقيح للحصول علي معدلات عالية من التبويض والحمل وكذلك زيادة في عدد المواليد في الماعز الزرايبي.