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EFFECT OF BODY CONDITION OF RAHMANI EWES ON THEIR FOLLICULAR DEVELOPMENT DURING THE FIRST OVULATORY WAVE AFTER ESTROUS SYNCHRONIZATION

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Abstract

Egyptian Rahmani ewes (n=24) were used to investigate the effect of body c*ondition score (BCS) of ewes at mating on their ovarian follicular development. Ewes were classified into three groups (8 for each) according to their BCS to <2, 2 - <3 and ≥3. Estrus was synchronized using two vulval sub-mucosal doses of Estrumate ($PGF_2\alpha$, each of 0.25 ml, 65 µg Cloprostenol) at 11- day interval. B-mode linear array ultrasound scanner was used endorectally to monitor follicular growth on both ovaries at the first five days of the second injection of Estrumate. Follicles were classified according to their diameters into three classes, small (≤ 0.3 cm), medium (>0.3, to <0.5 cm) and large (≥0.5 cm). One way ANOVA was done (SAS, 2004) and Duncan's Multiple Range test was used to differentiate between significant means.*

In the left ovary, BCS significantly (P<0.05) affected the number of both small and dominant follicles. While in the right one, BCS significantly (P<0.05) affected the number of both large and dominant follicles. The total small, large and dominant follicles were significantly affected by BCS of Rahmani ewes. While no significant differences were recorded for the effect of BCS of ewes on both medium and total follicles. Therefore, it is recommended to control body conditions around the score of 3 to get higher ovulation rate and to increase the opportunity of enhancing twining rate of Rahmani ewes.

Keywords: Rahmani, ewes, body condition, follicular development

INTRODUCTION

The female energetic investment in reproduction is considerable and the consequences of a mistake are serious and life threatening to both the mother and offspring (Rex *et al*., 2006). Therefore, understanding the pattern of ovarian follicular development is seen as an important step leading to maximize fertility in sheep (Ali *et al*., 2006).

The use of ultrasonography as a noninvasive and repetitive method of monitoring development of follicles in sheep (Lussier *et al*., 1994; Carlos *et al*., 1997; Bartlewski *et al*., 1999; Ali *et al*., 2006; and Vinoles *et al*., 2010) has enabled a more comprehensive understanding of follicular dynamics.

Folliculogenesis in sheep occurs from puberty throughout adult life; during these years, only a few follicles from a pool of several million will grow to an ovulatory size, and fewer still will ovulate (Carlos *et al*., 1997). The process of folliculogenesis

is thought to take around 6 months, with most of this time being devoted to the growth of primary follicles to a diameter of 2.5 mm. The growth of follicles from 2.5 to 5 mm occurs in just a few days, and this is the critical step in the selection of a follicle to a "dominant" or estrogenic stage, depending on the hormonal environment. During the ovulatory cycle in sheep, follicles having 2-3 mm diameters appear and reach to the maximum 4-12 mm (Bartlewski *et al*., 1999; and Vinoles *et al*., 2002).

In the cyclic animals, a follicular wave terminates when the dominant follicle either regresses or ovulates, leading to the start of a new wave of follicular growth (Lussier *et al*., 1994). Therefore, ovulation rate and the subsequent twining rate of a flock mainly depend on number of large follicles those will become dominant.

However, there is a lack of information about the relationship between body condition score of subtropics Rahmani ewes and the different types of the first ovulatory wave follicles on their ovaries, that is the main objective of this study.

MATERIAL AND METHODS

The present study was carried out at the experimental farm of the Animal Production Department, Faculty of Agriculture, Cairo University, Giza, Egypt at May 2007.

Animals and management

Egyptian Rahmani ewes (n=24) were used to investigate the effect of body condition score (BCS) of ewes at mating on their ovarian follicular development. Ewes were classified into three groups (8 per each) according to their BCS to < 2, 2 - < 3 or ≥ 3.

Ewes were kept in semi-shaded pens and were exposed to natural day light and temperature. Water was available *ad. libitium*. Egyptian clover (*Trifolium alexandrinum*), clover hay, concentrate mixture (13% crude protein and 0.65 kg total digestible nutrients) and wheat straw were used for ration formulation according NRC (1986).

Estrus synchronization

Estrus was synchronized using two vulval sub-mucosal doses of Estrumate ($PGF_2\alpha$, each of 0.25 ml, 65 µg Cloprostenol, product of Coopers Co., England) at 11- day interval. B-mode linear array ultrasound scanner (Model: Scanner 100 LC, Pie Medical Company, Masstricht, Netherlands) was used by insertion into rectum to monitor follicular growth on both ovaries at the first five days of the second injection of Estrumate. Follicles were counted and their diameters were determined. Follicles were classified according to their diameters into three classes, small (≤ 0.3 cm), medium (> 3 to < 0.5 cm) and large (≥ 0.5 cm).

Statistical analysis

To study the effect of body condition on follicular dynamic of Rahmani sheep, ewes were divided into three classes according to their body conditions (< 2, 2 - <3 and ≥ 3). The measured traits were numbers of the small, medium, large, total and dominant follicles on both ovaries. One way ANOVA was done (SAS, 2004) and Duncan's Multiple Range test was used to differentiate between significant means.

Data were expressed as means ± SEM, and differences were considered to be statistically significant at $p < 0.05$.

RESULTS AND DISCUSSIONS

The present study seems to be the first one which relate between BCS of Egyptian subtropical ewes and their follicular development. In a previous study, Ali *et al*. (2006) described the development of individual follicles and corpora lutea in Egyptian Ossimi ewe lambs at different seasons of the year and found little influences on the follicular characteristics.

In the present study, effect of body condition score (BCS) of Rahmani ewes on number of follicles in left, right and both ovaries are presented in Figure 1. In the left ovary, BCS significantly ($P < 0.05$) affected the number of both small and dominant follicles. While in the right one, BCS significantly ($P<0.05$) affected the number of both large and dominant follicles. Therefore, both the left and the right ovary significantly affected number of dominant follicles which directly affects ovulation rate of ewes.

The total small, large and dominant follicles were significantly affected by BCS of Rahmani ewes (Figure 1). Where increasing BCS of ewes led to decrease number of small follicles ($P = 0.049$) and increase number of large ($P = 0.01$) and dominant ($P = 0.001$) follicles that refers to the importance of BCS for controlling ovulation and twining rates of ewes as previously reported by Schoeman and Els (1990) and Vinoles *et al*. (2010). In many previous studies, the ovulation rates of ewes in different body conditions were closely related to the numbers of large ovarian follicles present. Where ewes in high body condition had more large and oestrogenic ovarian follicles than ewes in low body condition (Rhind and McNeilly, 1986; McNeilly *et al*, 1987; Rhind *et al*, 1989; Rhind *et al*., 1993) and the low body condition was accompanied by reduced ovarian follicular development (McNeilly *et al*., 1987). McNeilly *et al*. (1987) reported that body condition influenced ovulation rate by altering the concentration of FSH in blood, which in turn affected the number of potentially ovulatory follicles growing beyond 4 mm. Also, ewes in high body condition had a higher number of gonadotrophin-dependent follicles than did ewes in low body condition (Rhind *et al*. 1989; Viñoles *et al*. 2002 and 2010). Vinoles *et al*. (2010) reported that, high concentrations of metabolic hormones in fat ewes are associated with the development of more follicular waves. In sheep, follicle populations are very sensitive to nutritional input and folliculogenesis and ovulation rate can be readily increased by nutritional manipulation (Rex *et al*., 2006). They stated that the effect of nutrition on the follicle wave would be to lengthen it, because nutritional supplementation would suppress estradiol secretion from the dominant follicle allowing the dominant follicle to maintain its dominance for a longer time.

No significant differences, in the present study, were recorded for the effect of BCS of ewes on both medium and total follicles, which is in agreement with the results of Rhind *et al*. (1993).

It is clear from the results of the present study that, increasing BCS of ewes led to increase numbers of large and dominant follicles that are available for ovulation and of course enhance the twining rates of ewes. Therefore, it is recommended to control body conditions around the score of 3 to get higher ovulation rate and to increase the opportunity of enhancing twining rate of Rahmani ewes.

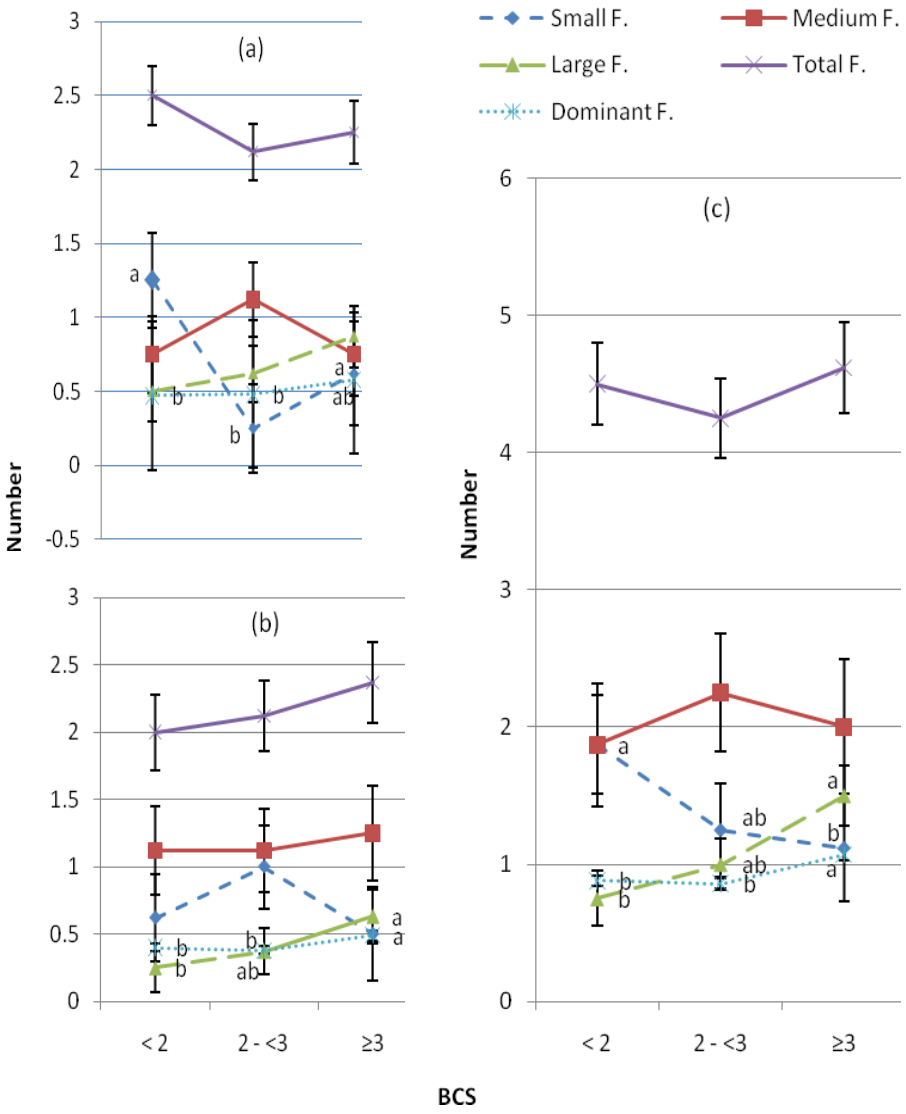

Figure 1: Effect of body condition score (BCS; < 2, 2 - < 3 and ≥ 3) of Rahmani ewes on number of different types of follicles (F.) in left (a) and right (b) ovaries and the total follicles of both ovaries (c)

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تأثير الحالة الجسمانية لنعاج الرحمانى على التطور الحويصلى لموجة النمو المبيضى الأولى

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تم إستخدام عدد ٢٤ من نعاج الرحمانى لدراسة تأثير الحالة الجسمانية لنعاج الرحمانى على التطور الحويصلى لموجة النمو المبيضى الأولى. تم تقسيم النعاج لثلاث مجموعات بناءً على الحالة الجسمانية لها إلى<٢ ، ٢ - <٣ ، ≤ ٣ . تم استحداث الشياع للنعاج بالحقن بهرمون البروستجلاندين (جرعتين بفاصل زمنى ١١ يوم). تم استخدام جهاز السونار لتحديد أعداد و أقطار الحويصلات المبيضية تمهيدً لتقسيمها إلى حويصلات صغيرة (≥ ٠.٣ سم) و متوسطة (> ٠.٣ و < ٠.٥ سم) و كبيرة (≤ ٠.٥ سم). أستخدم تحليل التباين لبرنامج الـ SAS وتم مقارنة المتوسطات عند مستوى معنوية < ٠.٠٥ .

وجد أن الحالة الجسمانية لنعاج الرحمانى قد أثرت معنوياً على الحويصلات الصغيرة و السائدة بالمبيض الأيسر وعلى الحويصلات الكبيرة و السائدة بالمبيض الأيمن. ومن ثم فقد تأثر معنوياً العدد الكلى من الحويصلات الصغيرة و الكبيرة و السائدة بالحالة الجسمانية لنعاج الرحمانى. ولذلك ينصح بضبط حالة جسم النعاج قبل بداية موسم التناسل حول الدرجة ٣ الأمر الذى يزيد من معدلات التبويض ومن ثم تعزيز فرصة زيادة معدلات التوأمية.