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IMPACT OF BODY CONDITION SCORE ON THE REPRODUCTIVE PERFORMANCE OF BARKI SHEEP UNDER SEMI INTENSIVE PRODUCTION SYSTEM

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SUMMARY

The study focused attention on the relationships between body condition score (BCS) at mating and the reproductive performance of Barki ewes. A number of 541 ewes were mated naturally in autumn for three consecutive years. The flock was managed under a semi-intensive production system, with feeding based on natural pasture grazing over the mating period. Grain flushing was given to the ewes before mating. A five category BCS scale was used to classify ewes one week before joining Average values for BCS at mating were 3.32, fertility, 83 % and prolificacy, 1.03. Year were highly significant (P<.0.01) for body weight but not significant for fertility and prolificacy. Age of dam had a significant effect on weight of dam, fertility and prolificacy. Significant differences were observed for BSC effects on fertility, prolificacy and weight of ewe (P<0.05 to P<0.l), which gave highest values between BCS of (3) and (4) categories. In conclusion, the BCS at mating seemed to affect fertility more than prolificacy.

Keywords: Barki sheep, body condition score, fertility, prolificacy

INTRODUCTION

Barki is one of the main sheep breeds in Egypt. The breed is hardy and is adapted to desert conditions. In the western coastal strip of Egypt there is nearly one million Barki sheep. But the breed is known to be of lowest fertility compared with other native breeds. It seems necessary to adopt some field techniques to improve reproductive rate of Barki ewes. This trial focused attention on the relationship between BCS, at mating and reproductive performance of Barki ewes. BCS has been widely accepted and recommended as indicator of natural status of sheep (MLC. 1983; INRA, 1988).

MATERIAL AND METHODS

Source of Data:

The present study was carried out over three successive breeding seasons (2006 – 2008) utilizing data on an experimental flock of Barki sheep raised under semi-intensive production system at Maryout Research Station, belonging to Desert Research Center. This station is located in North Western Coast of Egypt. A total number of 541 records of Barki ewes representing 180 breeding ewes were used in the present study. Biological data, ewe live body weight and body condition score (BCS) at mating season, for each breeding ewes at each breeding season were recorded using the method described by Russel *et al*. (1969). Meanwhile number of ewes lambed, number of lambs born, number of ewes failed to lamb in two consecutive breeding seasons were recorded. Reproductive traits estimated were fertility (number of ewes lambed per ewe joined) and prolificacy (number of lambs born per ewe lambed).

Flock Management Practices:

Ewes were naturally mated once a year in autumn from 15th September to 15th October. Breeding rams and ewes were selected according to breed characteristics, productive and reproductive performance. Breeding ewes were homogeneity distributed in mating groups in breeding pens (20 – 25 head) according to their ages and were assigned with a fertile breeding ram. Rams' briskets were colored with different colored grease fortnightly and breeding pens were checked for colored ewes daily. All mated ewes were scanned using ultra-sound techniques at the day 50th after termination of the mating season to identify the pregnant and non-pregnant ewes. At the end of the experiment, the ewes which failed to lambed in two consecutive years (barren ewes) were slaughtered and their genetalia were examined.

Feeding Regime:

The flock was kept under similar regular feeding regime due to management program and physiological status of the ewes throughout the experimental period. Sheep were fed on a concentrate mixture consisted of undecorticated cotton seed cake 50%, wheat

bran 18%, yellow maize 15%, rice polish 11%, molasses 3%, limestone 2% and common salt 1%, half to one kg of concentrate mixture was offered daily per head according to their physiological status in addition to 0.5 kg of berseem hay (*Trifolium alexandrinum) ad lib.* Whenever available he flock was allowed to graze alfalfa in neighboring areas from sunrise until before sunset for about seven hours per day. Ewes were supplemented daily with Flushing took place two weeks before breeding season once a day with whole barley grains (0.5 kg/head), in order to evaluate its impact on reproductive performance.. Sheep were allowed to drink clean and fresh water twice daily.

Statistical Analysis:

Data were analyzed by least squares analysis of variance using the General Linear Model procedure described by SAS (1998), with all main effects regarded as fixed. Two statistical models were established, In the model (1), total variance was partitioned into parts attributed to non-genetic source of variance assumed to influence BCS, live body weight, fertility and prolificacy. Interactions among these factors were also considered.

Model (1):

$$Y_{ijk} = \mu + a_i + b_j + (ab)_{ij} + e_{ijk}$$

Where:

Y_{ijk} = the observations,

μ = the overall mean,

a_i = the effect due to i^{th} age of dam, $I =$ 2 to 6 years,

b_j = the effect due to j^{th} year of breeding, $J =$ 1,2 ,3 year,

$(ab)_{ij}$ = the effect due to the interaction between age of dam and year of breeding,

e_{ijk} = random error associated with the $_{ijk}^{th}$ observation.

In model (2), data were subjected to one way analysis of variance to study the statistical significant difference among BCS and its impact on fertility and prolificacy performance of the ewes.

Model (2):

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

Where:

Y_{ij} = the observation of reproductive traits,

μ = the overall mean,

a_i = the effect due to i^{th} BCS, I = 1,2……5,

e_{ij} = random error associated with the $_{ijk}^{th}$ observation.

RESULTS AND DISCUSSION

Least squares means (X) and standard errors (SE) for the non-genetic factors are presented in Table (1). The overall means attained for body condition score (BCS) at mating, ewe live body weight, fertility and prolificacy traits were 2.4, 36.8 kg, 82.9 % and 1.03, respectively for the 541 ewes records used throughout the study period.

Analysis of variance for the same traits are included in table 1.

The attained results (Table 1) revealed that year had exerted a significant effect ($P < 0.05$) on BCS at mating. Similar effect of the year on BCS at mating in autumn have been observed by Gibon *et al.* (1985) in mountain grazing ewes. Mean while, it could be observed that age of dam as well as the interaction between year and age of dam had exerted a highly significant effect ($P < 0.01$) on BCS of ewes at mating. The annual values of BCS throughout the studied years, slightly decreased from (2.6) to (2.3), but the differences were significant ($P < 0.05$). The observed annual variations in values of BCS at mating may be due to variations of age of ewe and live body weight from one year to another. Age of dam and interaction between year and age of dam had a highly significant effects ($P < 0.01$) on live body weight at mating. However, year had no significant effect ($P < 0.05$) on ewe live body weight at mating. As a matter of fact management as well as climatic conditions was very similar during the three years of study

Reproductive Traits:

The overall least squares mean of fertility (82.9 %) for the studied ewes is nearly the same as that already reported by Mohammady (1999) for the same breed. However, lower estimates of fertility trait for Barki sheep 66.6 %, 70 %, 64 %, were reported by Younis and Galal (1973), Bedier (1978), and Ahmed *et al.* (1992) respectively. The current estimates of flock fertility varied from 78.7% to 85.7% for the studied years. The year of breeding showed a non significant effect on fertility and prolificacy traits. In contrary, age of dam had a significant effect ($P < 0.05$) on both studied traits as shown in Table (1). The results are confirmed by Yilmaz *et al.* (2011), who reported that, age of the ewes had a significant effect ($P<0.05$) on fertility rate and litter size. The present results are confirmed by Sezenler *et al.* (2011)**,** who found a significant effect ($P < 0.05$) of breeding age on fertility rate as it was lowest (0.621) for three years old ewes and highest (0.907) for six years old ewes. On the other hand, the effect of breeding age on

litter size was significant (P<0.01) and ranged from 1.394 at 2 years to 1.906 at six years.

According to the attained results (Table 1), fertility and prolificacy were higher in multiparous ewes. These results are in agreement with the findings of Ragab (2010) and Mohammady (2005), who reported that, lambing rate and litter size of the Barki ewes increased as the age of dam increased and reached its maximum at the age of 4-5 years. In the present study, the interaction between year of breeding and age of dam was found to have a significant (P < 0.05) effect on fertility but had a non significant effect on prolificacy.

Body Condition Score:

Results in Table 2 showed that BCS of Barki ewes at mating had a significant effect (P < 0.05) on both fertility and prolificacy traits. It is also clear that BCS of Barki ewes affected fertility trait more markedly than prolificacy (Figure1). These results are in agreement with those found by Gibon *et al.* (1985), Paramio and Folch (1985) and Folch *et al.* (1987). The overall values obtained for fertility and prolificacy traits were 82.9 % and 1.03, respectively. The obtained fertility estimates varied from 60.0% to 87.7% for the studied categories of BCSs.

From Table (2), it can be seen that the highest fertility rate (87.72%) was attained by ewes of (3) BCS that weighed 38 kg – 42 kg at mating. The result is in harmony with the findings of Maurya *et al.* (2009), who indicated that (3) or (3.5) BCS at time of mating, had the highest lambing rate as well as, the highest lambs birth weight per lambing. Additionally, the attained results are confirmed by those previously reported by Sejian *et al.* (2010), who concluded that the reproductive performance of (3.0–3.5) BCS of Malpura ewes was better than those of lower and higher BCS. Also, Yilmaz *et al.* (2011) reported that, the highest pregnancy, lambing rate, and fecundity values were those for 2.01 and (3.00) BCS, categories, while the lowest values for the same traits were observed for BCS of (1.5) category.

The higher percentages of barren ewes (33 ewes, failed to lamb for two consecutive years) in the present study were recorded for both BCS (1 &5)which represented 30.39%, of the total ewes joined in this category with body weight at mating of (28 kg -32 kg), and 40 % with body weight at mating of (48 kg – 50 kg), respectively. In this respect, Gordon (1997) suggested that, BCS of a ewe is directly related to hypothalamic activity and GnRH secretion that affects the reproductive performance. On the other hand, Ragab (2010) reported that the highest fertility rate 90.6 % was that for ewes weighing (33 kg – 42 kg), followed by ewes weighing > 42 kg 84.6% and lowest for that ewes weighing (22 kg – 32 kg) 73.8 %.

In contrast to the previous result, Mesut *et al.* (2011) reported that the effect of BCS on the litter size was lowest in 3 BCS ewes and it was highest in those of (5|) BCS and BCS had exerted non significant effect (P>0.05) on that trait.

A number of 4 barren ewes of BCS 1and 5 were slaughtered at the end of the experiment to examine their genetalia. It was observed that ewes scored BCS (1) have an old Haemarrhagic endometrtiss (Plate 2). In the mean time, barren ewes of 5 BCS seemed to be very fat and had a large amount of fat around kidney (plate 1). Examination of reproductive organs (genetalia) showed that, small size cystic right ovary and structureless of left ovary as well as rudent genetalia. Similar observations were recorded by Paramio and Folch (1985), who observed a significant decrease in the fertility of Angora ewes with the highest body fat (BCS > 4). These findings are in harmony with the observation of Ragab (2010) who showed that, congenital and/or genetic abnormalities of reproductive organs or poor health conditions leading to low body weight of Barki ewes. In view of the obtained result it may be recommended to maintain the majority of Barki ewes in the 3 or 3.5 BCS of categories during mating season to get higher reproductive performance.

CONCLUSION

In general, the findings of the present study are parallel to those indicated in the literature. The study revealed that, BCS can be used as an indicator of the nutritional status of the flock. Under current semi-intensive production system, the obtained results showed clearly that BCS of Barki breed at mating season significantly affects the reproductive performance of the flock. There is a certain level of improve in fertility with increase in the body condition score. But, it could not be observed the same increase in prolificacy. The results showed clearly that BCS of Barki ewes should be between 3.0-3.5 to achieve a better reproductive performance. Hence it might be recommended to improve feeding level especially before mating season. The study revealed that 3.0–3.5 BCS could be considered optimal for best reproductive rate in Barki ewes.

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Table 1. Least squares means ($\bar{x}$) and standard errors (SE) for BCS, body weight, fertility and prolificacy of Barki ewes as affected by year of breeding and age of dam

Source of variance	BCS	Weight	Fertility	prolificacy
Overall mean	2.4 ±0.041	36.8± 0.217	82.9± 0.016	1.03± .008
Year :	*	*	NS	NS
2006	2.6a±0.069	37.5a ±0.359	85.7a±0.025	1.02a±0.010
2007	2.5a±0.067	36.6b±0.346	83.3a±0.026	1.03a±0.012
2008	2.3b±0.075	36.4b±0.364	78.7a±0.034	1.05a±0.021
Age of dam:	**	**	*	*
Two years	1.36c±0.06	31.7b ± 0.40	0.73b±0.042	1.00b±0.00
Three years	1.96b±0.08	35.5b ± 0.41	0.79ab±0.036	1.02b±0.015
Four years	2.7a ±0.05	38.46a± 0.28	0.86a±0.024	1.03ab±0.012
Five years	3.1a±0.12	40.4a± 0.64	0.88a±0.041	1.04ab±0.03
Six years	3.04a±0.11	40.3a±0.58	0.81ab±0.050	1.1a±0.04
Year X age of dam:	**	**	*	NS
2006 * 2	1.33±0.09	30.16±0.55	0.72±0.06	1.00±0.00
2006 * 3	2.4±0.12	35.9±0.62	0.93±0.03	1.02±0.01
2006 * 4	2.8±0.11	39.0±0.56	0.88±0.04	1.04±0.02
2006 * 5	1.9±0.24	40.72±1.07	0.94±0.05	1.00±0.00
2006 * 6	2.6±0.17	37.09±0.83	0.82±0.08	1.00±0.00
2007 * 2	1.9±0.11	34.4±0.68	0.83±0.05	1.00±0.000
2007 * 3	1.6 ±0.12	33.4±0.58	0.73±0.08	1.04±0.04
2007 * 4	1.89±0.09	39.4±0.44	0.89±0.03	1.03±0.01
2007 * 5	3.2 ±0.18	41.65±1.19	0.75±0.09	1.00±0.00
2007 * 6	2.8 ±0.16	39.38±0.84	0.85±0.07	1.1±0.06
2008 * 2	1.0±0.09	30.4±0.50	0.63±0.09	1.00±0.000
2008 * 3	2.0±0.14	35.4±0.66	0.72±0.09	1.00±0.00
2008 * 4	2.5±0.09	37.4±0.45	0.82±0.05	1.02±0.02
2008 * 5	3.2±0.12	39.9±0.52	0.96±0.04	1.1±0.07
2008 * 6	3.0±0.17	40.7±0.83	0.78±0.14	1.3±0.18

NS, non significant: * Significant, ** Highly significant: Means within the same column with different letters indicate significant differences at ($P < 0.01$)

Table 2. Effect of (BCS) at mating on the fertility and prolificacy of Barki sheep

Source of variance	No. of ewes joined	No of ewes conceived	Fertility (%)	Prolificacy
Means ± SE	541	449	82.9 ± 0.016	1.03 ± 0.008
BCS			****	****
1	102	71	69.61 ab	1.00b
2	199	170	85.43a	1.017b
3	171	150	87.72a	1.013b
4	64	55	85.94a	1.163a
5	5	3	60b	1.00b

SE, standard error: **, highly significant ($P < 0.01$): Means within the same column with different letters indicate significant differences at ($P < 0.01$).

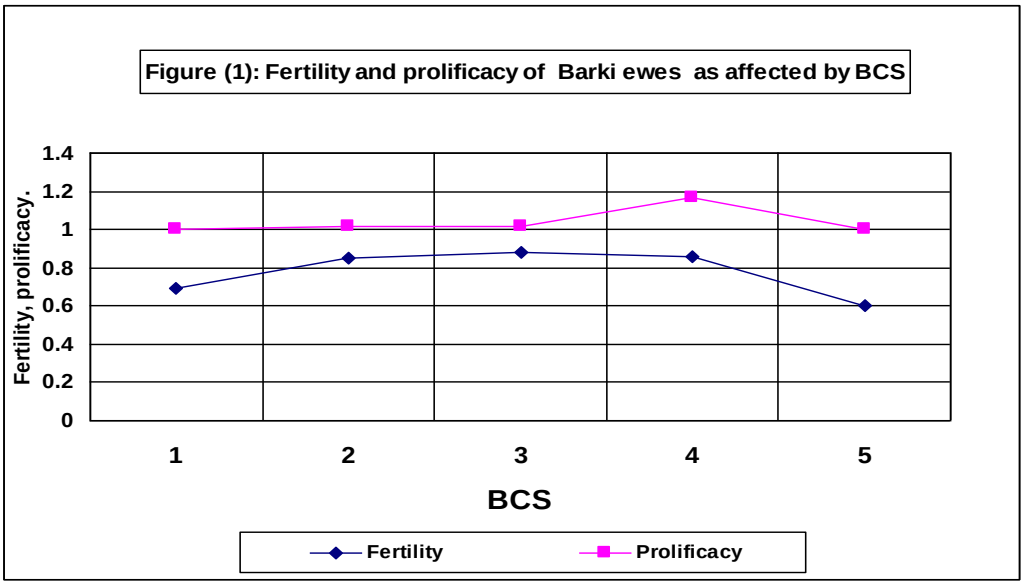

Plate 1. ILUSTRATE THE MORPHOLOGICAL FOR EWES SCORED 5 BCS

Plate 2. ILUSTRATE THE MORPHOLOGICAL FOR EWES SCORED 1 BCS

تأثير درجة امتلاء الجسم بالدهن على الأداء التناسلي للأغنام البرقي المرباة تحت نظام الإنتاج شبة المكثف

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تم دراسة العلاقة بين درجة امتلاء الجسم بالدهن عند موسم التلقيح والأداء التناسلي لقطيع من الأغنام البرقي. يتم تلقيح الإناث طبيعياً مرة واحدة سنوياً أثناء موسم الخريف ولمدة ثلاثة سنوات متتالية. استخدم في هذه الدراسة ٥٤١ سجل نعجة برقى والمرباة تحت نظام الإنتاج شبة المكثف حيث تعتمد التغذية على المراعى الطبيعية أثناء موسم التلقيح. تم إجراء الدفع الغذائي للإناث قبل موسم التلقيح بأسبوعين. وقبل أسبوع من بداية موسم التلقيح، تم إجراء مقياس درجة امتلاء الجسم بالدهن، حيث سجلت الإناث تحت الفئات من ١-٥ وبفاصل درجة واحدة وذلك للحكم على حالة الجسم، حيث تمثل الفئة (١) نحيفة جدا بينما تمثل الفئة (٥) بدينة جداً. كان متوسط درجة امتلاء الجسم بالدهن للنعاج عند التلقيح ٣.٣٢ ونسبة الخصوبة ٨٣% ونسبة التوأمة ١.٠٣ . كان للسنة تأثير معنوي عالي على وزن الجسم بينما لم يكن للسنة تأثير معنوي على معدل الخصوبة وكذلك على معدل التوأمة. كان لعمر الأم تأثير معنوي على الصفات المدروسة من حيث وزن الجسم – معدل الخصوبة وكذلك على معدل التوأمة. كان لدرجة امتلاء الجسم بالدهن تأثير معنوي عالي على كلا من معدل الخصوبة ومعدل التوأمة ولكن تأثر معدل الخصوبة بشكل اكبر من معدل التوأمة. كذلك أظهرت الدراسة أن أعلى معدل خصوبة وأعلى معدل توأمة كان عند فئات (٣) و (٤) لدرجة امتلاء الجسم بالدهن.