

WHICH IS MORE IMPORTANT FOR REPRODUCTION OF EGYPTIAN OSSIMI EWES: BODY CONDITION SCORE OR BODY WEIGHT?

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SUMMARY

The present study was carried out using 171 of Ossimi ewes, related to a commercial sheep flock. It is aimed to study which factor is more important for reproductive performance, ewe body condition score (BCS) at mating or ewe body weight. Ewes were classified according to their body weights to 30-34 kg, 35-39 kg, 40-44 kg and ≥ 45 kg and to their body conditions to the scores ≤ 2 , 2.5, 3 and >3 . The traits were analyzed using chi square CATMOD procedure (SAS, 2004).

Body condition score of ewes at mating significantly affected 78% of the studied reproductive traits, compared to only 11% for their body weights. In addition, the significance levels for the effect of BCS varied between $P < 0.001$ (Ewes conceived at the first two estruses per ewes joined to rams [CR1], Lambing rate, and Potential lambing rate), $P < 0.01$ (ewes showed estrus per ewes joined to rams [ESE/EJ] and kilograms born per ewes joined to rams [KgB/EJ]) and $P < 0.05$ (ewes needed 3 estruses or more to be conceived per ewes joined to rams [CR2] and ewes conceived at the whole breeding season per ewes joined to rams [CR3]). While only CR1 was affected by body weight of ewes ($P < 0.05$), that refers to the importance of BCS of ewes at mating than their body weights. Therefore, it is recommended to depend on BCS rather than body weight to assess the status of ewes before mating. This choice will help holders of sheep flocks for making decisions to cull, keep or give ewes the proper regime to control their body conditions to the required scores.

Keywords: *Ewes, body condition score, body weight, reproductive performance*

INTRODUCTION

The body weight of the ewe has two components, basic skeletal size of the sheep and the degree of fatness (body condition) (Gordan, 1997). The concept of BCS has been described as the relationship between fat and non-fat tissues in the living animal (Caldeira *et al.*, 2007a).

Many publications have been reported about the importance of both body weight of a ewe and its body condition to reproduction. Adalsteinsson (1979) concluded that variation in the live body weight and body condition of a ewe prior to mating affects fecundity. Gordan (1997) and Michels *et al.* (2000) reported that body weight of the ewe at mating has been shown to influence both ovulation rate and subsequent litter size. However, body condition scoring has been widely accepted as the most practical method for assessing changes in energy reserves in many species (Bewley and Schutz, 2008).

Body condition score is considered as a better predictor of body fatness than live body weight (Russel *et al.*, 1969, Teixeira *et al.*, 1989, Sanson *et al.*, 1993 and Silva *et al.*, 2005). In addition, feed intake of Greyface x Texel female sheep with a given

body weight was affected considerably by the animal's fatness (Tolkamp *et al.*, 2006). This means that body weight, alone, is not a sufficient descriptor of the animal to correctly predict feed intake for sheep; the predictions were improved by taking BCS into account.

In Egypt, most holders of commercial sheep flocks use body weight to evaluate the status of ewes before mating, while very few use body condition score (BCS). Therefore, the present work aims to study which factor is more important for the reproductive performance of ewes at mating, under semi-arid conditions, BCS or live body weight, that may help for optimizing reproductive and productive performances of ocal sheep.

MATERIALS AND METHODS

The present study was carried out on a commercial sheep flock located in Sharqia Governorate. A total of 171 Ossimi ewes were included in this study aged between 1 and 5 years (Table 1) and joined to rams in Autumn 2007.

Table 1. Number of ewes for the different body condition score (BCS) and body weight (BWT) classes

BWT	BCS				Total
	≤ 2	2.5	3	>3	
30-34 kg	13	12	6	5	36
35-39 kg	12	14	8	6	40
40-44 kg	11	12	16	7	46
≥45 kg	5	11	16	17	49
Total	41	49	46	35	171

Management of the flock

A day before the onset of breeding season, ewes were weighed and scored to body condition by a trained person. Ewes were classified according to their body weights to 30-34 kg, 35-39 kg, 40-44 kg and ≥45 kg. The BCS was measured by using the technique of Russel *et al.* (1969). The score of 2.5 was added to the scale because many ewes had BCS located in-between the scores of 2 and 3.

Ewes were kept loose in semi-shade pens, where drinking water was available all day time. Egyptian clover (*Trifolium Alexandrinum*), clover hay, concentrate mixture and wheat straw were used for ration formulation according to season of the year. Feeding requirements were calculated according to NRC (1985).

Estrus synchronization and mating:-

Ewes were estrus-synchronized with intramuscular dose of 0.5 ml PGF_{2α} (Estrumate, 125µg Cloprostenol, Coopers Company, England). After 11 days of the first injection, ewes did not show estrus were injected with another 0.5 ml dose.

Simultaneously, with the first and the second injections of Estrumate, ewes came in heat were introduced to fertile rams to be hand-mated. Breeding season lasted from first of October to the end of December.

Measured traits

- ESE/EJ: ewes showed estrus per ewes joined to rams.
- CR1: ewes conceived at the first two estruses per ewes joined to rams.
- CR2: ewes needed three estruses or more to be conceived per ewes joined to rams.

- CR3: ewes conceived at the whole breeding season per ewes joined to rams.
- Lambing rate: number of ewes lambing per ewes joined to rams.
- Potential lambing rate: number of lambs born per ewe joined to rams.
- LS: litter size (number of lambs born per ewe lambing).
- KgB/EJ: kilograms born per ewes joined to rams.
- KgB/EL: kilograms born per ewes lambing.

Statistical analysis

The experimental design was completely randomized with 16 groups arranged factorially (4 x 4) with BCS (≤ 2 , 2.5, 3 and >3) and body weights of ewes (30-34 kg, 35-39 kg, 40-44 kg and ≥ 45 kg) as main effects and the interaction was considered. No interactions between BCS of ewes and their body weights were observed for all traits. Therefore, the results highlighted the impact of main effects on the studied traits. The reproductive traits were analyzed using chi square CATMOD procedure (SAS, 2004). Means were obtained and contrasts were carried out to detect differences among effects. Least Squares Means (LSM) were obtained for the productive traits and Duncan's multiple range test was used to detect differences among means. Many levels for significance were taken into consideration to compare between body weight of ewes and their BCS ($P < 0.05$, $P < 0.01$ and $P < 0.001$). However, the significance level was set at 5% for both factors.

RESULTS AND DISCUSSIONS

Body condition score (BCS) of ewes at mating significantly affected ESE/EJ, CR1, CR2, CR3, Lambing rate, Potential lambing rate and KgB/EJ (Table 2). While, body weights of ewes at mating significantly affected only CR1. Therefore, BCS of ewes at mating significantly affected 78% of the studied reproductive traits compared to only 11% for their body weights. In addition, the significance levels for the effect of BCS varied between $P < 0.001$ (CR1, Lambing rate and Potential lambing rate), $P < 0.01$ (ESE/EJ and KgB/EJ) and $P < 0.05$ (CR2 and CR3). Only CR1 was affected by body weight of ewes ($P < 0.05$). These results refer to the importance of BCS at mating to the reproductive performance of ewes than their body weights.

Table 2. The effect of body condition score (BCS) and body weights (BWT) of ewes on their reproductive performances

	BCS	BWT
ESE/EJ	**	NS
CR1	***	*
CR2	*	NS
CR3	*	NS
Lambing rate	***	NS
Potential lambing rate	***	NS
KgB/EJ	**	NS
LS	NS	NS
KgB/EL	NS	NS

ESE/EJ: ewes showed estrus per ewes joined to rams.

CR1: ewes conceived at the first two estruses per ewes joined to rams.

CR2: ewes needed 3 estruses or more to be conceived per ewes joined to rams.

CR3: ewes conceived at the whole breeding season per ewes joined to rams.

NS: non-significant

*: $P < 0.05$

** : $P < 0.01$

***: $P < 0.001$

KgB/EJ: kilograms born per ewes joined to rams.

LS: number of lambs born per ewe lambing.

KgB/EL: kilograms born per ewes lambing.

All ewes that had moderate BCS (scores 2.5 and 3) showed estrus through breeding season compared to the highest or the lowest BCS ewes (Fig. 1). On the contrary, there was no clear trend for the effect of body weight of ewes on their estrous activity. This reinforces the importance of BCS of ewes for their estrous activity as previously reported by Rhind *et al.* (1984) and Gordon (1997). It is known that BCS of a ewe directly related to hypothalamic activity and GnRH secretion and that affects the reproductive performance Gordon (1997).

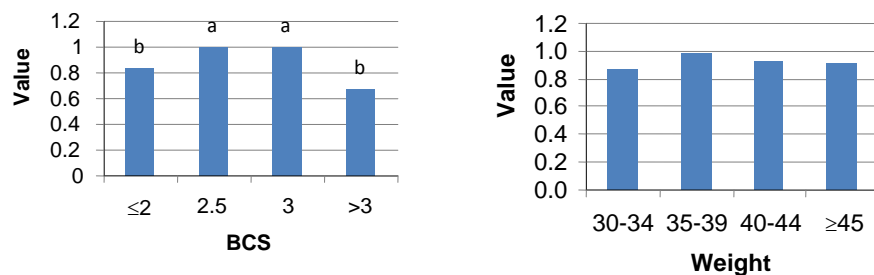


Fig. 1. Ewes showed estrus per ewes joined to rams as affected by BCS (≤ 2 , 2.5, 3 and >3) and body weights of ewes (30-34 kg, 35-39 kg, 40-44 kg and ≥ 45 kg)

Columns with different letters differ significantly from each other

No clear trend was observed for the effect of ewes body weights on conception rate (Fig 2) or on the other studied traits (Figs. 3 and 4). On the contrary, the highest values for conception rate, either at the first two estruses (CR1) or at the whole breeding season (CR3), were observed for BCS of 2.5 and 3. At the same trend, the highest values for the effect of body condition on the other studied traits (Lambing rate, Potential lambing rate and KgB/EJ) were recorded also at the same score classes. Kenyon *et al.* (2010) concluded that, achieving greater live weights and higher condition scores of ewe lambs at breeding will increase the proportion pregnant, especially early in the breeding period.

Success of a commercial sheep flock depends on reducing lambing interval for ewes to be as short as possible. This means that only two estrous cycles (about 35 days) in their breeding season should be applied, with culling individuals that are not conceived. In this regard, about 80% of ewes showed moderate BCS were conceived compared to only 37% and 57% for those had the lowest and the highest BCS, respectively (Fig. 2). However, Caldeira *et al.* (2007b) reported that, hormones and metabolite concentrations during the chronology of changes in BCS clearly show that ewes easily managed their body reserves when BCS was between 2 and 3.5. Hence, a BCS below 1.5 and above 3.5 must be avoided to prevent metabolic disturbances and to save the cost of excessive fattening in ewes.

The highest estimates for potential lambing rate and KgB/EJ in the present study (Figs. 3 and 4) were attained with moderate body condition ewes, that corresponds with that mentioned before by Caldeira *et al.* (2007b) who observed metabolic welfare for ewes between BCS of 2.5 and 3. Correspondingly, Rhind *et al.* (1984)

recorded about 23% increase for potential lambing rate of moderate BCS ewes (2.75) than the fat ones (BCS = 3.5), that is consistent with the results of the present study. Also, the results of Wallace *et al.* (2010) are comparable with results of the present study. They found that adiposity at conception had a profound influence on pregnancy outcome in adolescent sheep, where placental and lamb birth weights were increased in good adiposity ewe-lambs than the poor ones.

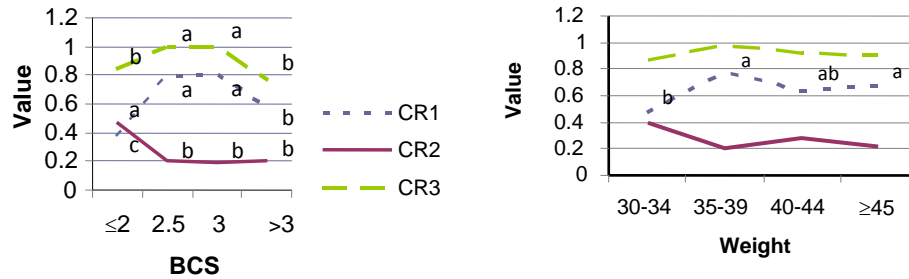


Fig. 2. Ewes conceived at the first two estruses per ewes joined to rams (CR1), ewes needed three estruses or more to be conceived per ewes joined to rams (CR2) and ewes conceived at the whole breeding season per ewes joined to rams (CR3) as affected by BCS (≤ 2 , 2.5, 3 and >3) and body weights of ewes (30-34 kg, 35-39 kg, 40-44 kg and ≥ 45 kg) Points with different letters differ significantly from each other.

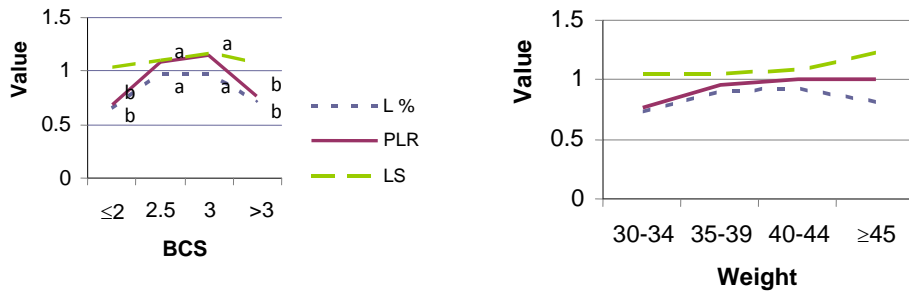


Fig. 3. Lambing rate (LR), potential lambing rate (PLR) and litter size (LS) as affected by BCS (≤ 2 , 2.5, 3 and >3) and body weights of ewes (30-34 kg, 35-39 kg, 40-44 kg and ≥ 45 kg) Points with different letters differ significantly from each other

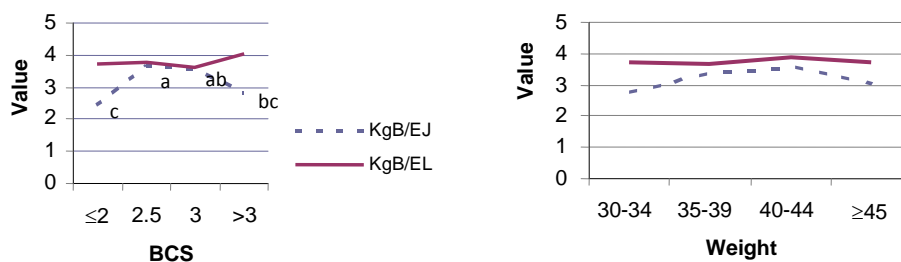


Fig. 4. Kilograms born per ewes joined to rams (KgB/EJ) and kilograms born per ewes lambing (KgB/EL) as affected by BCS (≤ 2 , 2.5, 3 and >3) and body weights of ewes (30-34 kg, 35-39 kg, 40-44 kg and ≥ 45 kg)

Points with different letters differ significantly from each other

Present results indicate that management of BCS certainly plays a key role in maximization of animal potential as previously concluded by Bewley and Schutz (2008). However, ewes that have score below two may need to be drawn out of the flock and given access to the best available grazing as recommended by Gordan (1997).

It is clear from the above mentioned results that, BCS of ewes is more important for reproduction than their body weights. Therefore, it is recommended to depend on BCS rather than body weight to assess the status of ewes before mating. This choice will help holders of sheep flocks for making decisions to cull, keep or give ewes the proper regime to control their body conditions to the required scores.

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أيهما أكثر أهمية لتناسل نعاج الأغنام المصرية: حالتها الجسمانية أم وزنها؟

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تم إجراء هذه الدراسة على عدد ١٧١ من نعاج الأوسيمي التابعة لأحد القطعان التجارية. وقد استهدف البحث دراسة أى العاملين أكثر أهمية لتناسل نعاج الأغنام المصرية، حالتها الجسمانية أم وزنها. تم تقسيم النعاج بناءً على أوزانها إلى أربع مجموعات (٣٠-٣٤ كجم، ٣٥-٣٩ كجم، ٤٠-٤٤ كجم، ≤ ٤٥ كجم) وكذلك على حسب حالتها الجسمانية إلى أربعة مجموعات (≥ ٢ ، ٢.٥، ٣، < ٣). تم التحليل الإحصائي باستخدام طريقة مربع كاي.

وجد أن الحالة الجسمانية لنعاج الأوسيمي قد أثرت معنوياً على ٧٨% من الصفات المدروسة مقابل ١١% فقط لتأثير وزن النعاج عليها. كذلك وجد أن مستويات المعنوية لتأثير الحالة الجسمانية للنعاج تراوحت بين $P < 0.001$ لصفات النعاج المخصبة خلال أول دورتي شبق/ النعاج الموضوعة مع الكيش، النعاج الوالدة/النعاج الموضوعة مع الكيش، الحملان المولودة / النعاج الموضوعة مع الكيش، و $P < 0.01$ لصفات النعاج التي أظهرت شبق / النعاج الموضوعة مع الكيش، كيلوجرامات الحملان المولودة / النعاج الموضوعة مع الكيش، و $P < 0.05$ لصفات النعاج التي لزم لها ثلاث دورات شبق أو أكثر لحدوث الإخصاب/النعاج الموضوعة مع الكيش، النعاج المخصبة خلال الموسم / النعاج الموضوعة مع الكيش. بينما لم يتأثر من الصفات المدروسة بوزن جسم النعاج سوى صفة النعاج المخصبة خلال أول دورتي شبق/ النعاج الموضوعة مع الكيش ($P < 0.05$)، مما يشير إلى أهمية الحالة الجسمانية لتناسل نعاج الأوسيمي مقارنة بأوزانها. ومن ثم فإنه يوصى بالأخذ في الاعتبار الحالة الجسمانية للنعاج استعداداً لموسم التناسل مقارنة بوزنها، الأمر الذي يساعد المربيين على إتخاذ القرارات الصائبة فيما يخص قطعانها نحو استبعاد أو استبقاء أفرادها، مع إتخاذ الإجراءات الغذائية التصحيحية لضبط حالتها الجسمانية قبل بداية موسم التناسل.