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Effect of non-genetic factors on growth performance in Sohagi sheep

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Abstract

The present study aimed to assess the impact of season, sex, year, parity, and birth type on the growth performance of Sohagi sheep. Data were collected from 1391 lambs born between 2001 and 2021 at the experimental sheep farm of the Animal Production Department, Faculty of Agriculture, Sohag University, Sohag, Egypt. The influence of non-genetic factors on lambs' average daily gain from birth until one year of age was calculated. Results show that average daily gain until 3 months (ADG1) and average daily gain until 12 months (ADG3) were significantly affected by sex ($P<0.01$), while average daily gain until 6 months (ADG2) wasn't affected significantly. Also, ADG1 and ADG3 were greater in males than females, while ADG2 in males was close to that for females. The ADG1 and ADG2 were significantly affected by birth type ($P<0.01$), single and twin lambs were grown faster than triplets. The ADG2 of lambs born to ewes of 3rd, 2nd and 4th parities was higher than those of 1st and ≥ 5th parities, but it wasn't significantly affected in each ADG1 and ADG3. Thus, it can be concluded that non-genetic factors affected the average daily gain of Sohagi lambs during the first six months after lambing and up to one year of age. Therefore, it must be taken into consideration when designing selection programs to improve the performance of Sohagi sheep.

Keywords:
Non-genetic, growth performance, Sohagi sheep

INTRODUCTION

Sheep are vital to the economies of many nations throughout the world. They play a significant role in supporting the livelihoods of many small and marginal farmers in Egypt (Sallam et al., 2012). The sheep population in Egypt has increased to 5.6 million, contributing to 6% of the country's red meat production (FAOSTAT, 2018). Sohagi sheep is a breed of sheep found in Upper Egypt that is considered one of the Sohag Governorate's most important sources of meat and wool. Despite its importance, researchers in Egypt have not given much solicitude to this breed compared to other breeds of sheep. Additionally, no breeding program has been implemented for the Sohagi sheep. (Elnahas *et al*., 2017). Sohagi sheep is one of eight minor native breeds in Egypt, mainly found in Upper Egypt, specifically in the Sohag and Qena governorates. These sheep are usually raised in jumbled flocks with some goats and are preserved as household animals in limited production systems (Elaref et al., 2020). Researcher team of the animal production department, Faculty of Agriculture, Sohag University have an early interest on unfirming the morphological characteristics and to enhance the performance of the Sohagi sheep breed in Upper Egypt at the Sohag and Qena governorates. Growth performance is a crucial measure of production efficiency due to its impact on the reproductive health of sheep. The fast growth rate of sheep allows them to reproduce early and produce more lambs throughout their lifetime (Bela and Haile, 2009). The potential for lamb growth is a crucial factor in genetic improvement programs. Small ruminants' meat-producing capability and economic success depend on their fast growth rate up to marketing age (Ghafouri-Kesbi and Eskandarinasab., 2008). Researchers have not previously studied the factors that influence the growth performance of Sohagi lambs from birth to marketing age. To identify the productive capacity to reach the marketing age of Sohagi sheep, this research was designed to investigate the influence of non-genetic factors on growth performance before weaning and until the marketing age of Sohagi sheep.

MATERIALS AND METHODS

Animal and management

Data were recorded for 1391 Sohagi lambs born to 616 dams and 47 sires and collected over 21 years (2001–2021) and maintained at the experimental sheep farm of the Animal Production Department, Faculty of Agriculture, Sohag University, Sohag, Egypt. They were housed in enclosed pens with access to an open area and were fed a mixture of 60% concentrate and 40% coarse green clover hay or alfalfa. Animals got their nutritional requirements according to NRC (2007). The year includes three mating seasons (January, May, and September) and three lambing seasons in February (1^{st}), June (2^{nd}) and October (3^{rd}). The lambs remained with their dams until the time when they were old enough to be weaned. Early weaning is followed for lambs after being 60 days old.

Table (1): Number of animal records, sires, dams, unadjusted means, standard error and coefficient of variation.

Trait	Number of animals	Sires	Dams	Mean ± S.E.	C.V
ADG1	1391	43	616	133.21 ± 5.00	19.96
ADG2	1391	43	616	57.54 ± 2.49	40.06
ADG3	1391	43	616	74.32 ± 2.52	39.53

Statistical analysis

The data analysis was carried out using the GLM procedure of SAS program (Version 9.1, 2003). The statistical model used for analyzing all obtained data was:

$$Y_{ijklm} = \mu + G_i + T_j + S_k + P_l + Y_l + e_{ijklm}$$

Where Y_{ijklm} is the dependent variable, μ is the overall mean, G_i the fixed effect of sex, T_j the fixed effect of type of birth, S_k the fixed effect of season, P_l the fixed effect of parity number of the ewe, Y_l the fixed effect of year of birth and ε_{ijklm} is the random residual error.

RESULTS

Least-square means and standard error of the average daily gain (ADG) of Sohagi lambs from birth weight until yearling weight are given in Table (1). Male average daily gain was significantly higher than female in the studied three phases (ADG1, ADG2 and ADG3). The difference between males and females was achieved (10.55 g) until 3 months of age. The ADG of males was higher than that of females, about 10.47 g and 28.09 g, until 6 months and 12 months of age, respectively. The growth performance of lambs is influenced by sex hormones, which in turn affect their average daily gain (ADG). Research has shown that male lambs tend to have a higher ADG than female lambs, indicating a significant influence of gender on growth rates. For instance, Yilmaz et al. (2005) reported that male lambs had a higher ADG than their female counterparts. These findings are consistent with those of other scientists as the study by Farrag et al. (2018) reported that male Saidi lambs outperformed females in terms of average daily gain. Birth type revealed a significant influence ($P<0.01$) on ADG1, while there was no significant distinction on ADG2 or ADG3. Growth rates were faster in lambs from single parturition than in lambs from double or triple parturition. This can explain the insufficiency of maternal milk for lambs from double or triple parturition. Mean separation test of Duncan for body growth rate (g) from birth until yearling growth rate of age revealed that lambs that are born as singles have been observed to be faster in growth and development compared to those born as twins. One possible reason for this could be the confined capacity of dams to provide enough nutrients for the development of multiple fetuses during embryonic life. On the other hand, single lambs have a more adequate milk supply from their dams during early development. Additionally, lambs tend to become self-reliant after they are separated from their dams, which could also contribute to their faster growth and development. Several scientists have previously documented the significance of the type of birth effect on average daily gain traits in breeds. The results of these studies agree with the findings of Suliman (1994), Marzouk and Mousa (1998). Additionally, Rastogi (2001) and Morsy (2002) have also reported similar results. The influence of season of birth was also highly significant ($P<0.01$) on ADG1 and ADG3 traits, but there was no significant effect on ADG2. The influence of birth season could be due to the better environmental conditions from February to May especially the availability of Egyptian clover. These results agree with those established in the literature for Hassan and El-Feel (1988), Oudah (2002), Yilmaz et al. (2005), Abbas et al. (2010), Farrag et al. (2018) and Elaref et al. (2020). The parity of ewes significantly affected ADG3 ($P<0.01$) but had no significant impact on ADG1 or ADG2. It was noticed that there was no specific trend with advance parity. It could be due to the competition for nutrients for the growth of young ewes and the fetus, along with the favorable uterine environment provided by the older ewes. These findings are consistent with similar studies conducted earlier by Deribe and Taye (2013) and Elaref et al. (2020). Year of birth has a significant effect ($P<0.01$) on all traits studied. The significant difference in the average daily gain of sohagi lambs is attributed to differences in the subsequent management and environmental conditions. According to Farrag et al., (2018), the year of pregnancy significantly affects the growth performance of Saidi lambs from birth to 18 months of age. Similarly, Odeh., (2002) found that the year of pregnancy has impact on the average daily gain of Rahmani sheep. The influence of the year of conception on the growth performance has been reported by (Paneh and Hafezian, (2009), Abbas et al., (2010) and Elaref et al., (2020)).

Table (2). Effect of non-genetic factors on average daily gain (ADG) from birth wight until yearling wight of Sohagi lambs (LSM ± SE).

Item	No.	ADG1 (g/day)		ADG2 (g/day)		ADG3 (g/day)	
		LSM ± SE	P value	LSM ± SE	P value	LSM ± SE	P value
Lamb sex							
Male	657	137.97±2.16	**	61.81a± 1.85	Ns.	87.99a±2.33	**
Female	734	126.82±2.09		51.97b± 1.79		58.49b±2.25	
Birth type							
Single	819	138.03a±0.90		57.82b±1.05		77.57a± 1.13	
Twin	549	128.17c± 1.02	**	58.39a±1.19	**	74.47b±1.28	Ns.
Triple	23	130.98b±4.94		54.46c±5.77		67.68c± 6.22	
Ewe parity							
1st	506	131.03ab±2.29		55.42ac±1.96		70.91ab±2.47	
2nd	314	132.12b± 2.41		57.65b± 2.07		72.02c± 2.60	
3rd	232	131.30c±2.54	Ns.	58.59a± 2.18	**	69.01ac± 2.74	Ns.
4th	155	137.14a±2.78		56.32ab±2.38		75.49b±3.00	
≥ 5th	184	130.38ac±2.79		56.47c± 2.39		78.77a±3.01	
Birth season							
1st	471	136.58a±2.26		55.64c± 1.94		73.19b± 2.44	
2nd	426	131.51b±2.17	**	56.84b±1.86	**	77.35a± 2.34	Ns.
3rd	494	129.08c±2.31		58.18a±1.98		69.18c± 2.49	
Year			**		**		**

[abc] mean values with a different superscript in the same Column (and within each factor) indicate significant difference (P<0.01). Birth season=1st February 2nd June 3rd October

CONCLUSION

Non-genetic factors must be considered when evaluating Sohagi sheep based on growth characteristics. Also, they must be taken into account when estimating genetic parameters and developing improvement plans.

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تأثير العوامل غير الوراثية على أداء النمو في الأغنام السوهاجي

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الملخص العربي

هدفت الدراسة إلى تقييم مدى تأثير الموسم والجنس وترتيب موسم الولادة ونوع الولادة على أداء نمو الأغنام السوهاجي. تم جمع البيانات من 1391 حيواناً ولدت بين عامي 2001 و2021 في مزرعة الأغنام التجريبية التابعة لقسم الإنتاج الحيواني بكلية الزراعة جامعة سوهاج في مصر. تم حساب تأثير العوامل غير الوراثية على معدل النمو اليومي عند الولادة حتى سنة من العمر، وأظهرت النتائج أن تأثير الجنس تأثر معنويا (P<0.01) في كل معدل النمو اليومي لثلاثة اشهر ADG1، ومعدل النمو اليومي 12 شهرا ADG3 على العكس من ذلك، معدل المنو اليومي لستة أشهر ADG2 لم يتأثر بشكل كبير، حيث كان معدل النمو اليومي للذكور أسرع من الإناث في كل من ADG1 و ADG3. وكان ومعدل النمو اليومي ADG2 للذكور قريب من ذلك للإناث. كما تأثر تأثير نوع الولادة معنويا (P<0.01) في كل من ADG1, ADG2. واحد وتوأم أسرع من ثلاثة توائم. أعطت النعاج ترتيب موسم الولادة الثالث والثاني والرابع حملان أسرع من النعاج من ترتيب والولادة الأولى ≤ الخامسة في ADG2، لكنها لم تتأثر بشكل ملحوظ في كل ADG1 وADG3. حيث كان أداء النمو لحملان سوهاجي قبل 3 أشهر أسرع من معدل النمو اليومي ستة اشهر ومعدل النمو اليومي 12 شهرا، يمكن استنتاج أن معدل النمو اليومي لحملان سوهاجي يتأثر بالعوامل البيئية. ولذلك، يجب أن تؤخذ بعين الاعتبار عند وضع خطط وبرامج الانتخاب فى الأغنام السوهاجى..