J. Animal and Poultry Prod., Mansoura Univ., Vol.10 (6):165 - 170, 2019

Studies on Growth Traits and Carcass Characteristics of Abou-Delik Sheep Breed under Intensive and Semi-Intensive Management Systems in Halaieb – Shalateen - Abouramad Triangle

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ABSTRACT

Sixteen Abou-Delik male lambs, of an average live body weight 22.3 ± 3.02 kg and aged three months were used in this study to assess the effect of intensive and semi-intensive management systems on growth performance, carcass traits and economical efficiency. Lambs were randomly divided into two symmetric groups (eight lambs each) and allocated to different management systems. Lambs of group one (G1), were represent intensive management system, while, lambs of group two (G2), considered as the semi intensive management system, The experiment was lasted for 180 days. At the end of experimental period, fourteen lambs were slaughtered and different carcass data were collected. Analysis of variance indicated that no significant difference (P< 0.05) were found between the intensive and semi intensive management systems in relation to final live body weight (37.63 kg vs. 36.88 kg), total live body weight gain (15.31 kg vs. 14.54 kg) and average daily gain from weaning age up to 9 months of lambs age (84.1 gm vs. 79.9 gm), respectively and live body morphemetric measurements of Abou-Delik lambs. There was a marked highly significant effect (P < 0.01) of management system and period on feed conversion ratio. Highly significant differences (P <0.001) between the two management systems. Feeding cost per head per day were LE 7.14 and LE 4.49 for the intensive and semi-intensive system, respectively. Benefit/Cost ratio were LE1.25 and LE2.26 for lambs at 6 months of age and 0.42 and 0.46 for the corresponding indicators at 9 months of age. Gross margin estimates were LE 156.5, 451, -390.7 and -243 for G1, G2 at 6 and 9 months of age, respectively.

Keywords: growth traits, carcass characteristics, economic indicators, halaieb-shalateen-abouramd, management system

INTRODUCTION

Ruminant production in most countries of tropical Africa relies heavily on the availability of grazing land .The quality and quantity of grasses available as feed are low as a result of a climate characterized by a relatively long-dry season that alternates with a short-rainy season. During the rainy season, although range plants grow rapidly, their nutritive value may be high at the start (Tedonkeng Pamo *et al.* 2006). Drought in the summer/autumn, severely affects sheep production systems due to low pasture growth and quality, thus limiting the feed available for grazing sheep during the production cycle. Abou-Delik sheep are the most dominant livestock in Shalaten-Halaib triangle region. The range vegetation is considered the basic source of ruminants feed in this region. The main nutritional problems of animals on range lands are erratic and short duration of rains precipitation lead to long drought periods, shortage of forage production, seasonal starvation of animals, unavailability of feed concentrates which brought from the Nile valley, unavailability of drinking water for animals during the dry season and improper economic inter-relationship between animal productivity and potential utilization of range plants (El-Shaer *et al.* 1997).

However, most previous studies comparing animals that pasture with animals fed in stipulation in different environmental conditions and space, and physical activity could distort the interpretation of results (Dunne *et al.*, 2005). The source of income of most inhabitants depends mainly on range animals. Rainfall sometimes starts from October up to March, but erratic, no accurate records for rainfall were reported in this region (El-Shaer *et al*. 1997). Lamb's meat quality is influenced by many factors such nutrition (Castro *et al.* 2005). Other factors that may influence the quality of the meat can be pre-slaughter stress, the rate of cooling of the carcasses and curing regime (Teixeira *et al.* 2005). Meat, to be accepted as superior quality, should comply with certain characteristics, in particular color and fat content. Therefore, the aim of this study was to evaluate the growth performance, carcass characteristics and economical efficiency of Abou-Delik sheep to identify its potentiality under different management systems.

MATERIALS AND METHODS

The study Location

The current experiment was conducted at Shalateen Research Station of Desert Research Center, located at Ras Hederba Valley. The research station is situated nearly 1300 km away from Cairo to southeast direction.

Geographically, it is located at latitude 22°,00,720 N and longitude 36°,48,955 E. The area is bordered by Sudan to the south and the Red Sea to the east. It is classified as an arid region with average ambient air temperatures of the study location are 35°C and 22°C, and relative humidity values are 37% and 43% for the summer and winter seasons, respectively (EMA, 1991). The average annual precipitation of 58.5 mm, mostly as erratic showers in November and December. Water resources are meager and available only to nomadic inhabitants and their animals from shallow wells. Thus, sedentary agricultural activities are absent and livestock grazing on rangelands is considered the only option of livelihood for the farmers.

Experimental procedures

Sixteen Abou-Delik sheep male lambs, of an average live body weight 22.3 ± 3.02 kg and aged three months were used in the present study. Experimental lambs were randomly divided into two symmetric groups (eight lambs each) and allocated to two different management systems. Lambs of group one (G1), were represent intensive management system. Lambs were kept in barns throughout the experiment and were fed a certain amount of commercial concentrate feed mixture (CFM) of 14 % crude protein, plus berseem hay (*Trifolium alexandrinum*) Nutrients requirements were adjusted biweekly according to live body weight changes While, lambs of group two (G2), which considered as the semi intensive management system, were maintained under grazing of free rangelands conditions.

Lambs grazed natural vegetations in the area. The grazing time was extended from morning up to afternoon, then moved back to the barns and offered CFM of 14 % crude protein. The amount of concentrate was adjusted biweekly according to the live body weight changes. Levels of feeding were calculated according to Kearl (1982) to cover nutritional requirements for 100 gm gain/ day. Lambs weights were recorded before the morning feeding at the beginning of the experiment and biweekly, thereafter, throughout the experimental period (180 days), from August 2018 up to January 2019. . The experimental period was partitioned into two periods; the first period (P1) was up to the sixth month of lamb age, while the second period (P2) extended from sixth month up to ninth month of lambs' age. Lambs morphemetric measurements were recorded biweekly, as well. Biological, carcass and economical data were collected. The experiment lambs have daily access to water. The concentrate feed mixture and berseem hay were formulated and analyzed in duplicate for proximate chemical analysis according to AOAC (2000). Table (1) shows the chemical composition of CFM and berseem hay utilized in the current experiment (on DM basis)

Table 1. Chemical composition of concentrate feed mixture and berseem hay (on DM basis)

Chemical composition	Concentrate feed mixture	Berseem hay
Dry matter	89.55	90.60
Crude protein	14.20	13.20
Crude fiber	8.75	28.60
Ether extract	3.35	3.50
Ash	6.05	14.30

Slaughter data:

At the end of the experiment, fourteen lambs (seven in each group) were slaughtered after 24h fasting period to evaluate carcass traits. Animals were skinned; abdominal and thoracic organs were detached and weighed. The digestive tract was weighed both full and empty to get the gut fill weight by subtraction. The empty body weight (EBW) was obtained by subtracting alimentary tract content from pre-slaughter weight. Hot carcass weight was determined immediately after evisceration and expressed as percentage of slaughter weight and empty body weight to estimate dressing percentage (Koch *et al.,* 1963). Some recorded data that expressed as a percentages, especially if less than 30% or higher than 70%, were analyzed after transforming percentages by arcsine transform method.

Statistical analysis:

The data was subjected to two way analysis of variance using the general linear model (GLM) of Statistics 22.0 Software (SPSS, 2013). Two fixed effects were considered; management system and period and the interaction between them, to derive estimates of growth traits, carcass characteristics, morphemetric measurements and economic indicators. The following model was applied:

$$Y_{ij} = \mu + a_i + b_j + (ab_{ij}) + e_{ij}$$

Where:

Y_{ij} = the observations,
μ = the overall mean,
a_i = the effect due to i^{th} type of management system, i = 1,2 ,
b_j = the effect due to j^{th} age of lamb, where j = at 6 month of age (P1) and 9 month of age (P2),
(ab_{ij}) = the interaction between management system and age of lamb,
e_{ij} = random error associated with the ij^{th} observation.

The significant differences between means of the studied traits were tested according to Duncan's new multiple ranges test (Duncan, 1955).

Economical efficiency

Quantitative assessments of economic productivity are necessary to evaluate a certain managerial procedure under investigation. Economical efficiency of the current study was estimated as the cost of consumed feed (as fed) to produce one kilogram of marketed live lambs or slaughter. In the current study, variable cost considered feed costs only, while revenues represented the monetary value generated from live marketed lambs or slaughter. Benefit/cost ratio was calculated as revenues divided by total feeding costs. While gross margin (GM) was computed as total revenues minus total feeding costs (FAO, 2002). Economic indicators derived were based on farm gate prices in Egyptian pound (LE) as follows; berseem hay (LE 4500/ton), CFM (LE 7000/ton), marketed live lambs (LE 65/kg) and carcass (LE 140/kg) were considered.

RESULTS AND DISCUSSION

Growth performance

The obtained results of growth performance of Abou-Delik lambs for the two studied different management systems are presented in Table (2). No significant differences ($P < 0.05$) were showed between the intensive and semi intensive management systems in relation to final live body weight (37.63 kg *vs.* 36.88 kg), total live body weight gain (15.31 kg *vs.* 14.54 kg) and average daily gain up to the ninth month of lamb age (84.1 gm *vs.* 79.9 gm), respectively. These superiorities of lambs growth performance in intensive management system may due to the provision of concentrate feed mixture and lesser time exposure to environment stress. In the same time, comparatively lower weight gain of lambs under semi-intensive management system indicating that this system has limited feeding resources for sheep flocks. The current results are in agree with, Aydini *et al*., (2017), who reported that, no statistical differences between semi-extensive and intensive groups in growth traits. However, highly significant differences ($P < 0.01$) were observed between the two studied periods within the same group for average daily gain and live body weight gain at the sixth month of age (P1). Lambs of semi-intensive management system group showed a higher average daily gain during P1 than lambs of intensive management system group (138.1 gm *vs.* 130.5gm), respectively.

The interaction effect between the management system and the studied periods (P1 and P2), were highly significant in relation to body weight gain and average daily gain of lambs. Therefore, both groups showed a marked decline in average daily gain (49.0 gm and 35.5gm), respectively during period 2, when the experimental periods extended up to the ninth month of lambs age. In contrary, Meenakshi Sundaram *et al.,* (2002), during growth studies, found that lambs of age fifth to twelfth month in intensively reared lambs (slatted and mud floor groups) maintained their superiority in growth rate than those reared under semi intensive system of management. This result is in agree with, AYDIN1*et al*., (2017).

The least squares means of all studied live body morphemetric measurements of Abou- Delik lambs under

intensive and semi-intensive management systems are shown in Table (2). No significant differences were found between lambs under intensive and semi-intensive management systems. However, lambs of intensive management system showed slightly higher body measurements except, those measurements of leg circumference, tail length and tail circumference. These results are disagree with Huma Rizwana *et al.,* (2016), who found that, male Dumbi lambs kept under semi-intensive management system increase in body length than lambs reared under intensive management system with statistically significant differences ($P < 0.05$). In the same context, Bharambe and Burte (2012) compared Deccani lambs under grazing, semi stall fed and stall fed systems, found that the body length, body height and chest girth were significantly higher ($P< 0.01$) in stall fed system than semi stall fed system.

Table 2. Least squares means (X) and standard deviation (± SD) of growth traits and morphmetric measurements for Abou-Delik lambs under the studied management systems.

Items	Overall mean	G 1	G 2
	X ± SD	X ± SD	X ± SD
Initial live body weight, kg	22.33±2.96	22.31 ± 3.95	22.34 ± 1.98
Live body weight at 6 months of age, kg	30.27±5.48	30.4±4.29	30.2±5.42
Final body weight at 9 months of age, kg	37.25±3.28	37.63 ± 2.97	36.88 ± 3.83
Total body weight gain, kg	14.93±2.65	15.31 ± 2.88	14.54 ± 2.64
Body weight gain (P1), kg		11.7±1.85	12.4±a3.59
Body weight gain (P2), kg		4.4b±2.32	3.2±11.19b
ADG (initial – final), gm	82.01 ± 14.81	84.13 ± 15.81	79.88 ± 14.49
ADG (P1), gm		130.5^{a} ±20.55	138.1^{a} ±39.92
ADG (P2), gm		49.0^{b}±25.77	35.5^{b}±13.29
Body length, cm	62.94 ± 3.79	63.5 ± 5.16	62.38 ± 1.85
Body high, cm	65.75 ± 3.86	66.25 ± 4.27	65.25 ± 3.62
Body morphmetric measurements, cm			
Body circumference	78.25 ± 5.95	78.75 ± 5.78	77.75 ± 6.48
Leg circumference	38.06 ± 1.81	37.5 ± 1.51	38.63 ± 2.00
Tail length	48.44 ± 4.69	47.25 ± 5.63	49.63 ± 3.50
Tail circumference	23.75 ± 2.60	22.88 ± 2.42	24.63 ± 2.62

ADG; average daily gain, means followed by different superscript letters within the same column are significantly different ($P < 0.05$).

Carcass measurements

Least squares means of carcass measurements for Abou- Delik lambs under intensive and semi-intensive management systems are shown in Table (3). No significant differences were obtained between intensive and semi-intensive management systems, however the values of carcass width at loin were agreement with those results which noted by ARUN K DAS, *et al.,* (2008) but in disagreement with carcass measurements including leg circumference and chest circumference which noted by the same author, these differences may be due to vary of breed.

Table 3. Carcass measurements (cm) of Abou Delik lambs under intensive and semi-intensive management

Measurements	Overall mean	G1	G2
	X ± SD	X ± SD	X ± SD
Carcass length	59.50 ± 2.93	60.14 ± 3.13	58.86 ± 2.80
Carcass width at brisket	31.86 ±1.75	31.57 ± 1.51	32.14 ±2.04
Carcass width at loin	8.64 ±1.74	8.57 ±1.27	8.71 ±2.22
Carcass circumference	70.21 ± 3.26	69.14 ± 3.58	71.29 ± 2.75
Leg circumference	33.29 ±2.49	32.71 ± 3.45	33.86 ±0.90
Tail length	36.79 ±5.56	37.86 ± 3.49	35.71 ±7.23
Tail circumference	15.86 ± 2.11	15.00 ±1.73	16.71 ± 2.22

Carcass and non-carcass characteristics

Least squares means of slaughter weight, empty body weight, hot carcass weight, dressing percentages based on slaughter weight also based on empty body weight and organs plus ofalls as percentages for Abou-Delik lambs reared under intensive and semi-intensive management systems are presented in Table (4). No significant differences were obtained between the two management systems in slaughter weight, empty body weight, hot carcass weight and many organs plus ofalls as percentages as following slaughter weight (36.57 vs. 36.43 kg) as well as empty body weight and hot carcass weight respectively (29.79 vs. 31.92 kg) and (16.99 vs. 18.04 kg)

While significant differences were obtained in dressing percentages based on slaughter weight (49.47 vs. 46.47 %) also in liver as a percentages (1.74 vs. 1.39%) and edible parts as a percentages (2.60 vs. 2.14%) for semi-intensive and intensive management system respectively. However these results in dissimilarity with values which reported by Majdoub-Mathlouthi *et al.,* (2013), at fixed slaughter weights, hot and cold carcass weights increased ($P < 0.05$) by 12 and 11%, dressing percentage increased ($P< 0.05$) by 1.5% and commercial dressing percentage increased ($P< 0.01$) by 2.7% when concentrate level increased (table 3).

As same as, Papi *et al.* (2011) reported a 4 kg and 4.9% increase in carcass weight and dressing percentage, respectively, when concentrate proportion went from 30 to 50%. These results may be due to that, the percentages of total offals were higher in treatment groups than the control group ones. These results are closed with, Safari *et al.,* 2011, who said that, the non-carcass parts form 30-35% of the total live body weight in sheep and have much influence on dressing percentage. Consequently, the increase or decrease of non-carcass parts is inversely proportional to the yield of carcass part (Sen *et al.,* 2011, Suliman and Babiker, 2007).

Table 4. Slaughter weight, empty body weight, hot carcass weight in kg, dressing percentage and organs and ofalls (%) of Abou Delik lambs under intensive and semi-intensive management

Item	Over all Mean X± SD	G 1 X ± SD	G 2 X ± SD
Slaughter weight	36.50 ±3.48	36.57 ±3.21	36.43 ±3.99
Empty Body weight	30.85 ±2.99	29.79 ±2.68	31.92 ±3.09
Hot carcass weight	17.40 ±1.99	16.99 ±1.68	18.04 ±2.23
Dressing %			
% of slaughter weight	47.66 ±2.53	46.47 ^{b} ±2.46	49.47 ^{a} ±1.65
% of empty body weight	56.36 ±2.24	57.04 ±2.23	56.41 ±2.28
Organs And ofalls %[1]			
Head	7.72±0.92	7.68 ±0.62	7.76 ±1.20
Feet	2.73 ±0.29	2.64 ±0.37	2.83 ±0.15
Pelt	10.78 ±1.42	10.13 ±1.07	11.42 ±1.50
Lungs & Trachea	1.27 ±0.13	1.25 ±0.13	1.29 ±0.13
Heart	0.48 ±0.13	0.45 ±0.14	0.51 ±0.13
Liver	1.59 ±0.25	1.39 ^{b} ±0.12	1.78 ^{a} ±0.17
Spleen	0.16 ±0.02	0.16 ±0.03	0.16 ±0.02
Kidneys	0.30 ±0.02	0.30 ±0.02	0.30 ±0.02
Testes	1.19 ±0.15	1.23±0.12	1.16±0.17
Abdominal fat	1.66 ±0.48	1.57±0.40	1.74±0.58
Heart fat	0.20 ±0.05	0.20 ±0.04	0.20 ±0.06
Kidney fat	0.79 ±0.24	0.81 ±0.21	0.76 ±0.27
Testes fat	0.54 ^{a} ±0.15	0.58 ±0.18	0.51 ±0.11
Total fat	3.40 ±1.25	3.59 ±1.58	3.20 ±0.88
Non- edible parts[2]	21.23 ±2.03	20.45 ±1.65	22.01 ±2.19
Edible parts[3]	2.37 ±0.32	2.14 ^{b} ±0.15	2.60 ^{a} ±0.28

1, expressed as a percentage of empty body wt, 2, Non- edible parts (Head + feet +pelt), 3, Edible parts (Heart +liver + kidneys. different superscript letters within the same row are significantly different (P < 0.05).

Feed conversion ratio

Results of feed conversion ratio (FCR) of the two studied management systems are presented in Table (5). The current results revealed that, there was a marked highly significant effect (P < 0.01) of management system and period on feed conversion ratio. In the same time, interaction between management system and period showed highly significant differences within and between groups. Similar trends in feed conversion efficiency were observed for both studied groups of the two periods. Feed conversion was more efficient in lambs of semi-intensive management system during P 1 (up to 6 months of age) than the other studied groups. However, Lambs of intensive management system consumed higher quantity of dry matter intake (DMI) to produce one kilogram live body gain than lambs of semi intensive management system (8.1 kg vs. 3.4 kg), respectively. This might be due to, more quantity of DMI supplemented to intensive than semi intensive group. This result is in agree with Kochewad *et al.*, (2018), Karaca *et al*., (2016), Sari *et al* (2014) and Aydini *et al*., (2017),, they reported that feed conversion was more efficient in semi-intensive than intensive systems.

Economical efficiency

Economical indicators of the current study are presented in (Table 5). Results showed that, there is a highly significant differences (P <0.001) between the two management systems. In this context, feeding cost per head per day estimates were LE 7.14 and LE 4.49 for the intensive and semi-intensive system, respectively. Likewise, feeding costs needed to produce one kilogram live body weight gain, revealed a considerable lower in feeding costs under semi-intensive management system (LE 48.95) than feeding costs of intensive management system (LE 87.13). This may due to a higher feeding cost required than semi intensive management system (LE 642 vs. LE404), repectivily. This result is in agree with Karim *et al*., (2004). Similar trend was observed in case of carcass, whereas, feeding cost of one kg of carcass gain was estimated about LE 188.6 and LE 99.7 for intensive and semi-intensive system, respectively.

Table 5. Economic indicators of the studied management systems

Indicator	Overall mean	G 1 X SD	G 2 X SD
Feed costs;			
Feed costs/head, LE	523.3 ± 128.14	642.4^{a} ±36.30	404.3^{b} ± 48.80
Feed costs/head/day, LE	5.58 ± 1.42	7.14^{a} ±0.40	4.49 ^{b} ± 0.54
Revenues/head, LE	516.59 ± 313.01	525.2 ± 279.28	507.9 ± 352.61
Economical efficiency (live lamb), LE	68.53 ± 88.38	87.13 ± 96.72	48.95 ± 80.29
FCR, kg	12.27± 9.45	12.96 ± 8.59	11.57 ± 10.48
At 6 months of age (P1)		7.2^{a}±1.2	3.44^{b}±1.8
At 6 months of age (P2)		18.7^{b}±9.14	20a±8.03
B/C ratio:	1.10±0.84	0.84^{a} ± 0.477	1.36 ^{b}± 1.04
Age of lambs (6 months)		1.25a±0.19	2.26 ^{b} ±0.65
Age of lambs (9 months)		0.42b± 0.22	0.46 ^{b} ± 0.17
GM, LE	- 6.7±65.09	-117.1a± 235.26	103.7^{b} ± 138.59
Age of lambs (6 months), LE		156.5^{a}±120.2	451^{a}±233.55
Age of lambs (9 months), LE		- 390.7b±150.8	- 243b±77.78

Economic indicators

Estimates of gross margins are illustrated in Table (5) and figure (1). It could be notice that both management systems scored positive estimate of GM during P1, and lambs of semi-intensive management system was significantly (P<0.01) higher than lambs of intensive management system (LE 451 vs. LE 156.5), respectively. This result is in agree with, Huma Rizwana *et al.*, (2016) who reported that, male Dumbi lambs under semi-intensive management system was more profitable than intensive management system. In the same context, both lambs of studied management systems had a severe decline and scored negative estimates of GM. It is clear that lambs under semi- intensive system during P1 (up to 6 months of age) achieved the highest estimate of GM (LE 451) among the other studied management systems and periods. In the same

time, Lambs reared under intensive management system were lowest (LE -390.7) during P2 (up to 9 months of age). The marked reason for the current estimated GM, may due to biological performance of lambs during P2, which showed a marked decrease in ADG for both management systems, subsequently had a negative impact on the monetary values of revenues, as well as, lower efficient of FCR during P2 under the two studied management system during P2 as shown in table (5).

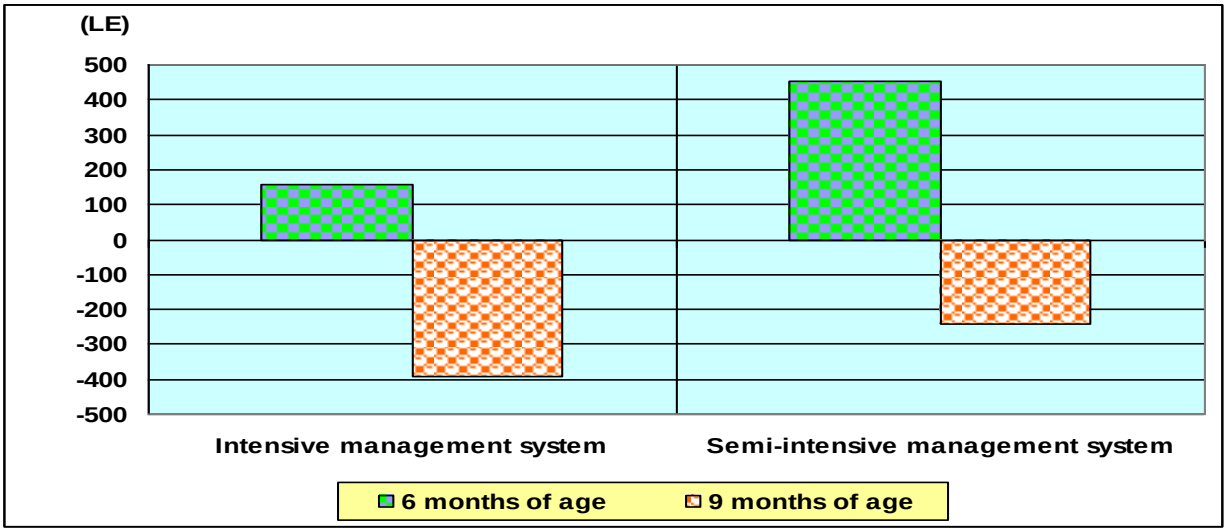

Figure 1. Effect of the interaction between management systems and age of lamb on gross margin.

From an economic point of view, Benefit/Cost ratios declared that, lambs in both management systems earned the highest value of LE 2.26 and LE1.25, at 6 months of lambs age (P1). Similar results were observed by Erol AYDIN1*et al*., (2017) found that, input/output ratios in the semi-intensive fattening system are higher compared to the intensive fattening system, for Tuj and Hemşin lambs at 90 days of fatting period. While, opposite trend was observed at the 9 months of lambs' age (P2), since the values of B/C were declined (LE 0.46 vs. LE 0.42) for semi intensive and intensive group, respectively.

CONCLUSION

It could be concluded that Abou-Delik sheep male lambs raised under semi-intensive management system revealed a high potentiality and better growth performance, feasible for producing meat and more profitable than intensive management system. The obtained results confirmed that Abou-Delik lambs reared under semi intensive system were recommended up to 6 months of age.

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دراسات على صفات النمو وصفات الذبيحة لسلالة أغنام أبو دليك تحت نظام الإنتاج المكثف وشبة المكثف فى مثلث حلايب- شلاتين ابورماد

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اجريت هذة الدراسة بهدف دراسة تأثير نظم الرعاية المختلفة (النظام المكثف وشبة المكثف) على اداء النمو وكفاءة التحويل الغذائى وصفات الذبيحة والكفاءة الاقتصادية لذكور حملان سلالة ابودليك تحت الظروف الصحراوية . استخد فى هذة الدراسة ١٦ من ذكور حملان من سلالة ابو دليك بمتوسط وزن ٢٢.٣ ± ٣.٠٢ كجم ومتوسط عمر ٣ أشهر .تم تقسيم الحملان عشوائيا الى مجموعتين متماثلتين، ٨ حملان داخل كل مجموعة. تمثل المجموعة الاولى نظام الرعاية المكثف (علف مركز + دريس)، بينما تمثل المجموعة الثانية نظام الرعاية شبة المكثف (علف مركز + رعى). استمرت التجربة لمدة ١٨٠ يوم. اشارت نتائج تحليل التباين الى ان ليس لنظام الرعاية تاثير معنوى على وزن الجسم النهائى، الزيادة فى وزن الجسم، معدل النمو اليومى وكذلك مقاييس الجسم. فى حين كان لنظام الرعاية المدروس تأثير عالى المعنوية على كلا من معدل التحويل الغذائى، حيث كانت هناك فروق معنوية واضحة بين المجموعتين فى تكلفة التغذية اليومية للحمل، حيث سجلت المجموعة الاولى ٧.١٤ جنية مقابل ٤.٤٩ جنية للمجموعة الثانية . كانت هناك فروق معنوية عالية بين نتائج المؤشرات الإقتصادية حيث كانت نسبة المنافع/التكاليف ٢.٢٦ ، ١.٢٥ لكل من المجموعة الثانية والأولى، على التوالى عند عمر ٦ أشهر. بينما إنخفضت نسبة المنافع/التكاليف على عمر ٩ أشهر إلى ٠.٤٢، ٠.٤٦ لكل من المجموعة الأولى والثانية ، على التوالى. كما بلغت قيمة هامش الربح المقدرة ١٥٦.٥ جنية، ٤٥١، - ٣٩٠.٧، -٢٤٣ جنية لكل من المجموعة الأولى والثانية عند أعمار ٦ شهور، ٩ أشهر، على التالى.