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Effect of Weaning Age on Lamb's Performance

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Abstract: Twenty four Ossimi male lambs with an average live body weight 3.75± 0.25 kg and 7 days age were randomly assigned to two feeding groups. The first one was left to suckle their dam's until 12 weeks of age (natural rearing) and served as a control group, while the other was early weaned at 8 weeks old. Both the two groups were supported by a starter ration besides dam's milk until being weaned. Data of digestion coefficients which carried out after 12 weeks, showed higher (P<0-05) DMI by early weaned lambs (T2) in comparison with the corresponding natural weaned group (T1). Also, results indicated higher ($p<0.05$) digestibility coefficients and nutritive values for the same ration by the early weaned group. Lamb's performance from 2-8 weeks old showed in general similar milk and creep feeding intakes, final live body weight, total and daily body weight gains for both T1 and T2. Lamb's performance from 9-12 weeks old illustrated that daily dry mater intake, EngI and CPI were higher ($p<0.05$) for early weaned group. Early weaned lambs recorded higher ($p<0.05$) final live body weight as a result to their higher ($p<0.05$) daily gain during their later life (232 g/h/day *vs* to 189 g/h/day) in comparison with the natural weaned group lambs. These results clearly indicated that, increasing solid feed consumption by early weaning stimulates rumen morphological development. Also, the important component in successful newborn rearing programs is an early transition to starter grain.

Key words: Weaning age · Lambs · Performance · Digestibility

INTRODUCTION

Early weaning may be defined as the withdrawal of the milk supply before the time when weaning would normally occur. The success of early weaning must depend partly upon the speed with which the rumen develop in both lambs and calves and partly upon the level of milk production of the dams [1], who also reported that rumen function develops rapidly after birth until, at about 8 weeks of age, the grazing lambs can digest herbage with the efficiency of an adult.

Bonsma and Engela [2] found that lambs weaned at 8 weeks of age had the same growth rate as unweaned controls. Bosman and Bonsma [3] confirmed this result.

In practice, the object of weaning lambs early is to increase the efficiency of production and no useful end is achieved by early weaning in circumstances where lambs can be satisfactorily fattened by suckling, unless the milk is rarely produced or required for other purposes. According to Bonsma and Engela [2] the milk yield of their Merino ewes fell rapidly during the first few weeks of lactation [4].

In view of these findings, it appears on theoretical grounds that lambs can be successfully weaned at any time after about 8 weeks of age. This theoretical prediction has been experimentally verified by several authors.

Local sheep breeds are characterized by their lower milk yield, which in turn would be reflected on the growth rate of their offspring. Hence, the aim of the present study was to justify the effect of weaning age on the efficiency of production from the early local weaned lambs.

MATERIALS AND METHODS

Experimental Rations and Animals Management: Twenty four Ossimi male lambs with an average live body weight 3.75± 0.25 kg and 7 days age were randomly assigned to two feeding groups. The first one was left to suckle their dam's until 12 weeks of age (natural rearing) and served as a control group, while the other was early weaned at 8 weeks old (early weaning). Both the two groups were supported by a starter ration (Table 1), besides dam's milk until being weaned. Starter were formulated and calculated according to NRC recommendations [5] and offered to lambs *ad libitum*.

Residuals were daily collected, while a composite sample was taken and dried for determination of dry matter intake and further proximate analysis. Lambs were

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Table 1: Composition of creep feeding ration offered to early and natural weaned lambs from 2-12 weeks old on (DM basis %)

	% ration composition
Yellow Corn	55.00
Soybean meal	30.00
Wheat bran	7.00
Molasses	5.00
Lime stone	1.50
Sodium chloride	1.00
Mineral mix. and Vit. (Premix)	0.50
Price LE / Ton	663.80
% DCP	13.83
% TDN	81.00

DM	OM	CP	EE	CF	NFE
90.9	93.8	19.1	3.1	4.4	67.2

* Primex, contained/kg Mn. 33 mg, Zn 25 mg, Fe 20 mg, Cu 6 mg, I 800 mg, Sel 66 mg and Co 160 mg.

kept in semi-opened pens, while water and salt blocks were freely available.

Animals were weighed biweekly intervals before morning meal, while daily feed intake, changes in live body weight, average daily gain, feed conversion (kg DMI/kg. gain) and feed costs (LE/kg. gain) were estimated.

Milk Determination: Average daily milk intake by lambs was determined once weekly during the rearing period, by milk difference technique according to Louca *et al*, [6].

Digestibility Trails and N Balance: A metabolic trail and N balance was conducted to evaluate the digestibility, feeding values and N retention of the experimental rations.

Simultaneously, by the end of the study (12 weeks), four representative lambs per each dietary treatment were randomly chosen and used in a digestibility trail. Lambs were placed in metabolic cages, weighed at the start and the end of the trail. The duration period of the trail, consisted of 7 days as an adaptation and preliminary period, followed by another 7 days as a collection one. Over the collection period, daily amounts of feed consumed and residuals were accurately weighed and recorded, meanwhile, faeces and urine were quantitatively collected once daily at 8 a.m.

Faeces Collection: The daily samples of faeces (10%) were immediately frozen at -20°C. At the end of the collection period, a composite sample for each lamb was prepared and dried in a drying oven at 65°C for 48 hours and then grinding and stored in suitable jars for proximate analysis. Also a composite sample of experimental rations were prepared by drying, grinding and stored in tight jars for further chemical analysis.

Urine Sampling: Five m1 of diluted sulphuric acid (1:1) were added in the urine collecting bottles to avoid ammonia losses. The urine output was measured daily along the collection period for each animal and representative samples (10%) were collected daily from each animal and a composite sample was then stored at -20 °C for nitrogen determination.

Chemical Analysis: Samples of feeds and faeces were analyzed for dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), ash contents and nitrogen in urine according to AOAC [7] procedures. Nitrogen free extract (NFE) of feed and faeces was assessed by difference.

Statistical Analysis: Data were analyzed using the general linear models procedure adopted by SAS [8]. Difference between means were tested for significances using the L.S.D test according to Duncan [9]. One way analysis of variance was adopted using the following equation:

$$Yij = u + Ti + Eij$$

Where:
Yij = The observations of the parameter measured.
U = Overall means
Ti = The effect of replication
Eij = The random error term.

RESULTS AND DISCUSSION

Effect of Age at Weaning on Digestion Coefficients, N Balance and Nutritive Values of the Experimental Rations: Data presented in Table 2 showed higher (P<0-05) DMI by early weaned lambs in comparison with the corresponding natural weaned group (780 *vs* 560 g/h/day, respectively).

This may be related to early weaning practice, as a managerial mechanism which positively encouraged lambs of the early weaned group to increase their intake to satisfy their daily requirements through the freely available access of solid feed. In addition, the earlier separation from the dams for longer times in their early life

Table 2: Effect of age at weaning on digestion coefficient, N balance and nutritive values of experimental rations at 12 weeks of age

	Treatments		
Items	T1 (NR)*	T2(EW)**	± SE
DM intake g/h/d	560[b]	780[a]	±23.74
Digestibility %			
DM	79.0[b]	88.5[a]	± 1.5
OM	81.0[b]	89.7[a]	± 1.3
CP	73.2[b]	85.5[a]	± 1.0
CF	86.7[b]	95.6[a]	± 1.8
EE	75.4[b]	88.2[a]	± 1.1
NFE	83.2[b]	90.5[a]	± 2.1
Nutritive values %			
TDN	79.0[b]	87.5[a]	± 2.3
DCP	14.0[b]	16.3[a]	± 0.9
Utilization of dietary N(g/h/d)			
NI	17.1[b]	23.8[a]	± 1.5
FN	4.6	3.5	± 0.5
UN	6.1	12.8	± 0.9
DN	12.5	20.3	± 1.2
NB	6.4[b]	7.5[a]	± 0.9

a and b different letters indicate significant difference (P = 0.05)

* NR = Natural rearing at 12 weeks old

** EW = early weaning at 8 weeks old

Table 3: Effect of age at weaning on body weight gain, feed efficiency and feed cost/kg gain for Ossimi male lambs fed different rations during the period (2-8wks old)

Item	T1	T2
Mean feed intake g/h/d±SE		
Milk (m.l./h/d)[(1)]	342±37.68	347±37.68
Starter (g/h/d)	185	188
DMI (g/h/d)	212±6.0	215±7.0
EngI (Mcal/h/d)	0.45±0.03	0.46± 0.03
CPI (g/h/d)	54±2.4	55±2.8
Body weight gain±SE		
Av. Initial B.W (kg)[(2)]	3.80±0.25	3.70±0.25
Av. Final B.W (kg)[(3)]	8.80±0.46	8.60±0.82
Total B.W. gain (kg)	5.0±0.37	4.9±0.54
Av. daily gain (g)	102±7.0	100±6.0
Feed efficiency and feed cost (pt.) kg gain±SE		
Kg DMI / Kg gain	2.10±0.03	2.20±0.03
Energy I Mcal/kg gain	4.4±0.11	4.6±0.11
Kg CPI / Kg gain	0.53±0.01	0.55±0.01
Feed cost (pt.) kg gain	177±9.0	181±11.0

a and b different letters indicate significant difference (P = 0.05).

(1) Current price of 1 kg ewes milk =160 pt.

(2) Av. Initial B.W = 7 days old.

(3) Final B.W = 8 weeks old.

was another stimulating factor in enhancing DM intake for such group.

Digestibility coefficients as shown in Table 2 indicated higher ($p<0.05$) values for the same ration by the early weaned groups lambs. This result may be suggested that weaning lambs as early as 8 weeks of age led to develop the capability of such lambs at an earlier age. According to Walker and Walker [10], the rumen microorganisms of 3-week-old lambs can digest as wide a variety of carbohydrates and proteins as can those found in the adult sheep. Moreover, Hinds *et al.* [11]found that lambs weaned at 6 weeks grew as well as those weaned at 9 weeks when fed *ad lib*. On the other hand, Brownlee [12] reported that weaning at 8-12 weeks is becoming fairly common in breeds which have relatively low milk yield, while Barnicoat *et al.*. [13] pointed out to insignificant difference in performance from weaning to slaughter between lambs weaned at 9,12 and 16 weeks.

Nutritive values of creep feeding ration (Table 2) indicted higher ($p<0.05$) nutritive values in different terms for the same ration by early weaned lambs. The highest nutritive values exhibited by the early weaned group may be attributed to the early weaning practice which led to activate and promote developed rumination by such group of lambs indicating well developed fermentation process.

Utilization of dietary N indicated higher ($p<0.05$) NI by early weaned lambs due to the higher ($p<0.05$) DMI, which led in turn to higher ($p<0.05$) N retention due to the well developed rumination and fermentation in comparison with the later weaned lambs. According to Ørskov *et al.* [14] the lack of ruminal development in milk-fed newborn animals may be due to the effective shunting of milk directly to abomasum by the reflexive closure of the reticular groove, thus preventing substrate for the establishment of ruminal fermentation from entering the rumen.

The higher developed rumination and fermentation in early weaned lambs led to improve the utilization of dietary N intake (85.5% CP digestibility, Table 2), which led to retain more dietary N. Commonly, NI, ND and N retention, were in favor of the early weaned group in comparison with the corresponding natural weaned lambs.

Effect of Age at Weaning on Lamb's Performance (2-8 Weeks Old): Data presented in (Table 3), showed in general similar milk and creep feeding intakes for both early and natural – fed groups and without significant differences between them.

As a result, no-significant differences were detected between the two reared groups in DMI, gross energy and CPI g/h/day. Also, early weaned lambs showed same final live body weight, total and daily body weight gains in comparison with the natural weaned group lambs during the earlier few weeks of their life, in spite of the similar initial live body weight and the similar intake of both the two groups.

Table 4: Effect of age at weaning on performance of Ossimi male lambs (9-2 weeks old)

Item	T1	T2
Mean feed intake g/h/d±SE		
Milk (ml/h/d)(1)	157	--
Starter (g/h/d)	487	637
DMI (g/h/d)	463±11	579±13
ENI (Mcal/h/d)	1.09±0.12	1.40± 0.14
CPI (g/h/d)	102±9.0	122± 10
Body weight gain±SE		
Av. Initial B.W (kg) (2)	8.80±0.5	8.60±0.8
Av. Final B.W (kg) (3)	14.10± 1.4	15.10±1.3
Total B.W. gain (kg)	5.30 ^{b}±0.8	6.50 ^{a}±0.7
Av. Daily gain (g)	189 ^{b}±26	232 ^{a}±25
Feed efficiency and feed cost (pt.) kg gain±SE		
Kg DMI / Kg gain	2.4±0.3	2.5±0.2
Energy I Mcal/kg gain	5.8±0.4	6.0±0.5
Kg CPI / Kg gain	0.54±0.04	0.53±0.04
Feed cost (pt.) kg gain	298 ^{a}±15	183 ^{b}±12

a and b different letters indicate significant difference (P = 0.05)

(1) Current price of 1 kg ewes milk =160 pt.

(2) Av. Initial B.W = 9 weeks old

(3) Final B.W = 12 weeks old

Similar results were obtained by Bonsma and Engela [2], who found that lambs weaned at 8 weeks of age had the same growth rate as un-weaned controls (10 weeks). Alhadrami *et al.*. [15] indicated that age at weaning affected ($p< 0.009$) average daily gain and feed conversion ratio in favor of the early weaned group lambs (8 weeks), in spite of their higher ($p<0.009$) DMI in comparison with the late-weaned lambs (12 weeks). Feed efficiency, feed costs and economic costing were not statically differ between the groups.

Effect of Age at Weaning on Lamb's Performance (9-12 Weeks Old): Data presented in (Table 4) illustrated the performance of both the early and natural weaned groups during 9-12 weeks of age. As shown, lower milk intake (157 ml/h/day) was available for the natural weaned group lambs. Daily dry mater intake was higher for early weaned group compared with the control (637 *vs* 487 g/h/day) with significant difference between them. Also, EngI and CPI intake were found to be in the same trend obtained of DMI. This may be related to the higher solid feed intake for lambs in the second group which encouraged them to accelerate solid feed to satisfy their daily requirements. In addition, it could be suggested that the natural rearing group consumed lower amount of solid feed because of suckling their dams. On the other hand, the early weaned lambs seem to have the suitable daily requirements relative to their age and live body weight.

As for the effect of age at weaning on lambs gains, it was shown higher ($p<0.05$) final live body weight in favor of the early weaned group lambs as a result to their higher ($p<0.05$) daily gain during their later life (232 g/h/day) in comparison with the natural weaned group lambs (189 g/h/day). However, both the two age groups had similar live body weight at the age of 8 weeks. Similar results were obtained by Schichowski *et al.* [16], who reported that lambs weaned at 8 weeks of age had greater ($P = 0.004$) ADG compared with lambs weaned at 16 wk of age. While, Holcombe *et al.* [17] concluded that early (30 days) and natural (60 days) weaned groups showed similar final live body weight after weaning, in spite of the higher ($p< 0.05$) intake of the early weaned group lambs. Also, Samy [18] found that similar final live body weight for both the two ages weaning groups (8 or 12 wks) being a result to the higher ($P<0.05$) daily gain for natural weaned group one (277.55 g/h/day) during 9-12 weeks of age.

Feed efficiency results (Table 4), showed similar values in different terms with nearly 60% costs/kg gain in comparison with the natural weaning (183 *vs* 298 pt/kg gain). This might be due to the higher cost and lower dry mater content of milk.

These results clearly indicated that, increasing solid feed consumption by early weaning stimulates rumen morphological development [4]. Also, the important component in successful newborn rearing programs is an early transition to starter grain. Also, this result might due to the increasing of solid- feed for lambs of T2 by early weaning, which enhanced the production of VFA's, which in turn activated the papillary development of such group biologically and functionally and this might be increased the utilization from ingredients of the diet which reflected on lambs gain and efficiency.

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