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The Effects of Early Weaning and Crossing with Chios on Fattening Performance of Local Lambs in the United Arab Emirates

Abstract: Thirty four male lambs were used (20 purebred local and 14 crossbreds resulting from breeding local ewes with Chios rams). Lambs of each group were weaned either early at 8 weeks or late at 12 weeks of age. Following weaning, lambs were fed for 8 weeks ad libitum before slaughter. Diet consisted of Rhodes grass hay and pelleted concentrates.

Genotype of lamb affected significantly initial body weight ($P < 0.021$), roughage intake ($P < 0.049$) and Longissimus dorsi area ($P < 0.030$). Crosses of Local x Chios excelled the pure locals in growth performance and carcass traits. Crossbreds had higher average daily gain (187 Vs. 163 g/d), better feed efficiency (3.80 Vs. 4.03 kg DM/Kg BW gain) and heavier carcasses and saleable parts (10.2 Vs. 8.8 Kg); differences, however, were insignificant.

Age at weaning affected significantly DM intake ($P < 0.009$), body length ($P < 0.001$) and fat thickness over the 9th rib ($P < 0.05$). Late weaned lambs scored higher estimates, while early weaned lambs showed better average daily gain, total weight gain, feed conversion ratio and less fat in meat. However, differences were not significant. Effects of interaction of genotype x weaning age were all not significant. Results indicated that crossing local sheep with Chios and use of early weaning would be beneficial in increasing meat productivity of slaughter lambs under intensive production system in the UAE.

تأثير الفطام المبكر والخلط مع الكيوس على تسمن الحملان المحلية في الإمارات العربية المتحدة.

المستخلص: استخدم في هذا البحث 34 حملا (20 محلي أصيل و 14 خليط بين النعاج المحلية وكباش الكيوس). فطمت حملان كل مجموعة أما مبكرا عند عمر 8 أسابيع أو متأخرا عند عمر 12 أسبوعا. غذيت الحملان بعد الفطام حتى الشبع لمدة 8 أسابيع ثم ذبحت. تكونت العلائق من حشيشة الرودس وخليط مركز محبب.

أثر التركيب الوراثي للحمل معنويا علي الوزن الابتدائي ($P<.021$) وكمية العلف الخشن المستهلك ($P<.049$) ومساحة العضلة العينية ($P<.030$) حيث تفوقت الحملان الخليطة. كما كان للحملان الخليطة أيضا زيادة يومية مكتسبة أعلى في الوزن (187 مقابل 163 جم / يوم) ومعدل تحويل غذائي أفضل (3,8 مقابل 4,03 كجم مادة جافة / كجم زيادة وزنية) وكذلك أوزان أعلى للذبح والأجزاء المباعة ولكن كانت الفروق غير معنوية.

أثر العمر عند الفطام معنويا على كمية المادة الجافة المأكولة ($P<0.09$) وطول الجسم ($P.001$) وسمك طبقة الدهن عند الضلع التاسع ($P<.05$) حيث سجلت الحملان المفطومة عند عمر 12 أسبوعا متوسطات أعلى بينما أظهرت قريناتها المفطومة مبكرا زيادة مكتسبة يومية أعلي وكفاءة تحويلية أفضل ونسبة دهن أقل في اللحم ولكن هذه الفروق كانت غير معنوية. وكذلك كانت كل تأثيرات التداخل (التركيب الوراثي X عمر الفطام) غير معنوية.

أشارت النتائج إلى أن الفطام المبكر والخلط مع الكيوس يمكن أن تكون مفيدة في زيادة إنتاجية اللحوم من حملان التسمين تحت نظم الإنتاج المكثف في دولة الإمارات العربية المتحدة.

Introduction

Sheep and goats are important animals in the United Arab Emirates (UAE). They are well adapted to the prevailing harsh environment and local population prefers their meat. Their production is 13000 metric tones, representing 57% of the domestic red meat produced in UAE. (AOAD, 1991). Local sheep in UAE are black (sometimes patched with brown) and coarse-wooled. They are thin-tailed (with slightly thicker base) and small in size; males are mostly horned and females unhorned. Productivity of sheep and goats are considered inefficient. Intensive lamb production is suggested and increasingly practiced as an effective means for improvement of meat production. Two

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procedures for intensification evaluated in the present study were crossbreeding and early weaning.

Numerous studies indicated that lamb production can be effectively improved by using crossbreeding (Dickerson, 1969; Dickerson et al., 1975; Galal et al., 1975; Nitter, 1978; Aboul-Naga and Aboul-Ela, 1987). Chios, which has larger size, better reproductive efficiency with reasonable adaptability to UAE climates, was adopted for crossing with local sheep. Aboul-Ela and Aboul-Naga (1987) stated that Chios was successfully used for improving fecundity of some subtropical fat-tailed breeds.

Weaning age varies greatly in sheep depending on production system. Early weaning proved to be essential for intensive lamb production; it enhances lamb crop and, profitability as well as meat quality (Aboul-Naga et al., 1980; Pope et al., 1984; Al-Saigh and Al-Timimi, 1987; and Ørskov, 1987).

The objective of the present study was to determine the effects of crossing local sheep with Chios and early weaning on the fattening performance of slaughter lambs in the UAE.

Materials and Methods

This experiment was conducted at the Faculty of Agricultural Sciences experimental farm, Al-Ain, UAE. Thirty four male lambs born during October and November, 1992 were used; 20 were purebred local and 14 were crosses resulting from breeding local ewes with Chios rams. Lambs of each group were weaned at either of two dates: early at 8 weeks and late at 12 weeks of age.

After weaning lambs were housed in individual open shaded feeding pens. Lambs were fed ad libitum diet consisted of Rhodes grass (Chloris gayana) hay and pelleted concentrates (comprised of commercial grain mix) with free access to water. Chemical composition of feed is shown in Table 1.

Table 1: Chemical composition of experimental feed (g/kg)

	Concentrates	Rhodes grass
Dry matter	91	96
Crude protein	138	125
Ether extract	50	19
Crude fiber	72	268
NFE[1]	672	441
Ash	68	147

[1] Nitrogen free extract.

Weaned lambs were fattened for 8 weeks before slaughter. Lambs were weighted and body measurements (height at withers, chest circumference, body length and hips width) were recorded at birth, weaning and biweekly then after. Feed intake was recorded daily for each individual lamb and then calculated on DM basis. Feed conversion ration (FCR) was calculated as total DM consumed /respective body weight gain. Hot carcass organs were also recorded. Joint cut of the 9, 10 and 11th ribs was dissected into lean, fat and bone. Fat thickness and Longissimus dorsi area were measured to indicate physical composition of the carcass. Samples of Longissimus dorsi muscles were chemically analyzed (AOAC, 1986).

The data were analyzed by Least Squares Technique using the general linear model procedure of SAS (1985). The following model was used:

$$Yijk = u + gi + tj + (gt)ij + eijk \text{ where}$$

Yijk is an observation taken on the k th type of weaning of the i th genotype; u is the overall mean; gi is the effect of the i th genotype, tj is the effect of the j th type of weaning, gt(ij) is the effect of interaction of genotype x type of weaning; and eijk is the error term.

Results and Discussion

The least squares means of feed intake, average daily gain (ADG) and feed conversion ratio (FCR) during the eight weeks of fattening are shown in Table 2. Crosses of local x Chios had higher roughage and concentrate intake but the difference was only significant ($P < .049$) in the case of roughage. Even though crossbreeding with Chios increased ADG (24 g/d, 15% over local breeds), difference was not significant. Also, crossbreds tended to be more efficient converters of feed than local lambs, FCR was 3.80 and 4.03 Kg DM/Kg BW gain for the two genotypes, respectively. It is worthy to note that ADG of pure local ram lambs (163 g/d) is comparable to those reported for Awassi, Chios and Cyprus fat-tailed sheep (100 – 200 g/d) (Gatenby, 1986). However, this rate of gain produced lambs of 19 kg at an average age of 126 days, which is much less than the 28 kg reported for Omani lambs by Maghoub and Lodge (1994) who estimated post-weaning ADG to be 260 g/d.

Late weaned lambs consumed higher amount of concentrates ($P < .005$), scoring greater total DM intake ($P < .009$) with relatively lower ADG and

higher FCR estimates. Early weaned group required 13.5% less feed to gain an increase of one-kg BW. The higher DM intake coupled with the lower feed efficiency observed for late weaned lambs may be due to their more advanced stage of growth and hence deposition of more fat rather than lean.

Means of initial BW, BW gain and BW and body dimensions at slaughter are presented in Table 3. Genotype affected significantly initial body weight ($P < .025$), slaughter weight ($P < 0.010$), chest girth ($P < .007$) and body length ($P < .021$). Crosses of local x Chios were heavier at both start and slaughter times with higher estimates of heart girth and body length. They also had larger weight gain during the fattening period (9.8 Vs. 8.7 kg), however, the difference was significant ($P < 0.087$). Late weaned lambs had higher estimate body length ($P < .0003$) and tended to have heavier slaughter weight (21.9 Vs. 20.0 kg) but the difference was insignificant ($P < 0.207$).

The crossbred lambs had heavier carcasses (9.63 Vs. 8.30 kg) and larger amount of saleable parts (10.22 Vs. 8.79 kg) as shown in Table 4), the difference in both traits was insignificant. On the other hand, local lambs showed better dressing percentage (53.1 Vs. 50.4%), again, the difference was insignificant. Despite crossbred lambs had heavier non-carcass offals (head, hide and legs), they produced 16% greater saleable parts than did the pure local lambs.

It is of interest to note that fat weight did not differ significantly between the two genotypes and total non-carcass fat weighed almost the same for both local and crossbred lambs (830 Vs. 844 g). Overall mean of tail fat weight was 292 grams. Crossbred lambs had heavier fat tail (390 Vs. 275 g). It should be stated here that local sheep in UAE are not typically fat tailed. Mahgoub and Lodge (1994) reported 596 g for tail weight of Omani ram lambs weighing 28 kg. It should be mentioned also that the Chios breed was derived from thin-tailed Greek Zackel and fat-tailed Karman breeds (Mason, 1967). These facts may mean that using Chios for crossing with local sheep in UAE would not affect carcass market acceptability of produced slaughter lambs although the number of lambs used could not make a final judgement. Late weaned lambs had heavier carcass weight (9.60 Vs. 8.34 kg) and better dressing percentage (53.6 Vs. 50%), but the differences were insignificant.

The traits representing physical and chemical composition of rib cuts are shown in Table 5. Crosses of Chios x local breed had larger LDA ($P < 030$) indication greater meat yield. This finding is consistent with the finding of greater saleable parts in crossbred lambs (Table 2). Also, crossbred lambs tended to have higher lean and lower fat percentages in their rib cuts, but the differences were not significant. Meanwhile, the relatively higher percentage of ether extract obtained for crossbred showed their tendency to produce meat with higher intramuscular fat and hence more marbling than do their pure local mates. On the other hand, late weaned lambs had thicker fat over the 9th rib (1.73 Vs. 1.27 mm., $P < .055$), greater separable fat (24.1 Vs. 22.5%) and higher percentage of ether extract (3.19 Vs. 2.41%), which indicate higher ability to deposit fat both inter and intramuscularly. Marked fatness of late weaned lambs is expected since they were four weeks older at slaughter than were early weaned lambs.

The results obtained from the present study indicate that when Chios blood is introduced to increase prolificacy in local sheep through crossing, such practice would have also an advantage of increased meat production efficiency in the produced male lambs. The early weaning practice required for the implementation of producing more than one lamb crop/year under intensive production system may also be advantageous in increasing the efficiency of meat production from the fattened lambs. However, meat quality and economic evaluation should be determined before accurately judging the feasibility of these two practices. More research with large numbers of lambs is required before applying these recommendations on the farm level.

Table 2: Least squares means[1] of feed intake, average daily gain and feed conversion of local lambs and their crosses with Chios

Trait	Genotype (G)		Type of Weaning (T)		SEM	Significance		
	Local	Crossbred	Early	Late		G	T	GXT
Roughage DM intake (kg)	12.6^{b}	14.2^{a}	12.8	13.9	0.55	*	NS	NS
Concentrate DM intake (kg)	22.4	23.2	21.4^{b}	24.2^{a}	0.64	NS	**	NS
Total DM intake (kg)	35.0	37.4	34.2^{b}	38.1^{a}	0.95	NS	**	NS
Average daily gain (g/d)	163	187	176	174	9.13	NS	NS	NS
FCR[2]	4.03	3.80	3.70	4.20	0.21	NS	NS	NS

NS = Nonsignificant; * = P < .05; ** = P < .01;
[1]Means within classification, within rows, followed by different letters significantly (P < .05)
[2]FCR = Feed conversion ratio = kg DM consumed/kg BW gain.

Table 3: Least squares means[1] of body weight and body dimensions of local lambs and their crosses with Chios

Trait	Genotype (G)		Type of Weaning (T)		SEM	Significance		
	Local	Crossbred	Early	Late		G	T	GXT
Initial weight (kg)	10.2^{b}	13.2^{a}	10.5	12.9	0.90	*	NS	NS
Final weight after fattening (slaughter weight) (kg)	18.9^{b}	23.0^{a}	20.2	21.9	1.07	**	NS	NS
Height at withers (cm)	55.9	58.3	56.4	57.8	0.99	NS	NS	NS
Chest girth (cm)	61.8^{b}	67.2^{a}	63.2	65.7	1.33	**	NS	NS
Body length (cm)	39.3^{b}	42.0^{a}	38.5^{b}	42.8^{a}	0.74	*	** *	NS
Hips width (cm)	11.6	12.20	11.6	12.1	0.30	NS	NS	NS

NS = Nonsignificant; * = P < .05; ** = P < .01; *** = P < .001
[1]Means within classification, within rows, followed by different letters significantly (P < .05)

Table 4: Least squares means of carcass characteristics of local lambs and their crosses with Chios

Trait	Genotype (G)		Type of Weaning (T)		SEM	Significance		
	Local	Crossbred	Early	Late		G	T	GXT
Hot carcass (kg)	8.30	9.638.34	9.60	0.55	0.64	NS	NS	NS
HCW/EBW[1] (%)	53.1	50.4	50.0	53.6	2.98	NS	NS	NS
Saleable parts[2] (kg)	8.79	10.22	8.88	10.13	0.57	NS	NS	NS
Tail fat	0.275	0.309	0.258	0.326	0.05	NS	NS	NS
Total fat weight[3] (kg)	0.830	0.844	0.716	0.958	0.11	NS	NS	NS

NS = Nonsignificant; * = P < .05;
[1]HCW, Hot carcass weight; EBW, Empty body weight = Slaughter weight - gut fill weight;
[2]Saleable parts - HCW + liver + kidneys + heart + spleen;
[3]Sum of kidney fat, caul fat, heart fat, pelvis fat and gut fat.

Table 5: Least squares means[1] of traits representing carcass composition of local lambs and their crosses with Chios

Trait	Genotype (G)		Type of Weaning (T)		SEM	Significance		
	Local	Crossbred	Early	Late		G	T	GXT
LDA[2] (cm^2)	7.60[b]	9.68[a]	8.55	8.74	0.64	*	NS	NS
FT[3] (mm)	1.42	1.58	1.27[b]	1.73[a]	0.16	NS	*	NS
Physical Dissection (%)								
Lean	49.2	50.6	50.8	49.0	1.86	NS	NS	NS
Fat	24.3	22.3	22.5	24.1	1.75	NS	NS	NS
Bone	26.5	27.1	26.7	26.9	0.98	NS	NS	NS
Chemical composition (%)								
Moisture	76.6	75.6	76.6	75.6	0.37	NS	NS	NS
Protein	19.9	20.1	19.8	20.2	0.21	NS	NS	NS
Ether Extract	2.20	2.81	2.41	3.19	0.78	NS	NS	NS
Ash	1.12	1.18	1.11	1.13	0.04	NS	NS	NS

NS = Nonsignificant; * = P < .05;
[1]Means within classification, within rows, followed by different letters differ significantly (P<.05); [2]LDA = Longissimus dorsi area;
[3]FT = Subcutaneous fat thickness

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