Weaning time, structure of rations and sex as the factors in production of qualitative lamb

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Many problems appeared, with introducing a modern technology in the intensive lamb production, but the influence of some genetic and paragenetic factors on the yield and quality of lamb should not be neglected.

There are many reports in the literature on the effects of breed, feed, management practices, age and sex on the yield and quality of lamb. Paul *et al.* (1964) found that the cuts from the old crop lambs — Suffolk x (Rambouillet x Columbia) — 11 to 12 months old, weighed more, contained a higher percent of lean and lower percent of bone, a lower percent of moisture and higher percent of fat (in lean tissue) than cuts from the new crop (5.5 months old). The type of feed (trefoil and ladino pasture) for 60 days prior to slaughter produced no marked difference in the yield of lean, fat, or bone in the raw cuts, although of the group of lambs the cuts from the feedlot animals (alfalfa hay plus whole barley) were significantly higher in percent lean.

The reports on the influence of fat on palatability of lamb meat are conflicting. Cover *et al.* (1944) and Wilcox and Galloway (1952) found little relationship. Workers in Nebraska (1930) reported that increased fat yielded roasts that were more tender and juicy, with a less pronounced and more desirable flavor in the lean. Weber *et al.* (1931) found that as fattening progressed, the flavor of the lean became less pronounced but the tenderness was not affected. Weber and Loeffel (1932) reported that roasts from weanling lambs were less pronounced in aroma and flavor of fat and lean, but more tender and juicy, than roasts from lambs fed 28 days after weaning. Palsson (1940) stated that bone increased least, lean only slightly more, and fat most as the sheep aged from 4.5 to 13 months. Callow (1950), however, found that young sheep fattened more slowly than older ones, and deposited less fat and more protein. Batcher *et al.* (1962) reported that, with increasing percent separable fat, the percent of lean and bone decreased, while the ether extract increased and the moisture decreased in the lean. Tenderness, juiciness, and flavor were not affected by percent separable fat. The authors,

from a study of the effect of weight and age on flavor and juiciness of lamb, weaned on the 120th day, and fed by mixtures, reported that meat of lambs aged over 6 months was more tender than from younger lambs but with more »natural» flavor of the lean. Murphy *et al.* (1966) reported of the effect of weight of separable cuts on physical and chemical composition of lamb and mutton.

This paper, considering the intensive breeding of early weaned lambs is an interesting problem, as a part of the results of a many-faceted study, reports on weaning time, structure of rations and sex as the factors in production of qualitative lamb.

EXPERIMENTAL PROCEDURE

Tests were made on 131 lambs, all of meliorated Ovćepolska sheep. As the yield and quality of lamb were studied from the aspect of weaning time, structure of rations and sex, the experimental lambs were divided into the following groups:

1. — From the aspect of weaning time

Group A — 18 male and 18 female, weaned on the 28th day;

Group B — 18 male and 19 female, weaned on the 35th day;

Group C — 18 male and 19 female, weaned on the 42nd day;

Group D(control) — 11 male and 10 female, sucking to the 112th day.

2. — From the aspect of feeding

Independently of weaning time, the lambs were divided into three groups:

Group A_1 — 26 male and 28 female, fed by limited quantities of mother's milk and mixture ad libitum;

Group B_1 — 28 male and 28 female, fed by limited quantities of mother's milk, mixture and meadow hay ad libitum and

Group C_1 (control) — 11 male and 10 female, fed by total quantity of mother's milk, and mixture and meadow hay ad libitum.

3. — From the aspect of sex

Independently of weaning time and feeding, the lambs were divided into two groups, according to sex: 65 male and 66 female.

Every lamb from A_1 and B_1 had 20.74, and from C_1 50.30 kg of milk. Feeding treatment, energy and protein values of the used mixtures, and lambs weighing during experiment, are reported in another paper (Sokarovski *et al.*, 1969).

All lambs were killed after 112 days The carcasses were weighed after cooling of 24 hours. Every chop (11,12 and 13 rib, from left side) was weighed and physically separated while cold into lean, fat, bone and waste. The cross-section area of m. longissimus dorsi (MLD) and fat tissue, behind 13th rib, was determined by planimeter. Chemical composition of MLD was determined

as follows: moisture (drying at 105° C, for 24 h), protein (micro Kjeldahl) and lipids (ether extract — Soxhlet). The panel included 10 persons. The samples were served hot and scored in scale ranged from +5 to —5, with descriptive terms, as follows: tenderness, very tender to very tough; juiciness, very juicy to very dry; natural flavor of lean, none to very pronounced; general acceptability, very good to very poor.

The effect of studied factors was followed through carcass weight, physical composition of carcass (on the base of 11, 12 and 13 rib), cross-section area and chemical composition of MLD, and taste panel scores.

RESULTS AND DISCUSSION

Initial and final live weight of lambs and dead weight too, are shown in Table 1. Dead weight is better in control than in experimental animals. There

Table 1. *Effect of weaning time on total gain and dead weight of lambs*

Group	Weight of the 1st day (kg)		Weight of the 112th day (kg)		Dead weight (%)	
	Male	Female	Male	Female	Male	Female
A	3.90	3.97	31.44	27.60	47.04	48.61
B	4.14	4.04	31.77	28.12	48.44	48.64
C	4.23	3.86	32.12	26.37	47.26	46.69
D	3.94	3.97	27.41	25.74	50.16	51.51

is no marked difference among experimental groups in relation to gain and dead weight. By using t-test, it was stated that differences of mean values, from the aspect of weaning time and feeding, between control and experimental groups, are significant at P =.01 and P=.001.

The effect of weaning time, feeding treatment and sex on rib-chops weight and physical composition of meat, is shown in Table 2. The later experimental lambs are weaned, the higher absolute rib-chops weight. That weight of experimental lambs is higher than of control group. Rib-chops from the lambs of B_1 group weighed more in relation to A_1. Rib-chops of male lambs weighed more than from female ones, except of control group.

The percent of lean is pretty high. The reason of it is, we suppose, that lean of lambs in age to 4 months, increases more than fat and bone. From the aspect of weaning time, the highest percent of lean contains meat from lambs of C, and from the aspect of feeding treatment, meat from lambs of A_1 group.

The percent of fat is lower, in comparison with other authors (4,7). Per-

cent of fat decreases with increasing the weight of rib-chops. It ishigher in female than in male lambs. Increasing fat, percentage of bone decreases.

Table 2. *Influence of weaning time, feeding and sex on weight and physical composition of lamb rib-chops*

	From aspect of		*Weaning time*				*Feeding*			*Sex*
	Group		*A*	*B*	*C*	*D*	A_1	B_1	C_1	—
		$\bar{X}$	273	283	296	253	269	298	253	279
Weight of	Male	S	43	42	51	50	41	47	50	49
chop		$\bar{X}$	252	253	256	261	246	261	261	255
(g)	Female	S	46	38	50	28	40	46	28	42
		$\bar{X}$	57.15	55.47	59.69	58.15	57.78	57.11	58.15	57.56
Separable	Male	S	5.31	3.23	7.06	6.71	5.46	5.96	6.71	5.81
lean (%)	Female	$\bar{X}$	55.43	53.10	59.27	49.72	57.33	54.55	49.72	55.00
		S	4.83	6.17	6.93	3.19	7.18	5.49	3.19	6.50
		$\bar{X}$	23.57	23.49	18.92	23.18	22.93	21.12	23.18	22.19
Separable	Male	S	6.06	4.50	7.52	6.69	6.47	8.03	6.69	6.43
fat (%)	Female	$\bar{X}$	26.01	28.11	21.42	31.36	24.21	26.12	31.36	26.10
		S	5.70	7.67	7.19	1.70	7.04	7.69	1.70	7.44
		$\bar{X}$	16.17	15.96	17.17	15.57	15.62	17.19	15.57	16.29
Bone (%)	Male	S	2.93	2.36	4.42	4.73	3.41	3.13	4.73	3.57
	Female	$\bar{X}$	13.99	14.46	15.08	15.59	14.77	14.25	15.59	14.68
		S	2.20	2.39	2.58	3.71	2.12	2.65	3.71	2.88
		$\bar{X}$	3.10	4.99	4.21	3.10	3.67	4.51	3.10	3.93
Waste (%)	Male	S	1.52	1.50	1.80	1.10	1.64	1.62	1.10	1.66
		$\bar{X}$	4.61	4.21	3.64	3.29	3.61	4.68	3.29	4.01
	Female	S	4.30	1.45	2.25	1.34	1.93	3.53	1.34	2.53

By using t-test, it was stated, that differences of mean values of lean, from the aspect of weaning time, are significant among the groups BC ($P = .01$) in male and AD, CD ($P = .001$) and BC ($P = .01$) in female; from the aspect of feeding, in groups B_1C_1 ($P = .05$) and A_1C_1 ($P = .01$) in female, and from the aspect of sex at $P = .05$. Fat, from the aspect of weaning time, in groups AC and BC ($P = .05$) in male and AC ($P = .05$), AD and BC ($P = .01$) and CD ($P = .001$) in female; from the aspect of feeding treatment, in groups A_1C_1 ($P = .01$) in female; from the aspect of sex at $P = .01$. Waste, from the aspect of weaning time, in groups AC and BD ($P = .01$) in male.

The effect of mentioned factors on cross-section area of MLD, is shown in Table 3. Mean values of experimental lambs (male and female) are higher in comparison with control, from all aspects. MLD area is bigger in male than in female lambs. In general, the fat tissue area is a little bit bigger in experimental animals but only from the aspect of weaning time. According

to t-test, the differences of mean values of MLD area, from the aspect of weaning time, are significant in male, among groups AD, BD and CD at $P = .05$, and in female in AD and BD ($P = .01$); from the aspect of feeding treatment, in male, in group A_1C_1 ($P = .01$), and in female A_1B_1 and A_1C_1 ($P = .05$); from the aspect of sex there is a significance at $P = .05$. The

Table 3. *Effect of weaning time, structure of rations and sex on MLD and fat tissue cross-section area (cm^2)*

Group	MLD				Fat tissue			
	Male		Female		Male		Female	
	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S
				From aspect of weaning time				
A	14.47	2.33	14.29	2.14	3.21	0.69	3.17	1.27
B	14.60	1.83	14.02	2.19	3.53	1.43	3.57	0.75
C	15.34	3.16	13.16	2.15	2.55	1.08	2.49	0.75
D	12.88	1.29	11.96	1.38	2.86	0.83	2.98	0.90
				From aspect of feeding treatment				
A_1	15.24	2.45	14.50	1.73	3.10	1.22	2.98	0.86
B_1	14.36	2.50	13.10	2.59	3.09	1.12	3.15	1.21
C_1	12.88	1.29	11.96	1.38	2.86	0.83	2.98	0.90
				From aspect of sex				
	14.48	2.44	13.53	2.17	3.06	1.11	3.05	1.02

differences of mean values of fat tissue area, from the aspect of weaning time, are significant at $P = .05$ among groups AC in male and female and BC in male ($P = .05$) and female ($P = .001$); feeding and sex do not show marked differences.

Mean values of moisture and ether extract of MLD are shown in Table 4. There is no marked difference in percentage of moisture and ether extract in all groups, regardless from which aspect are observed. Weaning time, structure of rations and sex did not show any effect in relation to chemical composition of MLD. Results of t-testing confirmed that there were no marked differences in mean values.

Table 4. *Moisture and ether extract content of lamb MLD (%)*

Group	Moisture				Ethere extract			
	Male		Female		Male		Female	
	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S
				From aspect of weaning time				
A	74.11	1.77	75.01	1.58	2.54	0.53	2.78	0.30
B	75.48	0.79	73.00	3.84	2.21	0.82	2.40	0.62
C	74.04	2.74	74.90	1.06	2.31	0.38	2.62	0.68
D	75.22	0.30	73.69	2.00	2.22	0.60	2.26	0.50
				From aspect of feeding treatment				
A_1	74.59	1.55	74.64	1.39	2.22	0.65	2.57	0.65
B_1	74.50	2.37	73.96	3.34	2.48	0.53	2.63	0.47
C_1	75.22	0.30	73.69	2.00	2.22	0.60	2.26	0.47
				From aspect of sex				
	74.64	1.81	74.21	2.41	2.33	0.58	2.55	0.54

Table 5. *Average panel scores for lamb*

Group	Tenderness		Juiciness		Flavor of lean		Gen. acceptability	
	Male	Female	Male	Female	Male	Female	Male	Female
				From aspect of weaning time				
A	2.0	2.5	2.2	2.6	2.4	2.5	2.6	2.8
B	2.3	2.3	2.8	3.3	2.7	3.4	3.3	3.4
C	2.6	3.0	2.5	2.8	2.8	2.6	3.1	3.1
D	3.1	3.5	2.9	3.0	3.2	3.2	3.1	3.1
				From aspect of feeding treatment				
Af	2.4	2.9	2.6	3.1	2.6	3.2	3.0	3.4
Bf	2.2	2.5	2.4	2.7	2.6	2.7	2.9	2.8
Cf	3.1	3.5	2.9	3.0	3.2	3.2	3.1	3.1
				From aspect of sex				
	2.4	3.0	2.1	2.9	2.7	3.0	3.0	3.4

Panel scores (Table 5) show the later weaned lambs, the more tender meat. That is the same for juiciness and general acceptability, except the lambs from B group, which meat is more tender and very good, despite they were weaned earlier than those from C group. Less pronounced and desirable flavor retains in meat of later weaned lambs. These findings are quite similar

to findings of Weber et al. From the aspect of feeding it can be stated that meat of lambs from B_1 was scored a little bit worse, relative to quality. We do not know the reason of it. From the aspect of sex, meat of female lambs was scored better, nearly in all cases.

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