4. RESULTS AND DISCUSSION

4.1. The effect of breed-groups and age of lambs on:

4.1.1. Body weights and daily gain, from 3 months to yearling, of lambs subjected to 3 periods of fattening:

Table (1) indicates that the averages of initial and final live body weights of the three fattening periods were 19.42 and 28.11, 31.73 and 37.38, 36.89 and 43.66 kg, respectively. These weights are nearly in accordance with the findings of Badreldin (1951) who found that body weights of Ossimi male lambs at 94, 184, 274 and 364 days old, were, 19.3, 31.16, 35.85 and 40.57 kg, respectively. Also nearly in agreement with Sharafeldin and Ghoneim (1966) who mentioned that the body weights of Ossimi male lambs were 30.1 and 42.1 kg at 33 and 49 weeks of age, respectively. Averages of weight of lambs, in the present study, at 3, 9, 12 months of age, are more than the weights of Ossimi male lambs reported by Imam (1962) which were 19.1, 30.4 and 34.9 kg at 4, 9 and 12 months of age. Averages of weights of experimental lambs at 6 and 12 months of age (28.11, 43.66 kg) were higher than the average weights, at the same ages, reported by Safa Al-Amin (1976) which were 24.50 and 37.67 kg and Hassona (1980) at 6 months which was 20.1 kg.

Least squares means of body weights of Ossimi and crossbred lambs show that crossing Ossimi rams with Rahmani ewes was not associated with increasing body weights of crossbred lambs relative to Ossimi lambs. The differences between means for each of initial and final weights of fattening period were statistically non-significant, however crossbred lambs slightly excelled Ossimi lambs. This result revealed that particularly in this experiment, the infusion of Ossimi blood into Rahmani sheep had not set

Table (1): Least squares means and standard errors of factors affecting initial and final body weights of lambs in fattening experiment.

Source of variation	No.	Initial weight (kg)	Final weight (kg)	Absolute weight increase(kg)
Age at fattening period				
3-6 months (A1)	13	19.42±2.03 b	28.11±2.47 b	8.69
6-9 months (A2)	14	31.73±1.97 a	37.38±2.40 a	5.65
9-12 months (A3)	19	36.89±1.68 a	43.66±2.04 a	6.77
Breeds group				
Ossimi (B1)	25	28.71±1.48	35.22±1.79	6.51
Crossbred (B2)	21	29.98±1.62	37.54±1.97	7.56
Interactions				
A1×B1	7	18.00±2.76	25.71±3.35	7.71
A1×B2	6	20.83±2.98	30.50±3.62	9.67
A2×B1	8	33.13±2.58	38.75±3.14	5.62
A2×B2	6	30.33±2.98	36.00±3.62	5.67
A3×B1	10	35.00±2.31	41.20±2.81	6.20
A3×B2	9	38.78±2.43	46.11±2.96	7.33
Overall mean	46	29.35±1.10	36.38±1.33	7.03

+ Means within classification, followed by different letters are significantly different ($P<0.05$) otherwise they are not. The same notation are followed in similar tables.

Table (2): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting initial and final body weights of lambs in fattening experiment.

Source of variation	d.f	Initial weight (kg)	Final weight (kg)
Age	2	22.35***	11.80***
Breed	1	0.34	0.76
Age × Breed	2	0.88	0.88
Remainder df	40		
Remainder MS		53.26	78.72
Coefficient of variation (CV%)		24.03	23.78
R^2		0.54	0.40
$\sqrt{R^2}$		0.74	0.63

R^2 = Coefficient of determination *** = Significant at ($P<0.001$)

up the hybrid vigor phenomenen. In addition to that, the unexpected trend, revealed in the present investigation, may be due to relatively small number of the available crossbred individuals used in this study. This result also may be due to that crossbred lambs grew faster than Ossimi lambs during the first fattening period (Table 3) while after 6 months usually lambs pass through a store period which means that they grew rather slowly (Hammond, 1983).

The analysis of variance in table (2) show that differences between body weights due to period of fattening effect were significant ($P<0.001$), while due to breed-group effect were non-significant. The non-significant effect of breed-group is in accordance with the findings of Badreldin (1951) working on the same Egyptian local breeds Ossimi and Rahmani lambs, who found that differences between the two breeds in body weights at 13, 26, 39 and 52 weeks of age were not significant. Farid et al., (1977) on Iranian fat-tailed sheep, Hassona (1980) with Barki, Ossimi, Rahmani lambs and their crosses with Ile de-France sheep, found that breed type did not show any significant effect on the average final weight after a fattening period started when lambs were 17-24 weeks and ended when they were 40 weeks. El-Said (1983) on Ossimi, Rahmani and their crosses, reported non-significant differences between body weights of purebred and crossbred lambs at weaning weights (4 months of age). El-Sayed et al., (1995) for Ossimi and 1/2 Rahmani×1/2 Ossimi at 4, 8 and 12 months of age, found that crossbreds were insignificantly different than the purebreds except at 12 months of age. Also, Arthur and Ahunu (1988) found that differences in breed type did not contribute significantly ($P>0.05$) to body weight of lambs at all ages up to 48 weeks.

On the other hand, superiority of crossbred lambs over the purebred one was proved by several Egyptian investigators working on different local and imported sheep breeds, including, Askar et al., (1954); Labban and Radwan (1963); Khalil (1966); Fahmy et al., (1969); Aboul-Naga (1970); Aboul-Naga et al., (1972); El-Kouni et al., (1974), El-Kimary (1975); Safa Al-Amin (1976); Aboul-Naga and Afifi (1980); El-Said (1983); Hassan (1984); Marzouk (1986); Hassan and El-Feel (1988); Mousa (1991); Hassan (1993); Abdel-Reheem (1994) and Marai (1998).

The mean coefficients of variation of lambs body weights (Table 2) for the initial and final weights were nearly the same as they were 24.03% and 23.78%, respectively. Coefficient of determination were 0.54 and 0.40, respectively which measure the contribution of the linear function of fattening periods as independent variables to the variation of initial and final body weights.

Table (1) also, shows that the highest absolute increase in body weight of lambs was in the first period of fattening (8.69 kg) from 3 to 6 months of age and the least absolute increase was in the second period of fattening (5.65 kg) while the third period of fattening was intermediate (6.77 kg). This result is expected as the average daily gains within the first period of fattening during the intervals 0 to 1.5 months, from 1.5 to 3 months and from 0 to 3 months, were 78.95, 115.01 and 97.20 gm/day, respectively (table, 3). While the average daily gain within the second period of fattening during the intervals 0 to 1.5 months, from 1.5 to 3 months and 0 to 3 months of age were 56.08, 70.42 and 62.50 gm/day, respectively. The intermediate averages of daily gains in the third period of fattening during the intervals 0 to 1.5 months, from 1.5 to 3 months and 0 to 3 months of age were 70.65, 82.05 and 75.54 g/day, respectively. Also

the first period of fattening had its effect when interacted with breed-group factor (Table 1) as absolute weight increase within this period were (7.71 and 9.67) which were higher than the corresponding values within periods in the second (5.62 and 5.67 kg) and third period of fattening (6.20 and 7.33 kg).

Least squares means of daily gains (Table 3) affected by age of lambs revealed that the average rates of daily gain increased gradually by ageing in the three fattening period. The averages of daily gains were more in crossbred lambs than in Ossimi purebred ones. However the differences between the averages of daily gains due to periods of fattening and breed-group and the interaction between them were non-significant. This result is in accordance with the findings of Badreldin (1951) working on Rahmani and Ossimi lambs, who found that, the differences between the two breeds, in post-weaning daily gain, during three age intervals (13-26, 26-39, 39-52 weeks) were non-significant. Farid et al., (1977), Hassan (1993) found that the effect of breed-group was not significant. While Safa Al-Amin (1976) found that the averages of daily gain for Ossimi, Rahmani and crossbred lambs at 8 months old were 34, 55 and 63 gm/day and at 12 months of age were 57, 62 and 55 gm/day and the effect of breed-group, age and their interaction on daily gain was highly significant ($P<0.01$). El-Said (1983) and Hassan and El-Feel (1988) observed the same result.

4.1.2. Feed consumption and feed conversion:

Tables 3 and 4 show that the amount of feed consumed and values of feed conversion increased gradually and significantly with advancing of age, and values of feed consumption of Ossimi lambs were less than crossbred lambs. While values of feed conversion were more for Ossimi than for crossbred lambs, however the differences between values consumed and converted due to breed-group effect, were non-significant.

Table (3): Least square means and standard error of factors affecting daily gain, feed consumption and feed conversion of lambs in fattening experiment.

Source of variation	No.	Daily gain (gm/day)			Feed consumption (gm/day)			Feed conversion (Feed/gain)		
		First period 0-1.5 month	Second period 1.5-3 month	Total period 0-3 month	First period 0-1.5 month	Second period 1.5-3 month	Total period 0-3 month	First period 0-1.5 month	Second period 1.5-3 month	Total period 0-3 month
Age at fattening period										
3-6 months (A1)	13	78.95±10.17a	115.01±14.12 a	97.20±10.60 a	424.56±42.11 b	512.24±46.39 b	471.23±43.73 b	7.57±2.10 b	5.52±2.22 ab	6.03±1.47 b
6-9 months (A2)	14	56.08±9.88 a	70.42±13.71b	62.50±10.29 b	664.38±40.88 a	725.23±45.03 a	694.92±42.45a	12.66±2.04 a	12.20±2.15 a	12.92±1.43 a
9-12 months (A3)	19	70.65±8.40 a	82.05±11.66 ab	75.54±8.76 ab	773.75±34.78 a	836.68±38.31a	805.22±36.11a	14.17±1.74 a	13.91±1.83 a	12.28±1.21a
Breeds group										
Ossimi (B1)	25	60.96±7.39	83.99±10.26	72.46±7.71	605.51±30.61	674.66±33.71	640.10±31.78	12.89±1.53	11.43±1.61	11.01±1.07
Crossbred (B2)	21	76.17±8.13	94.33±11.28	84.37±8.47	636.28±33.64	708.11±37.06	674.15±34.93	10.03±1.68	9.66±1.77	9.81±1.17
Interactions										
A1×B1	7	57.57±13.82	114.86±19.19	86.57±14.41	386.29±57.22	466.14±63.03	426.29±59.42	9.50±2.86	4.77±3.01	6.11±1.99
A1×B2	6	100.33±14.93	115.17±20.72	107.83±15.56	462.83±61.81	558.33±68.07	516.17±64.18	5.63±3.09	6.27±3.25	5.95±2.15
A2×B1	8	56.00±12.93	70.00±17.95	61.50±13.48	693.75±53.53	762.13±58.95	728.00±55.58	14.79±2.67	14.17±2.82	14.61±1.87
A2×B2	6	57.17±14.93	70.83±20.72	63.50±15.56	635.00±61.81	688.33±68.07	661.83±64.18	10.53±3.09	10.22±3.25	11.23±2.15
A3×B1	10	69.30±11.57	67.10±16.05	69.30±12.05	736.50±47.88	795.70±52.73	766.00±49.71	14.39±2.39	15.34±2.52	12.29±1.67
A3×B2	9	72.00±12.19	97.00±16.92	81.78±12.71	811.00±50.47	877.67±55.58	844.44±52.40	13.94±2.52	12.49±2.66	12.26±1.76
Overall mean	46	68.56±5.49	89.16±7.63	78.41±5.73	620.9±22.74	691.38±25.05	657.12±23.61	11.46±1.14	10.54±1.20	10.41±0.79

Feed conversion = [Feed consumption (gm/day) / Daily gain(gm/day)] (Feed/gain)

Table (4): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting daily gain, feed consumption and feed conversion of lambs in fattening experiment.

Source of variation	df	Daily gain (gm/day)			Feed consumption (gm/day)			Feed conversion (Feed/gain)		
		First period 0-1.5 month	Second period 1.5-3 month	Total period 0-3 month	First period 0-1.5 month	Second period 1.5-3 month	Total period 0-3 month	First period 0-1.5 month	Second period 1.5-3 month	Total period 0-3 month
Age	2	1.35	2.78	2.81	20.65***	14.61***	17.46***	3.05	4.47**	7.12**
Breed	1	1.92	0.46	1.08	0.46	0.45	0.52	1.59	0.55	0.57
Age × Breed	2	1.47	0.46	0.21	0.94	1.11	1.09	0.32	0.44	0.47
Remainder df	40									
Remainder MS		1337.75	2576.64	1453.04	2292.06	27804.71	24711.38	57.09	63.49	27.84
CV%		53.74	58.03	49.32	23.60	23.46	23.22	63.06	71.66	48.94
R^2		0.15	0.16	0.15	0.53	0.45	0.49	0.17	0.22	0.29
$\sqrt{R^2}$		0.38	0.39	0.39	0.73	0.67	0.70	0.41	0.46	0.54

R^2 = Coefficient of determination ** = Significant at (P<0.01) *** = Significant at (P<0.001)

Younis et al., (1973) working on Ebeidi male lambs, found that, estimated efficiency of feed conversion evaluated during 10, 20 and 30 weeks fattening periods, started when lambs reached 5 months of age, were 4.6, 4.8 and 5.3 kg SE/gain, respectively which are less than values obtained in the present study.

Due to the effect of fattening periods, breed-group and most of the interactions between them, the values of feed consumed during the interval from 0 to 1.5 months were less than the values during the interval from 1.5 to 3 months of age. The high rate of feed consumption during the first interval of fattening period (0 to 1.5 months) may be due to the transfer of feeding system from normal to fattening feeding. Crossing increased feed consumption during the interval (3 months) of the first and third periods of fattening and consequently feed conversion values decreased .

The values of feed conversion for Ossimi lambs, in the present study, were obviously more than the average values reported by Hassona (1980) as it was 5.505 T.D.N./kg gain. Gaili & Ali (1985) as it was 5.9 kg feed/kg gain for Sudan desert sheep and Abdel-Reheem (1994) as it was 7.4 kg DM/kg gain and 4.1 kg TDN/gain for Ossimi lambs. El-Said (1983) reported that the estimated values of feed conversion for Barki, 3/4 Ossimi ×1/4 Barki and 7/8 Ossimi × 1/8 Barki were 3.786, 3.459 and 3.434 kg S.E/kg gain, respectively and crossbred lambs were slightly more efficient in feed conversion than their parental purebred Barki lambs. He added also (in another work 1983) that for Ossimi and 1/2 Rahmani × 1/2 Ossimi, feed conversion was from 5.871 to 8.499 kg S.E/kg gain for Ossimi and 4.720 to 6.642 for crossbred. Safari (1985) working on three fat-tailed Iranian sheep, Meharaban, Bakhtiari and Cryptochids, found that feed conversion values

were 9.57, 10.18 and 10.29 kg DM/kg gain for the three breeds, respectively and differences between breed-groups were not significant.

On the other hand El-Hamadani (1974); Hofmeyr (1975); Plemyannikov and Ilyaletdinov (1975); Labusca et al., (1976) and Azamel (1978) Hassan and El-Feel (1991) found highly significant effect of breed-group on feed conversion.

4. 1. 3. Body dimensions just before slaughtering:

Results in tables (5 & 6) show that all body dimensions increased significantly by ageing ($P<0.01$), ($P<0.001$), while due to breed-group effect, differences among all dimensions were non-significant. These results are in agreement with the findings reported by Singh and Singh (1974) with respect to age effect and by Singh et al., (1988), Ibrahim et al., (1991 a) and El-Sayed et al., (1995) with respect of breed-group effect.

Ossimi lambs (Table 5) had slightly higher dimensions than crossbred lambs. Hamada and Badawi (1955); Burns (1961); Koncar (1957) and Ibrahim et al., (1991 a) studying different crossbreds, reported that crossbred groups were larger in their body dimensions than the purebreds.

Averages of body length, of the experimental lambs at 6, 9 and 12 months of age, were 64.74, 64.69 and 72.27 cm, respectively, which are higher than the body length at yearling age reported by Aboul-Naga et al., (1968) on Ossimi lambs (59.00 cm); Basuthakur and Singh (1969) on Caimbators sheep (59.84 cm). Eltya and Juma (1970) on Awassi Iraqi sheep (52.3 cm), Ghoneim et al., (1973) on Awassi Iraqi sheep (from 58.2 to 65.5 cm); Das Kornel and Surindra Kumar (1987) on Gaddi Indian sheep (69.92 cm); Singh et al., (1988) for Nali lambs at six months (60.79 cm); Ibrahim et al., (1991 a), at 6 and 12 months of age, with Ossimi (61.6 and

Table (5): Least square means and standard error of factors affecting of live body dimensions for lambs in fattening experiment.

Source of variation	No.	Live condition score	Body length (cm)	Height at withers (cm)	Heart girth (cm)	Chest width (cm)	Chest depth (cm)	Width at hind quarter (cm)
Age at fattening period								
6 months (A1)	13	2.94±0.22 b	64.74±2.08 b	55.00±1.58 b	68.29±2.61 b	17.42±0.54 b	25.06±0.90 b	19.95±0.74 b
9 months (A2)	14	3.74±0.21 a	64.69±2.02 b	63.00±1.54 a	79.65±2.53 a	18.79±0.52 b	26.63±0.88 b	21.00±0.72 b
12 months (A3)	19	4.38±0.18 a	72.27±1.72 a	62.72±1.31 a	83.49±2.16 a	21.27±0.45 a	29.50±0.74 a	24.29±0.61 a
Breeds group								
Ossimi (B1)	25	3.66±0.16	65.21±1.51	60.37±1.15	75.77±1.90	18.98±0.39	26.51±0.66	21.42±0.54
Crossbred (B2)	21	3.71±0.18	69.26±1.66	60.11±1.26	78.46±2.09	19.33±0.43	27.61±0.72	22.07±0.59
Interactions								
A1×B1	7	2.71±0.30	64.14±2.85	55.00±2.15	66.57±3.55	17.00±0.73	24.29±1.22	19.57±1.01
A1×B2	6	3.17±0.32	65.33±3.05	55.00±2.32	70.00±3.83	17.83±0.79	25.83±1.32	20.33±1.09
A2×B1	8	4.06±0.28	62.38±2.64	65.00±2.01	80.63±3.32	18.75±0.69	27.25±1.15	21.00±0.95
A2×B2	6	3.42±0.32	67.00±3.05	61.00±2.32	78.50±3.83	18.83±0.79	26.00±1.32	21.00±1.09
A3×B1	10	4.20±0.25	69.10±2.36	61.10±1.80	80.10±2.97	21.20±0.61	28.00±1.02	23.70±0.85
A3×B2	9	4.56±0.26	75.44±2.49	64.33±1.90	86.89±3.13	21.33±0.65	31.00±1.08	24.89±0.89
Overall mean	46	3.69±0.12	67.23±1.12	60.24±0.86	77.11±1.41	19.16±0.29	27.06±0.49	21.75±0.40

Table (6): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting of live body dimensions for lambs in fattening experiment.

Source of variation	d.f	Live condition score	Body length (cm)	Height at withers (cm)	Heart girth (cm)	Chest width (cm)	Chest depth (cm)	Width at hind quarter (cm)
Age	2	12.72***	5.66**	8.79***	10.37***	16.17***	7.75**	11.71***
Breed	1	0.05	3.26	0.02	0.92	0.36	1.28	0.66
Age × Breed	2	2.09	0.46	1.61	0.90	0.16	1.72	0.20
Remainder df	40							
Remainder MS		0.63	55.88	32.37	88.02	3.77	10.49	7.15
CV%		20.90	11.05	9.38	12.04	10.00	11.85	12.13
R^2		0.43	0.29	0.35	0.38	0.46	0.34	0.38
$\sqrt{R^2}$		0.66	0.54	0.59	0.61	0.68	0.58	0.62

R^2 = Coefficient of determination ** = Significant at (P<0.01) *** = Significant at (P<0.001)

71.6 cm), respectively and crossbred lambs (Ossimi × Rahmani) (61.0 and 71.0 cm); El-Sayed et al., (1995) at 12 months of age, with Ossimi sheep (61.0 cm) and crossbred (64.1 cm).

Averages of height at withers of the experimental lambs at 6, 9 and 12 months of age were 55.00, 63.00 and 62.72 cm, respectively, which are lower than the height at withers at yearling age reported by Thakur et al., (1967) on Gaddi and Romney Marsh (63.70 and 64.16 cm, respectively); Todorovski et al., (1973) on Awassi sheep (69.6 cm); Ibrahim et al., (1991 a) at 6 and 12 months of age, on Ossimi (62.8 and 70.0 cm, respectively) and on crossbred lambs (61.3 and 68.1 cm respectively); El-Sayed et al., (1995) at 12 months of age, on Ossimi (65.1 cm) and crossbred lambs (65.9 cm).

Average of height at withers of experimental lambs at yearling was higher than the heights at withers reported by Ghoneim et al., (1973) on Awassi lambs (57.8 cm); Das Kornel and Surindra Kumar (1987) on Gaddi Indian sheep (56.03 cm); Singh et al., (1988) on Nali sheep at 6 months of age (50.86 cm).

Averages of heart girth of the experimental lambs at 6, 9 and 12 months of age, were 68.29, 79.65 and 83.49 cm, respectively, which are higher than the same dimension at yearling reported by Thakur et al., (1967) on Gaddi and Romney Marsh lambs (71.85 and 76.04 cm respectively); Aboul-Naga et al., (1968) on Ossimi lambs (74.0 cm); Eltya and Juma (1970 a) on Awassi Iraqi sheep (83.05 cm); Ghoneim et al., (1973) working on Awassi Iraqi lambs (71.3 cm); El-Sayed et al., (1995) at yearling age, on Ossimi lambs (80.4 cm) and crossbred (79.2 cm).

Average of heart girth of the experimental lambs at yearling was lower than the dimension at yearling age reported by Todorovski et al.,

(1973) on Awassi Yugoslavian lambs (90.6 cm); Das Kornel and Sirindra Kumar (1987) on Gaddi Indian lambs (87.27 cm); Ibrahim et al., (1991 a) at 6 and 12 months of age, on Ossimi lambs (76.1 and 86.9 cm, respectively) and on crossbred lambs (71.7 and 84.9 cm respectively).

Averages of chest depth of the experimental lambs at 6, 9 and 12 months of age were 25.06, 26.63 and 29.50 cm, respectively which are higher than the same dimensions at yearling age reported by Thakur et al., (1967) on Gaddi and Romney Marsh lambs (18.44 and 21.54 cm); Ghoneim et al., (1973) on Awassi sheep (21.3 cm), Ghoneim (1973) on commercial Karadi sheep in Iraq (ranged from 19.7 to 22.0 cm) and El-Sayed et al., (1995) with Ossimi lambs (28.60 cm).

The present dimensions of chest depth are lower than chest depth at 6 and 12 months of age reported by Ibrahim et al., (1991 a) on Ossimi (27.5 and 31.3 cm, respectively) and on crossbreds (Ossimi × Rahmani) (26.1 and 30.2 cm, respectively) and El-Sayed et al., (1995) at yearling age on crossbred lambs (Ossimi × Rahmani) (30.0 cm).

Averages of chest width of the experimental lambs at 6, 9 and 12 months of age were 17.42, 18.79 and 21.27 cm, respectively which are higher than the chest width at 6 and 12 months of age reported by Ibrahim et al., (1991 a) on Ossimi (17.3 and 19.2 cm, respectively) and on crossbreds (15.8 and 18.9 cm, respectively) and El-Sayed et al., (1995) at 12 months of age, on Ossimi sheep (19.3 cm).

Averages of width at hind quarter at the three ages were 19.95, 21.00 and 24.29 cm and live condition score were 2.94, 3.74 and 4.38, respectively which increased gradually by ageing and indicate that these two body measurements are correlated with maturity of lambs and could be used as indicator for lambs development and their body conformation.

The low values of coefficient of variation for all body dimensions which ranged from 9.38 to 12.13% (Table 6) indicate the degree of precision with which the dimensions are compared and they are a good index of reliability of the present experiment.

The moderate values of coefficient of determination R2 which ranged from 0.29 to 0.46 (Table 6) measures the contribution of the linear function of age at slaughtering as independent variable to the variation in body dimensions.

4. 2. Carcass traits:

4.2.1. Fasting weight (slaughter weight):

Tables (7& 8) show that the averages of slaughter weights increased by ageing and the differences among them were significant ($P<0.001$). The average of slaughter weight of Ossimi lambs was lower than the average of crossbred lambs and the differences between weights, due to breed-group and the interaction between breed-group and age effect were non-significant.

Slaughter weights of the experimental lambs at 6 months are lower than the weights, reported by El-Mahdy (1985) working on Rahmani lambs (31.33 kg); Fernandes et al., (1988) for Dorset × Deccani lambs (31.21 kg); Mirzabekov and Dulsembin (1988) for grey and Black Karakul lambs (33.1 and 32.2 kg, respectively); Dag and Ertugul (1993) for Karayaka and crossbred lambs at 6 months of age (33.30 and 39.58 kg, respectively); and at 9 months of age reported by El-Mahdy (1985) for Rahmani lambs, (50.50 kg).

Slaughter weights of experimental lambs are higher, at 9 months than weights at 11 months reported by Abbas (1978) working on Barki and Merino × Barki crossbred lambs (35.6 and 39.0 kg); Hassona (1980) for

Table (7): Least square means and standard error of factors affecting initial, final and fasting body weights of lambs in fattening experiment.

Source of variation	No.	Initial weight (kg)	Final weight (kg)	Fasting weight (kg)
Age at fattening period				
3-6 months (A1)	6	22.67±2.18 b	33.83±2.62 c	30.83±2.44 c
6-9 months (A2)	6	36.67±2.18 a	43.50±2.62 b	40.50±2.44 b
9-12 months (A3)	6	42.83±2.18 a	52.50±2.62 a	49.50±2.44 a
Breeds group				
Ossimi (B1)	9	33.78±1.78	40.89±2.14	38.00±1.99
Crossbred (B2)	9	34.33±1.78	45.67±2.14	42.56±1.99
Interactions				
A1×B1	3	21.00±3.08	29.33±3.70	27.00±3.45
A1×B2	3	24.33±3.08	38.33±3.70	34.67±3.45
A2×B1	3	37.00±3.08	42.67±3.70	39.33±3.45
A2×B2	3	36.33±3.08	44.33±3.70	41.67±3.45
A3×B1	3	43.33±3.08	50.67±3.70	47.67±3.45
A3×B2	3	42.33±3.08	54.33±3.70	51.33±3.45
Overall mean	18	34.06±1.26	43.28±1.51	40.28±1.40

Table (8): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting initial, final and fasting body weights of lambs in fattening experiment.

Source of variation	d.f	Initial weight (kg)	Final weight (kg)	Fasting weight (kg)
Age	2	22.57***	12.70**	14.61***
Breed	1	0.05	2.50	2.61
Age × Breed	2	0.31	0.52	0.32
Remainder df	12			
Remainder MS		28.39	41.17	35.78
Coefficient of variation(CV%)		15.65	14.83	14.85
R^2		0.79	0.71	0.73
$\sqrt{R^2}$		0.89	0.84	0.85

R^2 = Coefficient of determination ** = Significant at (P<0.01) *** = Significant at (P<0.001)

Barki, Ossimi and Rahmani, as well as, their crosses with Ile-de France at 10 months of age (31.7, 36.0, 35.5 and 38.3 kg respectively).

The effect of crossing was obvious in slaughter weights due to the interaction between age period and crossbred lambs.

The low and nearly equal values of coefficients of variation for initial, final and fasting weights (Table 8) indicate the degree of precision with which the weights in the beginning and finishing of fattening periods, are compared which also are a good index of reliability of the present experiment.

The high value of coefficient of determination R^2 (0.73) measures the marked contribution of linear function of age at slaughter as independent variable to the variation in body weight at slaughter.

4.2.2. Carcass dimensions and scores:

Table 9 and 10 show that averages of carcass hind-quarter circumference of lambs increased at 9 months compared with 6 months and decreased significantly ($P<0.01$) at 12 months of age. Averages of width of shoulder, carcass length and subcutaneous fat score increased at 12 months of age. While carcass conformation score differed insignificantly from 6 to 12 months of age.

In crossbred carcasses, averages of carcass length, width of shoulder and hind-quarter circumference increased significantly ($P<0.05$), while carcass conformation score and subcutaneous fat score decreased insignificantly.

Lower averages of carcass conformation score were reported by Aboul-Naga et al., (1973) for Rahmani, Ossimi and Barki lambs at 6 months of age, averaged 2.67, 2.92 and 3.00, respectively; and El-Said (1983) for Ossimi and crossbred lambs (Ossimi × Rahmani) at 12 months of age (2.4 and 3.20).

El-Mahdy (1985) on Rahmani lambs at 6 and 9 months of age, reported averages of carcass conformation score (2.84 and 4.50), carcass length (56.0 and 61.49 cm, respectively) and subcutaneous fat score

Table (9): Least square means and standard error of factors affecting of carcass dimensions and scores for lambs in fattening experiment.

Source of variation	No.	Carcass conformation score	Subcutaneous fat score	Carcass length (cm)	Width of shoulder (cm)	Hind quarter Circumference (cm)
Age at slaughtering						
6 months (A1)	6	4.53±0.29 a	3.17±0.46 b	57.19±0.94 b	18.80±0.59 b	39.55±1.70 b
9 months (A2)	6	4.33±0.19 a	2.83±0.30 b	57.21±0.63 b	17.82±0.39 b	42.26±1.13 a
12 months (A3)	6	4.64±0.29 a	3.50±0.45 a	63.61±0.93 a	23.04±0.58 a	39.19±1.68 b
Breeds group						
Ossimi (B1)	9	4.71±0.17	3.41±0.26	56.18±0.54	19.45±0.34	39.67±0.97
Crossbred (B2)	9	4.29±0.17	2.92±0.26	65.82±0.54	20.33±0.34	41.00±0.97
Interactions						
A1×B1	3	4.61±0.41	3.14±0.64	69.53±1.33	17.66±0.83	37.86±2.39
A1×B2	3	4.45±0.30	3.20±0.48	64.85±0.98	19.95±0.62	41.25±1.77
A2×B1	3	4.69±0.27	3.37±0.43	66.20±0.89	17.05±0.56	41.99±1.61
A2×B2	3	3.97±0.28	2.28±0.43	68.21±0.90	18.60±0.56	42.53±1.61
A3×B1	3	4.85±0.32	3.74±0.51	62.81±1.05	23.63±0.66	39.15±1.88
A3×B2	3	4.43±0.37	3.27±0.59	64.40±1.21	22.45±0.76	39.23±2.18
Overall mean	18	4.50±0.11	3.17±0.18	66.00±0.36	19.89±0.23	40.33±0.65

Table (10): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting of carcass dimensions and scores in fattening experiment.

Source of variation	d.f	Carcass conformation score	Subcutaneous fat score	Carcass length (cm)	Width of shoulder (cm)	Hind quarter Circumference (cm)
Age	2	2.22	3.60	34.37***	63.23***	9.34**
Breed	1	2.22	0.90	9.37*	5.95*	4.87*
Fasting weight	1	1.34	1.70	47.51***	2.07	8.10*
Age × Breed	2	0.49	0.84	8.44**	5.30*	0.60
Remainder df	11					
Remainder MS		0.23	0.56	2.37	0.93	7.71
C.V.		10.55	23.55	2.33	4.86	6.88
R^2		0.45	0.51	0.93	0.93	0.75
$\sqrt{R^2}$		0.67	0.71	0.96	0.96	0.87

R^2 = Coefficient of determination * = Significant at (P<0.05)
** = Significant at (P<0.01) *** = Significant at (P<0.001)

(2.16 and 2.37, respectively). He stated that the differences between all measurements at all ages were highly significant ($P<0.01$), except for subcutaneous fat score as the difference was not significant. Ibrahim et al., (1994 b) on Ossimi and crossbred lambs (Ossimi × Rahmani) at 12 months of age, stated higher averages of carcass length (68.3 and 75.4 cm, respectively) width of shoulder for crossbred (23.9 cm) and lower average of width of shoulder for Ossimi lambs at 6 months of age (15.2). They reported that the differences between breed groups, at 12 months of age were significant ($P<0.05$) on width of shoulder and carcass length was significant.

Coefficients of variation of carcass dimensions were low while of scores were high. High estimates may be due to that scores depend on individual appraisement. The same interpretation can be considered with respect to coefficient of determination R2 as the values were satisfactory high in carcass dimensions (0.75 to 0.93) and moderate in carcass scores (0.45 and 0.51), which measure the contribution of linear function of age at fattening periods and breed-group and their interaction to the variation in carcass dimensions.

4.2.3. **Hot carcass**:

Table 11 and 12 show that the hot carcass weights decreased at 9 months compared with 6 months and then increased at 12 months of age. The differences among weights due to age and breed-group effect were statistically significant ($P<0.001$), and due to the interaction between these two factors, the differences were non-significant, however most of the values related to Ossimi lambs were slightly higher than the values related to crossbred lambs. Safa Al-Amin (1976) with Ossimi, Rahmani and crossbred lambs at 8 and 12 months; Hassona (1980) with Barki, Ossimi,

Rahmani and their crosses with Ile-de-France; El-Said (1983) with Barki and crosses with Ossimi at 8 months; Hassan and El-Feel (1991) with Ossimi, Saidi, Barki and their crosses at 10 and 12 months, found that the effect of breed-group was not significant for hot carcass. On the contrary El-Said (1983) with Ossimi and Ossimi × Rahmani cross lambs at 8 and 12 months; El-Fiky (1984) with Rahmani, Ossimi, Barki and their crosses with Finnish Landrace, at 12 months of slaughter age; El-Qobati (1990) with Ossimi and crossbred lambs, at 6 months; Ibrahim et al., (1994 a) with the same breed-groups at 10 months found that breed-group effect was significant ($P<0.01$).

El-Said (1983) and Hassan and El-Feel (1991) with the above mensioned breed-groups found that the effect of slaughter age on hot carcass weight was significant ($P<0.05$) while Safa Al-Amin (1976) stated non-significant effect.

The average of hot carcass weight of lambs, in the present study, at 6 months is higher than the weights, reported by Darwish et al., (1975) on hot carcass of Rahmani lambs at 7 and 10 months (10.16 and 11.69 kg, respectively)

Safa Al-Amin (1976) with Ossimi lambs at 8 and 12 months (12.84 and 17.09 kg) and Rahmani (12.72 and 16.26 kg) and crossbred (13.32 and 15.85 kg); Hassona (1980) with lambs at 10 months (from 15.34 to 19.38 kg); Mabrouk et al., (1983) with Rahmani, Ossimi, Barki and their crosses with Ile-de-France at 55 weeks (11.95, 12.25, 11.90, 17.02, 18.82 and 11.99 kg, respectively); El-Said (1983) with Ossimi at 8 and 12 months (11.20 and 13.68 kg) and with crossbred at 8 months (16.31 kg); El-Said (1983) with Barki and it's crosses with Ossimi at 8 months (14.43, 17.69 and 15.99 respectively)' El-Mahdy (1985) with Rahmani lambs (14.46 kg);

Mirzabekov and Dulsembin (1988) for grey and black Karakul lambs at 6 months (14.2 and 14.2 kg); Ibrahim et al., (1994 b) with Ossimi and Ossimi × Rahmani at 8 months (13.8 and 17.2 kg) and at 12 months for Ossimi (16.7 kg).

The average of hot carcass weight of lambs, in the present study, at 12 months of age, were lower than that reported by El-Fiky (1984) with crosses at 12 months (23.51, 25.30 and 17.18 kg); El-Mahdy (1985), with Rahmani lambs at 9 months (24.64 kg), Anderson et al., (1991) with male lambs at 12 months (31.5 kg).

4.2.4. **Dressing percentages**:

Tables 11 and 12 show that dressing percentages decreased at 9 months compared with 6 months and then increased at 12 months of age. The differences among dressing percentages, due to age effect, were significant ($P<0.001$), while the effect due to breed-group and the interaction between these two factors were non-significant.

Hassan and El-Feel (1991) found that age at slaughter had a significant effect on dressing percentage while Gohler (1970) with German Mutton Merino male lambs, reported that age had non-significant effect.

Carena and Costa (1971); Venkatesan and Ranganathan (1972); Safa Al-Amin (1976); Hassona (1980); El-Said (1983); El-Fiky (1984); Hassan and El-Feel (1991) stated that breed-groups had non-significant effect on dressing percentage, while Galal et al., (1975)and Azamel (1978) found little effect of breed. In the contrary, Hassan (1984) and Marzouk (1986) with Ossimi, Barki and Saidi sheep and Ibrahim et al., (1994 a) on Ossimi lambs, reported significant differences between dressing percentages, due to breed-group effect.

Table (11): Least square means and standard error of factors affecting hot carcass and dressing percentage of lambs in fattening experiment.

Source of Variation	No.	Hot carcass (kg)	Dressing percentage	
			A%	B%
Age at slaughtering				
6 months (A1)	6	18.66±0.51 b	45.80±0.67 b	52.70±0.78 b
9 months (A1)	6	17.60±0.34 c	43.80±0.45 b	52.70±0.52 b
12 months (A3)	6	20.62±0.50 a	49.90±0.66 a	58.30±0.77 a
Breeds group				
Ossimi (B1)	9	19.08±0.29	46.70±0.39	54.60±0.45
Crossbred (B2)	9	18.84±0.29	46.20±0.39	54.50±0.45
Interactions				
A1×B1	3	18.44±0.71	45.10±0.95	51.70±1.09
A1×B2	3	18.88±0.53	46.40±0.70	53.80±0.81
A2×B1	3	17.75±0.48	44.10±0.64	53.40±0.73
A2×B2	3	17.45±0.48	43.50±0.64	52.00±0.74
A3×B1	3	21.05±0.56	51.00±0.74	58.70±0.86
A3×B2	3	20.20±0.65	48.70±0.86	57.90±1.00
Overall mean	18	18.96±0.20	46.50±0.26	54.60±0.30

Table (12): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting hot carcass and dressing percentage of lambs in fattening experiment.

Source of Variation	d.f	Hot carcass (kg)	Dressing percentage	
			A%	B%
Age	2	300.77***	27.68***	28.70***
Breed	1	28.91***	0.03	0.63
Fasting wt.	1	179.40***	3.61	4.53
Age × Breed	2	0.88	1.36	1.00
Remainder df	11			
Remainder MS		0.69	1.21	1.61
CV%		4.37	2.55	2.66
R^2		0.99	0.85	0.85
$\sqrt{R^2}$		0.99	0.92	0.92

R^2 = Coefficient of determination *** = Significant at (P<0.001)
A% = Dressing percentage calculated on fasting weight basis.
B% = Dressing percentage calculated on empty body weight basis.

The average of dressing percentage of lambs (A& B) in the present study, at 6 months, is higher than the dressing percentages, reported by Badreldin (1951) for both Ossimi and Rahmani breed at 11 months old (43.47 and 43.91%, respectively); Asker et al., (1954) for Awassi lambs slaughtered at 13 months (41.2%); Rodin (1968) with crossbreds and Tsigais breed at 7 months (43.1 and 40.0%; Dinescu (1972) for Turcana, Lincoln × Turcana and South-down ×Turcana lambs at 7.5 months (45.9, 47.0 and 46.5%, respectively); Darwish et al., (1975) working on Rahmani lambs at 7 and 10 months (41.89 and 41.86%, respectively); El-Said (1983) with Barki and Ossimi and their crosses, at 8 months (44.20 to 45.60%) and at 12 months on Ossimi lambs (42.10%); Ibrahim et al., (1994 b) on Ossimi lambs at 8 months (43.2%).

The average of dressing percentage (B) of experimental lambs, at 6 months is higher than the dressing percentages, reported by Khalil (1966) with Ossimi male lambs at 6 and 9 months (49.36 and 52.18%); Galal et al., (1971) for Barki and its crosses with Merino ram lams after fattening from 8 months for 12 weeks in feed lot (52.9, 51.8, 51.6 and 50.3%) Imanalinov (1973) on crossbred lambs from mating Kazakh ewes × Tajik, Saraja, Degeres, Edilbaev rams at 8 months (52.1, 50.4, 50.0 and 52.6, respectively); Safa Al-Amin (1976) with Ossimi, Rahmani and crosses between them at 8 months (47.48, 46.63 and 42.77%, respectively); El-Mahdy (1985) for Rahmani at 8 months (51.8%). The average of dressing percentage (B) of experimental lambs at 6 and 9 months is lower than the dressing percentages reported by El-Mahdy (1985) on Rahmani lambs at 6 and 9 months (53.3 and 54.5%, respectively); Ibrahim et al., (1994 b) on Ossimi sheep and 1/2 Rahmani × 1/2 Ossimi crossbreds lambs at 8 months (43.2 and 50.0%) and at 12 months (46.1 and 50.5%).

The average of dressing percentage (B) of lambs, in the present study, at 9 months, is higher or equal than the dressing percentage, reported by Srivastava and Roy (1969) on Bikaneri Magra male lambs at 9 months (52.62 and 50.67%).

The averages of dressing percentage of lambs in the present study, at 12 months is lower than dressing percentage, reported by Mowafy (1968) working on Barki sheep at 12 months of age (59.69%).

The very low and nearly equal values of coefficients of variation for dressing percentages A & B (Table 12) indicate the degree of precision with which the dressing percentages are compared which also may be considered as a good index of reliability of the present experiment.

The high values of coefficients of determination R^2 (0.85) measures the marked contribution of linear function of age at slaughter as independent variable to the variation in carcass dressing percentage.

4.2.5. **Prime and second cuts**:

Tables 13 and 14 show that the percentages of prime retail cuts, including round, rack and shoulder, increased gradually from 6 to 12 months of age and significantly ($P<0.001$) with round cut at 12 months and non-significantly with shoulder and rack cuts. While loin cut percentages decreased gradually and also significantly at 12 months compared with 6 months of age. The total prime cuts percentages formed from 69.9 at 6 months to 73.90 at 12 months and the differences between these values, due to age effect, were significant ($P<0.05$). The largest cut percentages were loin cut. Percentages of shoulder were slightly higher than rack percentages.

The average percentages of total prime cuts of Ossimi carcasses (72.10%) were slightly and unsignificantly higher than average percentages of crossbred carcasses (71.80%) and consequently the percentages of total

Table (13): Least square means and standard error of factors affecting prime and second cuts of lambs in fattening experiment.

Source of Variation	No.	Prime retail cuts %					Second vetail cuts %				
		Round %	Loin %	Rack %	Shoulder %	Total %	Neck %	Brisket %	Flank %	Tail %	Total %
Age at slaughtering											
6 months (A1)	6	28.91±0.78b	8.00±0.43 a	15.91±0.64 a	17.29±0.51 a	69.90±0.76 b	8.14±0.37 a	5.18±0.25 a	3.67±0.29 a	12.38±1.22 a	29.00±0.68 a
9 months (A1)	6	30.54±0.53 b	7.74±0.29 ab	16.34±0.44 a	17.43±0.34 a	71.90±0.52 b	8.79±0.25 a	4.99±0.17 a	3.64±0.20 a	10.35±0.83 a	27.00±0.46 a
12 months (A3)	6	31.40±0.89 a	7.10±0.49 b	17.67±0.73 a	18.69±0.58 a	73.90±0.87 a	8.57±0.42 a	4.22±0.29 b	3.19±0.33 a	10.01±1.40 b	25.90±0.77 b
Breeds group											
Ossimi (B1)	9	30.22±0.43	7.79±0.24	16.40±0.36	17.86±0.28	72.10±0.42	8.68±0.21	4.55±0.14	3.59±0.16	10.84±0.68	27.70±0.38
Crossbred (B2)	9	30.34±0.43	7.44±0.24	16.88±0.36	17.74±0.28	71.80±0.42	8.32±0.21	5.04±0.14	3.42±0.16	10.99±0.68	26.80±0.38
Interactions											
A1×B1	3	29.29±0.80	8.28±0.44	15.38±0.65	17.16±0.52	70.10±1.08	7.97±0.40	5.06±0.26	3.79±0.30	12.73±1.25	29.30±0.96
A1×B2	3	28.54±1.10	7.72±0.61	16.43±0.91	17.42±0.72	69.80±0.78	8.30±0.53	5.30±0.36	3.56±0.41	12.03±1.74	28.70±0.69
A2×B1	3	30.56±0.73	7.76±0.40	16.45±0.60	17.23±0.47	72.10±0.73	9.15±0.35	4.35±0.24	3.72±0.27	10.50±1.14	27.70±0.65
A2×B2	3	30.52±0.75	7.72±0.41	16.23±0.61	17.62±0.49	71.80±0.71	8.43±0.36	5.63±0.24	3.56±.0.28	10.19±1.18	26.30±0.63
A3×B1	3	30.82±1.07	7.32±0.58	17.36±0.88	19.19±0.69	74.00±0.96	8.91±0.51	4.26±0.35	3.25±0.40	9.27±1.68	26.20±0.86
A3×B2	3	30.00±0.98	6.87±0.54	17.98±0.81	18.18±0.64	73.80±1.04	8.22±0.47	4.19±0.32	3.14±0.36	10.76±1.55	25.60±0.93
Overall mean	18	30.28±0.29	7.61±0.16	16.64±0.24	17.80±0.19	72.00±0.29	8.50±0.14	4.80±0.10	3.50±0.11	10.92±0.46	27.30±0.26

Table (14): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting prime and second cuts of lambs in fattening experiment.

Source of Variation	df	Prime retail cuts %					Second vetail cuts %				
		Round %	Loin %	Rack %	Shoulder %	Total %	Neck %	Brisket %	Flank %	Tail %	Total %
Age	2	8.70***	2.84	0.59	0.92	5.80*	1.48	5.57**	0.26	7.70**	9.07**
Breed	1	3.23	1.16	2.08	0.02	3.19	0.98	5.40**	1.65	1.14	0.22
Fasting wt.	1	14.47***	0.02	1.98	1.91	15.17**	1.59	0.71	2.01	11.29**	16.88**
Age × Breed	2	0.85	0.24	0.56	1.35	0.00	1.38	4.51**	0.03	0.52	0.12
Remainder df	11										
Remainder MS		1.56	0.47	1.06	0.66	1.48	0.35	0.17	0.21	3.87	1.19
CV%		4.12	8.97	6.17	4.56	2.10	7.01	8.49	13.23	18.015	3.46
R^2		0.77	0.40	0.37	0.37	0.73	0.43	0.70	0.28	0.72	0.76
$\sqrt{R^2}$		0.88	0.63	0.61	0.61	0.85	0.66	0.84	0.53	0.85	0.87

R^2 = Coefficient of determination * = Significant at (P<0.05) ** = Significant at (P<0.01) *** = Significant at (P<0.001)

prime cuts, due to the interaction between Ossimi breed-group and age increased gradually but unsignificantly by ageing.

Tables 13 and 14 also show that percentages of second retail cuts including brisket, flank and tail decreased gradually from 6 to 12 months of age and unsignificantly with flank and significantly with brisket and tail ($P<0.01$), while percentages of neck cut unsignificantly increased. The total second cuts percentages formed indesending order, from 29.00 at 6 months to 25.90 at 12 months of age, and the differences between these values, due to age effect, were significant ($P<0.01$). The largest cut percentages were the tail while the smallest cut percentages were flank cut percentages. Percentages of brisket were higher than flank percentages.

The average percentage of brisket cut of crossbred carcasses were the only cut significantly ($P<0.01$) higher than the corresponding cut in Ossimi carcasses and the differences between brisket percentages due to the interaction between breed-group and slaughter age, were also significant ($P<0.01$).

Hassona (1980); El-Fiky (1984) and Ibrahim et al., (1994 b) at 12 months of age, with carcasses of cross lambs, reported that the effect of breed type on the percentage of prime cuts was significant ($P<0.01$). El-Said (1983) on slaughter lambs at 8 and 12 months of age, found that prime cuts percentage was higher in purebred Ossimi than 1/2 Rahmani×1/2 Ossimi crossbred, while El-Qobati (1990) at 6, 8, 10 months, and Ibrahim et al., (1994 b) at 8 months of age, found the opposite trend with the same breed-group.

The average total prime cut percentage of experimental carcasses at 6 months, was higher than the percentages reported by Burgkart and Schmidt (1966) studying Merino carcasses of male lambs (64.4%);

El-Mahdy (1985) on Rahmani carcasses (from 62 to 68.1%); Semenov et al., (1988) for Stavropol Mutton-wool breed type at 8 months (60.9 to 64.5%).

The average total prime cut percentages of the experimental carcasses, at 9 months, was higher than the percentages reported by Carpenter (1966) as it represented at least 70% of carcass weight. Aboul-Naga and El-Shobokshy (1974) with Ossimi lambs found that prime percentage was 70.20% at 8 months of age.

The average total prime cut percentage of the experimental carcasses, at 12 months, was lower than the percentages reported by Galal et al., (1971) on chilled carcasses of Barki and it's crosses with Merino, at 11 months of age, from 81.70 to 85.5%); Hassona (1980) on crosses between Rahmani, Ossimi, Barki with Ile-de-France, at 10 months (76.2, 78.2 and 79.2%); El-Said (1983) on carcasses of crossbred lambs at 8 months (77.6 and 79.3%) and at 12 months (70.80%).

Most of coefficient of variation for prime cuts were less than the values for second cuts, however both prime and second values were low as for prime cuts values ranged from 4.12 to 8.97% and for second cuts values ranged from 7.01 to 18.015%. Most of coefficients of determination were moderate and ranged from 0.28 to 0.77 for all cuts and these coefficients measure contribution of linear function of age at slaughter only as independent variable to the variation in percentage of prime and second cuts.

4.2.6. **Carcass physical composition (Lean, fat and bone percentages in 9, 10, 11th ribs)**:

Table 15 show the percentages of lean, fat and bone in 9, 10 and 11th ribs. Table 16, show that the differences between percentages of each of

Table (15): Least square means and standard error of factors affecting lean, fat and bone percentages on 9, 10, 11th ribs, meat components and L. dorsi (width, depth, index% and area) and fat thickness on 9, 10, 11th ribs and L. dorsi of lambs in fattening experiment..

Source of Variation	No	9, 10, 11th ribs				Meat components			L. Dorsi				
		Lean %	Fat %	Bone %	Fat thickness on ribs (mm)	Lean/fat	Lean/bone	Lean+fat / bone	Fat thickness of L. Dorsi (mm)	Width (cm)	Depth (cm)	Index %	Area (cm^2)
Age													
6 months (A1)	6	59.10±1.69 a	12.10±2.86 b	26.40±1.80 a	3.61±1.09 b	5.00±1.46 b	2.38±0.32 a	2.89±0.45 a	0.82±0.12 a	4.94±0.29 b	4.13±0.36 a	82.70±4.74 a	16.47±1.53 a
9 months (A1)	6	56.90±1.15 a	16.20±1.95 a	23.80±1.23 a	3.56±0.74 b	3.40±0.99 b	2.50±0.22 a	3.17±0.31 a	0.63±0.08 b	5.19±0.20 b	3.34±0.25 a	64.90±3.23 a	13.50±1.04 a
12 months (A3)	6	53.90±1.94 a	16.90±3.27 a	25.70±2.06 a	4.00±1.25 a	5.31±1.67 a	2.06±0.37 a	2.82±0.52 a	0.75±0.22 a	5.98±0.33 a	2.85±0.42 a	47.40±5.42 a	13.14±1.75 a
Breeds group													
Ossimi (B1)	9	54.70±0.94	16.00±1.59	26.10±1.01	4.08±0.61	3.87±0.81	2.17±0.18	2.82±0.25	0.76±0.07	5.30±0.16	3.60±0.20	69.60±2.64	14.49±0.85
Crossbred (B2)	9	58.60±0.94	14.00±1.59	24.50±1.01	3.36±0.61	5.28±0.81	2.46±0.18	3.11±0.25	0.70±0.07	5.45±0.16	3.29±0.20	61.90±2.64	14.26±0.85
Interactions													
A1×B1	3	58.20±2.40	10.90±4.06	29.10±2.56	3.34±1.55	4.57±2.07	2.13±0.46	2.52±0.64	0.78±0.17	4.73±0.42	4.31±0.52	87.60±6.73	15.99±2.17
A1×B2	3	60.00±1.74	13.40±2.93	23.80±1.85	3.87±1.12	5.43±1.49	2.62±0.33	3.27±0.46	0.85±0.12	5.16±0.30	3.95±0.37	77.00±4.86	16.95±1.57
A2×B1	3	55.30±1.63	17.60±2.75	24.00±1.73	3.98±1.05	2.95±1.40	2.40±0.31	3.13±0.43	0.73±0.12	5.41±0.28	3.28±0.35	61.00±4.55	13.79±1.47
A2×B2	3	58.50±1.58	14.90±2.68	23.50±1.69	3.15±1.02	3.86±1.36	2.60±0.30	3.12±0.42	0.53±0.11	4.97±0.27	3.42±0.34	68.80±4.43	13.22±1.43
A3×B1	3	50.10±2.14	20.20±3.62	25.40±2.28	4.93±1.38	4.09±1.85	1.96±0.41	2.80±0.57	0.77±0.15	5.75±0.37	3.21±0.46	39.20±6.00	13.69±1.94
A3×B2	3	57.20±2.33	13.70±3.93	26.00±2.48	3.07±1.50	6.54±2.00	2.15±0.44	2.84±0.62	0.73±0.17	6.21±0.40	2.50±0.50	38.40±6.51	12.60±2.10
Overall mean	18	56.70±0.64	14.40±1.08	25.30±0.68	3.72±0.41	4.57±0.55	2.31±0.12	2.96±0.17	0.73±0.05	5.37±0.11	3.44±0.14	65.50±1.80	14.37±0.58

Table (16): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting lean, fat and bone percentages on 9, 10, 11th ribs, meat components and L. dorsi (width, depth, index% and area) and fat thickness on 9, 10, 11th ribs and L. dorsi. of lambs in fattening experiment.

Source of Variation	df	9, 10, 11th ribs				Meat components			L. Dorsi				
		Lean %	Fat %	Bone %	Fat thickness on ribs (mm)	Lean/fat	Lean/bone	Lean+fat / bone	Fat thickness of L.Dorsi (mm)	Width (cm)	Depth (cm)	Index %	Area (cm^2)
Age	2	1.40	3.79	1.61	3.26	3.30	0.45	1.13	8.58**	9.42**	0.70	2.30	2.30
Breed	1	3.26	0.21	1.22	0.16	0.48	2.40	1.44	0.06	0.56	0.10	0.39	0.36
Fasting wt.	1	0.00	1.20	1.21	2.27	2.52	1.16	1.39	6.71*	0.24	4.18	2.21	5.23*
Age × Breed	2	0.39	0.88	0.66	0.65	0.22	0.15	0.41	0.67	1.73	0.80	1.69	0.26
Remainder df	11												
Remainder MS		7.41	21.13	8.42	3.09	5.50	0.27	0.53	0.0.4	0.22	0.34	58.08	6.06
CV%		5.58	20.18	9.61	47.22	51.29	22.39	24.56	26.40	8.76	16.94	14.06	17.13
R^2		0.38	0.49	0.39	0.48	0.48	0.30	0.35	0.70	0.68	0.40	0.49	0.49
$\sqrt{R^2}$		0.62	0.70	0.62	0.69	0.69	0.55	0.59	0.84	0.82	0.63	0.70	0.70

R^2 = Coefficient of determination * = Significant at (P<0.05) ** = Significant at (P<0.01)

lean, fat and bone due to the effects of slaughter age, breed-group and the interaction between them were non-significant. This result is in accordance with the findings of Galal et al., (1971) with Barki and crosses with Merino, that lean, fat, bone percentages in the 9, 10 and 11^{th} ribs differed with breed-group but the differences were non-significant. In the contrary, Mowafy (1968); Aboul-Naga and El-Shobokshy (1974); Safa Al-Amin (1976); Layla (1991) stated that the differences between percentages of each of lean, fat and bone, due to breed-group effect were significant. Due to age effect, Mowafy (1968) reported that the differences between percentages of only lean was significant.

Table 15 shows that due to slaughter age effect, from 6 to 12 months of age, the percentages of lean and bone decreased and fat increased.

Due to breed-group effect, crossbred carcasses contained more lean and less fat and bone than Ossimi carcasses.

The effect of the interaction between slaughter age and crossbreds was at 6 months obvious on lean, fat and bone percentages.

Fat thickness on ribs was more at 12 months than 6 and 9 months and on Ossimi than on crossbred carcasses, however the differences were non-significant.

The ratio of lean/fat decreased at 9 months than on crossbred carcasses, however the differences were non-significant.

The ratio of lean/fat decreased at 9 months and then increased again at 12 months, while the both ratios lean/bone and lean+fat/bone increased at 9 months and then decreased at 12 months of age. The three ratios were higher ($P>0.05$) in crossbred than Ossimi carcasses. The effect of interaction between ratios due to the two factors studied was non-significant.

The present results of the percentage of meat (muscle and fat) raised from 6 to 9 months and then decreased at 12 months of age and the percentage of bone decreased. These results are mostly in accordance with the findings of Hammond (1932).

The percentages of lean, fat and bone, in the present study, at 9 and 12 months are lower than the percentages reported by Mowafy (1968) at 8 months (67.76, 14.44 and 17.80% for Barki and 73.83, 6.12 and 20.00% for Merino, respectively) and also at 10 months (67.42, 15.47 and 17.11 for Barki and 73.46, 7.13 and 19.31% for Merino, respectively) and at 12 months (63.07, 20.72 and 16.21%) for Barki and 73.05, 7.54 and 19.41% for Merino, respectively); Zamoryshev and Kuznetsova (1971) for lean and bone of Romney sheep aged 270 days (80.44, 16.61% respectively); Galal et al., (1971) with Barki and it's crosses with Merino at 11 months for lean and fat (60.73-64.79% and 16.37-20.35%); Safa El-Amin (1976) for Ossimi carcasses at 8 months (59.28, 18.33 and 22.04%, respectively) and for crossbred carcasses at the same age (69.34, 8.07 and 20.61%, respectively) and at 12 months, the corresponding percentages for Ossimi (62.19, 15.77 and 21.05%) and for crossbred (67.63, 10.04% and 20.57%), Ibrahim et al., (1994 a) with Ossimi and it's crosses with Rahmani at 10 months for lean and fat percentages (68.90 and 9.60 for Ossimi and 68.20 and 10.70% for crossbred).

The percentages of lean, fat and bone in the present study, at 6 or 9 months are higher than the percentages reported by Aboul-Naga and El-Shoboksy (1974) with Ossimi carcasses at 8 months (58.6, 16.9 and 24.5%, respectively); El-Said (1983) with Ossimi and its cross with Rahmani at 8 months were 59.3 and 56.8 for lean percentage, 12.3 and 16.4 for fat percentage and 28.0 and 26.2 for bone percentage.

The average values of coefficients of variation for percentages of lean, fat and bone, in experimental carcasses, are relatively low for lean and bone and moderate for fat percentage, however the average value of fat thickness ribs is markedly high (47.22%). The value of the ratio lean/fat is higher (51.29%) than the values of the ratios lean/bone and lean+fat/bone (22.39 and 24.56%).

The high variation among coefficients may be due to the small number of carcasses used for carcass physical composition determination.

The values of coefficients of determination are moderate and range from 0.38 to 0.48 in case of lean, fat, bone percentages and 0.30 to 0.48 in case of the ratios of meat composition. The level of coefficients measure the moderate contribution of linear function of age at slaughter and breed-group as independent variables to the variation in percentage of meat components.

4.2.7. **Index and area of Longissumus dorsi**:

Tables 15 and 16 show that indices and areas of longissumus dorsi decreased gradually from 6 to 12 months of age. The averages of indices and areas of L. dorsi of Ossimi carcasses were higher than crossbred carcasses. The coefficients between these values, due to slaughter age and breed-group and the interactions between them, were non-significant, however differences between the dimensions of width of L. dorsi, due to age effect, were significant ($P<0.01$). Fat thickness on L. dorsi decreased from 6 to 9 months and increased again at 12 months of age, and the differences between dimensions were significant only due to the effect of slaughter age ($P<0.01$).

Galal et al., (1971) with Barki and it's crosses with Merino; Azamel (1978) with crosses between Merino and Barki; Hassona (1980) with Barki,

Ossimi and Rahmani; El-Said (1983) on Ossimi, Rahmani and their crosse; Abdel-Reheem (1994) with Ossimi, Chios and their crosses, reported that, the differences among breed-group, with respect to area of L. dorsi, were not significant. El-Fiky (1984) found that breed-group differences, in fat thickness on L. dorsi muscle reached significance ($P<0.05$), while with respect to L. dorsi index, the differences were non-significant. El-Mahdy (1985) with Rahmani lambs reported that the differences between indices, due to age effect were not significant, while between areas were significant ($P<0.05$) and differences between each of fat thickness on rib and L. dorsi, due to age effect, were not significant.

The area of L. dorsi, in the experimental carcasses, are higher, at the three slaughter ages than the areas reported by Chatterjee et al., (1969) on Bannur Indian lambs (area ranged from 785 to 1089 mm^2); Aboul-Naga et al., (1973) with Rahmani, Ossimi and Barki lambs (9.80, 9.80 and 11.50 cm^2); Mokhtar (1974) with Barki and its crosses with Merino (12.44 and 12.46 cm^2); Azamel (1978) with cross between 3/8 Merino × 5/8 Barki (12.65 cm^2); Hassona (1980) with Ossimi and cross with Ile-de-France (11.60 and 12.40 cm^2)' El-Said (1983) with Ossimi, Barki, Rahmani and crosses between them, at 8 months (9.30, 8.70, 8.93, 9.25 and 9.32 cm^2).

The area of L. dorsi, in the experimental carcasses at 12 months of age are lower than L. dorsi areas reported by Abdel-Reheem (1994) with Ossimi, Chios and crosses between them (14.5, 13.7, 16. 2 and 17.1 cm^2).

The indices of L. dorsi, in the present experimental carcasses, were higher than the indices of L. dorsi reported by Aboul-Naga et al., (1973) with Rahmani and Ossimi Breeds (35.00 and 46.20%, respectively); El-Mahdy (1985) with Rahmani lambs at 24, 32, 36 and 40 weeks (57.7, 60.1, 60.5 and 56.8%, respectively).

The fat thickness on L. dorsi in the experimental carcasses, at yearling and for Ossimi at it's cross with Rahmani, were higher than fat thickness of L. dorsi reported by Galal et al., (1971) for Barki and crossbred with Merino (from 0.26 to 0.35 cm), Galal et al., (1975) with Barki, Awassi and their cross (from 0.24 to 0.37 cm); Hassona (1980) with Barki, Ossimi, Rahmani and crosses with Ile-de-France (from 3.7 to 5.3 mm) El-Said (1983) with Ossimi, Barki, Rahmani and their crosses, at 8 months (from 2.10 to 2.62 mm); El-Said (1983) in another study with the same breed-group at the same age (from 2.0 to 2.14 mm); El-Mahdy (1985) with Rahmani lambs (from 1.03 to 1.30 mm); Ibrahim et al., (1994 b) using Ossimi and its cross with Rahmani at 8 and 12 months (3.7 and 3.9 mm for Ossimi, 2.0 and 6.1 mm for the crossbred) and also the fat thickness on ribs (2.8 and 3.9 mm for Ossimi, 2.4 and 4.8 for crossbred lambs) and differences between breed-groups at different ages in fat thickness on L. dorsi and ribs were not significant.

The coefficients of variation were relatively low and most of coefficients of determination were moderate in values, which indicate the effect of breed group and age on the L. dorsi parameters (area and index).

Table 17 shows that the areas (cm^2) of water holding capacity of longissumus dorsi muscle increased gradually ($P>0.05$) by ageing and ranged from 5.27 cm^2 at 6 months to 4.67 cm^2 at 12 months of age.The crossbred meat had more average water holding capacity area than Ossimi meat. However breed groups and age differences of this muscle, in this respect, were not significant and there was no significant effect for breed group and age interaction. The latter result is in agreement with the findings of Safa Al-Amin (1976) using Ossimi, Rahmani and Merino-Rahmani crosses at 8, 12 and 18 months of age.

pH values of 9, 10, 11th ribs from 6 to 12 months of age, flactuated significantly ($P<0.01$) without definite trend while the value of the two breed groups were nearly equal (Table 17).

4.2.8. **Chemical composition of lean-meat**:-

Table 17 shows that percentages of moisture, protein and ash decreased by ageing from 6 to 12 months of slaughter age, meanwhile fat percentage increased. The present results are in accordance with the findings of Hassan (1984) and Marzouk (1986).

From 6 to 9 months of age, percentages of moisture remains fairly constant while protein and ash percentages reduction were 17.6% and 45%, respectively. From 9 to 12 months rates of reduction for moisture, protein and ash percentages were 10.4. 5.0 and 11.8%, respectively which are less in protein and ash percentages than the reduction from 6 to 9 months. From 6 to 12 months of age the reduction in moisture, protein and ash percentages were 10.31, 21.63 and 51.5, respectively.

The increase in fat percentage from 6 to 9, from 9 to 12 and from 6 to 12 months of age were 213.6, 89.9 and 495.5%, respectively.

Little change was obtained between Ossimi and crossbred lean-meat in percentages of moisture, protein and ash, however significant changes were measured in fat percentages as crossbred lean-meat contained higher fat percentage than Ossimi lean-meat (Table 17).

The above results are in agreement with Lawrie (1985) who stated that irrespective of species, breed or sex, the composition of muscles varies with increasing animal age, there being a general increase in most parameters other than water and different components reach adult values at different times. He added that intramuscular fat appears to increase and moisture content on a whole tissue basis to decrease with advancing of age.

Table (17): Least square means and standard error of factors affecting chemical analysis of lean on 9, 10, 11th ribs.

Source of variation	No.	Moisture %	Protein %	Fat %	Ash %	pH	W.H.C Area (Cm^2)
Age at fattening period							
6 months (A1)	6	73.7±0.53 a	24.50±0.36 a	2.2±0.32 c	2.00±0.28 a	6.07±0.12 b	5.27±0.65 a
9 months (A2)	6	73.8±0.53 a	20.20±0.36 b	6.9±0.32 b	1.10±0.28 b	6.81±0.12a	4.73±0.65 a
12 months (A3)	6	66.1±0.53 b	19.20±0.36 b	13.1±0.32 a	0.97±0.28 b	6.15±0.12 b	4.67±0.65 a
Breeds group							
Ossimi (B1)	9	72.20±0.44	21.20±0.30	5.20±0.26	2.30±0.23	6.37±0.10	4.74±0.53
Crossbred (B2)	9	70.40±044	21.30±0.30	6.10±0.26	2.20±0.23	6.31±0.10	5.03±0.53
Interactions							
A1×B1	3	75.00±0.75	24.30±0.51	1.50±0.45	2.30±0.39	6.05±0.17	5.70±0.91
A1×B2	3	72.50±0.75	24.70±0.51	2.90±0.45	2.60±0.39	6.08±0.17	4.83±0.91
A2×B1	3	74.00±0.75	20.60±0.51	6.90±0.45	1.10±0.39	6.84±0.17	4.57±0.91
A2×B2	3	73.60±0.75	19.70±0.51	7.00±0.45	1.20±0.39	6.79±0.17	4.90±0.91
A3×B1	3	67.20±0.75	18.80±0.51	12.80±0.45	1.93±0.39	6.23±0.17	3.97±0.91
A3×B2	3	64.90±0.75	19.50±0.51	13.30±0.45	1.96±0.39	6.07±0.17	5.37±0.91
Overall mean	18	71.30±0.31	21.20±0.21	5.60±0.18	2.20±0.16	6.34±0.07	4.89±0.37

Table (18): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting chemical analysis of lean on 9, 10, 11th ribs.

Source of variation	d.f	Moisture %	Protein %	Fat %	Ash %	PH	W.H.C Area (Cm^2)
Age	2	27.43***	29.17***	221.47***	300.62*	11.70**	0.26
Breed	1	3.25	0.01	9.85**	0.47	0.19	0.15
Age × Breed	2	0.44	0.66	6.01*	1.24	0.18	0.77
Remainder df	12						
Remainder MS		1.71	0.79	0.61	0.46	0.09	2.50
C.V. %		2.27	3.24	5.67	7.92	4.62	32.35
R^2		0.83	0.83	0.97	0.98	0.67	0.16
$\sqrt{R^2}$		0.91	0.91	0.98	0.99	0.82	0.40

R^2 = Coefficient of determination * = Significant at (P<0.05)
** = Significant at (P<0.01) *** = Significant at (P<0.001)

The percentage of moisture, protein, fat and ash in lean-meat of experimental lambs at 6 and 9 months of slaughter age were higher than the percentages reported by Bali et al., (1976) which were 16.56% for protein, 2.37% for fat; Cattaneo et al., (1979) which were 70.5-72.5% for moisture, 18.9-19,8% for protein and 0.4-1.3% for ash; Abdel-Rahman (1982) which were 73.75% for Moisture, 15.75% for protein and 1.04% for ash; El-Shahat et al., (1986) with Ossimi as protein percentage was 16.6.

The differences between percentages of moisture, protein, fat and ash, due to age effect, were significant ($P<0.001$) except of ash was significant ($P<0.05$). This result is in accordance with Hassan (1984) with respect to protein percentage.

Due to breed-group and the interaction between age at slaughter and breed-group effect, the significance was in fat percentage only ($P<0.01$ & $P<0.05$). Marzouk (1986); Kleemann et al., (1990) on Merino, Polldorest-Merino and Border Lessester-Merino, indicated that breed-group had a significant effect on percentages of moisture, protein and ash. Hassan and El-Feel (1991) with Ossimi, Saidi, Rahmani and their crosses found that the differences, in chemical composition, due to breed-group effect, were not significant, except that for protein percentage which was significant ($P<0.01$).

4. 2. 9. Percentages of body offals and internal organs:

Table 19 shows percentages of body offals and internal organs relative to empty live weight. The percentages of head, legs, kidneys fat, lungs & trachea increased gradually from 6 to 12 months of slaughter age, while percentages of heart, kidneys, liver, spleen decreased from 6 to 9 months and increased again at 12 months. Most of percentages of belt,

Table (19): Least square means and standard error of factors affecting percentages of body offals and internal organs of lambs in fattening experiment.

Source of Variation	No.	Offals and internal organs %												
		Belt	Head	Legs	Heart	Kidneys	Liver	Lungs and trachea	Spleen	Kidneys fat	Internal fat	Tests	Digestive tract full	Digestive tract empty
Age at slaughtering														
6 months (A1)	6	10.33±0.47 a	6.30±0.24 a	2.27±0.09 a	0.49±0.02 a	0.31±0.01 a	1.86±0.10 a	1.45±0.12 a	0.15±0.01 b	0.24±0.05 a	0.34±0.08 a	0.53±0.01 a	22.40±0.88 a	7.71±0.53 a
9 months (A1)	6	10.68±0.32 a	6.51±0.16 a	2.38±0.06 ab	0.37±0.01 b	0.26±0.01 c	1.25±0.06 c	1.49±0.08 a	0.11±0.01 c	0.26±0.04 a	0.32±0.06 a	0.53±0.01 a	25.25±0.59 a	7.47±0.35 a
12 months (A3)	6	8.13±0.47 b	6.75±0.24 a	2.47±0.09 b	0.51±0.02 a	0.30±0.01 b	1.48±0.09 b	1.57±0.12 a	0.18±0.01 a	0.31±0.05 a	0.22±0.08 a	0.53±0.01 a	21.01±0.87 b	5.96±0.53 b
Breeds group														
Ossimi (B1)	9	9.75±0.27	6.64±0.14	2.38±0.05	0.44±0.01	0.29±0.01	1.51±0.05	1.50±0.07	0.14±0.01	0.25±0.03	0.31±0.05	0.60±0.01	22.73±0.50	6.85±0.31
Crossbred (B2)	9	9.67±0.27	6.40±0.14	2.37±0.05	0.47±0.01	0.29±0.01	1.55±0.05	1.50±0.07	0.15±0.01	0.29±0.03	0.27±0.05	0.46±0.01	23.05±0.50	7.25±0.31
Interactions														
A1×B1	3	9.61±0.49	5.92±0.25	2.28±0.10	0.48±0.02	0.30±0.01	1.67±0.10	1.34±0.12	0.14±0.01	0.18±0.06	0.44±0.09	0.58±0.01	22.73±0.92	7.27±0.56
A1×B2	3	11.05±0.67	6.68±0.34	2.26±0.13	0.51±0.03	0.32±0.02	2.04±0.13	1.56±0.17	0.16±0.01	0.29±0.08	0.25±0.12	0.48±0.01	22.73±1.24	8.15±0.75
A2×B1	3	10.84±0.45	6.99±0.23	2.42±0.09	0.36±0.02	0.25±0.01	1.27±0.09	1.52±0.11	0.09±0.01	0.22±0.05	0.30±0.08	0.61±0.01	24.47±0.83	7.83±0.51
A2×B2	3	10.52±0.45	6.02±0.23	2.33±0.09	0.37±0.02	0.26±0.01	1.23±0.09	1.46±0.11	0.13±0.01	0.30±0.05	0.34±0.08	0.45±0.01	26.03±0.83	7.11±0.51
A3×B1	3	8.80±0.61	6.99±0.31	2.44±0.12	0.48±0.03	0.30±0.02	1.58±0.12	1.65±0.15	0.18±0.01	0.34±0.07	0.21±0.11	0.61±0.01	20.98±1.13	5.44±0.66
A3×B2	3	7.45±0.52	6.50±0.27	2.50±0.11	0.54±0.02	0.29±0.01	1.38±0.11	1.48±0.13	0.17±0.01	0.27±0.06	0.23±0.09	0.46±0.01	21.04±0.97	6.48±0.59
Overall mean	18	9.71±0.18	6.52±0.09	2.37±0.04	0.46±0.01	0.29±0.01	1.53±0.04	1.50±0.05	0.14±0.003	0.27±0.02	0.29±0.3	0.53±0.004	22.89±0.34	7.05±0.21

Table (20): F-ratio of least squares analysis of variance, coefficients of variation (C.V %), R^2 and $\sqrt{R^2}$ for factors affecting percentages of body offals and internal organs of lambs in fattening experiment.

Source of Variation	d.f	Offals and internal organs %												
		Belt	Head	Legs	Heart	Kidneys	Liver	Lungs and trachea	Spleen	Kidneys	Internal fat	Tests	Digestive tract full	Digestive tract empty
Age	2	12.15***	2.05	4.73**	30.64***	16.35***	20.06***	1.25	38.85***	0.50	0.28	0.13	21.59***	4.95
Breed	1	0.56	1.65	1.99	4.88*	1.12	0.12	0.53	7.84**	1.32	1.51	366.64***	1.68	0.58
Fasting wt.	1	0.36	0.68	12.38***	0.09	1.33	0.02	4.24	0.24	0.24	2.85	0.90	2.30	0.03
Age × Breed	2	4.81*	7.14**	0.37	0.90	0.65	4.92**	1.56	4.55**	1.83	1.20	4.56**	0.89	1.81
Remainder df	11													
Remainder MS		0.60	0.16	0.02	0.001	0.0004	0.02	0.04	0.0002	0.01	0.02	0.0002	2.06	0.76
CV%		7.95	6.09	6.52	7.67	6.89	10.22	12.74	9.45	32.91	46.85	2.83	6.27	12.37
R^2		0.76	0.65	0.69	0.86	0.77	0.82	0.49	0.90	0.36	0.40	0.97	0.82	0.56
$\sqrt{R^2}$		0.87	0.81	0.83	0.93	0.88	0.91	0.70	0.95	0.62	0.63	0.98	0.91	0.75

R^2 = Coefficient of determination * = Significant at (P<0.05) ** = Significant at (P<0.01) *** = Significant at (P<0.001)

digestive tract empty and internal fat decreased from 6 to 12 months of age, while tests percentages remain constant.

Percentages of offals and internal organs of Ossimi lambs were higher than crossbred lambs in belt, head, legs, tests and internal fat and were lower than crossbred in digestive tract empty, liver, heart, kidneys fat and were nearly equal in percentages of kidneys, lungs & trachea and spleen.

Table (20) shows that the differences between percentages of belt, legs, heart, kidneys, liver, spleen, due to slaughter age effect, were significant ($P<0.01$ & $P<0.001$). While due to breed-group effect, the significance was in percentages of heart, spleen and tests only, ($P<0.05$ & $P<0.01$ & $P<0.001$). Safa Al-Amin (1976) reported that the differences between percentages of head, hide, empty digestive tract empty, spleen and kidneys, due to breed effect were significant ($P<0.01$), while differences between percentages of feet, blood, heart, lungs, liver and testicles, due to breed effect were non-significant. She added that age effect was significant ($P<0.01$) with respect to head, hide, feet, empty digestive tract, blood, spleen and testicles only. Ibrahim et al., (1994 a) found non-significant differences due to the effect of breed groups for spleen and fleece skin only and significant with the lungs, heart, head, feet and digestive tract empty.

The effect of interaction between slaughter age and breed-group was significant with percentages of belt, head, liver, spleen and tests ($P<0.05$, $P<0.01$).

The percentages of head, skin, feet, empty digestive tract, lungs & trachea, spleen and tests at 9 months of age, are nearly in accordance with most of the findings of Badreldin (1951) using Ossimi and Rahmani lambs at 11 months of age and Khalil (1966) using Ossimi lambs at 9 months and

Darwish et al., (1973) on Rahmani lambs. The percentages of pelt, liver, spleen, kidney reported by Epstein (1961) are higher than the corresponding values obtained in the present study while the values of head, feet, lungs & trachea are lower. Farhan et al., (1969) on Awassi lambs aged 7.5-8.5 months and Safa Al-Amin (1976) on Ossimi lambs at 8 and 12 months of age, found higher percentages of most body offals and internal organs.

Most of the coefficients of variation for percentages of body offals and internal organs were low and ranged from 2.83 to 12.74% except kidneys fat and internal fat which were 32.91 and 46.85%, respectively. These values are accepted however the number of carcasses studied was small. Most of coefficients of determination were high and ranged from 0.36 to 0.97. The high coefficients measure the marked contribution of linear function of age at slaughter, in the first order, and breed-group, in the second order, as two independent variables to variation in body offals and internal organs of the studied lambs.

4. 2. 10. Prediction of some carcass cuts of lambs meat from some body dimension just before slaughtering:

The linear and quadratic regressions for the prediction equations of carcass cuts at 9 months of age, revealed that, chest depth may be used for predicting shoulder cut percentage ($P<0.05$), width at hind quarter for predicting rack cut percentage ($P<0.001$), body length for predicting round cut and tail percentage ($P<0.001$). In addition to that the quadratic regression for the prediction equation revealed also that chest width may be used for predicting rack cut percentage ($P<0.01$) (Table 21).

Table (21): Linear and quadratic regression equations of carcass cuts on body dimensions just before slaughtering at 9 month old.

A. Linear regression equations:

RO= 55.43 + (-0.26)BL*** + (-0.19)HW + 0.07HG + 0.07CW + (-0.04)CD + (-0.03)WQ

LO = 11.64 + 0.02BL + (-0.06)HW + 0.08HG + (-0.11)CW + (-0.03)CD + (-0.20)WQ

RA = 15.19 + (-0.001)BL + (-0.12)HW + 0.01HG + 0.51CW + 0.39CD + (-0.56)WQ***

SH=16.51+ (-0.04)BL + (-0.06)HW + 0.03HG + (-0.30)CW + 0.34CD* + 0.08WQ

NE= 10.11 + (-0.003)BL + (-0.04)HW + 0.08HG +(-0.16)CW + (-0.02)CD + (-0.09)WQ

BR = 3.02 + 0.04BL + 0.11HW + (-0.08)HG + (-0.21)CW + 0.05CD + 0.06WQ

FL = 2.15 + 0.02BL + (-0.03)HW + 0.05HG + (-0.05)CW + 0.004CD + (-0.08)WQ

TA = -14.25 + 0.13BL*** + 0.32HW + (-0.25)HG + 0.78CW + (-0.51)CD + 0.67WQ

B. Quadratic regression equations:

RO = 42.90+(-0.002)BL***+(-0.002)HW+0.001HG+0.001CW + (-0.001)CD + (-0.0013)WQ

LO = 9.58+0.0002BL+(-0.0004)HW+0.0004HG+(-0.003)CW+(-0.001)CD+(-0.0042)WQ

RA=15.95+(-0.00005)BL+(-0.0011)HW+0.0002HG+0.012CW**+0.007CD+(-0.012)WQ***

SH = 17.14+(-0.0002)BL+(-0.0005)HW+0.0002HG+(-0.008)CW+0.006CD*+0.001WQ

NE = 9.53+(-0.0001)BL+(-0.0004)HW+0.001HG+(-0.004)CW+(-0.0004)CD+(-0.002)WQ

BR = 3.97+0.003BL+0.001HW+(-0.001)HG+(-0.005)CW+0.001CD+0.014WQ

FL = 2.84+0.0001BL+(-0.0002)HW+0.0003HG+(-0.001)CW+0.0001CD+(-0.002)WQ

TA = -2.41+0.001BL*** + 0.003HW+(-0.002)HG+0.021CW+(-0.008)CD+0.14WQ

Carcass cuts (%)
RO = Round
LO = Loin
RA = Rack
SH = Shoulder
NE = Neck
BR =Brisket
FL = Flank
TA = Tail %

body dimensions (Cm)
BL = Body length
HW = Height at withers
HG = Heart girth
CW = Chest width
CD = Chest depth
WQ= Width at hind quarter

* = Significant at (P<0.05) ** = Significant at (P<0.01) *** = Significant at (P<0.001)