

Factors Affecting Body Weight and Carcass Yield of a Flock of Fleisch Merino Sheep under Subtropical Conditions

M. T. Ragab, M. A. Sharafeldin and F. S. Badawy

Faculty Agric., Cairo Univ. and The General Organization for Meat and Milk Production, Cairo, Egypt.

THIS WORK was studied to investigate the effect of season of lambing, age of dam, type of birth and sex of lamb on lamb production. Also, the effect of age of lambs and season of lambing on hot carcass percentage was studied.

It was found that Spring-born lambs were slightly heavier at birth than those born in Autumn. At weaning and yearling ages the reverse was the case. The differences between the two seasons in this respect, were insignificant for birth and weaning weights and highly significant for yearling weight.

Lambs born from the 4 year old ewes were heavier than those born from 2 year old ones at birth, weaning and yearling ages. The differences between the two groups, in this respect, were significant at birth, but insignificant at weaning and yearling ages. Male lambs were heavier than females. Sex differences were insignificant at birth and weaning ages, but highly significant for yearling weight.

Single male and female lambs were heavier than their respective individual twins at birth, weaning and yearling ages. The differences due to type of birth were highly significant in the three cases.

The overall mean of carcass percentage increased linearly as age of lambs increased since it was 39.98% for six month old lambs and 47.72 when lambs were twelve months of age in case of Spring lambs. Also, in Autumn lambing, the carcass percentage was 42.10 at six months and 49.39 for lambs of twelve months of age.

Season of lambing did not show any significant effect on carcass percentage.

In this work, the effect of season of lambing, age of dam, type of birth and sex of lamb on lamb production were studied as well as the effect of age of lamb and season of lambing on carcass percentage. It is hoped that the result obtained may help in throwing more light on the factors that might limit productivity of Merino sheep in Egypt.

Material and Methods

The flock of Merino sheep subject of this study was that described by Ragab *et al.* (1976). Lambs dropped by 2 year and 4 year old ewes (294 lambs) were weighed within 24 hr after delivery, and thereafter at monthly periods till they reached the age of one year. Weights were recorded to the nearest 0.01 kg and lambs were not allowed to suckle or feed for 12 hr before weighting. Lambs were weaned when they reached four months of age.

Out of the age groups of 6, 9 and 12 months, 5 single male lambs were chosen within each lambing season, fastened for 12 hr and slaughtered to estimate hot carcass percentage. Mortality rates for lambs of each age groups of ewe within each lambing season were calculated at weaning age.

Lambs were fed according to the following system :

a) *Pre weaning-stage*

Lambs suckled their mothers till they reached four months of age and then weaned. Clover or clover hay was provided *ad-lib*, when lambs were at three weeks of age. Also a daily ration of concentrate mixture (100-250g) consisting of 35% decorticated cotton seed, 42% rice bran, 20% bran, 2% minerals and 1% salt was made available.

b) *Post-weaning stage (from 4 to 12 months of age)*

Clover or clover hay was fed *ad-lib*. A mixture of concentrates consisting of 50% undecorticated cotton seed meal, 47% rice bran, 2% minerals and 1% salt was offered to the lambs after weaning in increasing quantity. The quantities of concentrates given to the lambs were 700, 750, 850, 900 and 1000 g to lambs of 4-5 months, 5-6 months, 6-8 months, 8-10 months and 10-12 months of age, respectively.

Vaccinations against anaerobic diseases, smallpox, haemorrhagic septicemia and blue tongue were regularly performed. The statistical analysis were carried out according to Snedecor(1956)

Results and Discussions

1. Factors affecting birth weight

a. Effect of season of lambing

Lambs born in Spring were slightly heavier at birth than those born in the Autumn (Table 1). The differences between the two seasons in this respect were 0.15 and 0.09 kg for male and female lambs respectively. These differences were non - significant (Table 2). However, Barr *et al.* (1968), Reyneke (1969) and Gould and Witeman (1971) reported that birth weights of Spring born lambs were heavier than Autumn born ones. The increase of the Spring born ones over the Autumn born lambs in the three experiments were 0.21, 0.11 and 0.90 kg respectively.

TABLE 1. Number of lambs, type of birth and birth weights of lambs born at Spring and Autumn.

Season of lambing	Spring			Autumn		
	No.	Mean kg	C.V. %	No.	Mean kg	C.V. %
Male lambs	96	3.48	25.80	62	3.33	29.30
Female lambs	73	3.38	25.30	63	3.29	13.90

b. Effect of age of dam

Lambs born out of 4 years old ewes were heavier than those dropped from 2 year old ones (Table 3). These differences in weight of lambs were significant (Table 2). These results are in accordance with those reported by Chopra and Acharya (1971).

TABLE 2. Analysis of variance for the effect of age of dam at lambing, season of lambing, type of birth and sex on birth weight.

Source of variance	d.F.	S.S.	M.S.	F. Value
Between age (A)	1	35.98	35.98	3.86*
Between season (E)	1	3.89	3.89	0.417
Between type of birth (T)	1	842.12	842.13	90.45**
Between sex (S)	1	5.83	5.83	0.626
AXE	1	2.00	2.00	0.215
AXT	1	2.14	2.14	0.229
AXS	1	1.78	1.78	0.191
SXE	1	.00	.00	
Residual	288	2681.28	9.31	
Total	296	3575.03		

* Significant.

** Highly significant.

Such results may be due to the fact, that the young ewes cannot fully supply their young, either during pregnancy or after birth with their necessary needs of nutrients since they are still growing and have to build up their own bodies too. Therefore, it is expected that their lambs will be of relatively smaller birth weights than those of mature ones.

c. Effect of sex

sex of lambs showed insignificant effect upon birth weight (Table 2). Although males were slightly heavier than females (Table 3). Hommond (1932) described the reason for the non-significant effect of sex on birth weight to the fact that the influence of male sex hormones is not marked at this early age.

TABLE 3, Effect of age of dam and sex of lamb on birth weight.

Sex	Spring lambing						Autumn lambing					
	2 year old ewes			4 year old ewes			2 year old ewes			4 year old ewes		
	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %
Male lambs	39	3.19	23.9	57	3.68	23.9	25	2.69	21.9	37	3.77	28.1
Female lambs	33	3.10	21.4	40	3.47	28.7	26	2.65	24.5	37	3.75	31.1

d. Effect of type of birth

Type birth was found to affect birth weight of lambs significantly (Table 2). Single male and female lambs were born heavier than their respective individual twin lamb (Table 4). This finding however, agrees with those reported by Ruttle (1971).

Undoubtedly, the nutrients, which a pregnant ewe could provide, are rather limited, and what is available to a single lamb should be more than what every twin one could have. Therefore, twin lambs tended to be smaller in size at birth.

TABLE 4, Effect of type of birth on birth weight.

Sex	Spring lambing						Autumn lambing					
	2 year old ewes			4 year old ewes			2 year old ewes			4 year old ewes		
	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %
Single male	30	3.54	10.9	43	3.94	19.50	20	2.18	67.60	29	4.12	16.3
Twin male	9	2.01	5.10	14	2.87	10.40	5	2.20	11.80	8	2.51	16.3
Single female	27	3.29	18.70	22	3.99	12.70	24	2.69	24.50	28	3.92	21.9
Twin female	6	2.35	4.30	18	2.84	37.30	2	2.20	14.40	9	2.00	25.0

TABLE 5. Effect of season of lambing, age of dam and sex of lamb on weaning and yearling weight.

Sex	Spring lambing						Autumn lambing					
	2 year old ewes			4 year old ewes			2 year old ewes			4 year old ewes		
	No	Mean (kg)	C.V. %	No	Mean (kg)	C.V. %	No	Mean (kg)	C.V. %	No	Mean (kg)	C.V. %
Male lambs	31	22.45	15.3	52	23.24	18.6	19	23.43	14.4	32	23.86	19.0
Female lambs	31	21.80	12.4	37	22.94	13.3	22	22.16	15.8	33	23.25	19.6
Male lambs	19	37.63	10.5	49	39.48	17.6	18	45.69	17.7	20	45.94	17.0
Female lambs	31	34.27	31.5	34	35.49	20.9	22	42.23	12.8	32	41.90	19.1

TABLE 6. Analysis of variance for the effect of age of dam at lambing season of lambing type of birth and sex on weaning weight.

Source of variance	d.F.	S.S.	M.S.	F. Value
Between age (A)	1	42.41	42.41	3.31
Between season (E)	1	21.39	21.39	1.67
Between type of birth (T)	1	296.24	296.24	23.54**
Between sex (S)	1	45.41	45.41	3.54
AXE	1	3.17	3.17	0.247
AXT	1	28.37	28.37	2.21
AXS	1	1.15	1.15	0.089
SXE	1	4.63	4.63	0.361
Residual	250	3205.00	12.82	
Total	258	3647.77		

** Highly significant.

2. Factors affecting weaning weight

a. Effect of season of lambing

The result given in (Table 5) shows that lambs in Autumn were slightly heavier at weaning than those born in Spring, although the differences were not significant (Table 6).

b. Effect of age of dam

It was found that lambs dropped from 4 year old ewes were heavier than those of 2 year old ewes (Table 5). However, such differences lacked statistical significance (Table 6). These findings were in the same magnitude reported by Asker *et al.* (1952) and Karam (1959 b).

c. Effect of sex

The results given in Table 5 shows that at weaning age male lambs were of heavier average weight than the female ones. These differences were not statistically significant (Table 6). These findings agree with those reported by Ruttle (1971).

d. Effect of type of birth

Type of birth affected weaning weight of lambs in a highly significant way (Table 6). Single male and female lambs were heavier than their respective individual twin lambs (Table 7). These findings are in accordance with the results reported by Ruttle (1971).

The differences between single lambs and individual twin lambs in weaning weight may be due to the competition between the twins for their mothers' milk, while no such competition exists in the case of single lambs.

3. Factors affecting yearling weight

Effect of season of lambing

The results given in Table 5 show that the Autumn born lambs have higher yearling weights than Spring born lambs. The differences were highly significant (Table 8). These findings agree with those reported by Ragab *et al.* (1953) and Ruttle (1971).

A certain fact ought to be taken into consideration when explaining the effect of season of lambing on yearling weight. In Egypt, generally and particularly in Kaam O'Sheem Farm where this work was carried out, the winter pasture is mainly Egyptian clover "*Trifolium Alexandrium*" (Berseem) which is available for grazing from November to May. In summer, the available green fodder is green maize which is of higher fiber content, less lush and less nutritive value than the clover (Berseem). Also there is a considerable rise in the ambient temperature from April onward. The Spring born lambs were

weaned during May and June when the winter pasture was ending and replaced by the Summer pasture which continued during post-weaning stage (being June to November). The temperature also rose during the period from June to October. Those two factors had detrimental effects on the growth and development of Spring lambs. The contrary was the case with the Autumn ones which were weaned when the weather (January February) was mild and the pasture was plentiful and lush. These two factors continue to exert their effect during the post weaning stage (from December to May) resulting in higher yearling weights. Therefore, it could be concluded that the effect of the season of lambing on yearling weight of lambs is a result of both the change in the environmental conditions and the availability of the appropriate green fodder in both quantity and quality.

TABLE 7. Effect of type of birth on weaning and yearling weight.

Sex & type	Spring lambing						Autumn lambing					
	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %	No.	Mean (kg)	C.V. %
Single male	25	22.72	12.3	39	24.07	22.6	16	24.14	13.0	27	24.05	20.9
Twin male	6	21.31	17.7	13	20.72	12.5	3	19.63	8.1	5	22.92	13.3
Single female	25	22.37	11.3	22	23.40	11.1	20	22.30	16.6	27	23.79	19.4
Twin female	6	19.43	9.6	15	21.16	12.8	2	20.75	14.9	6	20.83	15.5
Single male	17	38.09	9.8	36	41.25	17.2	15	46.13	12.5	15	47.34	16.9
Twin male	2	33.75	12.4	13	34.56	15.2	3	43.50	39.6	5	39.82	6.3
Single female	2	35.34	34.6	20	42.28	8.1	20	42.28	25.7	26	43.01	18.9

b. Effect of age of dam

Lambs dropped from nature dams were slightly heavier at yearling age than those from 2 year old ewes (Table 5). These differences were non-significant (Table 8). Bosman (1959) and Dass and Acharya (1970) obtained similar results.

These non-significant differences could be attributed to the fact that during post-weaning stage growth of the lamb does not depend any longer on his mother. Therefore, the effect of her age declines markedly as in yearling weight Bosman (1959).

TABLE 8. Analysis of variance for the effect of age of date at lambing, season of lambing, type of birth and sex on yearling weights.

Source of variance	d.F.	S.S.	M.S.	F. Value
Between age (A)	1	83.68	83.68	1.82
Between season (E)	1	2350.39	2350.39	52.39**
Between type of birth (T)	1	639.60	639.60	14.26**
Between sex (S)	1	698.11	698.11	15.56**
AXE	1	220.57	220.57	4.91*
AXT	1	127.94	127.94	2.85
AXS	1	4.76	4.76	0.11
SXE	1	302.27	302.27	6.74*
Residual	216	9689.76	44.63	
Total	224	14117.08		

* Significant.

**Highly significant.

c. *Effect of sex*

Table 5 shows that at yearling age males were heavier than female. These differences were highly significant (Table 8). Results obtained from the present work are in accordance with those reported by Malik (1970).

This difference is due to the hormonal differences between sexes which become more pronounced with advance in age and with progress in the function of the gonads as age advances.

d. *Effect of type of birth*

Single male and female lambs were heavier than their respective individual twin lambs at yearling weight (Table 7). The differences were highly significant (Table 8). This agrees with the findings of Cossard and Weir (1956).

4. *Carcass percentage*a. *Effect of age of lamb*

Table 9 shows that the average carcass percentage rises as age of lamb increases. The differences were highly significant (Table 10). This finding agrees with those reported by Hammond (1932) and Goetzee (1971).

Hammond (1932) pointed out that the fundamental cause of the increase in carcass percentage as age and live weight increased was due to the increase in fat deposition as well as muscle development in the animal.

b. *Effect of season of lambing*

Table 9 shows that the average carcass percentage for the Autumn born lambs was slightly higher than for Spring born lambs. Those differences between the two seasons, in this respect was not significant (Table 10). This finding agrees with the findings of Basson *et al.* (1970).

TABLE 9. Effect of age of lamb and season of lambing on carcass percentage.

Age of lamb months	Body weight kg	Spring lambing carcass percentage without liver kidney & testes	With liver etc.	Body weight kg	Autumn lambing carcass percentage without liver kidney & testes	With liver etc.
6	28.20	38.29	40.89	30.20	43.70	46.47
	30.70	41.04	43.50	28.10	38.25	39.89
	28.20	40.07	42.24	33.10	45.31	47.35
	32.10	41.12	43.61	23.10	41.17	43.45
	24.60	30.05	41.15	31.00	41.28	43.29
Average	28.76	39.98	42.37	29.10	42.10	44.24
9	47.00	45.95	47.97	36.20	49.80	52.65
	39.00	46.66	49.31	25.30	44.26	47.27
	36.00	15.83	48.24	31.20	48.72	51.65
	31.50	44.88	47.03	36.90	48.78	51.45
				33.40	46.82	48.96
Average	38.38	45.73	48.19	32.60	47.85	50.53
12	48.70	46.20	48.74	37.50	48.00	50.49
	47.50	47.37	49.45	45.00	46.66	49.12
	44.00	50.00	52.54	61.80	53.33	55.51
	39.80	45.27	47.63	56.00	49.82	51.77
	48.00	49.58	51.71	44.00	47.18	49.22
Average	45.60	47.72	50.05	48.86	49.39	51.67

TABLE 10. Analysis of variance for the effect of age of lamb and season of lambing on carcass percentage.

Source of variance	D.F.	S.S.	M.S.	F. Value
Age of lamb	2	94.98	24.99	13.58**
Season of lambing	1	3.72	3.72	2.02
Residual	25	46.00	1.84	
Total	28	99.70		

** Highly significant.

General Discussion

In this study mutton production of the Fleisch Merino under subtropical conditions was investigated. Spring born lambs were found to be slightly heavier at birth than those born in the Autumn, at weaning and yearling age, the reverse was the case. The differences between Spring born lambs and Autumn born ones in their yearling weight were attributed to the fact that post-weaning stage (January to May) coincides with the most favourable environmental conditions for the Autumn born lamb. In the case of Spring born lambs the post weaning stage takes place when the environmental conditions are the least favourable (July to October).

Concerning yearling weights of the indigenous breeds it was found to be 36.1, 36.7 and 36.3 as reported by Karam (1959 b) for Rahmani sheep, Ghoneim *et al.* (1968) for Ossimi Sheep and Fahmy *et al.* (1971) for Barki sheep respectively, while in this work the overall mean for yearling weight was 41.42 and 38.14 kg for male and female lambs respectively. It is obvious that yearling weights for Merino lambs obtained from this study were heavier than yearling weights for indigenous sheep breeds.

The average carcass percentage for Merino lambs aged about one year was found to be 51.67 and 50.05 for Autumn and Spring lambs respectively. This is more than those reported by Bardreldin (1951) for Ossimi and Rahmani sheep, being 43.0 and 41.2 respectively and that arrived at by Asker (1964) for Awassi sheep being 41.2%.

It was a problem to find a consumer for Merino's mutton at the early stages of importation. Now the public are accustomed to such meat and the demand has already surpassed the supply.

References

- Asker, A.A. (1964) Some economic characters of Awassi sheep in Iraq. *J. Anim. Prod. U.A.R* 4, 1.
- Asker, A.A., Ragab, M.T. and Kadi, M.R. (1952) The influence of some environmental factors affecting weight of some Ossimi and Rahmani sheep, *Fac. Agric., Fouad I Univ., Bull.* 119.
- Barr, A.L., Cunningham, C.J. Harper, J.O. and Inskip, E.K. (1968) Biologic and economic aspects of spring and fall breeding of sheep. *Bull. W. Va. Univ. Agric., Exp. Stn., No.* 562, :15-15 pp. (*A.B.A.* 37, 519).
- Badreldin, A.L. (1951) Growth and carcass percentage in Ossimi and Rahmani sheep. *Fac. Agric., Fouad I Univ. Bull.* 3.
- Basson *et al.* (1970) Growth and puberty of lambs raised underintensive conditions. *Proc. S. Afr. Soc. Anim. Prod.*, 1970 No. 9 :171-175 (*A.B.A.* 39, 702).
- Basman, S. W. (1959) Certain factors that determine reproduction in Merino Ewes. *S. Afr. J. Agric. Sci.* 2, 165. (*A.B.A.* 28, 753).
- Cassard, D. W. and Weir, W.C. (1956) Hereditary and environmental variation in the weight and growth rates of Suffolk lambs under farm conditions. *J. Anim. Sci.* 15, 1221.
- Chopra, S.C. and Acharya, R. M. (1971) A note on non-genetic factors affecting body weights of Bikaneri sheep (Magra strain), *Anim. Prod.* 13, 349.
- G.S. and Acharya, R.M. (1970)¹ Growth of Bikaneri sheep. *J. Anim. Sci.* 31, 1.
- Fahmy, M.H., Galal, E.S.E and Ghoneim, Y.S. (1971) Birth weight of Hungarian Merino sheep in North-Western Coastal Egyptian Desert. *J. Anim. Prod. U.A.R.* 9, 49.
- Ghoneim, A.M.A. *et al.* (1968) I. Growth studies during the suckling period. II. Growth studies from weaning up to one year old. (*A.B.A.* 29, 442.)
- Goetzee, C.G. (1971) Intensive mutton production from wool-bearing sheep. Comparison of two methods of producing slaughter lambs on crap farm, 1966 - 1969 final report *Summ. Dep. in Argic. Res. Pretoria 1970, Pt. 1, 66 - 70, (A.B.A. 40, 301).*
- Gould, M.B. and Whitman, J.V. (1971) Association of certain variables with the performance of Spring fall-born lambs. *J. Anim. Sci.* 33, 531.
- Hammond, J., (1932) "Growth and Development of Mutton Qualities in Sheep" Oliver and Boyd, London.
- Karm, H.A. (1959 b) Birth weight and yearling weights of Rahmani sheep. I. Effect of some environmental factors. II. Heritability estimates and correlations. *Emp. J. Exp. Agric.* 27, 315.
- Malik, B.S., (1970) Relationship of birth weight and certain body measurements at birth with yearling weight of Magra lambs. *Ind. Vet.* 47, 749. (*A.B.A.* 39, 300).
- Ragab, M. T., Asker, A.A. and Youssef, A.A. (1953) Comparative study of body weight and measurements of Ossimi and Rahmani sheep. *Bull. Fac., Cairo Univ.*, No. 27.
- Reyneke, J. (1969) Autumn Versus Spring lambs. *Prod. S. Afr. Soc. Anim. Prod.* 8, 147 - 148, (*A.B.,A.*) 38 431).
- Ruttle, J.L. (1971) Influence of sex and type of birth on performance of early weaned lambs. *J. Anim. Sci.* 32, 974 - 976.
- Snedecor, G.W., (1956) "Statistical Methods" 4th Ed, The Iowa state College Press, Ames, Iowa, U.S.A.
- Ragab, M.T., Sharafeldine, M.A. and Badawy, F.S. (1967) A study of Reproductive Performance of Flock of a Fleish Merina Sheep under Subtropical Conditions. *Egypt. J. Anim. Prod. (in Press).*

العوامل المؤثرة على إنتاج الحملان من قطيع من أغنام اللحم تحت ظروف شبه جافة

محمد توفيق رجب ، ممدوح عبد الوهاب شرف الدين و فوزى السيد بدوى

كلية الزراعة ، جامعة القاهرة

لدراسة أوزان الميلاد والقطام وعمر سنة استخدامات الحملان الناتجة من التماح التى بلغت أعمارها عند الولادة ٢ ، ٤ سنوات وعددها ٢٩٤ حصل • هنا واجرى اختبار عشوائى لثلاثين حمل فردى الولادة وتم استعمالهم لدراسة نسبة التصافى عند أعمار ٦ ، ٩ ، ١٢ شهرا واوضحت هذه الدراسة أن الحملان المولودة فى الربيع كانت ذات أوزان ميلاد أعلى من مثيلاتها المولودة فى الخريف ولكن الفروق الناتجة عن اختلاف موسم الولادة لم تكن معنوية •

بينما حدث العكس عند القطام وعند عمر سنة إذ كانت الحملان المولودة فى الخريف أعلى من الحملان المولودة فى الربيع وكانت الفروق معنوية عند القطام وعالية المعنوية عند عمر سنة • وجد أن أوزان الحملان الناتجة من تماح أعمارها أربع سنوات أعلى من أوزان مثيلاتها الناتجة من تماح أعمارها سنتين وذلك عند الميلاد والقطام وعمر سنة وكانت الاختلافات بين حملان المجموعتين معنوية عند الميلاد وغير معنوية عند القطام وعند عمر سنة • لوحظ أن الحملان فردية الولادة ذات أوزان أعلى من الحملان توأمية الولادة وذلك عند الميلاد والقطام وعمر سنة وكانت الفروق عالية المعنوية فى الثلاثة حالات •

وجد أن وزن الحملان الذكور عند الميلاد والقطام أعلى من وزن الحملان الاناث عند نفس الأعمار وكانت الفروق غير معنوية عند الميلاد والقطام وعالية المعنوية عند عمر سنة •

وجد أن نسبة التصافى تزداد اضطرابيا بتقدم عمر الحمل حيث كانت نسبة التضامن ٤٢.٣٤% ، ٤٨.١٩% ، ٥٠.٠٥% عند الأعمار ٦ ، ٩ ، ١٢ شهرا وذلك للحملان المولودة فى الربيع وبالنسبة للحملان المولودة فى الخريف كانت نسبة التصافى عند نفس الأعمار السابقة ٤٤.٢٤ ، ٥٠.٥٣ ، ٥١.٦٧ على التوالى وكانت هذه الاختلافات الناتجة عن اختلاف العمر عالية المعنوية • هذا ولم يثبت أن لموسم الولادة تأثير معنوى على نسبة التصافى •