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Fattening Sheep on Ration of Broiler Litter Ensiled with Green Berseem (Trifolium Alexandrinum L.)

2. Animal Performance and Carcass Traits.

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THIRTY four yearling rams. averaged 25.7±0.72 kg body weight, were used to investigate the merits of using diets containing different proportions of broiler litter silage (BLS. broiler litter ensiled with fresh berseem). Two animals were sacrified, at the beginning of feeding. The remaining 32 animals were randomly alloted to 4 fattennig diets containining 0. 33, 66 and 100% BLS for 16 weeks. Performance, efficiency of feed utilization and carcass characteristics were studied. Feeding different levels of the BLS to fattening yearling lambs significantly affected weight gain and some of the carcass traits, *i.e.* slaughter and hot carcass weights, flank and most of organs. It did not significantly affect the feed conversion (TDN/carcass weight), the dressing percentage , chilld carcass weight, most of the whole sale-cuts, both total edible offals and internal fat percentages and eye muscle area. The costs of production of carcass weight dropped from LE 4.155 per kg on the control diet to LE 3.370 and 3.135 per kg for animals fattened on 33 and 66% BLS, respectively . Replacing conventinal fattening diets with 33% BLS could be safely used as it had the lowest percentage loss in production.

Key words : Fattening sheep, broiler litter, berseem, carcass traits, feed efficiency.

The possibility of recycling animal waste as a feed ingredients has been received considerable attention in recent years. A common conclusioin is that, if nutritioinal principals are correctly followed , a portion of the animal waste would apparantly be of agreat value as an animal feed. It has the potential to reduce feed costs and provide a partial solution to manure management and environmental problems. Replacing the broiler litter-berseem silage (BLS) up to 66% of the control sheep diets did not remarkably influence intake, digestibility and feeding value of the rations (Khamis *et al.*, 1992). Moreover, many workers reported that processed animal waste has not altered the taste or quality of beef meat, milk or eggs (El Sabban *et al.*, 1970; Hadjipanayiotou, 1984and McClure and Fontenot, 1985). Limited literatures on using poultry excreta, in particular as a silage, in fattening sheep and its effect on their carcass traits are available (Razzaque *et al.*, 1983 and El-Bedawy *et al.*, 1989). The present study was planned as acontinuation of the first part of this series, to investigate the effect of feeding various proportions of broiler litter-green berseem silage (BLS) on performance and carcass characteristics of yearling lambs.

Material and Methods

Animal and feeding

This study was carried out at Maryout Research Station, 35 km south of Alexandria, Egypt. Thirty four Barki x Merion crosbred yearling lambs (approximately 10 months old and averaged 25.7±0.728 kg body weight) were used. At the beginning of the experiment, two random animals were sacrified in order to obtain base Iine carcass data. The other thirty two animals were divided according to body weight to four groups of eight animals each and were placed in four pens in a complete randomized design. One of the four experimental diets was randomly assigned to the four groups for 16 weeks (112 days) in amounts to cover the requirements for maintenance and a 150 g/day weight gain (ARC, 1965). The control group was given a conventional (control) diet which consisted of berseem hay (Trifolium alexandrinum L., 4th cut, 1FN, 1-27-516), commercial concentrates mixture and wheat straw IFN, 1-05-175). The brioler litter-green berseem silage (BLS) replaced 33, 66 and 100% of the control diet, on TDN basis. Detailes of silage (BLS) making and its materials, pH and some physical characteristics, chemical composition of its ingredients and control rations were shown in the first part of this series work (Khamis *et al.*, 1992). In brief, the BLS was made of equal parts (on DM basis) of chopped green beseem (Trifolium alexandrinum L., 3rd cut, IFN, 2-01-348) and broiler litter with wheat straw as bedding materials in addition to 4% sugarcan molasses (1FN, 4-04-695) and 1% mineral mixture. The experimental silage contained 32.8, 25.9, 16.2. 12.0, 8.35 and 37.55% DM, Ash, CP, CF, EE,and NFE, respectively . The crude protein and fiber contents of the control diets were as follows : 22.1 and 7.75% for the commercial concentrate mixture, 12.2 and 29.3% for berseem hay and 2.01 and 38.6% for wheat straw, respectively. The animals were given their diets in groups, weighed weekly and changes of live weight as well as average daily intakes were recorded

Carcass traits

A total of 18 carcasses were evaluated in this study. At the beginning of the experiment, 2 carcasses were used to botain base line carcass data. Then, after 112 days of initiation, four representative carcasses form each group were evaluated. The animals were sacrified after feed and water were withheld for 12-14 hrs and fasted live weight were recorded. The carcasses were dressed immediately after slaughter and the weight of the hot carcasses, internal organs and offals were recorded. Empty body weights were recorded and dressing percentages were calculated on basis of live body weight as well as empty body weights (Koch *et al.*, 1963). Thereafter, the fat tail was removed and weighed and the carcasses were refrigerated for 24 hrs at an average temperature of 4°C (Frild *et al.*, 1963). Chilled carcasses were then weighed and whole sale cuts were separated and weighed. They were legs, loin, rack, shoulder, flank and neck, in addition to the tail which was separated before chilling. Whole-sale cuts were then separated into its physical components, namely: fat, lean and bones. The area of the Lengissimus dorsi, L.D.) muscle was measured between the 12th and 13th ribs (Henderson *et al.*, 1966) using a polar planemeter. The efficiency of feed conversion into live weight, and carcass weight and economic evaluation were calculated.

All data, except for the two sacrified animals just befor the start of this study, were subjected to the statistical analysis (Snedecor and Cochran, 1980). Duncan multible range test was, also used to test the significant differences only whenever possible.

Results and Discussion

Live weight data for the yearling lambs (Table1) revealed that with increasing dietary levels of BLS, the rate of gain progressivley decreased during the first 4 weeks. However, during the 2nd and 3rd periods (4-8 weeks and 8-16 weeks), animals receiving the 33% diet compensated growth and were slightly superior to the control group due, mainly to their higher feed intake. Their average daily gain amounted approximately 132 and 143 g during the 2nd and 3rd periods respectively. These values were higher than those recorded for fattening growing yearling Barki x Merino crossbred rams fed 250 grams of concentrates and fresh alfalfa *ad lib* as reported by Azamil (1978).

TABLE 1. Average daily gain (g) of fattening lambs fed diets containing different proportions of BLS.

Period	Dietary broiler litter silage, %				1 F-test		
	0	33	66	100	D	P	I
I-0-4 weeks	102.7a	46.9b	22.3b	18.4b	**	**	*
II-4-8 weeks	127.2a	131.7a	113.8a	53.6b	**	**	*
III-8-16 weeks	137.3ab	142.9a	94.9ab	83.7b	**	**	*
IV-0-112 day	127a	116a	80.4b	58.9c	**	**	*

D, Between diets; P, Between periods; I, Interaction.
* = $P < 0.05$; ** = $P < 0.01$
1 / Values in the same row with different superscripts differ ($P < 0.01$).

It is noticed (Table 2) that feeding more than 33% of the BLS adversely affected weight gains and the efficiency of feed utilization, whether calucated on the basis of dry matter on energy. Replacing 33% of the control diet with BLS decreased daily gain by about 9.16% but the efficiency of utilization of TDN was reduced by ony 2.2% based on data from all 8 animals per group. Incorporation of poultry waste beyond 50% level had adverse effect on growth, feed intake and feed efficiency of lamds (Smith and Lindahl, 1977 and Sangwan and Mandokhot, 1979).

Slaughter weight and empyt body weight were declined as the percentages of BLS increased (Table 3). Differences were significant ($p < 0.05$), as will be seen later; reduction in weight gain might be of economic significance. Dressing as percentages from embty body weight ranged from 49.8% in animals given the 100% BLS to 52.7% in those fed the control diets; whereas it was 50.8% before fattening. These values are, to some extent, closer to those obtained by Galal *et al.*, (1975) on Barkix Merino crossbred sheep and Younis *et al.* (1975) on Barki sheep (49.2%). It seems that fattening sheep on diets included different proportions of BLS did not significantly affect the dressing percentages as shown in Table 3. Similar findings were obtained recently by Rodriguez *et al.* (1990) on yearling sheep fed different proportions of broiler litter. Moreover, El Hag and El Hag (1981) found that dressing percentage or carcass yield of

TABLE 2. Mean values of daily gain and feed utilization for fattening on diets containing BLS (group feeding).

Item	Dietary broiler litter silage, %				± SE	F-test
	0	33	66	100		
Number of animals	8	8	8	8	0.728	*
Initial live weight, kg	24.2b	25.2b	25.2b	28.00a	1.06	*
Final live weight, kg	38.4a	38.2a	34.2b	34.6b	5.36	**
Daily gain, g/day	127.0a	116.0a	80.4b	58.9c		
Mean of total intake:						
kg DM/head/112 day	156.0	153.0	137.0	100.0	-	-
kg DM/100 kg BW/ 112 day	643.0	606.0	543.0	357.0	-	-
kg TDN/head / 122 day	103	96.1	773.8	52.2	-	-
kg DCP/ head / 112 day	22.0	18.8	13.7	10.6	-	-
Feed conversion						
kg DM/kg gain	11.0	11.8	15.2	15.3	-	-
kg TDNI/ kg gain	7.26	7.42	8.19	7.95	-	-
kg DCPI/ kg gain	1.55	1.46	1.52	1.61		

Values in the same row with different superscripts differ ($P < 0.01$).
* = $P < 0.05$; ** = $P < 0.01$

Sudan desert sheep showed very colse similarity when dehydrated poultry excreta was substituted the cottonseed cake in the control ration.

There was no evidence of changes in most of the proportion in the carasses of the whole-sale cuts (Table 3) that might be attributed to the BLS treatments except for flank and legs which differed significantly ($p < 0.05$) and were generally close to those obtained befor fattening. Such results are in agreement with those obtained by El Bedawy *et al.*, (1989) on Rahmany lambs given caged layer manure which substituted 25% of common concentrate mixture.

Concerning the physical composition of the total prime cuts, neck and flank (Table3) significant differences ($P < 0.05$) in the proportions of both fat and bone only in the total prime cuts were detected. There was a clear cut evedince that incorporation of the BLS in the fattening diets significantly affected the proportion of lean ($p < 0.01$) and fat ($p<0.05$) in the flank.

TABLE 3. Dressing percentages, whole-sale cuts and physical composition of prime cuts in carcasses of yearling lambs fattened on diets containing BLS.

Items	1/ Before fattening	Dietary BLS %				± SE	F-test
		0	33	66	100		
Slughter weight, kg	30.0	40.0a	36.2b	37.5b	34.2c	1.10	*
Empty body weight, kg	22.6	34.1a	31.6ab	32.8a	30.0bc	0.95	*
Dressing, %							
from slaughter Wt.	38.3	45.0	44.1	45.5	43.6	0.45	ns
from empty body Wt.	50.8	52.7	50.5	51.0	49.8	0.50	ns
Hot carcass, kg	11.5	18.0a	16.0b	16.7b	15.0c	0.75	*
Chilled carcass Wt., kg	11.2	16.8	15.3	15.6	14.7	0.99	ns
Whole -sale cuts, %							
Neck	8.45	10.1	10.7	10.1	9.96	0.15	ns
Shoulder	19.6	19.7	19.2	19.2	19.3	0.39	ns
Rack	26.5	23.5	24.1	23.5	23.1	0.24	ns
Loin	5.77	6.03	5.22	6.23	6.24	0.19	ns
Flank	6.24	7.42a	5.80b	5.58b	7.79a	0.40	*
Legs	33.4	33.3c	34.9b	35.4a	33.7c	0.31	*
Total prime cuts, %							
Lean	71.5	65.0	63.6	65.0	64.3	1.08	ns
Fat	6.13	13.1ab	14.2a	12.5ab	10.5c	0.50	*
Bone	21.1	21.0b	20.9bc	21.4b	22.7a	0.20	*
Flank,%							
Lean	84.7	68.1c	81.7a	67.0c	75.3b	2.10	**
Fat	15.6	31.7a	16.8b	32.8a	20.6b	3.10	*
Neck, %							
Lean	78.8	63.5	59.4	66.0	64.4	2.48	ns
Fat	3.17	11.4	11.9	9.5	8.6	2.69	ns
Bone	17.5	24.1	22.6	23.5	25.3	0.71	ns

1/ data were not included in statistical analysis.
Values in the same row with different superscripts differ (P<0.01).
ns= not significant; * = P <0.05; **=P<0.01.

Results of total edible offals as internal offals (heart, liver and kidneys), organs as external offals (heart, pelt, feet and tail), total intrnal fat as separable fat (Omental and kidney) as percent of slaughter weight in addition to eye (Longissiuns dorsi, L.D.) muscle area are illustrated in Table 4. No obvious differences due to feeding treatments

on either total edible offals or total internal fat as percent of slaughter weight. It seems that all organs, except for tail, as percent of slaughter weight affected significantly by dietary BLS levels. Moreover, animals fed the 66% BLS showed the greatest values in comparison with the others even those sacrified before fattening. Data in Table 4, also, showed that feeding different proportions of BLS did not affect both eye muscle area and kilogram carcass per cm2 L.D. while total fatty tissues was significantly ($p < 0.05$) influenced. The present results, concerning eye muscle area, edible offals and dressing percentages, were higher than those recorded for fattened yearling rams (Merino x Barki crossbred) on fresh alfalfa and concentrate mixture (Azamil, 1978).

TABLE 4. Organs, edible offals and intrnal fat as percent of slaughter weight and eye (Longissimus dorsi, L.D.) muscle area of yearling lambs fattened on diets containing BLS.

Item	Before fattening	Dietary BLS,%				± SE	F-test
		0	33	66	100		
Slaughter weight, kg	30.0	40.0a	36.2b	37.5b	34.2c	1.10	*
Total edible offals, % 1/	1.84	2.11	2.60	2.27	2.47	0.087	ns
Total internal fat, % 2/	0.82	1.23	1.16	1.22	1.07	0.078	ns
Organs, %:							
Head	6.42	7.25c	7.39c	10.19a	9.57b	0.11	*
Pelt	1.81.7	12.2bc	13.1b	19.8a	14.4b	0.45	**
Feet	2.57	2.10c	2.47b	2.81a	2.99a	0.12	*
Tail	0.39	0.59	0.47	0.65	0.42	0.051	ns
Eye muscle area, cm^2	9.98	15.8	14.7	14.1	14.0	0.66	ns
kg carcass per cm^2 L.D.	1.12	1.06	1.04	1.11	1.05	0.026	ns
Total fatty tissues, kg3/	0.360	0.77a	0.48b	0.66a	0.49b	0.065	*
Gramme fat per cm^2 L.D.	36.1	48.6a	32.6b	46.9a	35.1b	1.459	*

Values in the same row with different superscripts differe (P<0.01).
ns= not significant, * = P< 0.05; ** = P < 0.01.
1/ Heart, liver and kidneys were included .
2/ Omental and kidney were included
3/ Omental, kidneys and tail fat.

Table 5 presents a comparative summary of efficiency of feed conversion into live weight, carcass weight and cost of production. The comparison is best illustrated on basis of carcass weight rather than on live weight gain. Gain in carcass weights of the animals fed the 33, 66 and 100% BLS diets were 86.4, 77.7 and 45.2% of the control value, respectively. All differences among all groups were significant. Similarly, calculated efficiency of energy utilization (in terms of total digestible nutrients, TDN) for fattening on BLS diets indicated an increased requirements of kg TDM per one kg of live weight ($p < 0.05$) or carcass weight without significant differences. Furthermore, the cost of production (LE/kg) of either live weight or carcass weight was lowere on BLS diets compared to those on the conventional diet (control). According to 1992

TABLE 5. Feed conversion and cost of production in yearling lambs fed BLS diests.

Item	Dietary BLS %				± SE	F-test
	0	33	66	100		
Slaughter weight, kg	40.0a	36.2b	37.5b	34.2c	1.10	*
Total gain, kg, in:						
Live weight	14.2a	13.2a	10.8b	5.000c	1.44	**
Carcasss weight	8.30a	7.17a	6.45a	3.75b	0.659	*
TDN conversion:						
Live weight	6.90b	7.17b	7.17b	10.5a	0.448	*
Carcass weight	12.3	13.3	12.0	14.0	0.458	ns
Cost of production , LE/kg: 1/						
Live weight	2.34	2.19	1.86	2.07	-	-
Carcass weight	4.155	3.37	3.135	4.444		

Values in the same row with different superscripts differ (P < 0.01).
ns= not significant; * P < 0.05; ** P < 0.01.
1/ According to the prices of 1992.

prices, cost of production of carcass weight, dropped from LE 4.155 per kg on the control diet to 3.370 and 3.135 per kg on those fed 33 and 66% BLS, respectively. This amounted to saving of 15, 23.4 and 37.9% on the BLS, replaced diets. However, the negative association between the losses in product output and the savings on costs of production should not be overlooked. This can be summarized as follows:

BLS levels %	Percentage loss in production	Percentage saving on costs of production
33	5.5	15.0
66	23.4	23.4
100	51.8	37.9

Similar results were obtained by Goering and Smith (1977) and Smith and Lindahl (1977) who reported that the poultry litter based diets reduced feed costs by 17% in comparison with alfalfa meal for lambs. It is, therefore concluded that replacing conventional fattening diets with broiler litter ensiled with green berseem at level of 33%, on DM basis seemed to be quite reasonable and encourging as it had the lowest percent loss in production. Higher levels of BLS, *i.e.*66 or 100% should be avoided because of the great losse in meat output eventhough costs decreased. However, the possibility of using higher levels of the BLS during fattening, followed by a short finishing period on conventional diets need to be investigated.

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تسمين الاغنام على علائق مخلفات فرشة الدواجن مع البرسيم المصرى ٢-أداء الحيوانات وصفات الذبيحة

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اجرى هذا البحث لدراسة تأثير استخدام علائق تسمين تحتوى على نسبة مختلفة من سيلاج مكون اساسا من مخلفات فرشة الدواجن مع البرسيم المصرى على اداء ذكور متوسطة من الاغنام الخليطة (برقى ، مرينو) وكذلك على الصفات المختلفة للذبيحة واستخدم فى الدراسة عدد ٣٢ حيوان حيث قسمت الى أربع مجموعات (٨ حيوانات بكل مجموعة) وقد أعطيت كل مجموعة واحدا من العلائق التالية : المجموعة الاولى غذيت على عليقة تقليدية (مقارنة) ثم استبدلت فى العلائق الثلاث الاخرى بمستويات من السيلاج بنسب ٣٣، ٦٦ ، ١٠٠٪ حيث استمرت التغذية لمدة ١١٢ يوما سجلت خلالها أوزان المأكول وكذلك التغير فى أوزان الحيوانات ثم اخذت قياسات على الذبيحة لكل مجموعة بعد الانتهاء من التجربة . مع العلم بأنه تم ذبح عدد حيوانين (غير معاملين) قبل بداية التجربة .

وأشارت نتائج هذه الدراسة أن تسمين الاغنام على مستويات مختلفة من هذا السيلاج كان له تأثير معنوى على معدلات النمو اليومى وكذلك على بعض صفات الذبيحة مثل وزن الذبح، وزن الذبيحة الساخنة، وزن لحم البطن ووزن معظم الاعضاء. كما أنه لم يكن هناك أى تأثير معنوى على معظم صفات الذبيحة مثل نسبة التصافى، وزن الذبيحة المجمدة ، مجموع الاجزاء الثانوية ، الدهن الكلى، مساحة العضلة العينية ، وكذلك قطعيات الذبيحة الممثله فى الرقبه والكتف والصدر والقطن .

وقد أوصت هذه الدراسة باستخدام سيلاج البرسيم المصرى الطازج مع مخلفات فرشة الدواجن وخاصة بمستوى ٣٣٪ فى تسمين ذكور الاغنام النامية حيث أن تكلفة الانتاج كانت أقل مايمكن عند استخدام هذا المستوى فى التسمين .