

INFLUENCE OF OLIVE CAKE LEVEL IN SHEEP RATION WITHOUT OR WITH UREA ON GROWING LAMBS PERFORMANCE

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SUMMARY

Two feeding trials were conducted using Ossimi ram lambs averaging 22Kg for 150 and 90 days for trials 1 & 2, respectively. In each trial, 20 lambs were assigned to form equal groups. In trial one, olive cake levels (0, 15, 20 & 25%) were used replacing clover hay forming four dietary treatments. In trial two, differences were only with ensiling olive cake with urea for 21 days. Feed intake, animals' body weight gain and feed conversion were obtained; also, a simple economic evaluation was obtained. Results of trial one showed that: 1- Feed intake was insignificant different between the tested groups. 2- The inclusion of crude olive cake in the ration up to 25% did not affect lambs body gain significantly. 3- Feed conversion showed insignificant differences regarding DM, TDN, SV and DE and significant differences regarding DCP. The DCP/gain (g/Kg), tended to be lower with olive cake containing rations especially that contained 25% olive cake compared to the control ration. 4- The economic evaluation showed that olive cake rations resulted in lower feed cost/kg gain. The 25% olive cake ration reduced feed cost/kg gain by about 13.5%. Results of trial two showed that: 1- Animals performance was not affected significantly by the use of urea-treated olive cake rations compared to the control. 2- Feed intake was not affected significantly as comparing urea-treated olive cake rations with the control. However, with urea-treated olive cake tended to improve as the level of olive cake increased in the ration reflecting the effect of increasing its nitrogen content through ensiling. 3- Feed conversion was not affected significantly regarding DM, TDN, SV and DE/gain. But DCP/gain showed significantly lower values with olive cake rations that ensiled with 4% urea for 21 days before feeding. 4- The economic evaluation showed that the cost price/kg gain was nearly similar for all rations with differences, not more than 3%.

Keywords: *Feed intake, daily gain, feed conversion, lambs and olive cake.*

INTRODUCTION

There is a significant increase in the demand for animal protein due to the increase in human population. On the other hand, feed supplies has risen but at a lower rate than that needed. Such trend resulted in shortage in feedstuffs. Therefore, the greatest technical and managerial problem in Egypt is the provision of adequate nutrients to the existing animal population (Aboul-Fotouh *et al.*, 2013). The total area of olives tended to increase up to 117 thousand feddan in 2004 year, 70% of it produce olive fruits with a total production of about 315 thousand tons. About 20% of total cultivated area is situated in Fayoum Governorate (EAS, 2004). Mediterranean countries produce 98% of the world olive oil. Olive oil production in 2009 was almost twice (2.91 million tons) as that of 1995 (1.65 million tons) (FAO, 2010). FAO (1985) reported that olive by-products could be used as alternative feeds for ruminants. Nefzaoui (1997) indicated that it could be used as fuel, fertilizers and chemical products. Abarghohi *et al.* (2011), showed that the spilt use of olive cake as a feed in diets of ruminants is limited. In Egypt, Hathout *et al.* (1977), Khamis *et al.* (1989), El- Sayed *et al.* (1996), Fayed *et al.* (1999), Youssef & Fayed (2001) and Youssef *et al.* (2001) cleared that olive by-products could be used as a feed ingredient with reasonable level especially for small ruminants. Olive by-products differ greatly due to the technology used for oil extraction and the nature of olive by-product (Nefzaoui, 1997) as well as the varieties cultivated.

Therefore, the present study aimed to investigate the effect of crude olive cake level in the ration alone and with urea supplement on feed intake, lambs daily gain and feed conversion of the experimental rations. Where a simple economic evaluation of the tested rations was considered.

MATERIALS AND METHODS

The present study was carried out at the Experimental Station of Seds, Animal Production Research Institute, Agricultural Research Centre, Ministry of Agriculture, Egypt. Chemical analysis were conducted at Anim. Prod. Dept., Fac. Agric., Fayoum Univ., Fayoum Governorate, A.R.E. Lambs performance was tested using different levels of olive cake in the ration (without treatment in feeding trial one and with urea- treatment in the second one .

Feeding trials:

Trial one:

Twenty Ossimi ram lambs weighing 21.8 Kg in average were randomly assigned to four equal groups in order to study the effect of replacing clover hay partially by olive cake on lambs performance, daily gain, feed intake and feed conversions as well as simple economic evaluations were conducted.

Animals were fed in groups on rations presented in Table (1), forming four experimental dietary groups (5 animals each). The trial was extended for 150 days. Rations were offered twice daily, and fresh water was available all time.

Table (1). Ingredients of the tested rations (olive cake levels), trial one.

Item	Ration			
	0% OC	15 % OC	20 % OC	25 % OC
Concentrate mixture (CM)	60	60	60	60
Clover hay (CH)	40	25	20	15
¹ Olive cake (OC)	0	15	20	25

¹Crude, residue of mechanical extraction of oil, after a period of air drying .

Trial two:

Twenty Ossimi ram lambs weighing 21.9 Kg on average were randomly assigned to four equal groups in order to study the effect of replacing clover hay partially by urea- treated olive cake on lambs performance daily gain, feed intake and feed conversion as well as a simple economic evaluation was conducted. Animals were fed in groups on rations presented in Table (2), forming four experimental dietary groups (5 animals each). The trial was lasted for 90 days. Rations were offered twice daily, and fresh water was available all time.

In both trials animals were fed at a rate of 4% of their body weight, on DM basis. Feeds tested cover the nutritional requirements of growing lambs with surplus (NRC, 1985).

Table (2). Ingredients of the tested rations (urea-Treated olive cake-(UOC)), trial two.

Item	Ration			
	0%OC	15 % OC	20 % OC	25 % OC
Concentrate mixture (CM).	60	60	60	60
Clover hay (CH).	40	25	20	15
Urea-treated olive cake (UOC)	0	15	20	25

Feeding value of the tested rations (SV %, TDN%, DE (Mcal) and DCP%) in Tables (3) and(4)were according Aboul -Fotouh *et al.* (2013).

Table (3). Nutritive values of the rations containing crude olive cake at different levels (trial one).

Item	Rations				
	0% OC	15% OC	20% OC	25% OC	± SE
TDN,%	64.09	63.26	66.27	61.56	3.61
SV, %	55.53	55.28	56.98	54.02	3.58
DE, M cal/kg	2.83	2.77	2.90	2.69	0.16
DCP, %	12.06 ^a	10.52 ^b	11.00 ^{ab}	9.99 ^b	0.56

TDN, Total digestibility nutrients; SV, Starch value; DE, Digestible energy; DCP, Digestible crude protein.. OC, Olive cake and SE, Standard error.

Table (4). Nutritive value of rations at different levels of 4% urea treated crude olive cake.

Item	Rations				± SE
	0% OC	15% OC	20% OC	25% OC	
TDN,%	64.09	63.93	65.07	67.18	1.95
SV,%	55.53	56.16	57.59	59.88	1.93
DE, M cal/kg	2.83	2.77	2.81	2.99	0.12
DCP,%	12.06 ^A	9.49 ^B	9.09 ^B	9.41 ^B	0.42

-TDN, total digestibility nutrients; SV, starch value; DE, digestible energy; DCP, digestible crude protein. -OC, olive cake; SE, standard error.

Rations feed intake in feeding trials: It was estimated as g/ kg, %of body weight, per metabolic body size regarding the intake as DM, TDN, SV, DE and DCP.

Feed conversion in feeding trials: It was calculated and expressed in terms of DM (kg), TDN (Kg), SV (kg), DE (Mcal) and DCP (g) required to produce Kg gain of lambs.

Economic evaluation: It was calculated considering that the price of ton for concentrate mixture, clover hay, olive cake were LE 950, 540, 200 respectively.

Statistical analysis:

The completely randomized design was used for analysis, the least significant difference (LSD) was used when treatments effects were significant (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Trial one (untreated olive cake rations):

The effect of different crude olive cake levels in the ration on Ossimi lambs growth performance is presented in Table (5).

Table (5). Growth performance of Ossimi lambs as affected by different levels of crude olive cake in the ration.

Item	Rations				SE
	0% OC	15% OC	20% OC	25% OC	
Body weight, kg:					
Average initial wt., kg	22.00	21.80	21.80	21.70	2.00
Average final wt., kg	45.70	46.10	45.30	46.00	1.86
Total gain, kg	23.70	24.30	23.50	24.50	1.36
Daily gain, gm	157.80	161.80	156.40	161.60	8.56

-All comparisons were insignificant. -OC, olive cake. SE, standard error of the means

It was observed that the inclusion of crude olive cake in the ration up to 25% did not affect lambs body gain significantly. The insignificant differences were also pointed out by Giouze lgiannis *et al* (1978), Nefzaoui & Ksaier (1981), Aboaysha *et al* (1982) and Omer *et al* (1995) using olive cake levels up to 35%. Feed intake results (Table 6), did not show any significant differences (DM, TDN, SV, DE and DCP). Such results may be due to that all groups (treatments) tested were fed in a similar percentage of body weight.

Feed conversion (Table 7) showed insignificant differences regarding energy intake (TDN, SV& DE) and DM per kg gain. It showed significant differences regard DCP conversion. Generally as the level of crude olive cake increased in the ration the DCP/kg gain reduced (i.e. improved). Such results are not expected, as it was reported that as the level of crude olive cake increased in the ration as feed conversion values increased (i.e. gain to the worst). Giouze Lgiannis *et al.* (1978); Accardi *et al.* (1979), Razzaque *et al* (1982) stated the negative relationship between crude olive cake and intake/ kg gain.

Table (6). Feed intake as affected by rations differing in crude olive cake level.

Item	Rations				SE
	0% OC	15% OC	20% OC	25% OC	
% of body weight:					
DM	4.00	4.00	4.00	4.00	
TDN	2.56	2.53	2.65	2.46	
SV	2.22	2.21	2.28	2.16	
DE	11.32	11.08	11.60	10.76	
DCP	0.48	0.42	0.44	0.40	
Per kg W ^{0.75} :					
DM, g	101.78	95.09	95.29	95.86	1.89
TDN, g	65.23	60.15	63.15	59.04	1.19
SV, g	56.52	52.57	54.30	51.78	1.04
DE, Kcal	288.04	263.42	276.34	257.88	10.02
DCP, g	12.27	10.01	10.48	9.58	0.50

-DM, dry mater; TDN, total digestible nutrients; SV, starch value; DE, digestible energy& DCP, digestible crude protein. -OC, olive cake. SE, standard error of the means.

Table (7). Feed conversion and economical evaluation of Ossimi lambs as affected in the ration with different levels of olive cake.

Item	Rations				SE
	0% OC	15% OC	20% OC	25% OC	
Feed conversion:					
DM/gain, kg/kg	8.9	8.2	7.9	8.2	0.2
TDN/gain, kg/kg	5.7	5.4	5.0	5.0	0.2
SV/gain, kg/kg	5.0	4.7	4.4	4.4	0.1
DE, M cal/kg	25.2	23.8	21.9	21.9	0.2
DCP, g/kg	1074.2 ^A	903.6 ^B	831.9 ^{BC}	816.2 ^C	26.2
Economic evaluation:					
Air dry intake kg/kg gain	9.82	9.10	8.76	9.00	
Relative feed cost, L.E/kg gain%	100	89.10	87.80	86.50	

-OC, olive cake. SE, standard error of the means. Averages in the same row having different superscripts are significantly different (A, B,...at p<0.01)

The economic evaluation (Table 7) was in favor of the ration contained 25% olive crude cake followed by both 20 and 15% crude olive cake then the control regarding relative% of feed price /kg gain. Such trend was also observed regarding the levels used in the present study by El-Shorafa and Faqih (1982) and Khamis *et al.* (1989).

Trial two (urea treated olive cake ration).

The effect of different urea-treated crude olive cake levels in the ration on Ossimi lambs growth performance are presented in Table (8).

Table (8). Growth performance of Ossimi lambs as effects by rations with different urea-treated olive cake levels.

Item	Rations				SE
	0% OC	15% OC	20% OC	25% OC	
Body weight, kg:					
Average initial wt., kg	22.00	22.00	21.80	21.80	1.79
Average final wt., kg	36.00	34.00	34.00	35.10	1.55
Total gain, kg	14.00	12.00	12.20	13.30	1.26
Daily gain, gm	155.00	133.40	135.60	147.80	14.59

-OC, urea treated olive cake. - SE, standard error of the means

Insignificant differences were obtained when urea treated olive cake level increased in the ration. However, the control tended to show better performance, as the level of urea- treated OC increased in the ration as animals performance improved. The difference between 25% urea treated olive cake rations and the control did not exceed 5%. Such trend may be due to the increase in N level due to urea treatment to a limit that enhances rumen activity. Barth *et al.* (1974) reported improvement in feed digestibility when urea-N in the ration increased up to 36% of the total – N. Nefzaoui *et al.* (1983) reported improvement in retained-N by about 2.7 urea with 3% NH₃ in exhausted olive cake ensiled with ammonia.

Feed intake as affected by rations differing in urea-treated olive cake level is presented in Table (9). Data on feed intake as % of body weight tended to show nearly similar trend to that in lambs performance.

Table (9). Feed intake as affected by rations difference in urea-treated olive cake level.

Item	Rations				SE
	0% OC	15% OC	20% OC	25% OC	
% of body weight					
DM	4.00	3.60	3.75	4.00	
TDN	2.56	2.30	2.44	2.69	
SV	2.22	2.02	2.16	2.40	
DE	11.32	9.97	10.53	11.96	
DCP	0.48	0.34	0.34	0.38	
Per kg W ^{0.75} :					
DM, g	91.67	81.92	85.23	91.11	2.06
TDN, g	58.75	52.38	55.42	61.21	1.36
SV, g	50.92	46.00	49.10	54.56	1.20
DE, Kcal	259.42	226.91	239.20	272.40	6.01
DCP, g	11.06	7.78	7.75	8.58	0.25

-DM, Dry mater; TDN, total digestibility nutrients; SV, starch value; DE, digestible energy& DCP, digestible crude protein. -OC, urea treated olive cake. - SE, standard error of the means.

Feed conversion as affected by rations differing in urea-treated olive cake level is presented in Table (10). The increase in urea treated olive cake resulted in a reduction in feed efficiency (DM, TDN, SV and DE). But improved that of protein.

Table (10). Feed conversion and economical evaluation as affected by rations differing in urea-treated olive cake level.

Item	Rations				SE
	0% OC	15% OC	20% OC	25% OC	
Feed conversion					
DM/gain, kg/kg	7.10	7.23	7.36	7.28	0.50
TDN/gain, kg/kg	4.55	4.63	4.79	4.89	0.32
SV/gain, kg/kg	3.94	4.06	4.24	4.36	0.28
DE, M cal/kg	20.08	20.04	20.66	21.77	1.28
DCP, g/kg	856.13 ^A	686.66 ^B	668.88 ^B	685.39 ^B	49.94
Economic evaluation:					
Air dry intake kg/kg gain	7.87	8.06	8.21	8.13	
Relative feed cost, L.E/kg gain%	100	101.83	98.66	97.05	

-DM, Dry mater; TDN, total digestibility nutrients; SV, starch value; DE, digestible energy& DCP, digestible crude protein. -OC, urea treated olive cake. -SE, standard error of the means. - Averages in the same row having different superscripts are significantly different (A, B...at p<0.01)

The economic evaluation (Table 10) showed that the differences in price / kg gain were nearly similar (about 2-3%). However the 25% urea-treated olive cake is slightly more economic than the other rations. Nearly similar trend was observed with rations containing untreated olive pulp (22% level) by Abou El-

Nasr (1985). Also, Omer *et al* (1995) reported that replacing 20% of barley with olive cake was economically feasible.

CONCLUSION

Such findings may suggest the use of 25% olive cake ration especially that of untreated one with no adverse effect on lamb's performance.

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تأثير مستوى تفل الزيتون فى العليقة بدون أو مع المعاملة باليوربا على أداء الحملان النامية .

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أجريت تجربتان تغذية باستخدام ذكور الحملان الأوسيمى متوسط وزنها 22 كجم لمدة 150 و 90 يوما للتجربة الأولى والثانية على التوالي . فى كل تجربة تم وضع 20 حمل لتشكيل أربعة مجموعات متساوية العدد. فى التجربة الأولى استخدمت 4 مستويات مختلفة من تفل الزيتون (0 ، 15 ، 20 ، 25%) لتحل محل دريس البرسيم لتشكيل أربع معاملات غذائية بينما فى التجربة الثانية كان الاختلاف فقط هو كمر تفل الزيتون مع اليوربا (4 %) لمدة 21 يوما. قدرت كمية الغذاء المأكول كما تم الحصول على الزيادة فى وزن جسم الحيوانات وتقدير معدل النمو اليومي وكفاءة التحويل الغذائى وكذلك تم إجراء تقييم اقتصادى بسيط للعلائق المختبرة. وأظهرت نتائج التجربة الأولى مايلى :

- 1- لم يكن هناك إختلاف معنوى فى كمية الغذاء المأكول بين المجموع المختبرة
 - 2- لم يكن هناك تأثير معنوى بين المستويات المضافة من تفل الزيتون الخام على معدلات النمو للحملان حتى مستوى 25%.
 - 3- أوضحت نتائج كفاءة التحويل الغذائى أنه لا توجد إختلافات معنوية فى المادة الجافة ومقاييس الطاقة بين المعاملات بينما وجدت إختلافات معنوية فيما يتعلق بالبروتين الخام المهضوم. إتجهت نتائج البروتين الخام المهضوم (حم بروتين مهضوم / كجم نمو) اللازمة لكل كجم نمو إلى الإنخفاض مع العلائق التى إحتوت على تفل الزيتون خاصة العليقة التى إحتوت على 25 % تفل زيتون مقارنة مع عليقة المقارنة.
 - 4 – أوضحت نتائج التقييم الإقتصادى أن العلائق المحتوية على تفل الزيتون أدت إلى خفض تكاليف الغذاء اللازم لإنتاج كجم نمو حيث أدت العليقة المحتوية على 25 % تفل زيتون على خفض تكاليف الغذاء اللازم لإنتاج كجم نمو بحوالى 13,5 %.
- أوضحت نتائج تجربة التغذية الثانية مايلى : 1 – أداء الحيوانات لم يختلف معنويا من حيث النمو فى كل المعاملات الغذائية بمعاملات اليوربا مقارنة بعليقة المقارنة . 2 - لم يكن هناك إختلاف معنوى من حيث تأثير إضافة اليوربا على كمية الغذاء المأكول مقارنة بعليقة المقارنة بينما لوحظ تحسن فى الغذاء المأكول كلما زادت نسبة تفل الزيتون المعامل باليوربا فى العليقة وهذا يعكس زيادة محتواها من النيتروجين أثناء عملية الكمر مع اليوربا. 3 – لم تتأثر كفاءة التحويل الغذائى معنويا فيما يتعلق بالمادة الجافة , معادل النشا , مجموع المركبات المهضومة الكلية، الطاقة المهضومة بينما أوضحت نتائج البروتين المهضوم / كجم نمو إنخفاض معنوى(تحسن) مع علائق تفل الزيتون التى تم كمرها مع اليوربا 4 % لمدة 21 يوم. 4 – أوضحت نتائج التقييم الإقتصادى (التكلفة الغذائية / كجم نمو) أنها كانت متشابهة بين العلائق المختبرة مع إختلافات لاتزيد عن 3 % . يستنتج أنه يمكن إستخدام العليقة التى تحتوى على 25 % تفل زيتون غير المعامل باليوربا فى علائق الحملان النامية بدون أى تأثير سلبى على أدائها .