

Effect of Feeding Discarded Dates, Palm Leaves and Its Combination on Growth Performance, Diet Digestibility, Blood Metabolites and Profitability of Ossimi Lambs.

Harby O.H. Galab¹, Gamal A. El- Sayaad¹, Ahmed S.M. Soliman¹, Hamdy M. A. El-Sayed², Tamer M.M. Hassan^{1*}

¹Department of Animal Production, Faculty of Agriculture, Benha University, Egypt.

²Department of Animal Production, Faculty of Agriculture, Ain Shams University, Egypt.

*Corresponding author: tamer.mohamed@fagr.bu.edu.eg

Abstract

The aim of this study was to investigate the effects of feeding a formulated from local feed sources with using discarded Dates, Palm leaves and its combination on growing Ossimi male lambs growth performance, diet digestibility, blood metabolites and profitability in New Valley Governorate. Forty nine Ossimi male lambs with average body weight 24.82 kg (4-5 months of age) were divided randomly to seven groups (seven lambs per each group) were fed individually. First group lambs were fed the control diet (0% discarded Dates and 0% Palm leaves). The second and third group of lambs were fed an experimental diet contained 7.5 and 15% of discarded Dates, respectively; the fourth and fifth group of lambs were fed an experimental diet contained 6 and 12% of Palm leaves, respectively; the sixth group of lambs were fed an experimental diet contained 7.5 % of discarded Dates and 6% Palm leaves; the seventh group of lambs were fed an experimental diet contained 15 % of discarded Dates and 12% Palm leaves during 120 days of feeding period. All lambs in each group individually weighed to the nearest gram monthly till the end of experimental period. Animals were housed individually in clean and hygienic pens. Body weight was measured weekly and feed consumption was recorded daily. Digestibility trial was conducted and digestion coefficient was calculated for diet dry matter (DM) and nutrients. At the end of experiment, blood samples were collected for analysis. Economic efficiency (profitability) was evaluated for using discarded Dates, Palm leaves and its combination in the diet. Results showed that there were no significant differences between groups in growth performance parameters between groups. Similar findings were recorded for digestibility of DM and nutrients. Addition of discarded Dates, Palm leaves and its combination in the diets did not negatively affect blood metabolites. Economical profitability was significantly found when feeding 12% Palm leaves (T4); 15% discarded Dates and 12 % Palm leaves (T6) in the diet. It can be concluded that discarded Dates, Palm leaves and its combination can be utilized effectively in the diet without adverse effect on growth performance, digestibility blood metabolites of Ossimi lambs.

Keywords: discarded Dates, Palm leaves, growth performance, blood metabolites, Ossimi lambs.

Introduction

Date palms is the major tree crop in Egypt and industry yields large quantities of several by-products which may be used for feeding livestock including low quality dates, date pits and fronds or date palm leaves. Egypt considers the highest country for date production over the world with 1590414 ton (FAO, 2019) around 18% of the global date production (El-Ansary *et al.*, 2019).

In Egypt there are approximately 20 million date palm trees and in New Valley governorate are 2 million date palm trees (FAO, 2019). Dates Palm loosed during ten-years (2000-2010) at harvesting were 10-15% and 8.1% during postharvest processes. This is due to mechanical (harvesting, sorting, grading and transportation) or biological (pests and insects) reasons (El-sayed and Abdel Gheal, 2013). Low quality dates can be used in rations of livestock and several studies showed that possibility using it in produce diets for feed livestock (Ahmed *et al.*, 2014). Using date palm in industrial of fodder helps greatly to found vast field for exploited low quality dates, as well as helps in increasing livestock productivity. A date palm tree can produce 13.5-20 kg of dry fronds annually (Chehman and Longo, 2001; Pascual *et al.*, 2000). This can produce a lot of thousand tons of dry

fronds per year. Unfortunately, large quantities of the fronds are not used and being burned by farmers thus causing environmental pollution. Chopped palm fronds have good potential for ruminants while, successfully used date palm fronds as an ingredient of concentrate formulated from local by-products for feeding local sheep (El-Hag and Al-Shargi, 1998; Mahgoub *et al.*, 2007; Al-Suwaiegh, 2016).

This study aimed to investigate the effects of feeding a formulated from local feed sources with using discarded Dates, Palm leaves and its combination on growing Ossimi male lambs growth performance, diet digestibility, blood metabolites and profitability in New Valley Governorate.

Materials and Methods

The experimental work of this study was carried out in a private sheep farm under supervision of Benha University Animal Production Professors duration time from February to May 2019 at New Valley Governorate, El-Dakhla City at Western Desert, Egypt.

Experimental animals and diets:

Forty nine Ossimi male lambs with average body weight 24.82 kg and at 4-5 months of age were divided randomly to seven groups (seven lambs per each group) were fed individually. First group lambs were fed the control diet (0% discarded Dates and 0% Palm leaves). The second and third group of lambs were fed an experimental diet contained 7.5 and 15% of discarded Dates, respectively; the fourth and fifth group of lambs were fed an experimental diet contained 6 and 12% of Palm leaves, respectively; the sixth group of lambs were fed an experimental diet contained 7.5 % of discarded Dates and 6% Palm leaves; the seventh group of lambs were fed an experimental diet contained 15 % of discarded Dates and 12% Palm leaves.

Lambs were subjected to health inspection before the beginning of the trial to ensure that they are in good condition. The experimental lasted 135 days, in which 15 days were considered as a preliminary period, followed by 120 days as an experimental period. The experimental rations were analyzed for DM, CP, CF, ADF, NDF, EE and ash content according to AOAC (1995) as showed in Table 1. Feed ingredient components of experimental diets in Table 2 and the chemical composition of experimental diets showed in Table 3. All diets were balanced and designed to meet the nutritional requirements of lambs. Diets of experimental lambs were formulated according to NRC (2007) recommendations for sheep.

Table 1. Chemical analysis of feed stuffs used in experimental diets.

Feed stuffs	DM%	CP%	CF%	EE	NFE%	Ash%
Soybean meal	90.00	44.00	6.70	3.00	41.40	4.90
Yellow corn	90.10	9.00	3.50	4.30	80.30	2.90
Wheat bran	90.00	15.70	10.80	4.10	63.60	5.80
Alfafa alfafa	89.70	14.90	22.20	1.80	51.60	9.50
Discarded Dates	83.00	5.20	2.80	0.60	85.20	6.20
Palm leaves	92.00	3.60	36.40	1.40	46.60	12.00

Table 2. Feed ingredient components of experimental diets.

Feed ingredients	Control	T1	T2	T3	T4	T5	T6
Soybean meal	11.00	12.00	12.00	11.00	12.00	13.00	16.00
Yellow corn	36.00	28.50	21.00	31.00	24.00	28.50	21.00
Wheat bran	21.00	20.00	20.00	26.00	32.00	19.00	16.00
Alfafa alfafa	30.00	30.00	30.00	24.00	18.00	24.00	18.00
Discarded Dates	0.00	7.50	15.00	0.00	0.00	7.50	15.00
Palm leaves	0.00	0.00	0.00	6.00	12.00	6.00	12.00
Minerals and vitamins	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Table 3. Chemical composition of experimental diets (on % DM bases).

Experimental diets	DM%	CP%	CF%	NDF	ADF	EE%	NFE%	Ash%
Control	90.15	15.85	10.92	32.21	20.53	3.28	62.29	7.66
T1	89.62	15.85	10.83	33.17	21.32	3.00	62.45	7.87
T2	89.08	15.56	10.78	32.04	20.95	2.72	62.81	8.15
T3	90.28	15.51	12.15	35.41	22.56	3.28	60.75	7.96
T4	92.03	15.57	13.47	36.84	23.75	3.19	59.04	8.31
T5	89.75	15.47	11.64	34.52	22.12	2.96	61.32	8.05
T6	89.36	15.33	12.33	35.77	23.08	2.62	61.31	8.41

Lambs growth performance:

All experimental lambs in each group individually weighed to the nearest gram monthly till the end of experimental period (120 days) in the morning before feeding and drinking. Fresh water supply was available along 24 hours. The feed supply was provided twice daily once at 8:00 am and another at 5:00 pm. Both of the consumed diets and refusals, if any, were recorded daily. Total weight gain, average daily weight gain, total and daily feed intake and feed conversion ratio were then calculated.

Digestibility trial:

After three weeks preliminary period, a digestibility trial was carried out for determination of the apparent digestion coefficient (ADC) of diet dry matter (DM) and nutrients. A stainless steel wire mesh was placed on the floor to keep fecal matter away from urine, which was passed through a stream into drainage. Feed intake was daily recorded. Feces were collected, mixed and weighed at morning for successive 7 days then stored at -20°C till analysis. Fecal samples (10%) were taken daily and dried out at 60°C for 48h and ground. Feed and fecal samples were analyzed according to AOAC (1995). Dry matter was measured

using hot air circulation oven (Heraeus Ut20, Germany) at 105 °C for 3 hours. Crude protein was measured using Kjeltac® system 2100, FOSS-Sweden. Ether extract (EE) was determined by Soxtec® system 2045, FOSS-Sweden. Crude fiber (CF) was measured using the method of Van Soest et al. (1991) by Fibretherm® system, Gerhardt-Germany. The ADC of diet was calculated for DM, CP, EE, CF and nitrogen-free extract (NFE) from each dietary treatment using the equation proposed by McDonald et al. (2002).

ADC%

$$= \frac{\text{Total amount of nutrients in feed} - \text{total amount of nutrients in feces}}{\text{Total amount of nutrient in feed}} \times 100$$

Blood sampling and analysis:

Blood samples were taken at the end of the experimental period from 4 lambs of each group in the morning just before feeding. Samples obtained by allowing blood to flow freely from the jugular vein through a clean dry needle into 10 ml test tubes. Blood samples were left at room temperature for 45-65 min then centrifuged for 30 min at 4000 r.p.m. Serum was separated into clean dried glass vials (5-7ml) and stored frozen (-20 °C) until analysis. Blood serum was analyzed for serum glucose (Trinder, 1969), serum total protein (Armstrong and Carr, 1964), Serum albumin (Dounas et al., 1971), serum globulin (by subtracting the albumin value from the total protein concentration) serum urea (Patton and Crouch, 1977), serum creatinine, ALT and AST (Reitman and Frankel, 1957).

Economic efficiency (profitability):

Finance analysis was made to evaluate the production profitability of using discarded Dates, Palm leaves and its combination in diets of experimental lambs. The net return (NR) was calculated according to Sankhyā (1983) from the difference between total income (TI) and total costs

(TC). Total income and total costs were individually calculated for each lamb. The total costs include: the feeding costs (discarded Dates, Palm leaves, its combination and ration), the labor costs (price of a farmer working hour multiplied by the number of hours employed per lamb, veterinary care costs (drugs, vaccines, and veterinary supervision). Water, electricity, equipment maintenance in addition to costs of litter and building rent value were also calculated per lamb for each group. The total income included: income value from final live body weight (lamb). All these parameters were estimated in L.E. over the course of the experiment.

Statistical analysis:

Statistical analysis was carried out by using the least squares procedure for analyzing the data with unequal subclass number described by SAS (2004).

The Statistical model used may be written as follows:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where: Y_{ij} = the observation of growth performance, diet digestibility and blood metabolites for ij lamb; μ = general mean, common element to all observations; T_i = the fixed effect due to i^{th} treatment groups (i =control, 1, 2, 3, 4, 5, 6). Tests of significance for differences between means were carried out according to Duncan (1955).

Results and Discussions

Lambs growth performance:

Results of the final body weight, total weight gain, average daily gain and feed conversion ratio showed a significant improvement ($P<0.05$) for lambs fed diet contained 7.5% discarded dates and 6% Palm leaves (T5) compared with the other treatment groups as showed in Table 4.

Table 4. Growth performance of growing lambs fed the experimental diets.

Items	Control	T1	T2	T3	T4	T5	T6	SEM*	P-value
Initial body weight, kg	25.41	25.02	24.60	24.58	24.82	24.50	24.77	0.55	0.91
Final body weight, kg	49.31	48.80	48.55	48.51	47.92	49.00	47.41	0.53	0.21
Total weight gain, kg	23.90 ^{ab}	23.68 ^{bc}	23.81 ^{ab}	23.92 ^{ab}	23.10 ^{cd}	24.50 ^a	22.55 ^d	0.22	<0.0001
Average daily gain, grams	199 ^{ab}	197 ^{bc}	198 ^{ab}	199 ^{ab}	192 ^{cd}	204 ^a	187 ^d	1.83	<0.0001
Total feed intake of DM, kg	150.00 ^a	148.80 ^{ab}	147.60 ^{ab}	148.80 ^{ab}	142.80 ^{bc}	153.60 ^a	139.20 ^c	2.4	0.0009
Feed conversion ratio (feed/intake)	6.27	6.28	6.19	6.22	6.18	6.26	6.17	0.08	0.41

^{a,b,c} Within rows means bearing different superscripts differ significantly at $P<0.05$.

*SEM- Standard error of mean.

The present results of lambs' performance are similar to those obtained by Alhomaidy et al. (2011) and Al-Owaimer et al. (2011) who concluded that the growth performance of Najadi lambs fed on diets containing different dates levels (0, 15 and 30%) was significantly ($P<0.05$) improved. Also, Hassan et al. (2014) who observed that Awassi lambs fed diet containing 20% dates and control group had the

heavier body weight ($P<0.05$) than the other treatment groups.

Apparent digestion coefficient:

The apparent digestion coefficient% of dry matter (DM) and nutrients of experimental diets are presented in Table (5). Results showed a significant ($P<0.05$) difference in digestion coefficient% of DM,

crude fiber and acid detergent fiber (ADF) between different experimental groups. It was observed that DM digestibility decreased significantly ($P<0.05$) for lambs fed 15% discarded Dates and 12% Palm leaves (T6) in comparison with the other groups. Crude fiber and ADF digestibility increased significantly ($P<0.05$) for lambs fed 7.5% discarded Dates (T1) than the other feeding groups. The differences among means of crude protein, neutral detergent fiber (NDF), ether extract and nitrogen free extract (NFE) digestion

coefficient% due to treatment effect were not significant. In a digestibility trial in Awassi lambs performed by Hassan et al. (2014), it was found that the rumen degradability of DM of discarded Dates was better than that of control group. On other spices, Abd El-Rahman et al. (2012) who indicated that digestion coefficient of goats fed on diets containing different levels of cull Dates (0, 10, 20 and 40%) are not significantly different among all treatments for DM, crude protein, crude fiber, ether extract and NFE.

Table 5. Coefficients of nutrient apparent digestibility (%) of the experimental lambs

Items	Control	T1	T2	T3	T4	T5	T6	SEM*	P-value
Dry matter	66.90 ^a	66.10 ^a	66.21 ^a	65.98 ^a	66.21 ^a	66.72 ^a	64.81 ^b	0.28	0.006
Crude protein	62.82	62.12	61.94	62.41	62.02	62.99	61.00	0.62	0.38
Crude fiber	57.11 ^a	56.56 ^{ab}	55.63 ^{ab}	55.16 ^{ab}	54.78 ^b	54.94 ^b	50.58 ^c	0.64	<0.0001
NDF ¹	56.82	58.41	54.79	56.15	55.69	56.39	56.64	0.90	0.26
ADF ²	54.48 ^{ab}	55.51 ^a	52.41 ^c	53.04 ^{bc}	52.11 ^c	53.43 ^{bc}	53.34 ^{bc}	0.62	0.01
Ether extract	75.51	75.93	75.00	73.45	75.46	73.80	74.97	0.74	0.22
NFE ³	66.16	65.44	65.18	64.13	65.50	65.70	65.65	0.70	0.58

^{ab,c} Within rows means bearing different superscripts differ significantly at $P<0.05$.

*SEM- Standard error of mean

¹NDF= Neutral detergent fiber; ²ADF= Acid detergent fiber; ³NFE= Nitrogen free extract.

Blood metabolites:

Table (6) shows the results of some blood metabolites in the experimental groups. Blood picture and serum biochemistry are important in evaluating the use of non-conventional feed ingredients and their effects on status of animals (Ibrahim et al., 2016). Blood glucose level was found to significantly ($P<0.05$) raised with increasing discarded Dates level in the diet. Presence of soluble carbohydrates and digestible nutrients in the diet could increase blood glucose level (Abdollahzadeh et al., 2010). Serum levels of proteins and albumin are valuable in reflecting the health of hepatic cells. Serum protein,

albumin, globulin, ALT, creatinine, uric acid and total cholesterol values (Table 6) of lambs fed 7.5% discarded Dates and 6% Palm leaves (T5) significantly ($P<0.05$) higher than the other feeding groups. The values in this study were in the normal range indicating no anti-nutritional factors that might reduce nutrient absorption in the small intestine, proposing intact hepatocellular functions. Similar results was concluded by Shrdh et al. (2016) and Azzaz et al. (2017) who reported that using discarded dates in rations have no marked effects on serum concentrations.

Table 6. Blood metabolites of growing lambs fed the experimental diets.

Items	Control	T1	T2	T3	T4	T5	T6	SEM*	P-value
Glucose (mg/dl)	135.0 ^c	149.5 ^b	169.5 ^a	126.8 ^{cd}	122.6 ^d	135.9 ^c	134.3 ^c	2.89	<0.0001
Total protein (g/dl)	6.35 ^b	6.31 ^b	5.92 ^c	5.41 ^d	4.86 ^a	7.01 ^a	4.69 ^a	0.11	<0.0001
Albumin (g/dl)	3.22 ^b	3.34 ^b	3.75 ^a	3.19 ^b	2.71 ^c	3.81 ^a	2.39 ^d	0.06	<0.0001
Globulin (g/dl)	3.13 ^a	2.96 ^a	2.17 ^b	2.21 ^b	2.15 ^b	2.20 ^a	2.30 ^b	0.09	<0.0001
A/G ratio	1.03 ^d	1.14 ^{cd}	1.72 ^a	1.44 ^b	1.25 ^c	1.19 ^c	1.04 ^d	0.04	<0.0001
ALT (U/L) ¹	20.30 ^{bc}	20.28 ^{bc}	20.77 ^a	20.50 ^b	20.52 ^b	20.29 ^{bc}	20.18 ^c	0.07	0.0005
AST (U/L) ²	34.37	34.80	34.47	34.62	33.83	35.06	33.95	0.33	0.16
Creatinine (mg/dl)	0.83 ^{cd}	0.86 ^c	0.97 ^a	0.84 ^{cd}	0.81 ^{cd}	0.95 ^a	0.75 ^d	0.03	<0.0001
Uric acid (mg/dl)	40.14 ^d	44.58 ^{cd}	45.66 ^b	42.35 ^{cd}	46.82 ^b	49.53 ^a	42.45 ^{cd}	0.78	<0.0001
Total cholesterol (mg/dl)	80.96 ^{bc}	77.30 ^{de}	78.54 ^{cd}	76.55 ^a	82.25 ^b	80.57 ^{bcd}	87.08 ^a	1.07	<0.0001

^{ab,c} Within rows means bearing different superscripts differ significantly at $P<0.05$.

*SEM- Standard error of mean

¹AST - Aspartate transaminase

²ALT - Alanine transaminase

Economic efficiency (profitability):

Data of costs, income and net return are shown in Table 7. The total costs (TC) of lambs fed control diet higher (2075.70 L.E./animal) than TC of lambs fed T1, T2, T3, T4, T5 and T6 diets (2029.14, 2011.81, 1891.01, 1879.85, 1976.15 and 1858.15 L.E./animal, respectively). Net profit was higher (559.46, 564.81, 652.35, 693.67, 622.85 and 657.51 L.E./animal, respectively) for lambs fed T1, T2, T3, T4, T5 and T6 diets than that for lambs fed control diet (538.90 L.E./animal). Financial analysis of the T1, T2, T3, T4,

T5 and T6 feeding groups earned about 20.56, 25.91, 113.45, 154.77, 83.95 and 118.61 L.E./lamb, respectively, more profit than the control feeding group. Therefore, results of the present study showed that feeding lambs discarded Dates, Palm leaves and its combination in different levels increases profitability. These results agree with those of Abd El-Rahman et al. (2012) who found that feeding kids cull Dates in different levels (0, 50, 75 and 100%) increased net feed revenue and economic feed efficiency.

Table 7. Economic efficiency (profitability) of growing lambs fed the experimental diets.

Items	Control	T1	T2	T3	T4	T5	T6
Ration cost (L.E./ton)	3486	3328	3183	2572	2479	3055	2427
Equipment depreciation (L.E./animal)	32.70	32.70	32.70	32.70	32.70	32.70	32.70
Building depreciation (L.E./animal)	21.40	21.40	21.40	21.40	21.40	21.40	21.40
Water and electricity (L.E./animal)	19.60	19.60	19.60	19.60	19.60	19.60	19.60
Veterinary management (L.E./animal)	36.70	36.70	36.70	36.70	36.70	36.70	36.70
Labor cost (L.E./animal)	147.00	147.00	147.00	147.00	147.00	147.00	147.00
Total fixed cost (L.E./animal)	257.40	257.40	257.40	257.40	257.40	257.40	257.40
Purchased lambs (L.E./animal)	1295.40	1276.53	1254.60	1266.33	1253.58	1249.50	1263.27
Feed cost (L.E./animal)	522.90	495.21	469.81	367.28	368.87	469.25	337.84
Total variable cost (L.E./animal)	1818.30	1771.74	1754.41	1633.61	1622.45	1718.75	1601.11
Total costs (L.E./animal)	2075.70	2029.14	2011.81	1891.01	1879.85	1976.15	1858.51
Sheep sales (L.E./animal)	2563.60	2537.60	2525.12	2492.36	2522.52	2548.00	2464.80
Wool sales (L.E./animal)	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Litter sales (L.E./animal)	27.00	27.00	27.00	27.00	27.00	27.00	27.00
Total returns (L.E./animal)	2614.60	2588.60	2576.12	2543.36	2573.52	2599.00	2515.80
Net profit (L.E./animal)	538.90	559.46	564.81	652.35	693.67	622.85	657.29

Conclusion

The finding of this study showed that discarded Dates, Palm leaves and its combination can be fed to Ossimi lambs with no detrimental effects on growth performance, nutrients digestibility and blood metabolites. Palm leaves and discarded Dates could be suitable from now on as an economic perspective due to their low prices and large availability; although the costs of the other supplements may compensate the benefit of these two feeds.

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تأثير استخدام البلح المستبعد وأوراق النخيل والخليط بينهما على أداء النمو وهضم الغذاء ومكونات الدم والكفاءة

الاقتصادية في حملان الأوسيمي

حربى عمر حسين جلاب¹ و جمال على النين الصياد¹ و أحمد سليمان محمود سليمان¹ و حمدي محمد أحمد السيد² و تامر مسعد محمد حسن¹

¹ قسم الانتاج الحيواني- كلية الزراعة- جامعة بنها- جمهورية مصر العربية

² قسم الانتاج الحيواني- كلية الزراعة- جامعة عين شمس- جمهورية مصر العربية

تم إجراء هذا البحث لدراسة تأثير البلح المستبعد وأوراق النخيل والخليط بينهما على أداء النمو وهضم الغذاء ومكونات الدم والكفاءة الاقتصادية الى غذاء حملان الأوسيمي. تسعة وأربعون من حملان الأوسيمي الذكور بمتوسط وزن 24.82 كجم (بعمر 4-5 أشهر) تم تقسيمها عشوائيا الى سبعة مجموعات اختبارية (سبعة حملان بكل مجموعة)، كانت المجموعة الأولى المقارنة تتغذى على علفية خالية من البلح المستبعد وأوراق النخيل والمجموعة الثانية والثالثة كانت تتغذى على علفية تحتوي على 7.5 و 15 % بلح مستبعد على الترتيب و المجموعة الرابعة والخامسة كانت تتغذى على علفية تحتوي على 6 و 12 % أوراق نخيل على الترتيب و المجموعة السادسة كانت تتغذى على علفية تحتوي على 7.5 % بلح مستبعد و 6% أوراق نخيل والمجموعة السابعة كانت تتغذى على 15% بلح مستبعد و 12% أوراق نخيل لمدة 120 يوم. تم أيواء الحيوانات بشكل فردي في حظائر نظيفة وصحية. تم تسجيل وزن الحيوانات أسبوعيا وحساب المأكل اليومي. تم إجراء تجربة الهضم وحساب معامل الهضم لكل من المادة الجافة والعناصر الغذائية. في نهاية التجربة تم أخذ عينات من دم الحيوانات لتحليل صفات الدم. تم تقييم الكفاءة الاقتصادية لاستخدام البلح المستبعد وأوراق النخيل والخليط بينهما في غذاء الأغنام.

أظهرت النتائج عدم وجود فروق معنوية بين مجموعات التجربة على أداء النمو. نفس النتائج تم تسجيلها لتقدير معامل الهضم للمادة الجافة والعناصر الغذائية. أظهرت النتائج أن إضافة البلح المستبعد وأوراق النخيل والخليط بينهما لغذاء الحملان لم يؤثر سلبا على مكونات الدم. بينما ظهرت اختلافات معنوية بالكفاءة الاقتصادية لصالح استخدام 12% أوراق نخيل (المجموعة الرابعة) و 15% بلح مستبعد و 12% أوراق نخيل (المجموعة السادسة) في غذاء الحيوانات.

نخلص من ذلك الى أن البلح المستبعد وأوراق النخيل والخليط بينهما يمكن استخدامه بشكل فعال في النظام الغذائي دون تأثير سلبي على أداء النمو والهضم ومكونات الدم لحملان الأوسيمي.