Egyptian J. Nutrition and Feeds (2020), 23 (2): 241-250

NUTRITIONAL AND ECONOMICAL EVALUATION OF INCLUSION OF HOTELS LEFTOVER FOOD IN GROWING LAMBS RATIONS

Y. L. Phillip, Hanan A. M. Hassanien; M. H. Abou El-Fadel; Amany A. Khayyal; A. M. Hussein; Heba A. El-Sanafawy and R. I. M. Matari

Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Dokki, Giza, Egypt.

(Received 1/1/2020, accepted 4/2/2020)

SUMMARY

This experiment was conducted to study the nutritional and economical evaluation of inclusion of hotels leftover food in growing lambs rations. Fifteen crossbred lambs (Ossimi × Finnish) with 23.5±0.3 kg average live body weight of, and 7 months of age were distributed into 3 similar groups (5 lambs each) and randomly assigned to 3 experimental rations. The experimental rations were formulated from concentrate feed mixture (CFM) that partially substituted by 0, 25 and 50% of dried leftover food (DLF) for CFM1, CFM2 and CFM3, respectively, plus corn silage. The experiment lasted 120 days. Results indicated that most nutrient digestibilities were markedly improved with increasing level of DLF in ration. Feeding values expressed as DCP did not significantly differ among the experimental rations, while TDN values were significantly improved with increasing the level of DLF. Ruminal pH values were significantly decreased with increasing DLF level at 3 hrs post feeding, however, concentrations of ruminal NH_3N and TVFA´s were not affected by inclusion of DLF. No significant differences were observed in blood constituents among the experimental groups. Moreover, improving in average daily gain and the lowest feed cost to get one kg gain were observed with ration containing 50% DLF (R3), recording 10.97% and 12.44%, respectively. At the same time, the positive percentage of DLF gave the highest economic efficiency. It was concluded that inclusion of DLF in growing crossbred lambs' rations up to 50% in CFM improved their performance.

Keywords: *Lambs, leftover food, growth performance, digestibility, ruminal, blood parameters and economic efficiency.*

INTRODUCTION

In Egypt, animals suffer from shortage of feeds that are continuously increasing in their costs. At the same time, many thousand tons of wastes are produced yearly from leftover food. Leftover food from the human food may offer inexpensive alternatives to the expensive feedstuffs. It is well known that the feeding cost represents about 60-70 % of the total production cost of the different animal products. The challenge for the feed formulation is to obtain the least cost rations that fully match with animal requirements (Maertens *et al*., 2002). Therefore, efforts have been made towards the solution of feed shortage could continue favorably by improving the conventional sources and investigating for more unconventional feeds. Minimizing the feed cost could be achieved through the use of untraditional cheaper feed ingredients. One of the options to cope up with this problem is to partially replace the conventional concentrate feeds by cafeteria leftovers. With new technology, waste along the human food supply chain could be used as a partial substitute for cereal in animal feed (FAO, 2011). Using such leftover food for animal feeding is a means of recycling which otherwise, if accumulated, might cause environmental pollution. Food waste, which cannot be eaten by humans, such as leftover food from cafeterias, hospitals and hotels and some fruit and vegetable peels, fish bones, and egg shells can be made into useful products as well. Thus, food waste can be viewed as a reflection on human behavior rather than food quality (Parfitt *et al.* 2010). Food waste is the amount of food material produced and ultimately discarded during any stage of the food supply chain (Dou *et al.*, 2016).Leftover food is

defined as any edible waste from food production, transportation, distribution and consumption; it is also referred as garbage, swill, hotel waste and/or, kitchen waste (Kornegay *et al.*, 1965 and Price *et al.*, 1985). In fact, overall around 30-50% of produced food being end up uneaten and considered as waste (Gustavsson *et al.*, 2011). Feedstuffs such as kitchen leftovers can be used in Egypt, and could be invaluable feed resources for small and medium size holders of livestock. Food leftover (food wastes) are not fully utilized and substantial amounts of nutrients lost during preparation of food, especially from cafeterias of universities, hospitals and hotels. On the other hand, currently large amounts of food waste generated from household and industries have become one of the main factors to cause environmental pollution. To overcome this problem and challenge, the cutting edge technologies and research could be employed in which change the food leftover for being a useful ingredient for formulation ruminants' rations in cost effective way. The best recycling way of food waste to minimize the pollution is converting it to animal feed (Kim *et al*., 2001). Also, dried leftover could be used as a supplemental feed or a feed ingredient for swine and poultry (Kim, 1995), not only to decrease the use of expensive feed ingredients, such as imported feeds, but also to reduce environmental pollution (Yang *et al*., 2001). Large amounts of food waste (meat, vegetables, fruits, and breads) are produced daily in megacities. Results of the previous researchers suggest that food waste can be used successfully in diets of monogastric animals (Truong *et al.*, 2019). Today, lambs have being used large amounts of conventional feed ingredient for their rations; therefore, research should be conducted to investigate the partial use of alternative feed ingredients to meet the growing demand for meat production. We proposed that food waste, occurring in all sectors of the food supply chain, could be become a partial from all lambs' rations. So, this experiment was conducted to study nutritional and economical evaluation of inclusion of hotels leftover food in growing lambs rations.

MATERIALS AND METHODS

This study was carried out during the period of 2019/2020 (lasted 120 days) at Sakha Research Experimental Station, Animal Production Research Institute (APRI), Agriculture Research Center (ARC), Ministry of Agriculture, Dokki, Giza, Egypt and the chemical analysis was carried out at laboratories of APRI, ARC. Dried leftover food (DLF) that mainly consisted of beans, grains, rice, cooked vegetables, pasta, tomato, apple, grapes and bread… etc. was collected from hotels in Cairo in fresh state (approximately 75% moisture) and directly sun air dried after collection, chopped and mixed consistently for being use in this experiment.

Experimental animals and feeding:

A comparative feeding trial was conducted with using fifteen male crossbred lambs (Ossimi × Finnish) with 23.5±0.3 kg average live body weight, and 7 months of age using randomized complete block design. Lambs were randomly divided into three similar groups (five in each). The trial lasted 120 days. Chopped leftover food were used in partial replacement of the concentrate feed mixture (CFM) at

Table (1): Feed ingredients (%) of the experimental total mixed rations.

Item	CFM1	CFM2	CFM3
Leftover Food	-	25.00	50.00
Yellow corn	40.00	37.50	22.00
Sun flower meal	20.00	17.50	13.00
Wheat bran	31.00	11.00	6.00
Molasses	5.00	5.00	5.00
Limestone	3.00	3.00	3.00
Salt	1.00	1.00	1.00
Total	100	100	100

CFM1=concentrate feed mixture (control ration), CFM2=concentrate feed mixture contain 25% of dried leftover food and CFM3= concentrate feed mixture contain 50% dried leftover food.

levels of 0, 25 and 50% in rations of lambs (CFM1, CFM2 and CFM3, respectively). The CFM was fed at the level of 2.5% of body weight of lambs plus the roughage portion (corn silage) that was fed *ad libitum*. Each group was assigned randomly to feeding one of the experimental rations where R1 received concentrate feed mixture (CFM1) + corn silage (control, R1), R2: CFM2 + corn silage, R3: CFM3+ corn silage. The CFM was offered twice daily at 8.00 a.m. and 4.00 p.m. in two equal portions with the corn silage, which was offered at the beginning of the feeding. Animals were housed in three shaded yards and they were weighed biweekly in the morning before drinking and feeding. Total weight gain and average daily gain were calculated for each animal. Average daily feed intake was recorded and feed conversion ratio was calculated as the amounts of total DM, TDN and DCP required per 1kg ADG. Drinking water was available at all times. The experimental animals were in healthy condition and free from external and internal parasites and kept in pens under similar conditions. Ingredients of the experimental CFMs in the different experimental groups are shown in Table (1).

Digestibility trials and rumen liquor parameters:

At the end of the feeding trial, digestibility trials were conducted simultaneously on the animals of the feeding trial (3 lambs in each group) to determine the digestibility coefficients and feeding values of the experimental rations using acid insoluble ash (AIA) method (Van Keulen and Young, 1977).

Feces samples were taken from rectum twice daily with 12 hours interval for 5 days and composited for each animal and representative samples were taken and stored at -20^{o} C until analysis. Feces and corn silage were dried at 60 ^{o}C for 72 hours. Feed samples (CFMs, corn silage and leftover food) and fecal samples were ground through 1 mm screen on a Wiley mill grinder and representative samples of feed and feces were analyzed for dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE) and ash according to A.O.A.C. (2007).

At the end of the digestibility trials, rumen liquor samples were taken from the three lambs of each group using stomach tube at 0, 3 and 6 hrs post feeding. The rumen liquor samples were strained through 4 layers of cheese-cloth and immediately pH was determined using digital pH meter (Orian 680). Ammonia nitrogen (NH_3-N) concentration was determined according to Conway and O'Mally (1957). Rumen liquor samples were kept in the deep freezer until the estimation of TVFA's according to Warner (1964).

At the end of collection period of the digestibility trial, blood samples were withdrawn from jugular vein in heparinized tubes from each animal and centrifuged for 20 min. at 3000 r.p.m. Plasma was frozen and stored at -18 °C until analysis. Various chemical parameters were colorimetrically determined using commercial kits; following the same steps as described by manufactures. Total protein was measured as described by the Biuret method according to Henry and Davidsohn(1974); albumin was assayed according to Doumas *et al.*(1971); globulin was calculated by subtracting the albumin value from total protein value. Cholesterol was estimated according to Stein (1986); liver functions were assessed by measuring the activities of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) according to Reitman and Frankel (1957).Urea was detected according to Berthelot (1959); creatinine was measured according to Faulkner and King (1976).

Statistical analysis:

All data were analyzed using the general linear models procedure of SAS (2004) where data of percentages were subjected to arc-sin transformation to approximate normal distribution before being analyzed. The differences between means were statistically measured for significant at ($P<0.05$) according to Duncan's multiple range tests (Duncan, 1955). The model used was: $Y_{ij}= \mu + T_i + e_{ij}$

Where: Y_{ij} = the observation of ij, μ=overall mean of Y_{ij}, T_i = effect of i (treatments), e_{ij} = the experimental random error.

RESULTS AND DISCUSSION

Chemical composition:

Chemical analysis of feedstuffs, CFMs and calculated chemical composition of the experimental rations are presented in Table (2). The chemical composition of CFM1, CFM2 and CFM3 were closely

comparable to those using commonly in practical field of ruminant feeding. Also, the nutrient content values of corn silage are within the normal range that widely recorded in the literature. The chemical composition of DLF was contained 15.87, 14.25, 16.32, 43.05 and **10.51% for CP, CF, EE, NFE and**

Table (2): Chemical analysis of feedstuffs, concentrate feed mixtures and calculated chemical composition of experimental rations (on DM basis, %).

Item	DM	OM	CP	CF	EE	NFE	Ash
Feedstuffs:							
Dried leftover food (DLF)	90.38	89.49	15.87	14.25	16.32	43.05	10.51
Corn silage	24.64	94.46	4.85	31.30	2.48	55.83	5.54
Concentrate feed mixtures (CFMs):							
CFM_1	88.38	93.00	15.56	7.97	2.86	66.61	7.00
CFM_2	87.27	91.28	15.08	6.97	4.89	64.34	8.72
CFM_3	89.18	90.88	15.16	7.59	4.11	64.02	9.12
Experimental rations:							
R1	49.56	93.38	12.01	15.71	2.74	62.92	6.62
R2	49.45	92.44	11.45	15.25	3.57	62.17	7.56
R3	49.25	91.87	11.24	15.44	3.98	61.21	8.13

R1: CFM1 + corn silage (control), R2: CFM2 contain 25% of dried leftover food + corn silage, R3: CFM3 contain 50% of dried leftover food + corn silage.

ash, respectively. The value of CP is close to the range that reported by Kim (1995) who recorded that the approximate analysis of leftover foods was 20-28% for CP, 10-14% for EE, 2-4% CF and 6-12% for ash when its moisture content was below 5%. The differences of chemical composition may be due to of the different percentage of the content of DLF in concentrate feed mixtures. While, Cho *et al*. (2004) showed that the chemical composition of DLF was 93.70% DM, 20.62% CP, 9.99% EE, 8.87% CF and 13.67% ash. Generally, DLF is rich in most nutrients and could be used as an effective ingredient and mostly considering as an excellent feed supplement in the rations of lambs. Experimental rations appeared some differences in its chemical composition as a result of increasing the level of DLF in ration up to 50% in the tested rations.

Nutrient digestibility and feeding values:

Digestion coefficients and feeding values of experimental rations are given in Table (3). Results revealed that the digestibility of OM and EE were significantly ($P<0.05$) increased and the digestibility of DM, CP and CF were insignificantly improved with increasing the level of DLF in

Table (3): Digestion coefficients and feeding values of the experimental rations.

Item	R1	R2	R3	±SE
Digestibility coefficients, %				
DM	65.82	66.29	67.15	±0.41
OM	68.76^{b}	70.17^{b}	71.15^{a}	±0.43
CP	65.36	66.99	68.96	±1.23
CF	47.00	50.85	57.28	±3.49
EE	72.71^{b}	77.76^{b}	80.02^{a}	±1.11
NFE	74.69	75.23	74.60	±0.47
Feeding values, %				
TDN	65.25^{b}	66.94^{a}	67.92^{a}	±0.44
DCP	7.85	7.67	7.75	±0.17

a and b means in the same row with different superscripts are significantly ($P\leq0.05$) different. SE=standard error. R1: CFM1 + corn silage (control), R2: CFM2 contain 25% of dried leftover food + corn silage, R3: CFM3 contain 50% of dried leftover food + corn silage.

rations. The highest (P<0.05) values were observed with animals fed ration contained 50% DLF (R3), followed that having 25% DLF (R2) compared with that of 0% DLF (R1, control ration). Amene *et al*. (2016) showed that the digestibility of CP is not affected by the different levels of dried Cafeteria leftover that inclusion in the rations of growing pigs but the DM, CF and EE were increased with increasing levels of leftover in the dietary mix. While, Chae *et al.* (2000) showed that the digestibility of CP and EE were increased with increasing the different levels of dried food waste in the diets of growing pigs.

In further explanation, Almeida *et al.* (2014) reported that increased DM digestibility with increase in levels of dried cafeteria leftover (DCLO) in the diets of pigs could be due to the existence of more soluble components in DCLO. In addition, there was a chance for the food to be exposed to heat treatment during cooking and such kind of heat treatment increases digestibility of food. The positive effect of DLF on nutrient digestibilities could be regarded to its high content of CP and EE that potentially needed to enhance rumen microbial activity. Similarly, the improvement of nutrient digestibilities could be attributed to the enhancement of microbial efficiency via stimulating rumen proteolytic bacteria and increasing the number of cellulytic bacteria (Williams, 1988 and Dawson *et al*., 1990). Also, Ojokoh (2007) reported that microorganism can be playing an important role that had either positive or negative effect according to the balanced macro/ micro nutrients that released from the dietary ingredients of the offered rations. The positive effect of microorganism is generally regarded as part of the fermentation and increases the availability of nutrients, vitamins, essential amino acids by improving digestibility of protein and fiber. Feeding value as TDN was significantly higher for DLF ration (R2 & R3) than that for control one (R1), however DCP value did not significant (P<0.05) affected as inclusion the level of DLF in rations.

Rumen parameters:

Ruminal pH values, concentrations of NH_3-N and TVFA´s are shown in Table (4). Data revealed that pH values were significantly decreased at 3 hrs. post feeding with increasing the level of DLF up to 50% in ration (R3). Decreasing in pH was generally due to the production of TVFA´s(Odetokun, 2000) that largely depending on protein-based fermentation (Ogunshe *et al.,* 2007). There were insignificant differences observed in concentrations of either ruminal NH_3-N or TVFA´s mostly at 3 hrs post feeding among the experimental rations where the highest value was occurred with R1 respecting NH_3-N, while the value of TVFA´s was the highest with R3.

Table (4): Ruminal parameters of lambs fed the experimental rations.

Item	pH			NH_3-N (mg/100 ml RL)			TVFA´s (meq/ 100 ml RL)		
	0 hrs	3 hrs	6 hrs	0 hrs	3 hrs	6 hrs	0 hrs	3 hrs	6 hrs
R1	6.89	5.66[a]	6.38	12.17[a]	27.64	32.60	14.17	24.14	17.08
R2	6.63	5.38[b]	6.35	9.01[b]	23.27	21.74	14.32	25.13	17.53
R3	6.55	5.19[b]	6.30	7.19[b]	21.89	19.17	15.76	27.82	18.09
±SE	±0.106	±0.106	±0.141	±0.76	±2.11	±3.93	±0.89	±1.87	±0.72

a and b means in the same column with different superscripts are significantly (P≤0.05) different. SE=standard error.

R1: CFM1 + corn silage (control), R2: CFM2 contain 25% of dried leftover food + corn silage, R3: CFM3 contain 50% of dried leftover food + corn silage.

Decreases in concentration of ruminal NH_3-N with increasing DLF level may be due to the lower degradability of the DLF ingredient that consequently decreased ammonia releasing in the rumen. The production of ammonia and amines is quite common end products that released during ruminal fermentation processes as a result of protein hydrolysis. On the other hand, insignificant decrease of NH_3-N and insignificantly increases of TVFA´s at 6 hrs post feeding were found in comparison with control ration (R1) and that is might be due to the well balanced all dietary nutrients required for lambs and ruminal organisms as well. Such slightly increases of TVFA´s concentration may be due to the increase of digestibility of organic matter (El-Ashry *et al.,* 2003), higher digestibility of CF andor resulted from altered microbial population and its activities (Doane *et al*., 1997). Also, Allam *et al.*

(1984) reported that the ruminal TVFA´s concentration could be affected by DM digestibility, rate of absorption, rumen pH and microbial population in the rumen and their activity.

Blood parameters:

Blood parameters of lambs fed experimental rations are shown in Table (5). Data revealed that the level of DLF had no significant effects on the concentrations of blood parameters (totalprotein, albumin, globulin, cholesterol, AST, ALT, urea and creatinine). Inclusion of DLF in lambs' rations had no adverse reaction on lambs' health; Cho *et al.* (2004) found that feeding dried leftover food to broilers had no significant effect on blood total cholesterol concentrations.

Also, Mousa *et al.* (2018) reported that ducks fed leftover food (0, 10, 20 and 30%) increased ($P<0.05$) triglycerides and had no significant effect on serum cholesterol. While, Chen *et al.* (2007) reported that chickens fed dehydrated food waste product (0, 5, 10, or 20%) showed significant

Table (5): Blood parameters of lambs fed the experimental rations.

Item	R1	R2	R3	±SE
Total protein, g/dl	6.46	6.24	6.49	±0.220
Albumin, g/dl	3.56	3.60	3.63	±0.095
Globulin, g/dl	2.90	2.64	2.86	±0.169
Cholesterol, mg/dl	108.6	116.2	111.81	±3.500
AST, U/L	24.67	26.06	24.98	±1.680
ALT, U/L	34.81	30.80	28.30	±2.890
Urea, mg/dl	36.45	35.71	34.82	±1.810
Creatinine, mg/dl	1.58	1.65	1.51	±0.150

a and b means in the same row with different superscripts are significantly ($P\leq0.05$) different. SE=standard error. R1: CFM1 + corn silage (control), R2: CFM2 contain 25% of dried leftover food + corn silage, R3: CFM3 contain 50% of dried leftover food + corn silage.

($P<0.05$) higher the value of serum AST with increasing dehydrated food waste product in their diets. However, Hassanien *et al*. (2020) recorded that the level of DLF (20% and 40%) had no significant effects on the concentrations of blood cow calves parameters (total protein, globulin, cholesterol, AST, ALT, urea and creatinine) except for albumin that increased significantly only with 40% DLF-ration compared with control one.

Growth performance, feed intake and economic efficiency:

Data of growth performance, feed intake, feed conversion and economic efficiency are presented in Table (6). Total body weight gain (kg) and daily body weight gain (kg) were insignificantly increased with DLF-rations (R2 & R3) compared with control one (R1). The improvements in daily body weight gain of lambs in 25% and 50% DLF-rations might be due to higher intake of TDN and DCP (Table 6). In relation with this point, McClure *et al.*(1970)reported that when 50% of dried leftover food was substituted for commercial feed for ruminant, nutritional quality of final feed was good enough to meet nutrient requirement of ruminant. Further study conducted by Westendorf *et al*. (1998)revealed that cafeteria food waste (CFW) plus energy supplement at 50% of the level of corn/soybean meal (CSM) resulted in gains not different from pigs fed the CSM diet in the finishing period of pigs. Paek *et al*. (2005) reported that daily gain was not affected by dried leftover (DLF) substitution level up to 75%of formula feed. While, daily was gain markedly decreased at 100% substitution level. Daily DM intake was nearly comparable among groups, being slightly increased with increasing the proportion of DLF up to 50% in lambs' rations. These results are in agreement with those recorded by Maeng *et al.*(1997) who found that increasing substitution levels of fermented leftover foods in the diet for laying hens resulted in increasing feed intake. More recently, Amene *et al.* (2016) found that daily feed intake in all treatments was consistently increased with increase in proportion of dried cafeteria leftover (DCLO) in the diet of growing pigs.

Table (6): Growth performance, feed intake, feed conversion and economic efficiency of lambs fed the experimental rations.

Item	R1	R2	R3	±SE
Growth performance:				
Initial body weight (kg)	23.2	23.0	23.8	±1.33
Final body weight (kg)	41.8	42.0	44.4	±1.49
Total body weight gain (kg)	18.6	19.0	20.6	±0.69
Daily body weight gain (kg)	0.155	0.158	0.172	±0.005
Relative daily body weight gain%	100	101.94	110.97	
Daily feed intake (as fed):				
CFMI,g	632	664	713	
Corn silage intake, g	378	410	414	
DMI, g	1010	1074	1127	
TDNI, g	659	719	765	
DCPI, g	79.28	83.00	87.34	
Feed conversion:				
DMI kg/kg gain	6.52	6.80	6.55	
TDN kg/kg gain	4.25	4.55	4.44	
DCP kg/kg gain	0.51	0.53	0.51	
Economic efficiency:				
Price of daily gain	10.85	11.06	12.04	
Corn silage cost , L.E.	0.77	0.83	0.84	
CFM cost ,LE	2.52	1.97	1.30	
Average daily feed cost, L.E.	3.39	2.80	2.14	
Feed cost / kg gain, L.E.	21.87	17.72	12.44	
Daily profit, L.E.	7.55	8.26	9. 90	
Relative feed cost, %	100	82.60	64.46	
Relative daily profit, %	100	109.40	131.13	
Economic efficiency, %	3.20	3.95	5.63	

Based on prices of the Egyptian market during the experimental period (2019).
Prices of one ton dry leftover food, corn silage and 1kg gain were 700, 500 and 70 LE, respectively. Price of one ton of CFM1, CFM2, CFM3= 3995, 2961 and1828 L.E., respectively.
Differences within the same row were not significant. SE=standard error.
R1: CFM1+corn silage (control), R2: CFM2 contain 25% of dried leftover food+ corn silage, R3: FM3 contain 50% of dried leftover food + corn silage.

The daily DMI was similar among the experimental treatments and likewise the amount of each DMI, TDN and DCPI per 1 kg gain was comparable among the dietary treatments (R1, R2 and R3). Amene *et al.* (2016) showed that the final weight, total body weight gain (TBWG) and average daily gain (ADG) of the pigs were increased with increasing the levels of dried cafeteria leftover in their diet, and usually feed conversion ratio (FCR) was in reverse trend with ADG of the pigs. Hassanien *et al*. (2020) showed that total body gain and average daily gain, TDN intake and DCP intake were significantly increased for crossbred cow calves fed ration contained 40% DLF compared to those fed control or 20% DLF. Concerning feed conversion measurements in the present study, the quantities (kg) of DM, TDN and DCP per 1 kg live body gain were comparable among the dietary treatments, being its values were closely similar among them. Otherwise results obtained by Saikia and Bhar (2010) indicated that feed conversion was higher in pigs fed on food waste based diets than that of those fed diets free from such food waste. Data of economic efficiency that presented in Table (6) showed that average daily feed cost (LE) and feed cost per kg gain (LE) were decreased with increasing DLF level in CFM with 25 and 50% (R2 and R3). Also the price of daily weight gain was increased by increasing level of DLF in both tested rations (R2 and R3) compared with the control ration (R1). The favorable economic values were occurred with R3, followed by R2 in comparison with the control3 (R1). These results are reflected on economic efficiency, where the highest values being associated with R3 and the moderate one were resulted with the R2-ration while the lowest values were outputted by control ration. These findings indicate that economic efficiency of lambs was increased with increasing DLF level in CFM up to 50%

(R3). In turn the daily profit (L.E.) and relative daily profit (LE) were markedly increased with the increasing the level of DLF in ration (R3) compared with the other ones. Economic efficiency was higher with 50% DLF-ration (R3) than that of the other rations. The present results are in harmony with those recorded by Paek *et al.* (2005) who showed that income per head was higher in 50% substitution level of DLF. Ration containing different levels of DCLO was economically feasible than that free from it respecting cost effective diet for pigs. Additionally, the economic return was more promising for pig fed 67% DCLO containing ration (Amene *et al.,* 2016). Also, Hassanien *et al*. (2020) reported that average daily cost, feed cost/ kg gain, daily profit (LE), relative daily profit and economic efficiency were improved by increasing DLF (20,40%) in crossbred cow calves' rations compared with control one (0%). Generally, the unutilized wasted food after processed by potential suitable methods, should be using potentially in formulation of rations for all classes of livestock.

CONCLUSION

In conclusion, leftover food collected from hotels could be used as a beneficial ingredient in formulation of rations of growing lambs with positive effect on nutrient digestibility, some blood parameters, growth performance and economic efficiency, in particularly with the tested ration that contained 50% level of DLF.

REFERENCES

Allam, S.M., A.K. Abou Raya, E.A. Gehad and T.M. El-Bedawy (1984). Nutritional studies by sheep and goats fed NaOH treated straw. Egyptian British Conf. on Animal and Poultry Production. Zagazig, 11-13 Sept., pp. 53.

Almeida, F.N., J.K. Htoo, J. Thomson and H.H. Stein (2014). Effects of heat treatment on the apparent and standardized ileal digestibility of amino acids in canola meal fed to growing pigs. Animal Feed Science and Technology, 187: 44-52.

Amene, T., M. Urge, M. Eshetu and D. Diba (2016). Effects of different proportions of dried Cafeteria leftover inclusion in a concentrate mix on performance of growing pigs. Sci. Technology and Arts Res. J., 5 (1): 27-34.

AOAC (2007). Official Method of Analysis (18th Ed.) Association of Official Analytical Chemists. Washington, D.C., U.S.A.

Berthelot, M. (1959). Estimation of serum urea. Report Chem. Applique 1: 248.

Chae, B.J., S.C. Choi, Y.G. Kim, C.H. Kim and K.S. Sohn (2000). Effects of feeding dried food waste on growth and nutrient digestibility in growing-finishing pigs. Asian-Aust. J. Anim. Sci., 13: 1304-1308.

Chen, K.L., H.J. Chang, C.K. Yang, S.H. You, H.D. Jenq and B. Yu (2007). Effect of dietary inclusion of dehydrated food waste products on Taiwan native chicken (Taishi No. 13). Asian-Aust. J. Anim. Sci., 20 (5): 754-760.

Cho, Y.M., I.S. Shin and C.J. Yang (2004). Effects of feeding dried leftover food on productivity of laying hens. Asian. Aust. J. Anim. Sci., 17 (4): 518-522.

Conway, E.F. and E. O'Mally (1957). Micro diffusion methods. Ammonia and urea using buffered absorbents. Biochem. J., 36: 655.

Dawson, K.A., K.E. Newman and J.A. Boling (1990). Effect of microbial supplements containing yeast and lactobacilli on roughage fed ruminal microbial activities. J. Anim. Sci., 68: 3392-3398.

Doane, P.H., P. Schofield and A.N. Pell (1997). Neutral detergent fiber disappearance and gas volatile fatty acid production during the in vitro fermentation of six forage. J. Anim. Sci., 75: 3342-3352.

Dou, Z., J. Ferguson, D. Galligan, A. Kelly, S. Finn and R. Giegengack (2016). Assessing U.S. food wastage and opportunities for reduction. Global Food Security, 8:19-26.

Doumas, B., W. Walson and H. Blgga (1971). Albumin standards and measurement of serum with bromocresol green. Clin. Chem. Acta, 31: 87.

Duncan, D.B. (1955). Multiple ranges and multiple F-Test. Biometrics, 11: 1-42.

El-Ashry, M.A., A.M. Kholif, M. Fadel, H.A. El-Alamy, H.M. El-Sayed and S.M. Kholif (2003). Effect of biological treatments on chemical composition, *in vitro* and *in-vivo* nutrients digestibilities of poor quality roughage. Egyptian J. Nutrition and Feeds, 5(1): 55-69.

FAO (2011). Mapping supply and demand for animal source foods to 2030. Animal production and Health working paper No. 2, FAO, Rome, Italy.

Faulkner, W.R. and J.W. King (1976). Fundamentals of clinical chemistry, 2nd ed. (NW Tietz, Ed.), Saunders, Philadelphia, pp. 994-998.

Gustavsson, J., C. Cederberg, U. Sonesson, R. van Otterdijk and A. Meybeck (2011). Global food losses and food waste; FAO: Rome, Italy.

Hassanien, Hanan A.M., Y.L. Phillip, M.H. Abou El-Fadel, Amany A. Khayyal, A.M. Hussein, R.I.M. Matari and Hanim A. Elsheikh (2020). Utilization of leftover food collected from hotels in rations of crossbred cow calves. J. Animal and Poultry Prod., Mansoura Univ., 11 (5): 169-174.

Henry, J.B. and T.S. Davidsohn (1974). Clinical diagnosis and measurement by laboratory methods, 16th Ed., W.B. Saunders and Co., Philadelphia., PA. p. 260.

Kim, N.C. (1995). Feedstuff of food garbage by the rapid steam drying. J. KOWREC. Kor., 3(2): 69-78.

Kim, C.H., Y.H. Song, B.J. Chae and Y.C. Rhee (2001). Effects of feeding extruded swine manure and food waste mixture diets on growth performance, body composition and feeding behavior of broilers. J. Anim. Sci. Technol. Kor., 43(1): 91-100.

Kornegay, E.T., G.W. Vander Noot, K.M. Barth, W.S. MacGrath, J.G. Welch and E.D. Purkhiser (1965). Nutritive value of garbage as a feed for swine. I. Chemicals composition, digestibility and nitrogen utilization of various types of garbage. J. Anim. Sci., 24: 319-324.

Maeng, W.J., S.H. Chung, S.R. Lee, C. Kim and J.J. Ahn (1997). Effects of food wastes as a fermented feed on egg laying. Proc. of the 7th Annual Congress of Korean Society of Animal Science, pp. 184.

Maertens, L., J.M. Perez, M. Villamide, C. Cervera, T. Gidenne and G. Xiccato (2002). Nutritive value of raw materials for rabbits: EGRAN tables 2002. World Rabbit Science, 10 (4): 157-166.

McClure, K.E., E.W. Klosterman and R.R. Johnson (1970). Palatability and digestibility of processed garbage fed to ruminants. J. Anim. Sci., 31: 249 (Abstr.).

Mousa, Enasa F., H.A.M. Abdel-Raheem and Gehan R.M. Dawood (2018). Using dried leftover foods as untraditional feed in Muscovy duck diets. Assiut Vet. Med. J., 64 (158): 107-114.

Odetokun, S.M. (2000). Effect of fermentation on some physio-chemical properties, antinutrients and *In-vitro* multi-enzymes digestibility of selected legumes. Ph.D. Thesis Federal University of Technology, Akure, Nigeria, pp. 148.

Ogunshe, A.A.O., M.O. Omotosho and A.D.V. Ayasina (2007). Microbial studies and biochemical characteristics of controlled fermented Afiyo- a Nigerian fermented food condiment from *Prosopis africana* (Guill and Perr.) Taub. Pakistan Journal of Nutrition, 6 (6): 620-627.

Ojokoh, A.O. (2007). Effect of fermentation on the chemical composition of mango (*Mangifera indica*) peels. African Journal of Biotechnology, 6 (6): 1979-1981.

Paek, B.H., S.W. Kang, Y.M. Cho, W.M. Cho, C.J. Yang and S.G. Yun (2005). Effects of substituting concentrates with dried leftover food on growth and carcass characteristics of Hanwoo steers. Asian-Aust. J. Anim. Sci., 18 (2): 209-213.

Parfitt, J., M. Barthel and S. Macnaughton (2010). Food waste within food supply chains: quantification and potential for change to 2050. Philosophical Transactions of the Royal Society B. Biological Sciences, 365: 3065-3081.

Price, A.T., D.A. Derr, J.L. Sulir and A.J. Higgins (1985). Food waste recycling through swine. Biocycle J. Waste Recyc., 26: 34-37.

Reitman, S. and S. Frankel (1957). A calorimetric method for the determination of serum glutamic oxaloacetic and glutamic pyruvic transaminases. Amer. J. Clinc. Path., 28: 56.

Saikia, P. and R. Bhar (2010). Influence of Kitchen/food waste on growth performance of grower piglets. Veterinary World, 3 (1): 34-36.

SAS (2004). SAS/STAT 9.1 User's Guide: Statistics, SAS Institute Inc., Cary, N.C., USA.

Stein, E.A. (1986). Textbook of clinical chemistry, NW Tietz, ed. W.B. Saunders, Philadelphia, pp. 879-886, 1818-1829.

Truong, L., D. Morash, Y. Liu and A. King (2019). Food waste in animal feed with a focus on use for broilers. Int. J. of Recycl. Org. Waste Agric., 8 (4): 417- 429.

Van Keulen, J.V. and B.A. Young. (1977). Evaluation of acid insoluble ash as a natural marker in ruminant digestibility studies. J. Anim. Sci., 44: 282-287.

Warner A.C.I. (1964). Production of volatile fatty acids in the rumen methods of measurements. Nutr. Abstr. & REV., 34: 339.

Westendorf, M.L., Z.C. Dong and P.A. Schoknecht (1998). Recycled cafeteria food waste as a feed for swine: nutrient content, digestibility, growth and meat quality. J. Anim. Sci., 76: 2976-2983.

Williams, P.E.V. (1988). The action of yeast culture in the rumen. Feed Compounder, 8 (9): 14.

Yang, S.Y., H.Y. Park, C.W. Kim and K.K. Park (2001). Isolation of halo-tolerant lactic acid bacteria for fermentation of food wastes. J.L.H. Kor., 7 (2): 137-140.

التقييم الغذائي والإقتصادي لإدخال بقايا طعام الفنادق في علائق الحملان النامية

يوسف لطفي فيليب ، حنان أحمد محمود حسنيين ، مجدي حسن أبوالفضل ، أماني أمين خيال ، أحمد محمد حسين ، هبة عبدالرحيم الصنفاوي و رضا إبراهيم محمد مطري

معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية- وزارة الزراعة- دقي- جيزة- مصر.

أجريت هذه التجربة لدراسة التقييم الغذائي والإقتصادي لإدخال بقايا طعام الفنادق في علائق الحملان النامية. حيث أستخدم ١٥حمل خليط (أوسيمى × فنلندي) بمتوسط وزن الجسم ٢٣,٥ ±٠,٣ كجم، وعمر ٧ شهور. قسمت الحملان بصورة عشوائية إلى ثلاثة مجاميع متشابهة (٥ حملان لكل منها). تم تكوين العلائق التجريبية المركزة مع الإستبدال الجزئي بنسبة ٠ , ٢٥ , ٥٠% من بقايا الطعام المجففة للعليقة المركزة ١ و العليقة المركزة ٢ والعليقة المركزة ٣، علي التوالي، حيث تمت تغذية العلف المركز بنسبة ٢,٥% من وزن الجسم، بالإضافة إلى مكون سيلاج الذرة حتى الشبع مع استمرار التجربه لمدة ١٢٠ يوم.

أشارت النتائج إلى تحسن واضح في معظم معاملات الهضم مع زيادة مستوي بقايا الطعام المجفف في العلائق. بينما لم تتأثر قيم البروتين الخام المهضوم في حين تحسنت قيم مجموع المركبات الكلية المهضومة بصورة كبيرة مع زيادة مستوي بقايا الطعام المجفف. كما أشارت النتائج الخاصة بالكرش إلى إنخفاض معنوي في قيم pH بعد ٣ ساعات من التغذية مع زيادة مستوي بقايا الطعام المجفف, بينما لم تتأثر القياسات الاخرى والمتمثلة في الأمونيا والأحماض الدهنية الطيارة الكلية. لم يلاحظ أي فروق معنوية في قيم مكونات الدمنتيجة التغذية على العلائق المحتوية على بقايا الطعام, بينما حدث تحسن في معدل النمو١٠,٩٧% للمجموعة التى تغذت على عليقة تحتوى على ٥٠%بقاياطعامالفنادق كما أظهرت هذه المجموعة افل تكلفة غذاء مقابل واحد كجم نمو (١٢,٤٤%) مع أعلى كفاءة إقتصادية بزيادة تسبةنسبة بقايا الطعام في العليقة وخاصة مع المعامله الثالثة (٥٠%). خلصت النتائج إلى أن ادخال بقايا طعام الفنادق الجافة فى علائق الحملان النامية بنسبة تصل إلي ٥٠%من العلف المركز أدى إلى تحسن فى أداء الحملان وزيادة معدل النمو اليومى.