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EFFECT OF FEEDING MIXTURE OF FOOD WASTE AND OLIVE CAKE ON MILK YIELD AND ITS COMPOSITION OFLACTATING ZARAIBI GOATS

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SUMMARY

This study aimed to evaluate the effects of diets composed of ecological food waste (mixture of food waste from hotels and olive cake(FWOC)) on lactating goats productivity compared with traditional diets. The effect of inclusion mixture of food waste and olive cake in diets of Zaraibi goats on nutrients digestibility, rumen function, milk yield, milk composition and some blood parameters were studied. A feeding trial was conducted using twenty four Zaraibi goats (32.33±0.2Kg LBW and aged 3-4 years) at late pregnancy (one month before parturition). Animals were assigned into three similar groups (8 animals each) using the randomized complete block design. They were fed as groups on a basal ration, where concentrate feed mixture (CFM) was 50% of requirements according NRC (2007); while berseem as a roughage was offered at *libitum.*The tested rations were formulated from concentrate feed mixture (CFM) that partially substituted by 0, 15 and 30% of FWOC for CFM1, CFM2 and CFM3, respectively, along with berseem as a roughage portion to formulate the experimental rations R1 (Control), R2 and R3 as tested one. Results showed that nutrient digestibility coefficients and feeding values were improved with the higher level of FWOC (30%) in ration, than R2 and R1 (control). NH3-N values and TVF'A concentrations in the in rumen liquor were increase with increasing the level of FWOC up to 30% (R3) in ration. The vice versa trend was found among dietary treatment respecting pH values in rumen liquor. Actual milk yields were significant higher with R3 (1269.1g/d.) than control ration (R1 1047.6 and R2 1130.0 g, respectively). Concerning milk composition, R2 rations significant increased fat percentage compared with R3 ration and control one, while insignificant differ was observed with milk protein percentage among treatments, the highest value in R3. Improvement respecting milk TS was observed with FWOC rations compared with control ration with insignificant differences. No significant differences among experimental rations regarding all offspring performance measurements. At the end of the experimental period, plasma total protein was affected significantly ($P<0.05$) by the experimental rations with the highest value (7.75g/dl) was occurred with R3 and the lowest one (6.85g/dl) was with R1. Economic efficiency was improved by feeding ration that contained30% FWOC (R3) in comparison with R1. This study concluded that considerably to use mixture of food waste and olive cake up to 30% level could be recommended for formulation the rations of lactating Zaraibigoats. It was concluded that use 30% of mixture food waste and olive cake was more effective in lactating goats. It can pronounced enhance feed intake, digestibility, feeding values, milk production, feed efficiency, some blood parameters and economic efficiency evaluation of lactating goats.

Keywords*: Zaraibi goats, food waste, olive cake, digestibility, ruminal, milk quality, milk yield, blood parameters and economic efficiency.*

INTRODUCTION

The global demand for milk is expected to increase by 48% between 2005 and 2050(Alexandratos and Bruinsma, 2012).Ruminants can convert feeds unsuitable and unpalatable for humans into milk and meat, and thereby play a key role in food security. Milk production efficiency is usually calculated as the ratio between nutrients secreted in milk and nutrient intake, but this metric does not address concerns about human/livestock feed competition. A product from goat milk has special nutritional value because it easily digested than cow milk and may have certain therapeutic value. It can be used as an alimentary resource and remedial food for both infants and children (Silanikove *et al*., 2010).Nutrition was most important factors,which affects both the yield and composition of the milk produced (Bencini and Pulina, 1997). Furthermore, modification of nutrition is a powerful and short-term means of altering yield and milk composition in sheep and goats. The aspects of the nature of dietary requirements of sheep and goat that have an influence on the yield and milk composition have been studied extensively (Dønnem *et al*., 2011). The chemical composition of milk, in terms of fat content and its fatty acid composition, depends on dietary (composition and availability), animal (breed, lactation stage, body condition) and environmental (especially cold and heat stress) factors. Therefore, it is important to note that the effects of nutrition are often hidden in the complexity of numerous factors that are also known to alter milk yield and composition. However, protein contents vary widely within species, and apart from nutrition it is influenced by breed, stage of lactation, climate, parity, season, and udder health status (Potočnik *et al*., 2011). Milk quality can easily be controlled by the farmer with quick and obvious results, although it requires an understanding of the interactions between the composition of the diet and the quality criteria (Voutzourakis *et al*., 2014). While milk yield is one of the most important parameters in lactating goats systems, milk quality parameters (chemical composition, fatty acid composition, lipid oxidation capacity, mineral matter, etc.) are also substantial. The use of non-conventional feedstuffs minimizes the competition of livestock with humans for conventional food grains and reduces the cost of animal production (Luciano *et al*., 2013).“Food loss and waste” refers to the edible parts of plants and animals that are produced or harvested for human consumption, but that are not ultimately consumed by people. In particular, “Food waste” refers to food that is of good quality and fit for human consumption but that does not get consumed because it is discarded either before or after it spoils. Food waste is the result of negligence or a conscious decision to throw food away. Large amounts of food waste generated from household and industries have become one of the main factors to cause environmental pollution. Kim *et al*. (2001) reported that the best recycling way of food waste to decrease the pollution is used it to animal feed. Gustavsson *et al.* (2011) reported that overall around 30-50% of produced food being end up uneaten and considered as waste. Large amounts of food waste (vegetables, fruits, meat, and breads) are produced daily in megacities. Results of the previous researchers suggest that food waste can be used successfully in diets of mono gastric animals (Truong *et al.,* 2019).

Olive (*Oleaeuropaea L.*) oil industry by-products are promising unconventional feedstuffs (Bashir, 2011).Olive pulp is available in large quantities in North Sinai (Mehrez and Mousa, 2011). From 1000 kg of fresh olives, about 214 kg olive oil, 496 kg crude olive cake, 40 kg of leaves and 1633 kg of olive mill waste water are produced (Vlyssides *et al*., 2004). Ishfaq *et al*., (2015) concluded from *in vitro* studies that Indian olive cake can be included in complete feed at 30% level (w/w; 40% ADF replacement) for feeding in small ruminants without compromising *in vitro* degradability of the feed.In general, the nutritive value of olive cake (OC) as feed is low due to its high fiber content and low digestibility values. Therefore, OC has mostly been used in the diets of small ruminants since they can better utilize low quality feedstuff than large ruminants. Aguilera *et al*. (1992) used a mixture of extracted OC and olive molasses to replace part of the conventional feedstuffs, such as sunflower meal and barley grain, in the diets of ewes in late pregnancy and lactation. The performance of the ewes offered the concentrates with OCmolasses was similar or better than those fed the standard concentrate. Lamb growth rate during suckling was similar for those with mothers receiving an OC-molasses mixture, as for those fed a conventional concentrate.

The aim of this work is to study the effect of use mixture food waste and olive cake with rate of 0, 15, 30% in concentrate feed mixture of rations for lactating Zaraibi goats on milk yield and composition, feed efficiency, some blood parameters and economical evaluation of lactating goats.

MATERIALS AND METHODS

The experimental work of this study was carried out at Sakha Experimental Station (Kafr El-Sheikh Governorate), belonging to Animal Production Research Institute, Agricultural Research Center, Egypt, in order to study the effects of partial replacement of concentration feed mixture with mixture from food wastes and olive cake (FWOC) in rations of Zaraibi lactating goats. The treatments extended 120 days started in October 2019.

Collection and preparation of mixture of food wastes and olive cake:

Food waste (FW) was collected from hotels in Cairo in fresh state (approximately 75% moisture) and directly sun air dried after collection. Food waste mainly consisted of beans, grains, rice, cooked vegetables, pasta, tomato, apple, grapes and bread… etc. Olive cake (OC) was collected from a local semi-automatic olive pressing factory. Olive pulp was sun-drying. A few days later when the olive pulp was air dried, was placed in tight plastic sacks for later use.

Experimental animals and feeding:

Twenty four Zaraibi goats at the last month of gestation were chosen and divided into three similar groups using randomized complete block design. Goat's average live body weight 32.3±0.20 kg and aged 3-4 years were randomly distributed according to their body weight and milk production during previous lactation season into three groups (8 animals each). The groups were assigned at random to receive one of the three experimental rations. All animals were consumed experimental ration which containing from berseem and concentrate feed mixture. Animal were kept in a semi- open shaded yard and kept under the same managerial conditions during the experimental period. The forage consisted of berseem and the concentrate was made out of mixture of Food waste (FW) and olive cake (OC) 80:20% percentage (w/w) respectively. Chopped food wastes and olive cake (FWOC) were used in partial replacement of the concentrate feed mixture (CFM) at levels of 0, 15 and 30% in rations of Zaraibi goats (CFM1, CFM2 and CFM3, respectively). The formulas were based on the needs of lactating goats (NRC, 2007), i.e. 14% crude protein and 61% TDN. The experimental goats were healthy and free from external and internal parasites. Goatsin the 1st group were fed the control diet, which consisted of concentrate feed mixture (CFM1), berseem (R1). The 2ndgroup (R2) was fed ration of partial replacement of concentrate feed mixture (CFM2) at level 15% by FWOC plus the berseem. The 3rd group (R3) was fed ration of partial replacement of concentrate feed mixture (CFM3) at level 30% by FWOC plus the berseem. All animals were fed daily at 8.00 a.m. and 4.00 p.m. fresh water and block minerals were available all times. Animals were housed in three shaded yards and they were weighed biweekly in the morning before drinking and feeding, then 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 average daily gain. Ingredients (%) of the experimental CFMs in different experimental groups are shown in Table (1).

Table (1): Feed ingredients (%) of the experimental CFMs in different tested groups.

Item	CFM1	CFM2	CFM3
Mixture of Food wastes and olive cake(FWOC)	-	15	30
Yellow corn	40	35	21
Sun flower meal	20	15	10
Wheat bran	31	26	30
Molasses	5	5	5
Limestone	3	3	3
Salt	1	1	1
Total	100	100	100

CFM1=concentrate feed mixture (control ration), CFM2=concentrate feed mixture contain 15% of food waste and olive cake (FWOC 15%)and CFM3= concentrate feed mixture contain 30% mixture food waste and olive cake(FWOC30%) .

Digestibility trial and rumen liquor parameters:

At the end of the feeding trial, digestibility trials were conducted simultaneously on the animals of the feeding trial (3 does 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. Samples of feedstuffs, CFMs, berseem and feces were dried at 60^{o}C for 72 hours. Feed samples CFMs, berseem, food waste 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 three animals for 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 determine pH using digital pH meter (Orian 680). Ammonia nitrogen (NH_3-N) concentration was determined according to Conway and O'mally (1942). Rumen liquor samples were kept in the deep freezer until the estimation of TVFA's according to Warner (1964).

Milk yield and milk sampling:

During suckling, milk yield was recorded weekly using milking hand technique, and the total milk yield was calculated by summation of milk over the whole experimental period. Does were completely hand milked after removing away their offspring the day before to determine the milk yield till stripping the udder through two successive days during milking period. Milk samples were directly analyzed for fat, total solids (TS) and total proteins, using the methods described by Ling (1963). Lactose content was determined by the method of calorimetrically according to Barnett and Abd El-Tawab (1957). Ash content was determined according the methods reported in A.O.A.C. (2007). Solids – not fat (SNF) was calculated. Fat corrected milk, FCM (4% fat) was calculated by using equation of Gaines (1928):

FCM= 0.4X milk yield (kg)+ 15 X fat yield (kg).

Feed conversion was calculated as the amount of DM, TDN and DCP units/ kg milk. At the end of this study simple economical efficiency was expressed as the ratio between the cost of output and the input (feed consumed) based on the price (LE/ton) during experiment.

Blood parameters:

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. Plasma total protein was determined according to Armstrong and Carr (1964); albumin according to Doumas *et al. (*1971); aspartate (AST) and alanine (ALT) amino transaminases activities were determined as liver function according to Reitman and Frankel (1957); creatinine and urea were determined as kidney functions according to Folin (1994) and Siest *et al. (*1981), cholesterol according to Fassati and Prenciple(1982) and triglycerides according to Richmond (1973).

Statistical analysis:

Collected data were subjected to statistical analysis using one-way-analysis of variance according to Snedecor and Cochran (1980) uses the following mathematical model: $Y_{ij} = \mu + T_i + e_{ij}$

Where: Y_{ij} is the parameter under analysis, T_i is the overall mean, Ti is the effect due to treatment and e_{ij} is the experimental error. The general linear model of SAS (2009) program was used in processing measured parameters. The difference between means was statistically measured for significance at ($P<0.05$) according to Duncan (1955).

RESULTS AND DISCUSSION

Chemical composition of feedstuffs and rations:

Chemical composition of different feedstuffs, CFMs and calculated chemical composition of tested 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 lactating goats feeding. Also, the nutrient values of berseem are within the normal range that widely recorded in the literature. The chemical composition of FWOC was contained 15.64, 18.03, 9.22, 47.03 and 10.08% for CP, CF, EE, NFE and 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 the content of DLF. While, Cho *et al*. (2004) showed that the chemical composition of dried leftover foods was 93.70% DM, 20.62% CP, 9.99% EE, 8.87% CF and 13.67% ash. Generally, food waste 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 lactating goats. Experimental rations appeared some differences in its chemical composition as a result of increasing the level of FWOC in ration up to 30% in the tested rations. Food waste is generally high in fat and salt contents, and moderately high in protein and ash (Kornegay *et al*., 1970 and Myer *et al*., 1999). Furthermore, in animal feed, olive cake can be used is a potentially useful source of indigestible fiber, it contains high amounts of crude fiber, which can restrict its use in the chicken, but may be useful in ruminant and rabbits feeding.

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

Item	DM	OM	CP	CF	EE	NFE	Ash
Feedstuffs:							
Mixture of food waste(FWOC)	96.94	89.92	15.64	18.03	9.22	47.03	10.08
Berseem	15.45	88.41	16.31	25.03	1.36	45.71	11.59
Concentrate feed mixtures (CFMs):							
CFM1	88.38	93.00	13.75	7.97	2.86	68.42	7.00
CFM2	87.25	92.86	15.67	13.83	4.34	59.02	7.14
CFM3	89.44	92.18	14.22	14.47	5.37	58.12	7.82
Experimental rations:							
R1	30.68	90.49	13.62	17.45	2.60	56.82	9.51
R2	30.33	90.38	14.70	20.94	3.43	51.31	9.62
R3	30.74	90.00	13.89	21.35	4.03	50.73	10.00

R1: CFM1 + berseem (control), R2: CFM2 contain 15% mixture of food waste and olive cake (FWOC)+*berseem and R3: CFM3 contain 30% mixture of food waste and olive cake+ berseem.*

Nutrient digestibility and feeding values:

Digestion coefficients and feeding values of tested rations are given in Table (3). Results revealed that digestibility of most nutrients of DM, OM, CP and NFE were insignificant increased with increasing the level of FWOC in rations and the higher values mostly were obtained with animals fed ration contained30% FWOC (R3) and then that having 15% FWOC(R2)compared with that of 0% FWOC (R1, control group). While, digestibility of CF and EE were significant (P<0.05) improved as increasing the level of FWOC up to 30% in (R3). In further explanation, Almeida *et al*. (2014) reported that increased DM digestibility with increase in

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

Item	Experimental rations			± SE
	R1	R2	R3	
Digestibility coefficients %				
DM	61.74	64.58	66.18	±1.43
OM	64.41	67.09	68.56	±1.39
CP	69.96	67.27	70.69	±1.56
CF	54.31^{b}	61.68^{a}	68.10^{a}	±1.77
EE	67.83^{b}	75.85^{a}	79.55^{a}	±1.22
NFE	66.16	68.74	69.87	±1.63
Feeding values%				
DMI	1297.8	1303.71	1310.11	± 12.64
TDNI(g)	783.8^{b}	830.5^{ab}	859.0^{a}	±20.11
DCPI (kg)	0.123	0.130	0.127	0.003
TDN	60.37^{b}	63.71^{ab}	65.55^{a}	±1.28
DCP	9.52	9.89	9.81	± 0.22

a and b means in the same row for each parameters with different superscripts are significantly different (P<0.05). SE=Standard error.

R1: CFM1 + berseem (control), R2: CFM2 contain 15% mixture of food waste and olive cake+ berseem, R3: CFM3 contain 30% mixture of food waste and olive cake+ berseem.

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. 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. The positive effect of FWOC on nutrient digestibilities could be regarded to its high content of CP and EE that potentially needed to enhance rumen microbial activity. Similarly, this 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, 1988and Dawson *et al*., 1990).Data illustrated in Table (3) revealed that Increasing in DM intake with groups of FWOC the highest vales in group contain 15% FWOC in R2 (5.96%. The increase in kg TDN intake/head was 13.55% versus 3.81 % for kg DCP/head. Feeding values as TDN was higher significantly with 30% FWOC ration (R3) than ration (R1), the lowest values of TDN was in control ration (R1). There were insignificant differences between control ration (R1), other two groups(R2)and(R3).It could be noticed that animals of group (3) had the highest values for feed intake relative to those recorded for the other groups. Results indicated that there were gradually increase in Total DMI, TDNI and DCPI with increasing the replacing levels of FWOC which might be due to increases feed intake in rations. Generally, FWOC improved and increased digestibility coefficients for most of nutrients and nutritive values especially up to the rate of 30% as a source of protein of CFM. These results were agreement with those reported by Saleh pour *et al*. (2012). In addition, Shwerab *et al*. (2010) showed higher digestibility coefficients and nutritive value with increasing DDGS in sheep rations. The same results were obtained with Etman *et al*. (2011). They found that using DDGS as a source of protein in rations formulation of buffalo calves increased digestibility coefficients of all nutrients and feeding values.

Rumen parameters:

Ruminal pH values, concentrations of NH_3-N and TVFA´s are shown in Table (4). Data revealed that pH values were insignificantly decreased at 3 hrs. post feeding for all groups. 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). On the other hand, insignificant increase of NH_3-N at 6 hr. post feeding were observed with R2 and R3, while VFA's concentration show higher significant with R3 and 3 hr. post feeding and insignificant higher concentration at 6 hr. post feeding. 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 or 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.

Table (4): Rumen parameters of lactating goats fed experimental rations.

Item	Time	R1	R2	R3	±SE
pH	0	6.71	6.62	6.61	±0.06
	3	5.53	5.38	5.67	±0.12
	6	6.21	6.06	6.16	±0.09
NH3-N (mg/100ml RL)	0	12.28	17.70	17.16	±1.45
	3	31.17^{b}	33.97^{ab}	37.15^{a}	±1.48
	6	17.92	26.97	24.36	±2.90
TVFA's (Meq/100ml RL)	0	8.87^{b}	10.22^{a}	8.23^{c}	±0.13
	3	15.05^{b}	14.01^{b}	24.21^{a}	±1.06
	6	14.00	13.91	15.75	±1.32

a and b means in the same row for each parameters with different superscripts are significantly different (P<0.05)SE=Standard error.

Milk yield and its composition:

Milk production is the main purpose of lactating goats farming. The amount of milk produced and its quality are influenced mostly by the feed consumed.Data of daily milk yield and its composition are presented in Table (5).Results showed that the actual and 4% FCM yields weresignificantly ($P<0.05$)(1269.1 and 136.3 g/d., respectively higher with R3 showing no significant differences between R1 and R2. Feeds influenced the milk yield of the lactating goats which was higher in the (R2) and (R3) groups.The trend of the milk yield showed a more significant increase, for the "FWOC" group than the "control" one. This could be due to a better utilization of the energetic quota by the lactating goats, which had the diet integrated with olive cake. Regarding milk fat yield, its value was significant higher with FWOC rationsR2 and R3than that of control one R1.Also, Keles *et al*. (2017) mentioned that milk fat concentration increased markedly with increasing olive cake level from approximately 3.75– 4.45%, presumably because of increasing dietary levels of ether extract.

Otherwise, milk protein yield was significant higher (P<0.05) in FWOC 30% R3 than FWOC 15% R2 and control one R1. Nutritional strategies that optimize function can be considerably maximized milk yield and its components. Such strategies that favourable influence milk components include adequate rumen degradable protein and adequate amounts of forage NDF in the diet especially for early lactation of dairy animals (Varga and Ishler, 2007). FWOC supplementations in the ration statistically affect milk fat content. Significant differences were observed for the fat percentages in group R2 than control and group (R3).Hadjipanayiotou (1999) reported that milk fat content of goat and sheep increased by feeding diets containing 15% OC silage. Nefzaoui and Vanbelle, (1986) mentioned that probably, there was not any negative influence by the long chain unsaturated fatty acids of the olive cake lipid fraction on the activity of the rumen bacteria.Milk production in lactating goats is strongly influenced by the availability of glucose. Glucose is the limiting factor for the secretion of milk in the udder because it is a precursor of lactose synthesis, which controls the movement of water into milk as shown by Zhao and Keating (2007). FWOC has a high NFE that can supply more glucose for lactose synthesis, so it will increase milk yield. This effect is thought to be the cause of the increased milk production of lactating goats in their decline production period. A higher propionate lead to increase the lactose content in milk because it was a precursor of lactose synthesis; however milk fat was synthesized more by acetate.These results were agreement with previous studies in which lactating goats utilized FWOC more effectively.

Dams and their offspring performance:

Data presented in Table (6) showed that the effect of experimental rations on does and their offspring performances. Obtained results indicated insignificant differences between the tested groups and control group in all dams' parameters. In general, body weight and its changes were sharply decreased for R1, R2 and R3 from Pre-kidding up to at kidding .The sharp decrease in body weight and gain results from kidding and removal of fetus and its attachments. Over the period from kidding to weaning body weight of does were increased gradually from 29.2, 32.1 and 32.8 kg for R1, R2 and R3, respectively at kidding to reach 30.8, 32.2 and 33.2 kg, respectively at weaning. Accordingly, in the present study, body weight and its changes were sharply decreased after kidding then gradually decreased up to 45 day of lactation and began to increase later that may be related the stress of lactation and milk production. Data presented in Table (6) showed that the kids belonging to R3 showed the highest (P<0.05) significant in weaning weight and average daily gain, being 15.33 kg and 142.84g/d., respectively. It could be observed that very scanty differences among treatments in respect of all offspring performance measurements in particular birth weight of kids and this response greatly due to the very short period (only one month before parturition) in which dam goats start to fed the dietary treatments. So this very short period of feeding did not considerably affected on birth weight and daily gain during the suckling period for kids. These results are in agreement with the findings obtained by Saleh (2004) and Hanafy *et al*.(2011) who start to feeding ewes their dietary treatments just before around 1-2 month before parturition

Table (5): Effect of different experimental rations on milk yield and its composition.

Item	Experimental rations			±SE
	R1	R2	R3	
Daily milk yield, g/ h/d	1047.6 ^{b}	1130.0^{b}	1269.1^{a}	±27.80
Daily 4%-FCM, g/ h/d	934.74^{b}	1077.05^{b}	1138.05^{a}	±27.4
Milk composition:				
Fat ,%	3.28^{b}	3.69^{a}	3.31^{b}	±0.08
Fat yield, g	34.38^{b}	41.71^{a}	42.03^{a}	±1.35
Protein, %	2.64	2.65	2.78	±0.10
Protein yield, g	27.66^{b}	30.01^{a}	35.23^{a}	±1.22
Lactose, %	3.84	3.97	3.92	±0.11
Lactose yield	40.27 ^{b}	44.95 ^{a}	49.75 ^{a}	±1.94
Total solids, %	10.62^{b}	11.27^{b}	11.01^{ab}	±0.18
Total solids yield	111.28 ^{b}	127.37 ^{a}	139.73 ^{a}	±3.64
Solids not fat , %	8.97	7.58	7.69	±0.14
Solids yield	76.89 ^{b}	85.65 ^{a}	97.70 ^{a}	±2.81
Ash %	0.86	0.94	1.00	±0.06

a and b means in the same row for each parameters with different superscripts are significantly different P<0.05).

Fat corrected milk (4%) for goats calculated according to following equation: 4%-FCM = milk yield (0.4+0.15 fat%)

Table (6): Effect of feeding different experimental rations on dams and their offspring performance.

Item	Experimental rations			±SE
	R1	R2	R3	
Dams performance.				
No. of dam kidded	8	8	8	-
Initial weight at Late-pregnancy(kg)	32.20	32.40	32.40	±3.09
Body weight at parturition, kg	29.20	32.10	32.80	± 2.76
Body weight at 1st month before parturition, kg	23.00	24.20	25.60	±2.32
Body weight at 2nd month before parturition, kg	27.00	28.80	29.60	±2.11
Body weight at 3rd month before parturition, kg	30.80	32.20	33.20	±2.17
Offspring performance.				
Total number of kids	13	16	14	----
Litter size/ dam at birth (LSB)	1.62	2.00	1.75	----
Birth weight, kg	2.49	2.36	2.48	± 0.06
weaning weight , kg	13.63^{b}	14.10^{ab}	15.33^{a}	± 0.48
Total weight gain , kg	11.14	11.74	12.85	----
Average daily gain, g/ day	123.75^{b}	130.45^{ab}	142.84^{a}	±5.04
Relative improve (%)	100	105.4	115.3	----
Dam production				
Litter weight at birth ,kg	4.03	4.72	4.46	±0.54
Litter weight at weaning, kg	22.08	28.20	28.82	±3.23
Total litter weight gain, kg	18.05	23.48	22.48	----
Average daily gain, g/day	200.5	260.8	249.7	----
Relative improve (%)	100	130.1	124.5	----

a and b means in the same row for each parameters with different superscripts are significantly different P<0.05). SE=Standard error.

Blood parameters:

Protein fractions are estimated to evaluate the effect of FWOC components on immunity function in animals. Transaminases liver enzymes activities are estimated to evaluate the effect of FWOC components on liver function because these enzymes are elevated when liver cells are destructed due to exposure to toxic compounds. Urea and creatinine are estimated to evaluate the effect of FWOC on kidney function because urea and creatinine concentrations are elevated when kidney function are disturbed when animals exposure to toxic compounds. The values of lipogram profile including cholesterol triglycerides, total lipids, HDL and LDL levels are used to evaluate the effect of FWOC components on fat metabolism .Data in Table (7) revealed that the level of FWOC had significant effects on the concentrations of total protein; the means of total proteins was increased slightly with increasing the level of FWOC in tested rations. These increases in plasma total proteins levels may be due to indirect response to protein intake and quality of FWOC. Singh *et al*. (2013) noticed that dietary protein and energy levels are the most effective factors related to the blood plasma picture. Serum total protein and its fractions are considered as biological index reflecting health and productive performance of animal (Singh and Jha, 2009).There were significantly decreased in glucose in R2 and R3 compared with control group. This result was matching with finding of Schmidely *et al*. (1999a) goats fed high-fiber diets had lower peak concentrations of glucose in the plasma implying less glucose for energy use than milk fat deposit. The activity of ALT and AST was significantly lower in the group fed R2 and R3 containing mixture of food waste with olive cake (FWOC) than in the control group R1, but still within normal range we can say that feeding of mixture food waste and olive cake till 30% to lactating goatshad no harmful effect on liver cells. Mousa and Abd El-Samee (2002) reported that the concentration of serum globulin, total lipid, glucose, creatinine, AST and ALT did not differ significantly among the experimental groups due to olive pulp feeding. Also, 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. Blood urea nitrogen were positively correlated with protein in the diet. Urea in hese biological fluids was better related to protein concentration of the diet (r2 = 0.82) than with protein intake (r2 = 0.56) giving an effective indicator of N utilization. The concentrations of creatinine, was significantly Lowe in the group fed (FWOC30%) R3. Cholesterol was differing significant between groups. The cholesterol was significantly lower in the group R3 than control R1 and R2. This may be due that groups of FWOC had higher content of dietary fiber implicated causing reduction in serum and body cholesterol which referred to a natural hypocholesteremic agent (Hassan *et al*., 2013).Mustafa (2011) reported that cholesterol concentration was significantly decreased with high level addition of olive cake and this may due to that olive cake contains high level of omega–3 fatty acids which responsible for decreasing level of cholesterol concentration. 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. Data show that, the total antioxidant capacity of blood increased linearly with the increasing level of olive cake. So the vales in R3 significantly (P<0.05) higher in group R3 and R2 than control one R1.Presumably because of antioxidants in olive cake such as phenolics.

Feed efficiency of milk production of dams during the suckling period and economical efficiency of experimental diets:

Data of the effect of using mixture of food waste and olive cake (FWOC) in goats' rations on nutrients intake, feed conversion for milk production and economic efficiency for the three tested rations are presented in Table 7. The DMI g/h/d and TDNI g/h/d were affected by ration groups, the highest value were found in R2 (1437.05 and 915.54g/dam/day)comparing with control R1 had lowest value (1424.8and 859.71g/dam/day). The tested rations had insignificant effect on DCPI g/dam/day with the highest value (141.54g/h/d) that associated with R2 and the lowest value (135.42g/h/d) seemed to be with R3. The feed conversation (kg DM/kg milk) was insignificant improved due to the tested rations which formulated with 15% FWOC and 30% FWOC by 20.39% and 12.5%. Despite TDN/kg milk and g DCP/kg milk did not affected significantly by tested rations. Date of economic efficiency showed in table (9). Observed that the highest (4.42 L.E.) feed cost/kg milk yield L.E was found in control ration (R1) and the lowest one (2.82 L.E.) was found in (R3). The best economic efficiency was

Table (7): Some biochemical parameters in Blood plasma as affected by feeding experimental rations.

Item	Experimental rations			±SE
	R1	R2	R3	
Tp (g/dl)	6.85^b	7.46^a	7.75^a	±0.12
Alb (g/dl)	3.86	3.83	4.35	±0.18
Glo(g/dl)	3.00	3.64	3.40	±0.23
A/G ratio	1.30	1.05	1.33	±0.15
Ur, (mg/dl)	7.31	7.36	7.39	±0.09
Cr, mg/dl	1.27^a	1.15^{ab}	1.00^b	±0.05
Glu (mg/dl)	91.84^a	81.25^b	77.95^c	±0.79
ALT (U/L)	14.84^a	13.60^b	13.07^b	±0.25
AST (U/L)	25.51^a	22.36^b	21.35^b	±0.38
Total antioxidants				
TAC	0.59^c	0.64^b	0.70^a	± 0.012
Cho. (mg/dl)	131.59^a	114.66^b	101.95^c	±3.34
LDL	45.47^a	39.77^b	36.03^c	±0.33
HDL	73.62^a	72.57^{ab}	68.03^b	±1.50
TG (mg/dl)	95.31^a	89.95^b	84.68^c	±1.47

a, b and c means in the same row for each parameters with different superscripts are significantly different P<0.05). SE=Standard error.

TP=total protein; Alb=albumin; Glo=globulin; A/G ratio=albumin / globulin ratio; Glu= glucose Cr= Creatinine, Ur= Urea-NCho=cholesterol; TG=triglycerides; ALT=Alanine transaminase; AST=Aspartic transaminase; TAC= Total antioxidant capacity.

observed in R3 which recorded (156%) compared with control ration and the other one of tested rations record (120%). The improvement of economic efficiency for diets contained FWOC 30% could be related to the high feed conversion as well as to the positive effect of including FWOC on feeding value and decreasing feeding cost /h/d. The present results are in harmony with those recorded by Paek *et al.* (2005) who reported that income per head was highest in 50% substitution level of dried leftover food (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 food waste and olive cake, should be using potentially in formulation of rations for all classes of livestock.

Table (8): Feed intake, milk yield, feed conversion and feed efficiency of milk production of dams during the suckling period (90 days).

Item	Experimental ration			±SE
	R1	R2	R3	
Total DM intake, g/ dam/day	1424.08	1437.05	1380.51	---
TDNI, g/dam/day	859.71	915.54	905.92	---
DCPI, g / dam /day	135.57	141.54	135.42	---
Daily 4%FCM, g/ dam/day	934.74[b]	1077.05[b]	1138.05[a]	$\underline{+}$27.4
Feed conversion ratio:				
DM intake , g / g(4% FCM) milk	1.52	1.33	1.21	---
Relative improve (%)	---	-12.5	-20.39	---
TDNI, g / g (4% FCM) milk	0.919	0.850	0.796	---
Relative improve (%)	---	-7.51	-14.02	---
DCPI, g/ g (4% FCM) milk	0.15	0.13	0.12	---
Relative improve (%)	---	-13.3	-20.0	---
Feed efficiency ratio:				
g (4% FCM) milk /gDM intake	0.65	0.75	0.82	---
Relative improve (%)	100	115.38	126.15	---
g (4% FCM) milk/ gTDNI	1.09	1.18	1.26	---
Relative improve (%)	100	108.26	106.78	---
g (4% FCM)milk/ g DCPI	6.89	7.61	8.40	---
Relative improve (%)	100	110.45	121.92	---

a and b Means within the same row with different superscripts are significantly different (P<0.05).

Table (9): Feed intake (as fed) and economical evaluation of dams during the suckling period (90 days).

Item	Experimental rations			±SE
	R1	R2	R3	
Total number of dams	8	8	8	---
Average daily feed intake, g/ dam/day (as fed):				
CFM	900	900	900	---
Berseem	4069	4153	3783	---
Daily milk yield, g/ dam/day	1047.6[b]	1130.0[b]	1269.1[a]	$\underline{+}$27.80
Economical evaluation:				
Average total feed cost,LE/dam/ day:				
CFM	3.631	3.159	2.646	---
Berseem	1.017	1.038	0.945	---
Total feed cost, LE/dam/day--- in put	4.64	4.19	3.59	---
Price of average daily milk (LE/dam/day)--- out put	6.29	6.78	7.61	---
Feed cost / kg milk, L.E.	4.42	3.71	2.82	---
Net revenue (LE/goat/day)A	1.65	2.59	4.02	---
Economical feed efficiency B	1.35	1.62	2.11	---
Relative improvement (%)	100	120	156.29	---

a,b and c Means within the same row with different superscripts are significantly different (P<0.05).
prices of concentrate feed mixture (CFM1), (CFM2), (CFM3)and berseem(dry)were 4035,3510,2940 and 250L.E./ton, respectively
based on the market price in 2019and 6 LE/kg raw milk.R1: CFM1+berssem (control), R2: CFM2 contain 15% of mixture food waste and olive cake+ berseem, R3: FM3 contain 30% of mixture food waste and olive cake + berseem. Total daily feed cost (L.E.) = (cost of CFM+ berseem).
A Net revenue (LE/dam/day) = money output – money input. B Economical efficiency = money output/money in put.

CONCLUSION

In conclusion, mixture of food waste collected from hotels with olive cake mixture (FWOC) could be used as a beneficial ingredient in rations formulation of lactating goats with positive effect on nutrient digestibility, some blood parameters, milk composition, milk yield and economic efficiency, in particularly with the tested ration that contained 30% level of FWOC. FWOC could not prevent the decline of milk production and not significantly affect milk quality. Based on the treatment results, it can be concluded that FWOC up to 30% in the rations can be used as an alternative feed for lactating goats.

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تأثير التغذية علي مخلوط من الطعام المهدر و كسب الزيتون على كميه وتركيب اللبن في الماعز الزرايبي

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أجريت هذه الدراسة لمعرفة تأثير الاستبدال الجزئي من مخاليط الأعلاف المركزة بنسبه صفر ،١٥% ، ٣٠% بمخلوط من الطعام المهدرالمجمع من الفنادق ومخلفات عصر الزيتون،على معاملات هضم العناصر الغذائية واقتصاديات إنتاج اللبن من الماعز الزرايبي الحلاب وبعض قياسات الدم . تم استخدام ٢٤عنزة بمتوسط وزن ٣٢,٣± ١,٥ كجم وزعت عشوائيا في ثلاث مجموعات متساوية في العدد (٨ حيوانات لكل مجموعه)، غذيت المجموعة الأولي (مج١) وهي مجموعه المقارنة علي العليقة الضابطةالمكونة من العلف المركز والبرسيم كمادة الخشنة وتم التغذية طبقا لمقررات الـNRC لسنه ٢٠٠٧ ، وقد استخدم مخلوط من الطعام المهدر وتفل الزيتون بنسبه (٨٠:٢٠) لتحل محل١٥ ، ٣٠% من العلف المركز للمجموعتين الثانية والثالثة (مج٢ و مج٣) علي التوالي ،غذيت المجاميع لمدة ٣٠ يوم قبل نهاية موسم الحمل كفترة دفع غذائي واستمرت التجربة فتره الرضاعة .

أوضحت النتائج المتحصل عليها من التحليل الكيماوي تحسن كلا من معاملات الهضم والقيمة الغذائية مع زيادة مستوى مخلوط الطعام المهدر وتفل الزيتون إلى ٣٠%، بينما حدث ارتفاع معنوي في معدل إنتاج اللبن مع المجموعة المغذاة علي ٣٠% من المخلوط المجموعة الثالثة (١٢٦٩,١جم)، بالنسبة لتركيب اللبن أظهرت النتائج زيادة معنوية في نسبه الدهون مقارنه بالمجموعة الضابطة ، بينما لم تظهر النتائج اختلاف معنوي في بروتين اللبن ، في حين كانت اعلي قيمه في المجموعةالثالثة (مج٣) . لم تتأثر النتاج في المجاميع المختبرة بوجود المخلف . في قياسات الدم اظهر البروتين الكلي في البلازما تغير معنوي بالمقارنة بين المجاميع المحتوية على المخلف والمجموعةالضابطة. حدث تحسن في الكفاءة ألاقتصاديه للمجموعة المغذاة علي نسبه ٣٠% من مخلوط الطعام المهدر وتفل الزيتون وكان مقدار التحسن في الكفاءة الاقتصادية يقدر بحوالي ٥٦% مع ملاحظه انخفاض تكاليف إنتاج اللين وزيادة ربحيه المجموعة المحتوية علي نسبة إحلال ٣٠% من الطعام المهدر وتفل الزيتون بدلا من العلف المركز.

تلخص النتائج السابقة انه يمكن الاعتماد على استخدام مخلوط من الطعام المهدر من الفنادق وتفل الزيتون في تغذيه الماعز الحلاب الزرايبي بنسبه تصل إلي ٣٠% من المركز مع عدم تأثر إنتاج وتركيب اللبن الناتج أوتؤثر النتاج بالتغذية على المخلوط .