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Nutritional Evaluation of Fermented by-Products Mixtures in Comparison with Clover Hay and Impact of Its Feeding on Productive Performance of Zaraibi Goats.

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ABSTRACT

This study was conducted to investigate the effect of inclusion fermented field (Potato vines & rice straw) and food industrial by-product (dried beet pulp & molasses) mixture (FBM) to be replacement with clover hay in dairy goats does diets and its effect on nutrient digestibility, milk yield, milk composition and some blood parameters. Eighteen lactating Zaraibi goats does, average live body weight of 40.5± 1.5 kg at the 3^{rd} and 4^{th} parities were divided randomly into three similar groups (6 animals each), were used to receive one of 3 experimental diets. The first group was received concentrate feed mixture (CFM) and clover hay (CH) as control diet (CD). Meanwhile, second and third group received CFM and replacement (CH) with (FBM1) which composed of 65% potatoes vines (PV), 12 % dried beet pulp (DBP), 15% rice straw (RS) and 8% molasses as (TD1) group or with (FBM2) which composed of 74% potatoes vines(PV), 14% dried beet pulp (DBP), 7% rice straw (RS) and 5% molasses (on dry matter basis) as (TD2) group. The FBM based silage contained on average 41.7 & 40.5% dry matter, 12.45 & 12.83% crude protein (CP), and 55.4 & 52.6% neutral detergent fiber (NDF), 44.7 & 40.8% acid detergent fiber (ADF), Ether extract 2.5 &2.2% and ash content 9.5 &10.3%, for (FBM1 & FBM2), respectively. Results showed that there were no significant differences between two fermented by–products mixtures (FBM1 and FBM2) concerning NH3-N concentration and pH value. It was also observed that there was an increase in concentration of total volatile fatty acids with mixture (FBM2) compared with (FBM1) mixture. The highest ($P<0.05$) digestibility of DM, CP, NDF and ADF was recorded with (TD2). The nutritive values as TDN, DCP and ME (Mcal/kg) of (TD1 &TD2) were significantly ($P<0.05$) improved compared with control group. While, increasing in TDN for (TD1) was significantly . The highest significantly ($P<0.05$) value of milk yield was recorded for group TD2 as compared with control diet (CD), but there were no significant differences between (TD1) and (TD2) group was recorded. Meanwhile, the lowest value of milk yield was recorded with control diet (CD). There were no significant differences between the tested groups concerning milk composition percentages which were almost similar among experimental groups. Also, there were no significant differences between tested groups for some blood parameters (Glucose, AST and ALT). The feeding cost / head /day was decreased by 8.8 and 10.5 % with TD1 and TD2 groups, respectively as compared with control group, leading to an improvement of economic efficiency by 32.7 and 43.6%, with TD1 and TD2 diets, respectively compared with control group. Therefore, the replacement of clover hay with fermented by-products mixtures (FBM1&FBM2) with dairy goats does diet is highly recommended in the feeding practices of goats.

Keywords: Zaraibi goats, fermented mixed ration, digestibility, milk yield, milk composition and blood parameters **.**

INTRODUCTION

Feed is the major input cost in animal production, accounting for 65–70% of the total production costs and the need for rations based on locally available feedstuffs has shifted nutritionists studies to unconventional feedstuffs for ruminants (Lashkari *et al.*,2014). Poor nutrition for animals has been identified as the major constraint to animal production across the developing world (FAO, 2008). In Egypt, there is a great mounting pressure on cultivated land and water resources, we have to rely more on by-products from grain and other cash crops for feeding ruminants to produce milk and meat. On the meantime, agricultural by-products (field and food industrial) volume reached around 32 million tons annually (Agricultural Economics-Ministry of Agriculture in Egypt, 2014), more than two third of this amount is left annually without use. The high moisture content of some agricultural by-products field (Potato veins) relative to the nutrient composition makes it costly to transport, difficult to handle and easy to spoil. Also, the sun-drying needs to be suitable for its success atmospheric conditions and its impact on the nutritional value. Fermented By-products Mixture (FBM) is a proper type of feed especially when agricultural by-products with high moisture content are to be included (Li *et al.*, 2003). Nutritionally, Potato veins are a rich source of protein, fiber, vitamins, also had moderate to good quantities of all the essential amino acids, the DM content of fresh Potato veins was 11.9% and crude protein was 19.8% of DM (Kebede *et al.*,2008). Etela and Kalio (2011) reported that Potato veins could be used as an alternative supplementary feed for calves and small ruminants dry season and can be fed to dairy cattle as well (Ashiono *et al.*,2006). Due to the presence of anti-nutritional compounds such as trypsin inhibitor, hallucinogens, saponins, tannins, phytate and oxalate (Zhang and Corke, 2001) and (Aregheore, 2012), it can potentially be a negative effects on livestock production; which in turn its case reduction in palatability, digestibility, utilization of nutrients and rumen fermentation, resulting in not only decreased production but also low quality of meat and milk products (Alipour and Rouzbehan, 2007). Therefore, biotechnological processes, especially fermentation process may help in solving the anti-nutritional factors problems by hydrolysis of such anti-nutritional compounds which were reflected on its less effect on digestibility by animals (Pirmohammadi *et al.*, 2012). Fermentation provides a good sanitary that does not contain Alfa-toxins, Salmonella, and Escherichia coli (Li *et al.*, 2003).

The aims of this study were to investigate the effect of feeding fermented by-products mixture (some field and food industrial agricultural by products) completed replacement of clover hay on nutrient digestibility, nutritive values, milk yield and its composition, blood parameters and economic efficiency in the diets of dairy goats .

MATERIALS AND METHODS

This work was conducted at Sakha Experimental Station, Animal Production Research Institute, (APRI), Agricultural Research Center, Egypt, in order to study the effects of total replacement of clover hay with two Fermented By-products Mixtures (FBM) which contain different proportion of field (Potato vines & rice straw) and food industrial agricultural (dried beet pulp & molasses) by products in the diets of dairy goats on nutrient digestibility, nutritive values, milk production and composition, blood metabolites and economic efficiency.

Fermented by-products mixture

The fermented by-products mixtures (FBM) were prepared by using a potatoes vines, dried beet pulp, rice straw and molasses (with different percentages). Whereas, (FBM1) contained (potatoes vines 65%, rice straw 15%, beet pulp 12% and molasses 8%), meanwhile (FBM2) contain (potatoes vines 74%, rice straw 7%, beet pulp 14% and molasses 5%). Fermented By-products Mixtures, were made before two months of beginning of the experiment. Fresh potato vines wilted by spreading under the sun for one day, then chopped with rice straw and mixed with dried beet pulp and molasses and ensiled these mixture in plastic bags for 6 weeks. Representative samples were taken at the end of the period of ensiling for color, odor (as physical parameters) and fermentative analysis (pH, Ammonia-Nitrogen and Total volatile fatty acids). Ammonia –nitrogen of the silage was determined according to A.O.A.C. (2007), whereas total volatile fatty acids (TVFA's) were determined by the steam distillation procedure of Warner (1964).

Feeding and management

The feeding experiment was conducted by using 18 Zaraibi lactating goats just after weaning at 13^{th} week. Goats at the 3^{rd} and 4^{th} parities and initial body weight mean was 40.5 $\pm$ 1.5 kg. The experimental animals were divided equally to three groups. The first group received concentrate feed mixture (CFM) and clover hay (CH) as control diet (CD). Meanwhile, second and third groups received CFM and replacement (CH) with (FBM1) as (TD1) group or with (FBM2) mixture as (TD2), group (on dry matter basis). The (CFM) amount fixed to provide animals with 40% of their requirement according to NRC (1986), while other ingredients (CH, FBM1 and FBM2) were added add-lib to animals to cover the rest (60%) of their requirements. Feed offered and feeds refusals were weighted daily. Representative samples of each ingredients and mixtures were taken for chemical analysis. The feeding period lasted for 13 weeks. Daily feed intake was recorded for each group. Animals were weighed biweekly and changes in body weight were recorded.

Milk yield and milk sample

Milk yield was recorded weekly using milking hand technique, the total milk yield was calculated by summation of milk yield during all over the experimental period. Does were completely hand milked till stripping the udder one mutual meal (morning and evening) daily through two successive days through during milking period. Milk samples were analyzed for fat, protein, lactose and total solids by the automated infrared spectrophotometry (Foss 120 Milko-Scan, Foss Electric, Hillerød, Denmark) according to A.O.A.C. (1997) procedures. Solids-not-fat (SNF) was calculated (by differences). Fat corrected milk (FCM) for goats was calculated according to Mavrogenis and Papachristoforou (1988) equation, FCM for goat = milk yield (0.411 +0.147*% fat).

Feed conversion was calculated as the amount of DM, TDN, ME and DCP units/ 1kg fat corrected milk (FCM). At the end of this study, simple economical evaluation was calculated for tested diets according to the prevailing prices of ingredients during the time of experimental.

Where: prices as follows; concentrate feed mixture = 2200 L.E.\ton, clover hay = 900 L.E.\ton, potato vines silage = 95 L.E.\ton, dried beet pulp = 1300 L.E.\ton, rice straw = 280 L.E.\ton, molasses = 950 L.E.\ton, and price of 1kg 4% FCM= 3.00 L.E.

Digestibility trials

Digestibility trials lasted for 14 days was carried out on the dried animals after 2 weeks from last recording of milk production to determine nutrient digestibility of experimental diets using Acid Insoluble Ash (AIA) method which described by Van Keulen and Young (1977), through collected twice daily for 7 successive days. Representative samples of total mixed ration and feces, were analyzed according to A.O.A.O.(2007). The NDF and ADF were analyzed according to Van Soest's method (Van Soest *et al.*, 1991). The metabolizable energy (ME) was calculated as 3.56Mcal / 1 kg TDN (McDonald *et al.*, 1973).

Blood samples

Blood samples were taken from juggler vein at the end of the experimental. Samples were centrifuged at 3000 rpm for 20 min to obtain blood serum. The supernatant was frozen and stored at -20°C for subsequent analysis. Serum total protein assay was determined according to Gornal *et al.*(1949). Serum albumin was determined according to Doumas *et al.*(1971) and serum urea according Fawcett and Scott (1960). Serum Aspartate (AST) and alanine (ALT) aminotransaminases activities were determined according to Reitman *et al.*(1957). The serum globulin was calculated by the differences .

Statistical analysis

The data were analyzed using the general linear model procedure of SAS (1996). The differences among means were carried out according to Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Data of chemical composition of different ingredients and experimental diets are presented in Table (1). It is interested to note that the chemical composition of both fermented by-products mixture (FBM1 & FBM2) is practically similar for all nutrients components. However, the CD (control) diet contained clover hay higher OM, NDF and ADF content, but lower ash content, when compared with other tested diets.

Table 1. Chemical composition of different ingredients and experimental diets (on DM basis)

Item	Chemical composition % (on DM basis)						
	DM	OM	CP	NDF	ADF	EE	Ash
Feed Ingredients							
CFM	90.65	91.44	16.57	25.63	21.84	3.74	8.56
CH	87.82	90.33	11.31	50.42	38.36	1.84	9.67
PV	21.64	83.28	14.74	54.42	37.62	1.93	16.72
BB	89.13	95.37	11.82	41.32	32.81	0.86	4.63
RS	90.12	88.57	3.87	71.25	54.38	1.43	11.43
M	26.43	91.07	0.45	-	-	0.63	8.93
FBM1	41.7	90.5	12.45	55.4	44.7	2.5	9.5
FBM2	40.5	89.7	12.83	52.6	40.8	2.2	10.3
Experimental diets							
CD	100	89.47	14.13	42.37	24.18	2.08	10.53
TD1	100	87.84	14.42	41.68	23.73	2.16	12.16
TD2	100	87.28	14.55	41.32	22.86	2.24	12.72

CFM=Concentrate Feed Mixtures; CH= Clover hay; PV=Potato veins; BB= Beat bulb; M= Molasses; RS=Rice straw.
FBM1= first fermented by-products mixture FBM2= Second fermented by-products mixture

The FBM based silage contained on average 41,7 & 40.5%, dry matter (DM), 12.45 &12.83% crude protein (CP), 55.4 & 52.6 % neutral detergent fiber (NDF), 44.7 &40.80% acid detergent fiber (ADF), 2.5 &2. 2% ether extract (EE), and ash content 9.5 & 10.3% for (FBM1 & FBM2), respectively. The variation in the chemical composition of experimental diets reflected the composition of their ingredients. The data indicated also, that the values of DM, CP, ADF,NDF, EE and Ash of Potato veins fall within the corresponding ranges reported by Mohamed *et al.* (2012). Meanwhile, the NDF and ADF contents ranged (41.32- 42.37%) and (22.86 -24.18%), respectively for tested diets. Whereas, NDF and ADF values with control diet, almost recorded higher values as compare with other experimental diets.

Fermented mixture quality

Physical and fermentation characteristics of fermented mixtures are presented in Table (2). The results showed that the two fermented mixtures were free from mold, caramelized with good smell and free from smells of tobacco or vinegar odor.

Table 2. Physical and fermentation characteristics of fermented mixtures.

Items	Aroma	Taste	Moisture	pH	TVFA`s Meq/100ml	Ammonia-N% DM
FBM1	Good	Good	40%	4.10	15.82	0.20
FBM2	Good	Good	39%	4.32	16.28	0.15

Results in Table (2) showed that overall mean of pH values of the two fermented mixtures appeared to be within the normal range given by Abou-Akkada and Nour (1986) being (4.10 to 4.32). Results in Table (2) indicated the overall mean of TVFA`s concentration recorded 15.82 and 16.28 Meq/100ml. for FBM1 & FBM2, respectively, showing somewhat higher concentration with 2nd one than the first. There were no clear differences between two fermented by-products mixtures in concentration of ammonia-N%. The physical and fermentative characteristics of agricultural fermented by-products mixture (Table 2) indicated that the two fermented mixtures showed good characteristics as proposed by both Nishino *et al.*(2007) and Wang and Nishino (2008). However, fermentation characteristics are in agreement with previous studies reported by Wang *et al.*(2011).

Nutrient digestibility coefficients and nutritive values

Results of nutrients digestibility and nutritive values of experimental diets are presented in Table (3). The data in Table (3) showed that the fermented by-products mixtures (TD1&TD2) diets showed higher digestibility coefficients of DM, OM, CP, NDF and ADF than control diet. On the meantime, there were no significant differences among experimental diets for EE digestibility, as a result of increasing ruminal fermentation with fermented mixtures (TD1&TD2). The superiority of NDF and ADF digestibility of (TD1&TD2) could be due to feeding fermented mixtures which enhanced cellulolytic bacteria activity accordingly more NDF and ADF were digested.

Table 3. Digestibility coefficients and nutritive values of experimental diets.

Item	Experimental Diets			±SE
	CD	TD1	TD2	
Digestibility coefficients, %				
DM	61.78^{b}	62.54^{ab}	64.62^{a}	0.61
OM	63.67^{b}	64.72^{ab}	66.48^{a}	0.67
CP	65.82^{b}	68.54^{a}	69.42^{a}	0.78
NDF	55.64^{b}	59.73^{a}	60.21^{a}	0.64
ADF	51.82^{b}	54.68^{a}	56.84^{a}	0.65
NFE	72.63^{b}	74.38^{ab}	74.88^{a}	0. 52
EE	77.36	77.72	77.54	0.46
Nutritive value, %				
TDN	59.91^{b}	63.74^{ab}	64.9^{a}	1.64
DCP	9.30^{b}	9.88^{a}	10.10^{a}	0.87
ME (Mcal/kg)	2.45^{c}	2.77^{b}	2.89^{a}	0.42

a,b and c Means in the same raw with different superscripts differ (P<0.05)

The observed improvement in nutrients digestibilities with TD1 and TD2 diets compared to the control diet (CD), may be attributed to the ensiling mixture which enhanced micro flora activity accorded to digest NDF and ADF much better ($P<0.05$) than control diet (CD). The data pointed out that there was no significant differences in digestibility of DM, OM, CP NDF and ADF between diets TD1 and TD2. It is observed that the TD2 diet had the highest DM, OM , CP, NDF and ADF digestibility than the other two diets.

The effect of fermented feeds on digestibility may be a consequence of improved nutrient preservation during the fermentation process and conservation of greater proportion of digestibility nutrients Yang *et al.* (2009). These results were agreement with both Mohamed *et al.*(2012) and Kim *et al.* (2014) who reported that the including of fermented feeds in ruminant rations increased nutrients digestibility coefficients. Results obtained in this study revealed that the fermented mixture increase NDF and ADF digestibility with TD1 & TD2 diets. Huisden and McAllister (2009) and Makoto *et al.* (2014) reported that higher ruminal degradability of DM and fermented feed reduced ruminal pH and sugar concentration, enhancing lactic acid production, which facilitates DM disappearance with calves .

The TD2 diet had the highest values of nutritive values as TDN, DCP and ME (Mcal/kg), while diet of CD showed the lowest one. This may be possibly as a result to attribute the improvement of nutrients digestibility coefficients of rations containing fermented by-products mixtures. These results are in good agreement with those obtained by Wang *et al.*(2011); Mohamed *et al.* (2012) and Kim *et al.* (2014) who compared between animals received ration including fermented mixture and other group fed ration without fermented mixture. They obtained significant higher nutritive value expressed as TDN value of the rations including fermented by-products mixtures than the group was not fed fermented mixture.

Milk yield and its composition

Data of average daily milk yield (ADMY) and its milk composition are presented in Table (4). The differences in milk yield and fat corrected milk (FCM) were significant (P<0.05) among the tested experimental diets. The (ADMY) had the highest values with TD2 (1.25 kg/head), Meanwhile, the lowest value was recorded with CD (0.95 kg/head). In this respect, values of (FCM) were taken the same trend as that of average daily milk yield. The highest (P< 0.05) values with TD2 (1.13 kg/head), Meanwhile, the lowest value was recorded with CD (0.87 kg/head) group. On the meantime, there were no significant differences between TD1& TD2 for milk yield and (FCM). Improving of the digestion coefficients of most nutrients and feeding values improving with tested diets was reflected on more milk yield produced by does fed such diets (TD1&TD2). The obtained results indicated the positive effect of tested diets TD1&TD2 over that of the control diet. The obtained values are in agreement with those reported by Mohamed *et al.* (2012) and Khan *et al.* (2015) who illustrated that inclusion silage in dairy animals ration resulted in increasing milk yield, these may be due to one or more of the following reasons, 1) higher DMI and higher nutrients digestibility and 2) increased rumen micro flora activity which lead to an improve of feed efficiency hence an increase milk production.

Table 4. Effect of feeding experimental diets on milk yield and its composition (during total period, 13 week).

Item	Experimental Diets CD	TD1	TD2	±SE
Milk yield, kg /head/day				
Av.daily milk yield,kg /h/d	0.95^{b}	1.16^{a}	1.25^{a}	0.28
Av. fat corrected milk, kg /h/ d	0.87^{b}	1.05^{a}	1.13^{a}	0.42
Milk composition ,%				
Fat, %	3.46	3.40	3.36	0.19
Av. Fat yield, g/h/d	32.8^{b}	39.4^{a}	42.1^{a}	0.32
Protein ,%	3.70	3.64	3.58	0.21
Av. Protein yield, g/h/d	35.2^{b}	42.2^{a}	44.7^{a}	0.34
Lactose, %	4.24	4.25	4.27	0.15
Av. Lactose yield, g/h/d	40.3^{b}	49.3^{a}	53.3^{a}	0.36
Total solids, %	11.40	11.29	11.21	0.31
Av. Total solids yield, g/h/d	108^{c}	131^{b}	140^{a}	0.52
Solids not fat, %	7.94	7.89	7.85	0.16
Av.Solids not fat yield, g/h/d	75.4^{c}	91.5^{b}	98.1^{a}	0.46
Ash , %	0.87	0.85	0.89	0.11
Av. Ash yield, g/h/d	8.26	9.86	11.1	0.29

a,b and c Means in the same raw with different superscripts differ (P<0.05).

Fat correct milk (4%) for goats calculated according to the following equation : FCM kg = milk yield (0.411 +0.147*% *f*).

In spite the observed insignificant effect of experimental diets on milk components, there was a tendency of increase in milk components yield of does fed diet containing (TD1&TD2). In agreement with present results, Sommart *et al.* (2000), Chen *et al.* (2004), Mohamed *et al.* (2012), Khalid *et al.* (2013) and Saleh (2014) found that including fermented mixture increased components milk yield, but did not have a significant effect on milk composition (fat, protein, lactose and total solids) among experimental diets during milking period. These improvement in both milk yield and milk components yield in (TD1&TD2) was correlated with the high OM, CP, NDF, ADF and NFE digestibility. Results obtained in present study are in harmony with those found by Mohamed *et al.* (2012) and Huhtanen *et al.* (2013) who speculated positive effect of inclusion fermented by-products mixtures in dairy rations in comparison of the traditional ration.

Blood parameters

Values of some blood serum parameters are presented in Table (5). Diets containing fermented by-products mixture (TD1&TD2) was tended to increase significantly (P<0.05) for total protein, albumin, A/G ratio and glucose concentrations compared with control diet. While, increasing in globulin was not significant among diets.

Data in Table (5) showed that the highest mean values of serum total protein Albumin and A/G ratio were recorded with (TD2) group. These results may be due to the improvement in nutrients digestibility (protein & energy). Singh *et al.* (2013) reported that dietary protein and energy levels are the most effective factors in blood picture. Serum total protein and its fractions are considered as a biological index reflecting health and performance of animal (Singh and Jha, 2009). These results were agreement with the conclusion of Kumar and Vaithiyanathan (1990) and Singh *et al.* (2013) who reported positive correlation between dietary protein and serum protein concentration. Gang *et al.* (2014) noticed that the increase in digestibility of CP may be the reason for the increase in each of serum total protein and albumin concentration. Also, these results could probably attributed to the higher of glucose and protein concentration in blood serum of TD1&TD2 in (Table 5). It led to an increase in milk lactose synthesis and consequently milk production being increased. Also, the increasing in milk protein yield in the current study may be due to the more energy being available or milk protein synthesis, these finding agreed with Kuoppala *et al.* (2008) and Mohamed *et al.* (2012). Values of serum protein fraction indicated better utilization of dietary protein which led to better rumen microbial capture of forage nitrogen and ruminal nitrogen through digestive tract as result in lower ruminal ammonia-N production (Winters *et al.*, 2001; Davies *et al.*, 2012 and Gang *et al.*, 2014).

Table 5. Blood serum parameters as affected by feeding experimental diets.

Item	Experimental Diets			±SE
	CD	TD1	TD2	
Total protein (mg /dI)	8.02^b	8.43^a	8.49^a	0.12
Albumin(mg/dI)	3.95^b	4.33^a	4.38^a	0.08
Globulin(mg/dI)	4.07	4.10	4.11	0.21
A/G Ratio	0.97^b	1.06^a	1.07^a	0.16
Glucose(mg/dI)	37.44^b	39.73^a	41.80^a	0.41
AST (U/100ml)	60.43	61.28	61.65	0.48
ALT (U/100ml)	28.63	28.68	28.65	0.28

a and b Means in the same raw with different superscripts differ (P<0.05).
AST – Aspartate -amino transferase
ALT – Alanine - amino transferase

Blood serum Aspartate - amino transferase (AST) and Alanine - amino transferase (ALT) values were not significantly affected by experimental rations. Data indicated healthy status of the liver since the liver is the main organ of albumin synthesis. The present values of AST and ALT showed normal activity of the animal hepatic tissue and consequently, the integration of fermented by-products in the present investigation could be used without any adverse effect on the liver functions. In general, the obtained concentrations of blood constituents are within the normal range for healthy goats which reported by (Gihad *et al.*, 1987 and Kim *et al.*, 2012). So, there weren't any worst effect on lactating goats health when fed on fermented by-products on a long run in their rations.

Feed conversion and economic efficiency of experimental diets

The results of nutrients intake, feed conversion for milk production and economic efficiency of the experimental diets are presented in Table (6). Total nutrients intake / head as DM, TDN, ME and DCP by lactating does for (TD1&TD2) were higher as compared with control diet (CD). These results could probably attributed to the higher of the digestion coefficients of most of the nutrients and the feeding values of TD1&TD2 in (Table 3). Improving of TD1&TD2 was reflected on more milk yield produced by does fed such diets. These results had correlation effect with data of milk yield, feed intake and feeding values of TD1&TD2. This result agree with result showed by Bunyeth and Preston (2005) and Ashiono *et al.* (2006) and Khalid *et al.* (2013). Including (FBM) in tested diets improved the feed conversion values in terms of kg TDN, ME and DCP / 1 kg FCM as compared with control diet. As for the results of feed conversion, it was improved by does fed TD2 diet since it had the best value of feed conversion , followed by TD1, while CD recorded the lowest value calculated as TDN, ME and DCP / 1kg FCM. Replace clover hay with FBM resulted in better feed conversion values (1.35& 1.28), (857& 832) , (3.74& 3.71) and (133& 129) for DMI, TDN, ME and DCP with (TD1&TD2), respectively for producing 1 kg FCM compared to control diet.

Table 6. Effect of the experimental diets on feed intake, feed conversion and economic efficiency (during total period, 13 week).

Item	Experimental Diets		
	CD	TD1	TD2
Nutrients Intake			
Total DM intake, kg/ head	1.34	1. 42	1.45
Total TDN intake, kg/ head	0.80	0.90	0.94
Total ME intake, Mcal / head	3.28	3.93	4.19
Total DCP intake, g / head	125	140	146
Av.fat corrected milk,kg/head/d	0.87	1.05	1.13
Feed Conversion			
Av. DM, kg /kg milk	1.54	1.35	1.28
Av. TDN, g/ kg milk	919	857	832
Av. ME, Mcal / kg milk	3.77	3.74	3.71
Av. DCP, g/ kg milk	144	133	129
Economic Efficiency			
Av.daily feed, cost/ head/d L.E.	2.37	2.16	2.12
Total cost of feed/head L .E.(13week)	213.5	194.4	191.3
Total Price, milk L. E./ head	234.9	283.5	302.3
Net revenue ^{A} , L.E./ head	21.4	89.3	111
Economic Efficiency ^{B}	1.10	1.46	1.58
Economic Efficiency Improvement,%	-	32.7	43.6

A- Net revenue (LE/goat/day) = money output – money input

B- Economical efficiency = money output/money in put

These results are in agreement with results of Mohamed *et al.* (2012) and Khan *et al.* (2015) found that improvement in feed conversion as DMI and CPI/milk yield reached to about 8.5 and 11.3%, respectively compared to control. The positive effect of feed conversion efficiency was observed also by Mohamed *et al.* (2012); Khalid *et al.* (2013); Saleh (2014) and Khan *et al.* (2015) with including (FBM) in tested diets improved the feed conversion in small ruminant rations.

It is of interest to observe that daily feed cost /head/day was more pronounced with the CD; meanwhile, the TD2 showed the lowest daily feed cost /head/day. The average daily feed cost decreased by 8.8 and 10.5% with (TD1&TD2), respectively as compared to control diet. The net revenue (profit) above feeding cost (Table 6) was higher with TD1&TD2 diets including fermented by-products mixtures (FBM) than the control diet. The economic efficiency was improved by 32.7 and 43.6% with (TD1&TD2), respectively as compared to control diet. On the meantime, values of the economic efficiency are given in Table (6) illustrated that the FBM replacement in (TD1&TD2) reflected superiority over the control diet. The improvement of economic efficiency for (TD1&TD2) could be related to the high feed conversion efficiency, as well as to the positive effect of Including (FBM) on the nutritive value Giang *et al.*, (2004); Bunyeth and Preston (2005) and Ashiono *et al.* (2006) of tested diets not only that but to the less concentration of anti-nutritional compounds (Pirmohammadi *et al.*, 2012). The current study confirmed that, there is a positive relation between fermented by-products mixture and economic efficiency pathway decreased feeding cost and increasing milk yield produced by does fed such diets. These results are confirmed by Saleh (2014) and Khan *et al.* (2015) who reported that utilization of fermented by-products mixture support the farmer's income through produce more milk per animal. In addition, Mohamed *et al.* (2012) and Khalid *et al.* (2013) found that the diets containing fermented by-products mixture could be economically and successfully be used for lactating animals to improve economic efficiency increasing net revenue (profit) .

CONCLUSTION

From the results obtained in this study it could be concluded that fermented by-products mixtures (FBM1&FBM2) fed successfully and economically as full replacement for clover hay for lactating does without any adverse effects on animal performance which reflected on feeding cost and economic efficiency. Further studies are needed on commercial scale for better utilization with available different agricultural by-products which will be reflected in the improvement of livestock holder income in Egypt.

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التقييم الغذائي لمخلوط النواتج الزراعية الثانوية المتخمرة مقارنة بدريس البرسيم وتأثيره على الأداء الإنتاجي للماعز الزرايبي.

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تهدف هذه الدراسة الى تقييم خصائص مخلوط المخلفات الزراعية (الحقلية ومخلفات التصنيع الزراعي) المتخمر واحلاله محل دريس البرسيم في علائق الماعز الزرايبي الحلاب. وتم دراسة تأثير احلال مخلوط المخلفات المتخمر على كل من معدل انتاج اللبن وتركيبة والقيم الهضمية وبعض مقاييس الدم. حيث تم تكوين مخلوطين متخمرين من المخلفات الحقلية ومخلفات التصنيع الغذائي حيث يتكون المخلوط الأول من ٦٥% عروش البطاطس، ١٢% تفل البنجر ،١٥% قش أرز ، ٨%مولاس (م١). بينما يتكون المخلوط الثاني من ٧٤% عروش البطاطس، ١٤% تفل البنجر ، ٧% قش أرز ، ٥ % مولاس (م٢) حيث حفظت لإتمام التخمر لمدة ٦ أسابيع. وتم اختيار ١٨ عنزه زرايبى حلابة متوسط وزن الجسم ٤٢,٥ ± ١,٥كجم وعمر ٣-٤ سنوات، قسمت الى ٣ مجموعات متماثلة (٦ حيوانات لكل مجموعه) ، حيث تم تغذيه المجموعة الأولى على علف مركز ودريس برسيم كمجموعه مقارنة (ج١). بينما تم استبدال دريس البرسيم بالمخلوطين (م١، م٢) للمجموعتين (ج٢- ج٣) على التوالي . وكان متوسط تركيب المخلوطين (٤٠,٥، ٤١,٧%) مادة جافة،(١٢,٤٥، ١٢,٨٣%) بروتين خام ،(٥٥,٤, ٥٢,٦%) ألياف الذائبة في المحلول المتعادل،(٤٤,٧, ٤٠,٨%) ألياف ذائبة فى المحلول الحامضى،(٢,٥، ٢,٢ %) مستخلص الاثير و(٩,٥، ١٠,٣ %) رماد لكل من المخلوطين (م١ ، م٢) على التوالى. لقد أوضحت النتائج صفات الجودة للسيلاج ان أعلى قيمة لكل من الأمونيا وحامض الخليك والبيوتريك قد تحققت مع المخلوط م١. بينما حققت المجموعه (ج٣) أعلى قيم (٠.٠٥) معنويا لكل من معاملات هضم المادة الجافة , البروتين الخام , الألياف غير الذائبة فى المحلول المتعادل وكذلك الألياف غير الذائبة فى المحلول الحامضى مقارنة بمجموعه المقارنه ج١. بينما لم توجد فروق معنوية (٠.٠٥) بين المجموعات المختبرة بالنسبة لمعامل هضم مستخلص الاثير. كما أوضحت النتائج ان المجموعة (ج٣) قد سجلت أعلى متوسط (٠.٠٥) معنويا لانتاج اللبن, ولم توجد فروق معنويه (٠.٠٥) بين المجموعتين (ج٢, ج٣), بينما سجلت المجموعه ج١ أقل معدل معنويا (٠.٠٥) لمتوسط انتاج اللبن. كما لم تسجل فروق معنويه فيما بين المجموعات المختبرة بالنسبة لتركيب اللبن. ايضا من نتائج عينات الدم لا توجد اختلافات معنويه بين المجموعات المختبرة (البروتينات، السكر وانزيمات الكبد) و من ذلك لا يوجد تأثير ضار على وظائف الكبد والصحة العامة عند استخدام مخلوط المخلفات الزراعية (الحقلية ومخلفات التصنيع الزراعي) المتخمر. بالنسبة لتكاليف التغذية للرأس فى اليوم فقد انخفضت بمعدل (٨,٨، ١٠,٥ %) لكل من المجموعتين (ج٢, ج٣) على التوالى مقارنة بمجموعة المقارنة، ولقد أدى ذلك الى تحسين الكفاءة الاقتصادية بمقدار (٣٢,٧ ، ٤٣,٦%) للمجموعتين (ج٢, ج٣) على التوالي مقارنة بمجموعة المقارنة.نستنتج من ذلك ان استبدال دريس البرسيم بكلا المخلوطين (م١ ، م٢) فى علائق الماعز الحلاب قد أدى الى تقليل تكاليف التغذية وهذا بدوره سوف يؤدى الى توافر مصادر علفية جديدة غير تقليدية تسهم فى حل جزء من الفجوة العلفية فى مصر مما يؤدى الى تقليل تكاليف الانتاج .