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INFLUENCE OF FEEDING MIXTURE OF TOMATO AND APPLE POMACE SILAGE TO LACTATING GOATS ON PRODUCTIVE PERFORMANCE.

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SUMMARY

This experimental work was carried out to study the effect of replacing berseem hay with silage prepared from mixture of Tomato and Apple pomace (EMTAP) on digestion coefficients, some blood parameters, milk production and milk composition of lactating goats. Twenty-five lactating goats 2-3 years old and 26.84 kg weight were assigned randomly to five groups(five in each)using a randomized complete block design. Animals fed Berseem hay (BH) plus concentrate feed mixture (CFM). Five levels (0, 25, 50, 75 and 100%) of EMTAP used to replace berseem hay during the experiment. The experimental period extended one week postpartum until the fourth month of lactation .Group R1fed ration contained 100% BH plus CFM and served as control, while groupsR2, R3, R4 and R5 fed four levels of EMTAP (25, 50, 75 and 100%), respectively by replacing BH in the ration. Results showed that goats fed R3 diet (50% BH + 50% EMTAP) had significantly ($P<0.05$) better nutrients digestibility and feeding values compared with control. Significant ($P<0.05$) increases observed in milk production up to 13.06% and in milk fat yield up to 43.70% for R3 compared with control. Also, R3 recorded the best value of feed conversion and the best relative economic efficiency compared with other experimental groups. Daily gain of kids from birth up to weaning was significantly ($P<0.05$) higher with R3 than kids fed the other experimental rations.

It conclude that the nutritional value of tomato pomace and apple pomace were markedly improved when mixed together (at ratio 50:50), for making silage. The study conclude that replacement of berseem hay with EMTAP up to 50% in the diets of dairy goats could improve milk yield and composition without any adverse effect on their performance.

Keywords: tomato pomace; apple pomace; replacement; berseem hay; digestibility, lactating goats, milk production

INTRODUCTION

There is an acute gap between animal feed requirements and available feedstuffs for the whole population of ruminant animals in Egypt. Therefore, it is important to search for non-traditional sources of feeds for ruminants. In respect of this problem, a growing attention focused on use of crop by-products, agriculture industrial by-products, fruits and vegetables wastes for ruminant feeding. Using of these resources will decrease the amounts of concentrate feed mixture offered to animals and subsequently reduce feed cost as well as limiting the environmental pollution (Abou Slim and Bendary, 2005). Furthermore, it reduce the amount of some feedstuffs imported for animal feeding. Conventional and unconventional by-products of food processing industry frequently included in livestock diets (Denek and Can, 2006). The high cost of conventional feeds due to stiff competition for their use by human and livestock species have worsened the situation of feeding small ruminants. To mitigate this problem, continuous searching for various alternatives feed that is less competitive for human could perhaps an intervention area needed to augment sheep production (Okoruwa *et al.,* 2012). Uses of unconventional feed resources cheap and locally available are gaining more recognition in the field of small ruminant nutrition. Tomato and apple pomace are two alternative by-products obtained from tomato paste and apple juice industries. These by-products annually produced in huge amounts. The chemical composition of final pomace is linked to the morphology of the original feed stock and the extraction technique used. Tomato and apple pomace vary in nutrient density, thus processing can effectively improve their nutritive value. According to NRC (2001), apple pomace (AP) is very low in protein (6.4% protein on DM basis) but it serves as a useful energy source for ruminants (Oltjen *et al*., 1977). Studies showed that AP supplemented with natural protein was comparable to protein enriched corn silage (Rumsey, 1978; Bovard *et al*., 1977). In contrast, Elloitt *et al*. (1981) demonstrated that tomato pomace (TP) has the potential to be a good source of protein, but may be limited in energy due to its high fiber content. Previous studies indicated different results concerning feeding of TP and AP. The low protein concentration of AP (Alibes et al., 1984; NRC, 2001; Pirmohammadi *et al.*, 2006),and high protein content of TP (Del Valle *et al*., 2006; Fondevila *et al*., 1994; Weiss *et al*., 1997), suggest use together in animal feeding. The main objective of this study was to evaluate the effects of total or partial replacement of Berseem hay by silage of mixture of Tomato and Apple pomace (EMTAP) on some rumen and blood parameters, digestibility of nutrients, nutritional value of ration and their effect on milk production and composition of lactating goats.

MATERIALS AND METHOD

The present study carried out at Noubareia Experimental Station, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt. This study conducted to investigate the effect of total or partial replacement of Berseem hay by silage of the mixture of Tomato and Apple pomace (EMTAP) on performance of lactating goats.

Preparation of Tomato and Apple Pomace Silage

The fresh amounts of tomato and apple pomace used in silage making were collected from several local factories in Egypt.TP and AP mixed together (ratio 50:50) on DM basis and ensiled without any additive in a trench silo on a concrete floor. The mixture left sealed for 60 days. Chemical composition of silage determined according to AOAC (2000) and presented in (Table 1). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were determined using method of Van Soest *et al.* (1991).

Table (1): Chemical compositions of TP and AP used for silage making (%, on DM basis).

Item	TP	AP
DM	28.33	34.98
OM	86.16	95.64
CP%	14.55	6.04
CF%	24.87	17.66
EE%	4.64	2.16
NFE	42.10	69.78
Ash	13.84	4.36
NDF	58.27	41.44
ADF	40.93	29.65
ADL	10.94	6.94
Calcium	0.31	0.11
Phosphorus	0.45	0.12

TP :Tomato pomace - AP: Apple pomace.

Experimental design, animals and diets

Twenty-five lactating goats of 2-3 years old and 26.84 kg weight in average and in the first week of lactation. They assigned randomly into five groups, each of five lactating goats to use for the present investigation. Animals fed berseem hay (BH) plus concentrate feed mixture (CFM) at the ratio 1:1 on DM basis (control) with five levels of replacement with EMTAP on the expense of BH (0, 25, 50, 75 and 100).

CFM fed as an energy supplement during the experiment. It was offered twice a day at approximately 7:00 am and 02:.00 pm, while BH and silage mixture (EMTAP) offered at 9:00am and 4:00 pm. The feed allowances calculated according to NRC (2001).Goats had unlimited access to water. Experiment extended until the end of the fourth lactation month. The CFM used in this experiment consisted of 20% Yellow corn,19% Soybean meal, 26% Wheat bran, 25% Barely, 6% Molasses, 2% Limestone, 1.5% Salt and 0.5% Mineral premix. Its chemical composition (%,on DM base) was 88.58, 15.65,7.58, 2.53, 68.47, 5.77, 23.76, 16.87and 3.28 for DM,CP, CF,EE, NFE , Ash, NDF, ADF and ADL respectively.

Does and kids weighed directly 15 h after kidding then at 15, 30, 45 and 60 days of age where kids weaned at 60 days old. Kids isolated of their dams after the second day at 3:00 pm until the next day morning, stayed 8 h daily apart from their dams, then they weighed before and after suckling, in order to measure the amount of suckled milk, then does completely hand milked till stripping and milk yield was recorded. The does milked at 15,30,45and 60 days from kidding and samples of sucked milk were taken and analyzed for fat , total solids (TS), solid not fat (SNF) protein (P) and ash % according to Ling (1963), lactose was calculated by difference. Fat corrected milk (4% fat) was calculated by using the following equation according to Gaines (1928):

FCM = 0.4 milk yield (gm) +15 fat yield (gm)

Digestibility trials

Digestibility trials carried out at the end of feeding trial, using three rams for each group. Experimental animals housed in metabolic crates. Rams kept on experimental rations for a preliminary period of 21 days followed by 7 days for total feces and urine collection. Sub samples (20%) of feces and urine were taken once daily and stored at 18 ˚C until analysis.

Fecal sample dried at 60˚C for 72 hrs. Feed and fecal samples grounded through cheesecloth 1 mm screen on a Wiley mill grinder and a sample (50 gm/sample/treatment/ sheep) was taken for analysis. Samples of feed and feces were analyzed for crude protein (CP), crude fiber (CF), ether extract (EE) and ash, while urine samples analyzed to determine nitrogen (N) according to AOAC (2000). Cell wall constituents determined for neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) using Tecator Fibretic System according to VanSoest *et al.* (1991). Values of total digestible nutrients (TDN) calculated according to the classic formula of Maynard *et al.* (1979) on a dry matter basis.

Sampling and analysis of rumen liquor:

Rumen liquor samples were taken from three animals of each group at the last day of milking using stomach tube at 0, 3 and 6 hrs after the morning meal. Collected rumen liquor directly tested for pH using Orian 680 digital pH meter. Samples were strained through four layers of chesses cloth for each sampling time, while ammonia nitrogen (NH_3-N) was determined using magnesium oxide (MgO) as described by AOAC (2000).Total volatile fatty acid (TVFA'S) concentration estimated using steam distillation methods (Warner, 1964) and microbial protein measured by sodium tangistate method according to Shultz and Shultz (1970).

Blood samples

Samples collected at the end of collection period from the jugular vein of animals, allowed to flow into heparinized tubes, immediately centrifuged at 4000 rpm for 20 minutes to separate the serum, which stored at -20 ˚C for subsequent analysis. Blood serum analyzed using special kits to determine total protein as described by the Buiret method according to Henry and Todd (1974), albumin determined according to Doumas *et al.* (1971), globulin calculated as the difference between total protein and albumin. Creatinine determined using the method of Henry *et al.*, 1974, urea **(**Fawcett and Soctt, 1961), glucose (Tinder, 1969) and Cholesterol (Allian *et al.*, 1974). Alanine aminotransferase (ALT) (u/l), aspartate aminotransferase (AST) (u/l) were measured according to Reitman and Frankel (1957).

Statistical analyses

Data of growth statistically analyzed according to Snedecor and Cochran (1980) using SAS (1999).The difference between means was tested by Duncan' s Multiple Range Test (Duncan, 1955). The used model was:

Yij+ μ+Ti+eij

Where :

Yij= The observation on the 1th treatment.

μ= Overall mean.

Ti= Effect of the1th treatment.

eij = experimental error.

RESULTS AND DISCUSSION

Chemical composition of experimental silage and Berseem hay.

According to NRC (2001), apple pomace (AP) is very low in protein (contains only 6.04% protein (Table 2) on DM basis and it also serves as a useful energy source for ruminants (Oltjen *et al*., 1977). Studies showed that AP supplemented with natural protein was comparable to protein enriched corn silage (Bovard *et al.,* 1977; Fontenot *et al*., 1977 and Rumsey, 1978). In contrast, Elloitt *et al.* (1981) demonstrated that tomato pomace (TP) has the potential to be a good source of protein, but may be limited in energy due to the high fiber content. Previous studies indicated different results obtained by various authors concerning feeding TP or AP alone. Low protein content of AP (Alibes *et al*., 1984; NRC, 2001 and Pirmohammadi *et al*., 2006), and high protein content of TP as supplemental protein (*Gasa et al*., 1989; Fondevila *et al*., 1994; Weiss *et al*., 1997 and Del Valle *et al*., 2006) suggest the need to recognize ways to improve their feeding value and usefulness as by-products. It seems that their nutritional values could increase when used together in animal feeding. Our previous observation in respect of mixing TP with AP (at ratio 50:50), had more palatability and digestibility than mixing and processing with urea, wheat straw, NaCl or NaOH (unpublished data).

Also, the result indicated that CP content (11.88%) of silage mixture of tomato and apple pomace was closer to CP percentage in berseem hay (12.33%) (Table 2), so, these results high lighted that ensiled process of both by-products (TP and AP) could be the way to improve feeding value and usefulness of both by-products.

Abdollahzadeh, *et al.* (2010) demonstrated that using mixture of TP and AP compared to its individual form could improve their nutritive value and ensiled the mixture(EMTAP) can also be efficiently replaced up to 30% of dairy cows diet.

Silage fermentation characteristics.

Data of silage quality described as pH: 4.00, (% of DM) NH3-N: 0.10, Lactic acid :4.85, Acetic acid :3.22 and Butyric acid: 1.07(Table 2). Good quality silage would have pH value between 3.8 and 4.5 (Ranjhan, 1980; Saddick *et al*., 1993; Ahamed, 1998 and Amal fayed ,2014). As pH alone is unreliable because the optimal pH for forage silage depends on many factors, *i.e*. chemical composition of the ensiled material and the ensiling procedure. Data of NH_3-N, lactic acid, acetic acid, butyric acid and pH of Tomato and Apple pomace (EMTAP) silage judged them as good quality silage. These results are in agreement with those reported by Mc Donald *et al.,* (1995).

Table (2): Chemical compositions of experimental silage and berseem hay (% of DM basis)

Item	EMT	BH
DM	31.06	87.98
OM	91.73	93.63
CP	11.88	12.33
CF	19.98	26.44
EE	3.03	1.79
NFE	56.84	53.07
Ash	8.27	6.37
NDF	49.33	55.59
ADF	33.98	41.96
ADL	8.06	10.58

BH,: Berseem Hay
EMTAP: ensiled mixture of Tomato and Apple pomace
**Silage fermentation characteristics: pH=4.00,(% of DM) NH3-N: 0.10, Lactic acid :4.85, Acetic acid :3.22 and Butyric acid: 1.07*

Digestibility coefficients and feeding values

Digestion coefficients, feeding values and nitrogen utilization are presented in Table (3). Animals fed ration contained 50% EMTAP (R3) showed significantly (P<0.05) the higher digestion coefficients of most nutrients than those fed R2, R4 and R5 without significant difference with control , except for digestion coefficients values of CP and EE which significantly of higher (P<0.05) values than the control (R1). Rumsey (1978) reported that AP is equivalent to corn silage in total digestible nutrients values and rich in pectin, pentosans and ether extract. Generally, presence of more NFE, means appreciable quantities of soluble carbohydrates (Hang and Woodams, 1986; NRC,2001 and Vendruscolo *et al*., 2009);pectin (Kennedy et al., 1999 and Del valle*et al*., 2006) in AP and TP. Therefore, this may lead to higher digestibility of DM and OM in diets containing EMTAP than control. According to Ibrahem and Alwash (1983); Gasa*et al*. (1989) and Ojeda and Torrealba (2001) feeding TP improved the nutritional value of diet, due to more digestibility of protein (61.2 %) and ether extract (86.3 %). In our study, higher digestion coefficients were reflected on feeding values (TDN and DCP), whereas, R3 had higher (P<0.05) TDN and DCP values , but without significant difference than the control one. These results could due to the more feed intake by animals of this group as well. Abdollahzadeh, *et al*. (2010) demonstrated that using mixture of TP and AP compared to each alone could improve their feeding value when ensiled as mixture for ruminants feeding .Animals fed experimental ration contained 50% EMTAP (R3) showed significantly higher (P<0.05) values of all nitrogen utilization parameters (NI, ND, NB**,**NB/N1 and NB/ND) than those of R2, R4 and R5 without significant difference from the control group (R1). Many studies (Ibrahem and Alwash, 1983; Gasa*et al*., 1989 and Ojeda and Torrealba, 2001), showed that feeding TP improved the nutritional value of diet, due to its high digestible level of protein.

Table (3): Digestion coefficients, feeding values and nitrogen utilization of experimental rations fed to lactating goats (Mean ± SE).

Item	R_1	R_2	R_3	R_4	R_5
Digestion coefficients, %					
DM	60.25±0.44 [a]	59.36 ±0.31 [ab]	60.75 ±0.22 [a]	57.45±0.18 [c]	58.69±0.16 [b]
OM	62.61 ±0.27 [a]	61.42 ±0.48 [ab]	62.68 ±0.25 [a]	59.58± 0.33 [c]	60.67± 0.11 [b]
CP	63.16 ± 0.22 [b]	61.35±0.22 [c]	64.34± 0.14 [a]	61.27± 0.16 [c]	59.75 ± 0.27 [d]
CF	55.79 ± 0.43 [a]	51.99± 0.44 [c]	55.70 ± 0.17 [a]	52.91± 0.27 [b]	49.16 ± 0.16 [d]
EE	71.97±0.22 [b]	70.91± 0.27 [b]	73.23 ± 0.23 [a]	69.26± 0.17 [c]	65.09± 0.64 [d]
NFE	64.26± 0.52 [a]	63.23± 0.19 [b]	64.61± 0.27 [a]	60.60± 0.10 [c]	63.17± 0.25 [b]
Feeding values, %					
TDN	60.59± 0.42 [a]	59.47[b]±0.62	60.77±0.36 [a]	57.79±0.58 [c]	58.69±0.43 [c]
DCP	8.84± 0.07 [a]	8.46[b]± 0.12	8.93± 0.09 [a]	8.52± 0.11 [b]	8.19± 0.10 [c]
Nitrogen utilization, g/h/d					
NI	15.81 ± 0.25 [a]	15.54±0.44 [b]	15.82±0.31 [a]	15.55±0.26 [b]	15.56±0.43 [b]
ND	9.99 ± 0.11 [a]	9.70± 0.14 [b]	10.00± 0.19 [a]	9.54± 0.09 [b]	9.30± 0.11 [c]
NB	1.63± 0.05 [a]	1.39 ±0.03 [b]	1.65±0.05 [a]	0.99±0.62 [c]	0.72±0.09 [d]
NB/NI	10.31± 0.17 [a]	8.94± 0.31 [b]	10.43± 0.22 [a]	6.37± 0.12 [c]	4.63± 0.17 [d]
NB/ND	16.32± 0.10 [a]	14.32±0.58 [b]	16.50±0.13 [a]	10.33±0.45 [c]	7.74±0.14 [d]

[a,,b,c and d] *Means within rows with different superscripts are significantly different (P<0.05).*

R1: 100% BH + CFM(control) *R2: 75% BH +25% EMTAP+ CFM.*

R3: 50% BH + 50% EMTAP+ CFM. *R4: 25% BH + 75% EMTAP+ CFM.*

R5: 100% EMTAP+ CFM.

Milk yield and its composition.

Daily milk yield (DMY) and milk composition of lactating goats fed the experimental rations are presented in Table (4). It illustrated that lactating goats fed ration contained 50 % BH+50% EMTAP (R3) recorded significant increase (P<0.05) in milk yield up to 13% compared to control ration (R1). Similar effect was reported by Abdollahzadeh, *et al.* (2010) who found that EMTAP substitution caused better milk yield and they believed that feeding diets contain EMTAP made a progress in DM intake, nutrient digestibility and palatability of the diet, hence more milk attained with diets containing EMTAP compared to control. Also, Toyokawa *et al.* (1984) stated that milk yield increased when AP silage mixed well with wheat bran, chopped alfalfa and milled rice bran (at rate10% on DM basis), then fed to dairy cows. In contrast with the present result, Belibasakis (1990); Belibasakis and Ambatzidiz, (1995) and Weiss *et al*., (1997) reported that milk production and composition not affected when TP fed to lactating cows**.** In the present study, fat corrected milk (4% FCM) with R3 was significantly higher than that of control and other tested rations, being the highest with R3 while the lowest value was associated with R5 ration. Matching with these results, Abdollahzadeh, *et al.* (2010) showed that daily milk yield and 3.5% FCM were positively affected (P<0.05) by inclusion of EMTAP in diet of cows .Clear remarkable increases (P<0.05) were noticed in the yield of milk fat (38.87g) and protein (33.35g) for R3 compared with control (R1), in which yields of these compound were 27.05g and 27.98g, respectively. Milk fat yield increased (P<0.05) in group R3 by 43.69% compared with R1. Concerning milk constituents, goats fed ration contained 50% BH+50% EMTAP (R3) had significant increases (P<0.05) in percentages of all contents than other experimental groups .Abdollahzadeh, *et al.* (2010) observed that milk fat percentage slightly increased when EMTAP incorporated in diet of dairy cows.

Table (4): Milk yields and milk composition for lactating goats fed the experimental rations (mean ± SE).

Items	R1	R2	R3	R4	R5
Live body wt., kg	26.875± 0.95	26.825± 0.74	26.800±0.52	26.825±0.81	26.850±0.63
Milk yields, g/d	880.50±12.65^{a}	885.25±17.76^{a}	995.50±24.77^{a}	850.25±13.44^{b}	805.75±10.63^{c}
4%FCM, g	757.95±0.22 ^{b}	762.25±0.65 ^{b}	981.25±0.43 ^{a}	736.4±0.91 ^{c}	707.35±0.74 ^{d}
Fat, g/d	27.05±0.16 ^{b}	27.21±0.11 ^{b}	38.87±0.15 ^{a}	26.42±0.12 ^{c}	25.67±0.09 ^{d}
Protein, g/d	27.98±0.24 ^{b}	28.01±0.15 ^{b}	33.35±0.18 ^{a}	26.44±0.12 ^{c}	25.22±0.08 ^{d}
<u>Milk composition (%):</u>					
Total solids	12.51 ±0.05 ^{b}	12.53±0.11^{b}	13.64±0.12 ^{a}	12.52±0.16 ^{b}	12.56±0.15 ^{b}
Solids not fat	9.44±0.10 ^{b}	9.46±0.07 ^{b}	9.74±0.08 ^{a}	9.41±0.10 ^{b}	9.38±0.11 ^{c}
Fat	3.07±0.05 ^{c}	3.07±0.02 ^{c}	3.90±0.08 ^{a}	3.11±0.09 ^{b}	3.18±0.05 ^{b}
Protein	3.18±0.10 $^{b \backslash}$	3.16±0.18 ^{b}	3.35 ±0.11 ^{a}	3.11±0.18 ^{c}	3.13±0.11 ^{c}
Lactose	5.38±0.08 ^{b}	5.38±0.09 ^{b}	5.45±0.06 ^{a}	5.36±0.10 ^{b}	5.29±0.12 ^{c}
Ash	0.88±0.02 ^{b}	0.92±0.01 ^{ab}	0.94±0.04 ^{a}	0.94±0.02 ^{a}	0.96±0.02 ^{a}

$^{a,,b,c\ and\ d}$ *Means within rows with different superscripts are significantly different (P<0.05).*

R1: 100% BH + CFM (control)
R2: 75% BH +25% EMTAP+ CFM.
R3: 50% BH + 50% EMTAP+ CFM.
R4: 25% BH + 75% E MTAP+ CFM.
R5: 100% EMTAP+ CFM.

Birth weight and daily gain

Data concerning birth weight and daily gain of kids from birth up to weaning are shown in Table (5). Slight differences were observed among treatments in respect of birth weight with the highest value associated with R4 (ration contained 25% BH+ 75% EMTAP). Regarding body weight during the first month, the highest value recognized with R3 (ration contained 50 % BH+50% EMTAP) (6.100 kg).There was no significant difference between R2 and R3and also among R1, R2 and R4,while R5 recorded the lowest value with significant difference than the other experimental groups. The body weight during the second month had the same trend. Daily gain of kids from birth up to weaning (birth to 1st month- 1st month-2nd month and birth to 2ndmonth) were significantly (P<0.05) higher (148.00, 141.67 and 144.83g), respectively for R3than the kids fed the other experimental dietary treatments. Additionally, group R5 had the lowest value (P<0.05) of daily gain over the whole period (birth-2nd month).Abdollahzadeh, *et al.* (2010), indicated that diets containing EMTAP had higher DM intake and FE than the control diet.

Rumen Parameters

Data of rumen fermentation parameters at zero, 3 and 6 hrs post feeding are presented in Table 0 Ruminal pH values for R3 found to be insignificantly different with the control and R2 groups, but it was significantly (P < 0.05) higher than other experimental groups (R4 and R5). The values were declined at3hrs post feeding, then raised up again at 6 hrs post feeding. Concentration of TVFA's for R3 ration was significantly higher (P<0.05) than other rations except control. Similar trend noticed for ruminal NH_3-N concentration. Our results are in agreement with Amal fayed (2014) who found that concentrations of TVFA's and NH_3-N increased in rumen for lambs fed ration contained 50% EMTAP compared to control group. Allam *et al*. (2006) reported that TVFA's concentration in the rumen governed by several factors such as DM digestibility, rate of absorption, rumen pH, transportation of digesta from rumen to other parts of digestive tract, and the microbial population in rumen and their activities. Concerning rumen volume, rate of outflow and rumen digesta, they were significantly higher for R3 than other experimental rations and also similar effect was reflected on microbial protein synthesis which significantly increased with R3 compared to other rations. In fact, when DMI increased, it extremely correspond to the more rate of outflow and rumen digesta as well. On other hand, it will help more TVFA's production by ruminal microorganisms. Similar results obtained by Amal fayed, (2014) when using tomato-apple pomace silage diet for lambs.

Ta**ble (5): Changes inbody weight of goat kids fed the experimental rations (mean ± SE).**

	Body weight, kg			**Daily gain, g**		
	Birth weight	1st month weight	2nd month weight	Birth-1st month	1st month-2nd month	Birth-2nd month
R1	1.68±0.28	5.75± 0.30^{b}	9.75 ± 0.32^{b}	135.66 ±0.44^{b}	133.33± 0.63^{b}	134.50 ± 0.55^{b}
R2	1.65±0.25	5.97± 0.26^{ab}	9.90 ± 0.54^{ab}	143.83 ±0.64^{a}	131.17 ±0.19^{b}	137.50±0.37^{b}
R3	1.66±0.42	6.10± 0.52^{a}	10.35 ± 0.66^{a}	148.00± 0.18^{a}	141.67 ±0.71^{a}	144.83±0.16^{a}
R4	1.70±0.65	5.79± 0.38^{b}	9.65 ± 0.41^{b}	136.33 ±0.48^{b}	128.67± 0.33^{c}	132.50±0.50^{b}
R5	1.66±0.45	5.20± 0.42^{c}	8.50 ± 0.33^{c}	117.83 ±0.12^{c}	110.00 ±0.29^{d}	113.92±0.19^{c}

$^{abc\ and\ d}$ Means within column with different superscripts are significantly different (P<0.05)

R1: 100% BH + CFM (control) *R2: 75% BH +25% EMTAP+ CFM.*
R3: 50% BH + 50% EMTAP+ CFM. *R4: 25% BH + 75% EMTAP+ CFM.*
R5: 100% EMTAP+ CFM.

Table (6): Rumen liquor parameters of lactating goats fed the experimental diets.

Item	Time (hr)	R1	R2	R3	R4	R5
pH	0	6.77±0.16[a]	6.62±0.18[ab]	6.70±0.07 [a]	6.58±0.11[b]	6.52±0.17[b]
	3h	6.25±0.04 [a]	6.15±0.06[ab]	6.23±0.10 [a]	6.08±0.14 [b]	6.07±0.13 [b]
	6h	6.54±0.09 [a]	6.44±0.15 [ab]	6.50±0.09 [a]	6.39±0.18 [b]	6.36±0.14[b]
NH_3 (mg/100ml)	0	10.77±0.25[b]	10.86±0.19 [b]	1122±0.09[a]	11.9±0.18[b]	11.02±0.21[b]
	3h	12.86±0.16[c]	13.09±0.17[c]	14.28±0.14[a]	13.42±0.24 [b]	13.78±0.28[b]
	6h	11.03±0.13 [c]	11.06±0.0 5 [c]	11.94±0.15 [a]	11.33±0.17 [b]	11.48±0.13 [b]
TVFA's (meq/100 ml)	0	7.43±0.07[a]	7.19±0.03 [b]	7.48±0.13[a]	7.00±0.27[b]	6.76±0.19[b]
	3h	9.67±0.19 [a]	9.33±0.13 [b]	9.71±0.16 [a]	8.98±0.10 [c]	8.88±0.12 [c]
	6h	7.79±0.10 [a]	7.09±0.21 [b]	7.56±0.09 [a]	7.05±0.16 [b]	6.96±0.17 [b]
Rumen volume	-	2.81±0.19 [a]	2.72±0.08 [b]	2.84±0.11 [a]	2.68±0.15 [b]	2.64±0.18 [b]
Rate of outflow	-	5.43±0.15[b]	5.58±0.10 [b]	6.01±0.04 [a]	6.03±0.22[a]	5.14±0.16 [c]
Rumen digesta	-	3.79±0.12[b]	3.81±0.14 [b]	4.45±0.18[a]	3.84±0.16 [b]	3.83±0.15 [b]
Microbial protein	-	34.85±0.61[b]	34.26±0.43 [b]	37.83±0.31[a]	31.01±1.16[c]	30.72±1.02[c]

[a,,b, and c] *Means within rows with different superscripts are significantly different (P<0.05).*
R1: 100% BH + CFM (control) *R2: 75% BH +25% EMTAP+ CFM.*
R3: 50% BH + 50% EMTAP+ CFM. *R4: 25% BH + 75% EMTAP+ CFM.*
R5: 100% EMTAP+ CFM.

Blood parameters

The effect of experimental rations on some blood serum parameters are presented in Table (7). Results indicate that no significant differences observed among the experimental treatments concerning all blood serum parameters, except glucose concentration whereas, R3,R4 and R5 recorded lower significant concentrations (P<0.05) than R2 and R1(control). The changes in percentages of blood constituents in response to EMTAP substitution in the present experiment were not significant. Generally, all these parameters were within the normal range of sheep blood as reported by Reece (1991). The current results showed that using EMTAP in ruminant rations did not cause any negative effect on blood constituents of lactating goats.

Amal fayed (2014) obtained similar results when used EMTAP in diets of growing Barki lambs up to 50% and had no adverse effect on productive performance.

Feed intake, feed conversion and economic evaluation:

Data of feed intake, feed conversion and economic evaluation of the experimental rations are presented in Table (8). Results revealed that daily feed cost of experimental groups had lower values for EMTAP for different ratios (25, 50, 75 and 100%) than control one. TDMI, TDNI and fat corrected milk yield were higher (P<0.05) in both R1 and R2 than R4 and R5 groups, being the highest with R3. FCM/TDMI and FCM/TDNI had the same trend. R3 recorded the best value (P<0.05)of feed conversion compared with other experimental groups, respecting both DM and TDN: FCM, with significant differences among them. Abdollahzadeh, *et al.* (2010) reported that substitution of alfalfa hay by EMTAP (30%) in

Table(7): Blood serum parameters for lactating goats fed the experimental rations (mean ± SE).

Item	R1	R2	R3	R4	R5
Glouse (mg/dl)	100.42±0.19 [a]	98.98± 0.21[a]	89.10±0.19[b]	81.55 ±0.12 [c]	78.35 ± 0.17[d]
Cholesterol (mg/dl)	105.45±1.77	103.32± 1.22	101.75±1.71	103.80 ±1.50	100.83 ±164
Total Protein (g /dI)	7.75 ±0.41	7.81± 0.25	7.83 ± 0.64	7.78± 0.34	7.86 ±0.53
Albumin (g /dI)	3.75 ± 0.44	3.76± 0.26	3.66 ± 0.51	3.81 ±0.33	3.52± 0.76
Globulin (g/dI)	4.00 ± 0.73	4.05± 0.40	4.17 ± 0.82	3.97 ±0.43	4.34 ±0.55
Urea (mg/dl)	36.77 ± 0.54	36.83±0.76	38.64± 0.22	37.86±0.74	38.04±0. 98
Creatinine (mg/dl)	0.95 ± 0.11	0.91± 0.15	0.94 ± 0.10	0.91 ±0.09	0.90 ± 0.13
AST (U/L)	39.54 ± 0.41	39.23± 0.82	39.63 ± 0.87	40.43 ±0.75	40.71 ±0.60
ALT (U/L)	19.91± 0.34	19.74± 0.67	19.62± 0.35	20.53 ±0.73	19.31± 0.45

[a,, b,,c and d] *Means within rows with different superscripts are significantly different (P<0.05).*
R1: 100% BH + CFM (control) *R2: 75% BH +25% EMTAP+ CFM.*
R3: 50% BH + 50% EMTAP+ CFM. *R4: 25% BH + 75% EMTAP+ CFM.*
R5: 100% EMTAP+ CFM.

Table(8): Feed intake , feed conversion and economic evaluation for lactating goats fed the experimental rations (mean ± SE).

Item	R1	R2	R3	R4	R5
CFM	434.65	450	400.01	410	445.45
Silage	-	157.05	345.27	360	446.75
BH	482. 57	312.04	200	125.55	-
TDMI (g/h/d)	917.22±0.92 [b]	919.09±0.83 [b]	945.28±0.63 [a]	895.55±0.36 [c]	892.20±0.33[c]
TDNI (g/h)	555.74±0.44 [b]	546.58±0.52 [b]	574.45±0.15 [a]	517.51±0.71 [c]	523.63±0.23 [c]
4% FCM (g)	757.95±0.22 [b]	762.25±0.65 [b]	981.25±0.43 [a]	736.4±0.91 [c]	707.35±0.74 [d]
Feed conversion (g/g)					
TDMI / FCM (g /g)	1.21±0.55 [b]	1.21±0.76 [b]	0.963±0.94 [c]	1.22±0.54 [b]	1.26±0.81 [a]
TDNI/FCM (g/g)	0.733±0.90 [a]	0.717±0.35 [b]	0.585±0.18 [c]	0.703±0.26 [b]	0.740±0.41 [a]
Feed efficiency:					
FCM/TDMI	0.83±0.33 [b]	0.84±0.75 [b]	1.04±0.27 [a]	0.82±0.43 [b]	0.79±0.65 [b]
FCM/TDNI	1.36±0.43 [c]	1.39±0.43 [b]	1.71±0.43 [a]	1.42±0.43 [b]	1.35±0.43[c]
Economic evaluation:					
Daily feed cost, L.E	2.1	1.83	1.53	1.41	1.27
Price of daily milk yield, L.E	5.28	5.31	5.97	5.1	4.83
Economic return, L.E	3.18	3.48	4.44	3.69	3.56
Economic efficiency, (h/d)%	100	109.43	139.62	116.03	111.95

[a,,b and c] *Means within rows with different superscripts are significantly different (P<0.05)*
R1: 100% BH + CFM (control) *R2: 75% BH +25% EMTAP+ CFM.*
R3: 50% BH + 50% EMTAP+ CFM. *R4: 25% BH + 75% EMTAP+ CFM.*
R5: 100% EMTAP+ CFM.

diet of lactating cows significantly increased DM intake, feed efficiency and digestibility of some nutrients. It seemed that digestibility and palatability were further increased when TP and AP mixed and ensiled, than when separately fed. In addition, they indicated that diets containing EMTAP had higher DM intake and FE than control diet. The substitution of berseem hay by EMTAP resulted in better economic evaluation expressed as economic return. The best relative economic efficiency value was detect with (R3) being 139.62 compared with the control group (100%)because their higher milk production. Comparable results found by Amal fayed (2014) who reported that growing Barki lambs fed EMTAP in their diets up to 50% recorded the best economic efficiency value

CONCLUSION

It could conclude that the nutritional value of tomato pomace and apple pomace improved when mixed and ensiled (at ratio 50:50).Meanwhile, replacement of berseem hay with EMTAP up to 50% in diets led to a significant improvement in milk yield and its composition, digestibility, feed efficiency and economic return, without any adverse effect on the performance of lactating goats and their offspring.

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اثر إدخال سيلاج مخلوط تفل الطماطم وتفل التفاح فى عليقة الماعز الحلاب بديلا لدريس البرسيم على أداءها الإنتاجي .

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يهدف هدا البحث الى دراسة مدى تأثير إحلال سيلاج مخلوط مخلفى تفل الطماطم و تفل التفاح جزئيا او كليا لدريس البرسيم فى علائق الماعز الحلاب و نتاجها و مردود ذلك على معاملات الهضم و القيمة الغذائية والمأكول من المادة الجافة و محصول اللبن و مكوناته ومكونات الدم. لذلك تم استخدام خمسة وعشرين عنزة قسمت بعد الولادة بأسبوع الى خمسة مجاميع متساوية بمتوسط وزن 26,84 كيلو جرام (5 حيوانات فى كل مجموعة). حيث غذيت حيوانات المجموعة الاولى على عليقة تحتوى على 100% دريس البرسيم+ العلف المركز (كنترول)، والمجموعات من 2 الى 5 استبدل مخلوط السيلاج محل 25 و 50 و 75 و100% من الدريس على التوالي و استمرت التجربة حتى الشهر الرابع من الولادة . و اوضحت النتائج أن المجموعة الثالثة (50% دريس البرسيم+ 50% سيلاج مخلوط المخلفين +العلف المركز) حققت افضل النتائج بالنسبة لمعاملات الهضم و القيمة الغدائية و كفاءة التحويل الغذائى و ايضاإنتاج و مكونات اللبن و كان اعلى محصول لكل من البروتين و الدهن فى اللبن وتركيز الامونيا و الاحماض الدهنية الطيارة ، كما لم يوجد لها اى تأثير سلبى على مكونات الدم حيث لا توجد أي فروق معنوية بين المجموعات بالنسبة لقياسات الدم وكانت فى المعدل الطبيعى فيما ماعدا تركيز الجلوكوز حيث سجلت المجموعة الثانية تركيز اعلى من المجموعات الأخرى بدون اى فروق معنوية مع مجموعة الكنترول،كما سجلت المجموعة (الثالثة) ارتفاع فى معدل الزيادة فى الوزن بالنسبة للجداء خلال الفترة من الميلاد حتى الفطام .

يستخلص من هذا البحث انه يمكن الاستفادة من مخلفات التصنيع الغذائى للطماطم والتفاح والتى تعد من احد مصادر تلوث البيئة برفع قيمتهما الغذائية عن طريق عمل سيلاج من مخلوط تفل الطماطم و تفل التفاح .يمكن استخدامه بنجاح فى علائق الماعز الحلاب بالإحلال الجزئى لدريس البرسيم بنسبة تصل الى50%. دون أي تأثيرات سلبية على الإنتاجية والحالة الصحية للحيوان بينما يحسن من الكفاءة الغذائية. مما يساهم فى التغلب على مشكلة تغذية الحيوانات والاستفادة من المخلفات الزراعية مع الحفاظ على نظافة البيئة.