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EFFECT OF USING SILAGE FROM DIFFERENT MIXTURES OF BERSEEM (EGYPTIAN CLOVER) AND PANICUM MOMBASA ON PRODUCTION PERFORMANCE AND MILK PROPERTIES OF LACTATING ZARABI GOATS.

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ABSTRACT

This study was conducted to investigate the effect of using silage made from mixtures of different levels of Egyptian clover and Panicum mombasa on daily matter intake (DMI), rumen and some blood parameters, milk yield, (composition and quality), productive performance and economic efficiency for lactating Zarabi goats. A feeding trial that lasted 90 days was carried out on thirty-five lactating Zaraibi goats, averaged postpartum live body weight 37.85 kg and aged 3-4 years as well as in the number of birth kids (twin) were divided into five similar groups (Seven animals each) according to their ages and weights. Each animal group was randomly fed on the following experimental rations: G1 (control ration): consisted of 50% concentrate feed mixture (CFM) + 50% berseem silage (BS); G2: 50% CFM + 25% BS + 25% Panicum mombasa silage (PMS); G3: 50% CFM+ 12.5% BS+ 37.5% PMS; G4: 50% CFM+ 37.5% BS+ 12.5% PMS and G5 : 50% CFM+ 50% PMS. The experimental rations were formulated to cover maintenance and production allowance according to **NRC (2007).** Results showed that the highest significantly values (P<0.05) in chemical composition of experimental ratios were noticed in dry matter (DM), crude protein (CP) and nitrogen free extract (NFE) and organic matter (OM) in G5. The lowest significantly values (P<0.05) of percentages of crude fiber (CF) and ash were recorded in the ration G5 . The highest values of DM, OM, CP, ether extract (EE) and NFE and the lowest percentage of CF and ash were observed in the ration G3 (with the exception of G5 treatment). The highest significantly values (P<0.05) of averages as daily matter intake (DMI) were recorded for animals fed on G2, G4 and G3 while the animals of groups (G1 & G5) recorded the lowest values . Using the different ensiled mixtures of PM with BS had no significantly effect on pH values (with the exception of G4 which had slightly higher value), while NH3- N appeared to have significantly (P<0.05) higher concentration. Also, it resulted in higher microbial protein compared with animals fed on BS or PMS alone (G1 or G5) , moreover it had no significantly effect on the total VFA's concentrations for rations G2, G3 and G4, respectively

All measured blood parameters (total protein, albumin, globulin, urea-N, glucose, and creatinine) and physiological parameters were not significantly affected by the different experimental rations.

The actual dairy milk yield was significant (P<0.05) higher with tested rations G2 and G3 followed by G4 and G1 than that of G5. The milk components were not significantly affected by the different experimental rations, except milk fat content which increased significantly (P<0.05) in groups 2, 3, 4. No significant differences in the titratable acidity, pH values and physical properties were observed among the five treatments of experimental rations. The sum of saturated fatty acids (SFA) was found highest in G2 treatment followed by G3, G4, G1 and G5, in a descending order. The sum of unsaturated fatty acids (USFA) was found highest in G5 treatment and lowest in G2 treatment. The ratio of SFA/USFA was highest in G3& G2, than the others.

INTRODUCTION

Dairy goat farming can contribute to food security of goat farming families and become an income source through commercialization of raw milk and its dairy products. The characteristics of goat milk, both from a nutritional and social standpoint, are important and encourage studies to evaluate its production, properties and quality (**Fernandes *et al*., 2008**). Green forages are an important tool for the adequate feeding of goats. Researches have indicated that several factors, such as the availability all the year and the quality of forage (e.g energy levels, percentage of nutrients; protein, minerals, and vitamins), management of green forage (the possibility and easey of storage in the form of dry or silages ....etc.), intake level and provide concentrated feed mixtures, should be observed to increase the effectiveness of milk production of goats (**Lefrileux *et al*., 2008**). Under Egyptian conditions, its appear that the seasonality of forage production, which leads to the seasonality in animal production, when the farming is performed in an extensive regime (**Santos *et al*., 2004**). Among all available technologies to overcome the seasonality in production and quality of the forage, stands out the use of high-yield grasses at the extensive regime (**Oliveira *et al*., 2005**). Even under situations with a high supply of grasses, milk production can be limited by the nutritional quality of the forage (**Min et *al*., 2005**). Most grasses have low energy density , low protein levels as well as slow rate of degradation and passage, and these parameters limiting the forage intake (**Carvalho *et al*., 2016**). In situations where the amount of nutrients necessary for milk production is higher than supplied by the grasses, it is of paramount important to use the mixture of legume and grass forages next to the concentrated feed mixtures, and this allowing the animals to express their production potential, better body condition at birth, minimizing the negative effects of fat mobilization during early lactation, and increasing the milk production and weight gain (**Eknaes *et al*., 2006**). In diets for lactating goats its important to use strategy to increase the milk production under different production systems (**Lefrileux *et al*., 2008; Macedo *et al*., 2020 and Min *et al*., 2005**). Nevertheless, there is little information on intensive systems of milk production for goats, which uses silage made from mixtures of different levels of grass with legumes (Egyptian clover and Panicum Mombasa) and its effect on the production and quality of the milk, intake and efficiency of nutrient used for milk production, productive, reproductive performance and economic efficiency for lactating goats. Then choosing the best of the former information's is the aim of the current study.

MATERIALS AND METHODS

This study was carried out at El-Serw Experimental Research Station, Animal Production Research Institute. Panicum mombasa (PM) forage and Berseem (Egyptian clover) (B) were obtained from experiment field at El-Serw station, Forage Crops Research Department, Agricultural Research Center.

Experimental animals and feeding:

A feeding trial that lasted 90 days was carried out on thirty-five lactating Zaraibi goats , averaged postpartum live body weight 37.85 kg and aged 3-4 years as well as in the number of birth kids (twin) were divided randomly into five similar treatments, or divided into five similar groups (Seven animals each) according to their ages and weights . Each animal group was randomly fed of the following experimental treatments. G1 (control ration): consisted of 50% concentrate feed mixture (CFM) + 50% berseem silage (BS); G2: 50% CFM + 25% BS + 25% Panicum mombasa silage (PMS); G3: 50% CFM+ 12.5% BS+ 37.5% PMS; G4: 50% CFM+ 37.5% BS+ 12.5% PMS and G5: 50% CFM+ 50% PMS. The experimental rations were formulated to cover maintenance and production allowance according to **NRC (2007).** CFM: 40% yellow corn grain, 25% undecortecated cotton seed meal, 22% wheat bran, 6% rice bran, 3.5% molasses, 2.5% limestone, and 1% common salt.

The B and PM Grass were cut at the pre-flowering stage, chopped at about 3 cm in length and ensiled in three piles holding about 3 tons/ pile of the fresh materials. Silage made from 100% Berseem was prepared by adding 3% molasses on a fresh basis, mixed well (G1), while groups (G2), (G3), (G4) and finally group (G5) silages were made on the fresh basis without any additives according to **Ahmed *et al*., (2001 and 2013**). All silages mixed well and pressed to ensure compaction and then sealed to ensure airtight or anaerobic conditions for 40 days. After 40 days, the ensiled silages were opened and samples were analyzed for proximate fractions. The rations were offered in group feeding in two equal portions at 8.00 am and 4.00 pm. All lactating Zaraibi goats were weighted at the beginning and at the end of the feeding period biweekly. Feeding requirements were adjusted biweekly according to weight changes. Water was available at all times and was measured as average for each group. Feed intake and conversion were calculated. Chemical composition of the different ingredients and the experimental rations samples were analyzed according to the procedures of **A.O.A.C. (1995).** Chemical analysis of different feedstuffs and calculated rations are presented in **table (1).**

Rumen parameters:

Fifteen mature male Zaraibi goat kids' with average weight 34.53 ± 1.67 kg. , were randomly allotted in five equal groups, each group were fed on one of the five experimental rations (G1, G2, G3, G4 or G5) for a preliminary period of 14 days (adaptation periods). The amount of CFM was offered once daily at 8.00 a.m. and 4.00 p.m. while the silages were offered in two equal portions at 8.00 a.m. and 2.00 p.m. The daily required amounts of the experimental rations were calculated according to **NRC (2007**) recommendations for rams. Drinking water was available in buckets at all times.

At the end of adaptation periods, rumen liquor samples were individually collected after three hours of the morning meal by a rubber stomach tube. Collected rumen liquor samples were directly tested for pH values using Orian 680 digital pH meter, thereafter samples were strained through four layers of cheese cloth for ammonia nitrogen (NH3-N) determination using magnesium oxide (MgO) as described by the **Al-Rabbat *et al*., (1971).** Total volatile fatty acid (VFA's) concentration was estimated by using steam distillation methods (**Warner, 1964).**

Blood parameters

Fifteen maternal goats (N=5 / treatment) were randomly chosen to collect blood samples at weaning stage. 10 ml of blood samples were collected from the jugular vein from each animal into sterilized clean tubes. Then, the serum samples were obtained by centrifugation for 30 min at 3000 rpm and stored at –18 ^{o}C until analysis. Stored samples were analyzed for total protein (T.P), albumin (AL), urea, glucose and creatinine . The determination was assayed by commercial kits produced by Bio-Merieux (Craponne, France). Serum total globulin (GL) was calculated by differences (TP-AL).

Milk sampling and analysis:

The individual milk yield from morning and evening, using milking hand technique, was recorded weekly. Does were completely hand milking after removing away their off spring the day before to determine the milk yield till stripping the udder through two successive days during milking period.

At the same time individual milk samples of the complete morning milking were collected at the last three days of each period and was used for the analysis of the following parameters: milk fat, total solids (TS), ash and titratable acidity as described by **Ling, (1963**). Total nitrogen (TN) content was determined by **Kjeldahl method** (**IDF, 1993**), solids not fat (SNF) was calculated. Lactose was determined by the method of **Nickerson et al., (1976**). pH values were measured using digital pH meter (M41150, USA) equipped with glass electrodes.

Pepsin coagulation time of the milk:

Was determined using 0.1ml of 5% (V/V) bovine pepsin enzyme in distilled water per 10 ml of milk using thermostatically controlled water-bath, at 37°C and the time taken in the first signs of coagulation was measured for all samples, as described in the **Berridge methods (1952**).

Curd tension & syneresis:

Were determined using the method of **(Shalabi, 1987**) for curd tension, and (**Marshal, 1982**) for curd syneresis (whey separation).

Free fatty acids of milk fat:

Fatty acid methyl esters (FAME) of goat milk fat were analyzed chromatography. The fatty acids methyl esters were prepared as (**Christie, 1982**) using a solution of sulfuric acid/ methanol (1:9, v/v) and submitted to a HRGC analysis. The concentration of each fatty acid was expressed in percentage of the summation of the areas of all the FAME identified for each samples.

Statistical Analysis

Statistical evaluation of significant difference between means (mean ± SEM) were performed by ANOVA followed by the Duncan post hoc test to determine significant differences in all the parameters among all energy addition types using the SAS computer program (SAS Statistics version 2002). The significance differences between means were calculated using **Duncan's Multiple Range test (1955).**

RESULTS AND DISCUSSION

Chemical composition of rations:

The proximate composition of different ensiled mixtures of PM with B fed on lactating Zaraibi goats is summarized in **Table (1)**. Results showed that the highest significantly values ($P<0.05$) were noticed in dry matter (DM), crude protein (CP) and nitrogen free extract (NFE) and organic matter (OM) in G5. The lowest significantly values ($P<0.05$) of percentages of crude fiber (CF) and ash were recorded in the ration G5 . Moreover , results showed also that the highest values of DM, OM, CP, ether extract(EE) and NFE and the lowest percentage of CF and ash were observed in the ration G3 (with the exception of G5 treatment).

These results were in agreement with those reported by **Ajayi *et al.*, (2012**) and **Nkosi *et al.*, (2010**), and this variation was probably due to the combination of the legumes with grass. **Baraza *et al.*, (2009** corroborated these findings and said that different silage types resulted in different nutritional composition. The crude protein levels obtained for the mixtures of grass PM + B and sole grass (PM) in this study were higher than 7.0 % , which recommended for small ruminants (NRC, 1981) while 10–12 % recommended by ARC (1980). Generally, there are many factors affecting chemical composition of forages such as species and varieties, soil, fertilization, subsequent cuts, age, and environmental conditions (**Gabra *et al.*, 1991; Van Soest 1996 and Haggag *et al*., 2000).**

Table (1): Chemical analysis % (on DM basis) of experimental rations.

Item	DM	Chemical analysis % (on DM basis)					
		OM	CF	CP	EE	NFE	Ash
CFM	90.89	93.35	16.45	14.81	3.20	58.89	6.65
Silage, S[1] (100% B)	29.5	88.00	28.95	14.20	1.95	42.90	12.00
S[2] (50%B+50%PM)	34.53	88.23	24.17	15.10	2.02	46.94	11.77
S[3] (25%B+75%PM)	36.76	88.54	21.69	15.89	2.15	48.81	11.46
S[4] (75%B+25%PM)	32.22	88.20	26.40	14.82	2.01	44.97	11.80
S[5] (100% PM)	40.22	88.75	18.85	16.60	2.20	51.10	11.25
G1 (50% CFM+ 50% S[1])	60.20[b]	90.67	22.71[a]	14.51[b]	2.58	50.87	9.33
G2 (50% CFM +50%S[2])	62.72[b]	90.79	20.32[c]	14.96[b]	2.61	52.90	9.21
G3 (50% CFM +50%S3)	63.83[b]	90.94	19.08[d]	15.36[a]	2.68	53.82	9.06
G4 (50% CFM +50%S[4])	61.56[b]	90.77	21.43[b]	14.82[b]	2.61	51.91	9.23
G5 (50% CFM +50% S[5])	65.56[a]	91.05	17.66[e]	15.71[a]	2.70	54.97[a]	8.96

G1: 50% CFM + 50% BS G2: 50% CFM +25% BS + 25% PMS G3: 50% CFM+ 12.5% BS + 37.5% PMS. G4: 50% CFM +37.5 % BS +12.5 % PMS G5 : 50% CFM + 50% PMS . DM : dry matter, OM : organic matter, CP : crude protein , CF : crude fiber, EE :ether extract NFE : nitrogen free extract

Daily matter Intake (DMI) and water consumption:

The average of daily matter intakes by lactating Zaraibi goats are summarized in Table (2). The highest significantly values (P<0.05) of averages were recorded for animals fed on different ensiled mixtures of PM with BS (G2, G4 and G3) followed by the animals fed on BS (G1), while the animals fed PMS (G1 & G5) recorded the lowest values. Similar results were reported by **Gabra and Sherif (1985**) who noticed that daily matter intake was significantly higher with sheep fed on mixture of forage (50% trical + 50% berseem) than that feeding alone with trical or berseem . Similar results were observed , also , by **Shehata *et al.*, (2001**), **Ahmed[1] *et al.*, (2001**) and **Ibrahim *et al.*, (2012**) with using mixture of silages in small ruminant's rations . In addition , **Ojo *et al.*, (2019**) noticed the same trend when feeding rams on Panicum or Panicum with the addition of herbaceous forage legume pellets . They found a significant difference between the treatments in the amount of feed intake. On the other hand, these results were differed with **Adegun and Aye (2013**) who observed significant increase in the amount of feed intake between rams fed on Panicum only or rams fed on Panicum with the addition of different proportions of cotton seeds and moringa leaves.

The average daily water consumption of lactating Zaraibi goats fed on the tested experimental rations is summarized in Table (2). The highest significantly values (P<0.05) of averages (L/h/d and ml /g DMI) were recorded for animals fed PMS (G5) while the animals fed (G2) recorded the lowest values. Generally, the quantity of daily water consumption in the present study is nearly similar to those obtained by **Ahmed *et al*., (2013)** for lactating Zaraibi goats (ranged from 2.82 to 5.06 ml/g DM intake).

Table (2): Average of daily matter intakes and water consumption by lactating Zaraibi goats fed the experimental rations.

Item	Treatments				
	G1	G2	G3	G4	G5
Av. daily DMI / g during experimental period:					
CFM	760	800	780	790	770
Silage, S^1 (100% B)	730	-	-	-	-
S^2 (50%B+50%PM)	-	770	-	-	-
S^3 (25%B+75%PM)	-	-	750	-	-
S^4 (75%B+25%PM)	-	-	-	765	-
S^5 (100% PM)	-	-	-	-	690
Av. daily DMI (g)	1490^{ab}	1570^{a}	1530^{a}	1555^{a}	1460^{b}
% Roughage	48.99	49.04	49.02	49.20	47.26
Water consumption:					
L/h/d	4.10^{b}	4.01^{b}	4.23^{a}	4.25^{a}	4.28^{a}
ML/g DMI	2.75^{ab}	2.55^{b}	2.76^{ab}	2.73^{ab}	2.93^{a}

DMI: daily matter intake L/h/d: liter/head/day ML/g: milliliter /gram

Ruminal Parameters:

Some rumen parameters such as pH value, ammonia-nitrogen (NH3-N), total volatile fatty acids (TVFA's) and microbial protein are presented in **Table (3).** It could be noticed that, using the different ensiled mixtures of PM with B to fed lactating Zaraibi goats with the former experimental rations had no significantly effect on pH values (with the exception of G4 which had slightly higher value), while NH3-N appeared to have significantly (P<0.05) lower concentrations , than G1 . Also, it could be noticed that, animals fed ration containing the different ensiled mixtures of PM with B had significantly (P<0.05) higher microbial protein compared with animals fed BS or PMS alone (G1 or G5). The improvement in microbial protein synthesis with silage mixtures G2 & G3 may be due to the positive associative effect between these two silages and the better condition of the rumen fermentation, or might be due to increasing the uptake of ammonia by the rumen microflora which resulted in higher rate of microbial protein synthesis. At the same trend, animals fed on different ensiled mixtures containing green forage of berssem and Panicum mombasa had no significantly effect on the total VFA's concentrations (12.51, 12.16 and 11.72 meq/ 100ml for rations G2, G3 and G4, respectively), compared with animals fed BS or PMS alone (G1 or G5). The former results are in agreement with those reported by **Johnson and Sultan (1968)** who found that the pH values were affected by level and/ or the sources of CP and carbohydrate, while **Allam *et al*., (1984**) showed that the VFA's concentrations in rumen liquor was affected by several factors such as DM digestibility, rate of absorption, rumen pH, transportation of the digest from the rumen to the lower part of the digestive tract and the activities of microbial population in the rumen. Same results were agreement with that observed by **Etman *et al*., (2011**) who noticed that increasing in total VFA's, TN, NH3-N concentrations of rumen liquor were attributed to the higher levels of DMI in rations for fattening buffalo calves. On the other hand, **Faichney and White (1977) and Etman *et al*., (2012**) found that rations containing higher levels of protein resulted in higher NH3-N concentration in rumen.

Table (3): Overall mean of ruminal parameters of animals fed on different experimental rations.

Items\	Experimental rations					Significant
	G1	G2	G3	G4	G5	
pH values	6.47	6.42	6.58	6.85	6.46	NS
NH3-N (mg/100L)	22.71[a]	21.62[b]	21.86[ab]	22.60[a]	21.01[c]	(P <0.05)
Total VFA's (meq/ 100ml)	11.28	12.51	12.16	11.72	11.50	NS
Microbial protein (g/ 100ml)	0.493[ab]	0.530[ab]	0.512[a]	0.498[ab]	0.410[c]	(P <0.05)

a, b and c: Means in the same raw with different superscripts are significant (P<0.05) differed.

Blood parameters:

Results in **Table (4)** indicated that all measured blood parameters of lactating Zaraibi goats (total protein, albumin, globulin, urea-N, glucose, and creatinine) were not significantly affected by different experimental diets, indicating no adverse effects either on blood components or on animal health, as a general. Also, the obtained results indicated that blood components measured showed slight differences among treatments due to the source and the different levels of forages used, and all levels were within the normal ranges as reported by **Kaneko (1989)** for healthy goats. These results are in the same line with the finding of **Haggag *et al*., (2002**) who used triticale and berseem forage and their mixture in preparing small ruminants rations.

Table (4): Effect of experimental rations on some blood serum parameters of lactating Zaraibi goats.

Item	Treatments				
	G1	G2	G3	G4	G5
Total protein, g/100ml	6.46±0.08	6.52±0.09	6.43±0.06	6.40±0.08	6.44±0.06
Albumin (A), g/100ml	3.50±0.06	3.52±0.08	3.45±0.07	3.46±0.09	3.48±0.06
Globulin (G), g/100ml	2.96±0. 32	3.0±0.05	2.98±0.13	2.94±0.02	2.96±0.04
A/G ratio	1.18±0.01	1.17±0.06	1.16±0.07	1.18±0.05	1.17±0.09
Urea-N, mg/100ml	19.20±0.64	18.50±0.63	18.30±0.68	18.4±0.50	18.60±0.71
Glucose, mg/100ml	59.96±1.74	61.0±1.54	60.62±1.57	60. 0±1.63	60.13±1.65
Creatinine, mg/100ml	1.50±0.07	1.43±0.05	1.53±0.06	1.54±0.06	1.45±0.09

Physiological parameters:

Data of physiological parameters are presented in **Table (5).** The results indicated that all tested physiological parameters were not significantly affected by the different experimental rations. Sometime these values of respiration rate, pulse, rectum and skin temperatures detected among tested groups were not altered greatly because the Zaribi goats were generally in good health condition (as reported by **Ahmed *et al.*, 2019**)) during lactation period .

Table (5): Physiological parameters of lactating goats as affected by different experimental rations.

Parameters	Treatments				
	G1	G2	G3	G4	G5
Respiration rate	19.35 ±2.50	18.90 ±3.25	20.10 ±2.71	19.53 ±3.10	18.95 ±1.95
Pulse	81.13± 5.31	80.80 ±4.31	82.35 ±3.70	81.58±3.69	82.10± 4.75
Rectum temperature	39.05 ±1.25	38.50 ±2.16	38.95 ±1.30	37.95 ±1.95	37.80 ±1.80
Skin temperature	38.20± 1.53	37.85± 2.01	38.75± 1.75	37.93± 1.81	38.55 ±1.31

Milk yield and its composition:

Data in Table (6) showed that the amount of milk produced and its quality is influenced mostly by the tested rations . The actual dairy milk yield was significant ($P<0.05$) higher with tested rations G2 and G3 followed by G4 and G1 than that of G5. This could be due to a better utilization of the energetic quota by the lactating goats. With regards to the milk composition, it could be seen that the milk components were not significantly affected by the different experimental rations, except milk fat content which increased significantly ($P<0.05$) in groups 2, 3, 4 compared with G1 . No significant differences in the titratable acidity and pH values were observed among the experimental rations compared with control, and this was due to the alteration of the normal equilibrium between chlorides and lactose, changes the physiological and functional integrity of the mammary cell, and uncontroling the transit of the sodium chlorides from the blood to the milk.

Table (6): effect of experimental rations on the yield , chemical composition , acidity, pH value and Lactobacilli counts of the resultant milks.

Item	Treatments				
	G1	G2	G3	G4	G5
Av. daily milk yield , kg/h/d	1.26±0.6	1.36±0.8	1.32±0.4	1.28±0.6	1.24±0.5
Milk composition:					
Fat%	3.95±0.05	4.22±0.03	4.20±0.03	4.15±0.03	4.05±0.04
Protein%	3.05±0.03	3.10±0.03	3.06±0.02	3.04±0.03	3.02±0.02
Lactose%	4.55±0.03	4.48±0.02	4.45±0.02	4.42±0.03	4.58±0.03
Ash%	0.71±0.004	0.72±0.003	0.72±0.002	0.72±0.003	0.70±0.004
Total solids%	12.21±0.004	12.50±0.07	12.40±0.05	12.40±0.09	12.35±0.08
SNF	8.26±0.06	8.29±0.04	8.26±0.05	8.24±0.03	8.31±0.04
PH values	6.67	6.63	6.65	6.64	6.66
Acidity %	0.17±0.003	0.16±0.002	0.16±0.003	0.17±0.004	0.16±0.002
CFU X $10^{3/ml}$	490±8.30	440±5.85	465±7.9	483±8.30	475±7.95

CFU: cell forming unit.

Table (6) showed, moreover, that pH values and titratable acidity of milk of all groups were found approximately similar. Lactobacilli counts were found also near except milk of Group 2 which recorded slightly lower counts (**440±5.85** / ml).

Meanwhile, incubation of goat's milk of all treatments with **1%** *Lactococcus lactis subsp*. lactic starter resulted in increasing the rate of acid development for all tested groups Table (7). This development in acidity proved that goat's milk , of the tested groups , is proper for manufacturing some dairy products such as cheese, yoghurt and cultured milk. In the same time, acidity was increased and pH values were decreased in all treatments as the incubation period increased . Similar results were observed by **Youssef (1989) and Ahmed et al., (2019)**.

Table (7): Acidity and pH development of goat's milk inoculated with 1% lactococcus lactis subsp.

Group	Incubation period (hours)											
	Acidity %						pH value					
	0	1	2	3	4	5	0	1	2	3	4	5
G1	0.161	0.180	0.187	0.215	0.263	0.521	6.61	6.53	6.41	6.23	6.08	5.15
G2	0.163	0.175	0.185	0.223	0.265	0.562	6.57	6.42	6.33	6.27	6.03	5.05
G3	0.162	0.183	0.190	0.225	0.273	0.605	6.63	6.50	6.25	6.25	5.95	4.95
G4	0.165	0.186	0.193	0.231	0.284	0.595	6.59	6.45	6.27	6.24	5.90	4.90
G5	0.164	0.185	0.191	0.233	0.289	0.613	6.65	6.43	6.25	6.23	5.87	4.93

Physical properties:

Table (8) contained the pepsin coagulation time (P.C.T), curd tension (C.T), synersis and fat lost in whey, of milks of the five groups. Results indicated that there are no noticeable variations among the tested treatments of raw goat's milk concerning RCT, CT, whey syneresis and fat loss of whey .The highest values of PCT & CT were noticed in G3 and the highest one for synersis after 90 min. (62.8 ml) was found in G4. G5 recorded the highest rate of fat lost in whey (0.56%).These finding were nearly similar to that findings by **Mehana (1998) and Ahmed et al., (2019)** .

Table (8): Effect of the experimental rations , on PCT, CT, whey syneresis and fat lost in whey of goat's milk.

	PCT	CT	syneresis (ml/100ml)				Fat lost in whey %
Treatment	Min.	(gram)	10	30	60	90	
G1	2.35	35.3	27.30	41.50	50.0	61.3	0.53
G2	2.38	36.2	26.50	39.0	53.8	62.5	0.54
G3	2.40	37.0	28.80	42.3	52.5	60.9	0.50
G4	2.37	36.5	26.30	38.7	49.0	62.8	0.52
G5	2.35	35.1	27.50	40.5	51.6	61.5	0.56

Free fatty acids:

Data of free fatty acids of the five experimental groups is presented in **Table (9**). Results of these fatty acids may be summarized in the following points:

- The sum of saturated fatty acids (SFA) were found highest (64.02%) in G2 treatment followed by G3 (63.53%) , G4 (61.50) , G1 (61.10) .%) and G5 (60.13 %) , in a descending order .
- The sum of unsaturated fatty acids (USFA) was found highest (39.61%) in G5 treatment and lowest (35.84%) in G2 treatment .
- The percent of total SFA was found higher than the corresponding one USFA in all experimental groups.
- Palmitic acid recorded the highest value among the saturated fatty acids and ranged between 25.85 – 27.31 % in the five groups followed by stearic acid (1.95 – 12.01) and capric acid (7.27 – 8.93%), in order.
- Oleic acid was the predominant USFA in the five groups and ranged between 27.50 –29.50 %.
- All groups contained cis and trans USFA.
- Five of free fatty acids (C10:0, C14:0, C16:0, C18:0, C:18: l cis) comprises over 75% of the total free fatty acids in every group , and this was similar to that reported by **Park et al., (2007) and (Ahmed et al., 2019).**

- The ratio of SFA/USFA was highest in G3 (1.74) & G2 (1.66), than the other treatments. These values of free fatty acids were nearly with values obtained by **Ayad et al., (2015) and Ahmed et al., (2019)**.

Table (9): Free fatty acid profile of goat milk fat fed on the experiment of rations

Fatty acids		Treatments				
		G1	G2	G3	G4	G5
saturated fatty acids						
Butyric acid	C4 : 0	0.31	0.45	0.46	0.33	0.36
Caproic acid	C6 : 0	1.23	1.41	1.36	1.25	1.16
Caprylic acid	C8 : 0	1.90	1.99	2.29	1.93	1.87
Capric acid	C10 : 0	7.50	8.93	8.37	7.86	7.26
Lauric acid	C12 : 0	3.06	3.57	3.50	3.16	3.10
Myristic acid	C14 : 0	7.88	8.47	8.28	7.98	7.50
Palmitic acid	C16 : 0	25.99	27.31	27.11	26.60	25.85
Heptadecenoic acid	C17 : 0	0.97	0.71	0.80	0.75	0.91
Stearic acid	C18 : 0	12.01	10.95	11.09	11.35	11.81
Arachidic acid	C20:0	0.25	0.23	0.27	0.29	0.31
Sum of saturated fatty acids		61.1	64.02	63.53	61.50	60.13
unsaturated fatty acids						
Myristoleic acid	C14 : 1	0.41	0.36	0.35	0.44	0.36
Pentadecytic acid	C15 : 1	0.91	0.93	0.95	0.90	0.79
Palmiloleic acid	C16 : 1	0.85	0.59	0.71	0.83	0.81
Margaric acid	C17 : 1	0.61	0.53	0.49	0.55	0.58
Oleic acid	C18 : l cis	29.35	27.50	28.01	29.11	29.51
Oleic acid	C18 : 1 trans	1.83	1.35	1.43	1.71	1.76
Linoleic acid	C18:2 cis	2.90	2.81	2.65	3.15	3.61
Linoleic acid	C18:2 trans	0.13	0.19	0.22	0.18	0.21
Linoleinic acid	C18:3 n6	0.68	0.73	0.75	0.71	0.85
Linoleinc acid	C18:3 n3	0.25	0.25	0.31	0.28	0.41
Elcosapentaenoic acid	C20:5	0.42	0.39	0.43	0.33	0.42
Docasahexanaeroic acid	C22:6	0.29	0.21	0.18	0.27	0.30
Sum of unsaturated fatty acids :		38.63	35.84	36.48	38.46	39.61
Total		100.0	100.0	100.0	100.0	100.0
SFA/ Total fatty acids %		61.1	64.02	63.53	61.50	60.13
USFA/ Total fatty acids %		38.63	38.63	36.48	38.46	39.61
SFA/ USFA		1.58	1.66	1.74	1.60	1.52

Economic efficiency:

Economic efficiency, estimated as the price of gained weight divided by the cost of feed consumed is presented in **Table (10).** The data indicated generally that the relative economic efficiency of feeding dairy Zaraibi goats with the different experimental rations showed a reduction in feed cost/kg gain of animals fed G2 followed by G3, while the highest one was recorded for (G1) ration. It could be noticed that, using the different ensiled mixtures of PM with B (G2 & G3) fed to lactating Zaraibi goats , had higher effect on daily milk yield and its price compared with G5 treatment .

From this, it is clear that using of the different ensiled mixtures of PM with B in dairy Zaraibi goats diets which improved daily milk yield and its price, will be reflected on the productive and reproductive performance compared with other treatments, Generally, it is found that using a mixture from BS and PMS (G2&G3) in diets of dairy Zaraibi goats was the best economic efficiency, as shown in **Table (10).**

Table (10): Economic efficiency of lactating Zaraibi goats fed the experimental rations .

Item	Treatments				
	G1	G2	G3	G4	G5
Daily feed intake (g/h)					
CFM	830	874	852	863	842
Silage	2475	2800	2483	2575	1715
Cost of consumed feed, L.E/h	4.58	4.89	4.64	4.73	4.64
Daily milk yield, kg/h/d	1.26	1.36	1.32	1.28	1.24
Price of milk yield, L.E/h	7.56	8.16	7.92	7.68	7.44
Feed cost/kg milk yield, L.E	3.635	3.595	3.515	3.695	3.742
Economic efficiency%*	1.65	1.68	1.70	1.62	1.60

Economic efficiency was calculated as total output/total input according to the local prices (where 1 ton of CFM = 4000 L.E., berseem silage = 500 L.E., and one ton from Panicum silage = 1000 L.E). while 1kg milk = 6.0 L.E.

CONCLUSION

From the results of this experiment, it is clear that the use of ensiled mixtures of PM with B had a positive effect on dairy Zaraibi goat's diets, which reflected positively on daily milk yield and daily return, as well as, on productive performance and economic efficiency.

Further studies are needed to evaluate the Panicum mombasa forage (hay, fresh, and silage) with other different sources of protein, energy, and other feed additives, with farm animals.

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تأثير استخدام سيلاج مخاليط مختلفة من البرسيم (البرسيم المصري) والبانيكوم على الأداء الإنتاجي وخصائص اللبن الماعز الزاريبي الحلاب

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تم اجراء هذا البحث لدراسة امكانية استخدام السيلاج المصنع من البرسيم المصري و علف البانيكوم مومباسا علي الاداء الانتاجي "المأكول" و بعض مقاييس سائل الكرش و الدم وتصافي و تركيب و جودة اللبن و الخواص الفسيولوجية و الكفاءة الاقتصادية للماعز الزاريبي الحلاب. استمرت التجربة لمدة 90 يوم باستخدام 35 عنزة زاريبي حلاب تتراوح اعمارها بين 3 – 4 سنوات بمتوسط وزن 37.85 تم تقسيمهم الي 5 مجموعات (7 حيوانات لكل منها) وفقا لاعمارهم و اوزانهم. تم تغذية كل مجموعة حيوانية بشكل عشوائي بالمعاملات التالية: المجموعة الاولي (كنترول) تتكون من 50% علف مركز + 50% سيلاج البرسيم و المجموعة الثانية تتكون من 50% علف مركز + 50% سيلاج مصنع من (25% سيلاج البرسيم + 25% سيلاج البانيكوم) و المجموعة الثالثة 50% علف مركز + 50% سيلاج مصنع (12.5 سيلاج البرسيم + 37.5 سيلاج البانيكوم) و المجموعة الرابعة 50% علف مركز + 50% سيلاج مصنع (37.5 سيلاج البرسيم + 12.5 سيلاج البانيكوم) و المجموعة الخامسة 50% علف مركز + 50% سيلاج البانيكوم و ذلك حسب المقررات الغذائية وفقا لـ .(**NRC(2007**

و كانت اهم النتائج المتحصل عليها ما يلي-:

- سجلت العنزات المغذاة علي علائق المجموعة الخامسة (G5) ارتفاع معنوي للمادة الجافة و البروتين الخام و الكربوهيدرات الذائبة و غير معنوي للمادة العضوية بينما حدث انخفاض للالياف الخام و الرماد بالمقارنة بالمجموعات الأخري.
- اظهرت النتائج ان متوسط المأكول اليومي بالنسبة للمادة الجافة ارتفع معنويا للعنزات التى تتغذي علي خليط السيلاج للمجموعات (G2) تليها العنزات التي تتغذي علي خليط السيلاج للمجموعتين الرابعة (G4) و الثالثة (G3) علي التوالي ثم تليها المجوعة الأولى (G1) في حين سجل بقيم أقل للعنزات التي تغذت علي سيلاج البانيكوم (G5).
- و فيما يتعلق بمقاييس سائل الكرش: اظهرت النتائج ان العنزات المغذاة علي سيلاج مخاليط مختلفة من البرسيم و البانيكوم ليس لها تأثير معنوي بالنسبة لكل من قيم ال pH و الاحماض الدهنية الطيارة الكلية و لكن أظهرت ارتفاع معنوي بالنسبة لتركيزات الامونيا و البروتين الميكروبي مقارنة بالعنزات التي تغذت علي سيلاج البرسيم أو البانيكوم كل علي حدة (G1) أو (G5).

- لم تتأثر كل مكونات الدم التى تمت دراستها (البروتين و الالبيومين و الجلوبيولين و اليوريا N – و الجلوكوز و الكرياتينين) و كذلك الخواص الفسيولوجية بالمعاملات الغذائية المختلفة و التى غذيت للعنزات الحلابة.
- كان انتاج اللبن معنويا وعاليا فى معاملة المجموعة G2 & G3 والاقل فى المجموعة G5 ولم تتاثر مكونات اللبن معنويا بمخاليط العلائق المختلفة ماعدا نسبة الدهن التى زادت معنويا فى مجاميع . G2, G3, G4لم يلاحظ فروق معنوية فى نسبة الحموضة ، قيم الـ pH والصفات الطبيعية بين المجموعات الخمس. كان مجموع الاحماض الدهنية الحرة المشبعة الاعلى فى المجموعة (G2) والاقل فى المجموعة (G5) بعكس الاحماض الدهنية الغير مشبعة التى كانت الاعلى فى المجموعة (G5) والاقل فى المجموعة (G2) . كانت النسبة بين الاحماض الدهنية المشبعة الى الغير مشبعة عالية فى المجموعة (G2 & G3) عن باقى المجاميع.

يمكن الاستنتاج أن استخدام البانيكوم (Panicum Mombasa) له تأثير إيجابي على الأداء الإنتاجي للماعز الحلاب خاصة عند الخلط مع الأنواع المختلفة من البقوليات الخضراء مثل البرسيم المصري ، وذلك من حيث المأكول و الكفاءة الغذائية و الاقتصادية وتصافي و جودة اللبن و الاداء الأنتاجى والأقتصادى مما يعد نظامًا غذائيًا مفضلاً للماعز الزاريبي الحلاب.