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Effect of Diets Contaning Green Bean (*Phaseolus vulgaris*) Vines Hay on Milk Yield, its Composition and Yoghurt Quality for Dairy Goats.

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ABESTRACT

This study was conducted to investigate the effect of inclusion green bean vines hay (GBVH) in replacing with clover hay (CH) in diets of Damascus goat does on nutrients digestibility, milk yield, milk composition, some blood parameters and yoghurt quality. Twenty-five lactating Damascus goat does with an average live body weight of 42.8±1.5kg at the 3rd and 4th parities were divided randomly into five similar groups (5 each) where each group received one of 5 experimental rations. The first group was received concentration feed mixture (CFM) and (CH)(50:50%) as control ration (R0). Meanwhile, the tested rations R1 , R2 , R3 and R4 were received rations containing 25, 50, 75 and 100% GBVH in replacing CH in control ration, respectively. Results revealed that the chemical composition of both CH and GBVH is nearly similar respecting, CP and CF%. No significant differences between control ration (R0) and tested rations (R1, R2 and R3) in digestion coefficients of (DM, OM, CP, CF, EE, NFE%) as well as the feeding values (TDN and DCP). Inversely the tested rations of the highest level of GBVH (R4) almost had the lowest values of nutrients digestibility and TDN. While DCP values did not significant affected by the dietary treatments being the highest value was recognized with R3. Actual milk and 4%- FCM yields were significant higher with the 75% GBVH ration (R3) and insignificant higher with the tested rations R1and R2, than those of control ration (R0). But the highest level of 100% GBVH ration (R4) had produced the lowest amount of milk among the four tested rations. Concerning milk composition, most of tested rations significant increased fat percentage compared with control one, while inverse trend was observed with milk protein percentage among treatments. Slightly improvement respecting milk TS was observed with the most tested rations compared with control ration with significant differences among some tested rations (R2 and R4) with control (R0). No significant differences among experimental rations regarding all offspring performance measurements, with highest values of weight at birth, weight at 1st month, weight at 2nd month, daily gain from birth to 1st month and daily gain from birth to 2nd month which recorded (4.5kg, 10.6kg, 14.2kg 203.13g and 161.56g) at R2, respectively. At the end of the experimental period, plasma total protein was unaffected significantly ($P<0.05$) by the experimental rations with the highest value (9.43g/dl) was occurred with R2 and the lowest one (6.50g/dl) was with R3. Fat and TS contents were somewhat improved with tested rations in comparison with control ration regarding the produced yoghurt. Also, R1 and R3 have good organoleptic properties of fresh yoghurt made from goat milk. Results indicated that the GBVH replacement in (R1 up to R4) reflected superiority over the control ration. Yoghurt prepare from milk produced from R1 and R3 groups had higher curd tension and lower cured syneresis than those of the other treatments. Feed conversion and economic efficiency were considerably seemed to be the best ones with R2 and R3 rations. Therefore, the replacement of clover hay with green bean veins hay in dairy goat rations is highly recommended in the practical feeding of goats.

Keywords: Goats, green bean veins by-product, digestibility, milk yield, milk composition, blood parameters, yoghurt, economical efficiency.

INTRODUCTION

The lack of sufficient feeds to meet the nutritional requirements of existing animal population is one of the most critical problems of animal production in Egypt. Crops residues, which annually producing by huge amounts are considerably a potential supply of manipulated feeds for feeding animals in Egypt and the most developing countries (Mohamed *et al.,*2012). The annual production of vegetables and fruits by-products (filed and food industrial) in Egypt were estimated to be about 32 million tons (Agricultural Economics-Ministry 2014), more than two third of this amount is left annually without use. Vegetables vines are the cheapest supplying of essential amino acids, vitamins and minerals. Also, it contains good energy and protein for ruminal microbes, including both soluble carbohydrates and readily digestible NDF fractions, but its high moisture content may limit its storage (Mohamed *et al.,*2012). Preassembly green beans (*Phaseolus vulgaris*) vines could be effectively performance as a good feedstuffs in goats rations especially when conserved as a hay. This type of feeding could be reducing concentrate portion when incorporated in a ration and in turn reducing feeding cost. Most legumes are used for human consumption, while the by-products are usually utilized as animal feeds. Despite the high amount of legume by-products produced, information about their nutritive value is scarce, particularly about Phaseolus spp. by-product. Green beans vines are a potentially attractive by-product for feeding dairy goats. The real actual utilization of a feed depends on its nutrient availability and the first step should be determining its nutritive value (Lui *et al.,* 2004).

Goat's milk has slightly lower casein content than cow's milk, with a very low proportion or absence of α*s-1*casein, and higher degree of casein micelle dispersion and also, different structure and size of fat globules (Tziboula- Clark, 2003). All the previous factors influence the rheological properties of the coagulum in goat's milk that is almost being in semi liquid state. Moreover, goat's milk yoghurt shows a weaker gel, and a sharper flavor "goaty flavor", which is different from the typical flavour of cow's and buffalo's milk yoghurt (Haenlien, 2004). Several aroma compounds responsible for the specific "goaty flavor" have been identified: 3-methylbutanoic acid, octanoic acid, 4-methyloctanoic acid, 4-ethyloctanoic and nonanoic acid. These fatty acids are released by lipolysis (Ha and Lindsay, 1991). Heat treatment resulted in a general increase of volatile compounds of milk, leading to changes in flavour characteristics (Contarini and Povola, 2002).

The objective of this study was to determine the effect of replacement clover hay with green bean vines by-product hay in rations of Damascus dairy goats, on nutrient digestibility, feeding value, productive performances and yoghurt manufactured from goat milk.

MATERIALS AND METHODS

The present study was conducted at Sakha Experimental Research Station, Animal Production Research Institute, Agricultural Research Center, Egypt, in order to study the effects of partial replacement of clover hay (CH) with green bean veins hay (GBVH) in rations of Damascus dairy goats. Green bean vines by-product was obtained from El-Qalyubia Governorate during November and December months. These vegetable crop by-products were in wet form with moisture content about 78%. So it was dried by sun-drying for 15 days until 10% moisture.

Feeding and management

Twenty-five lactating Damascus dairy goats of average live body weight 42.8±1.5kg at the last month of gestation period were chosen and divided randomly according to their body weight and milk production during previous lactation season into five similar groups (5 each). Control group (R0) was fed ration contained concentrate feed mixture (CFM) and clover hay (CH) 50:50%. The tested groups, (R1) was fed ration contained CFM and replacement 25% from clover hay (CH) with GBVH, (R2) was fed ration contained CFM and replacement 50% from (CH) with (GBVH), (R3) was fed ration contained CFM and replacement 75% from (CH) with (GBVH) and (R4) was fed ration contained CFM and (GBVH). Animals were fed twice daily at 8.00 and 16.00 hrs, while water and minerals salt were available through the entire experimental period to provide the production requirements. The CFM amount was fixed to provide animals with 50% of their requirements according NRC (1986). The experimental goats were healthy and free from external and internal parasites. The feeding period lasted three months, last month of gestation and two months at the first of lactation period.

Milk yield, milk sampling and yoghurt manufactured

Milk yield was recorded weekly using milking hand technique, and the total milk yield was calculated by summation of milk over the whole experimental period. Does were completely hand milked after removing away their offspring the day before to determine the milk yield till stripping the udder through two successive days during milking period. Milk samples were analyzed for fat, protein, lactose and total solids by automated infrared spectrophotompretry (Foss 120 Milko-Scan, Foss Electric, Hillerod, Denmark) according to A.O.A.C (1997). Ash content was determined as reported in A.O.A.C. (2000).Yoghurt starter culture (YC–380) consisting of *streptococcus thermophiles* and *lactobacillus dellbreuckii subsp bulgaricus* at ratio (1:1) were obtained from CHR - Hansen's lab, Denmark.Yoghurt was manufactured according to the procedure of Goda *et al.,* (1993).Titratable acidity, total solids, fat, ash and total protein contents of the produced yoghurt were determined according to the methodology mentioned by A.O.A.C. (2000) while, pH value of yoghurt samples was measured using a pH meter JENCO Model 1671, USA. Curd-tension was measured using the penetrometer Model Koehler Instruments Co., (USA) controller as described by Kammerlehner and Kessler (1980). Curd synersis: was determined according to the method of Mehanna and Mehanna (1989). Sensory evaluation, the yoghurt samples were evaluated organoleptically by the staff members of Sakha Lab. Dairying Dept., APRI, scoring was carried out as recommended by Mehanna *et al.,*(2000).

Feed conversion was calculated as the amount of DM, TDN and DCP units/ kg milk. At the end of this study simple economical evaluation was calculated for rations according to the prevailing prices of ingredients and milk during the time of experimental period.

Digestibility trial.

At the end of the experimental feeding (3 does / group), five digestibility trials were conducted to determined the nutrients digestibility and feeding values of experimental rations using acid insoluble ash (AIA) technique according to Van Keulen and Young, (1977). Feces samples were collected twice daily for 7 successive days. Representative samples of feedstuffs, CFM, GBVH, CH and feces were analyzed according to A.O.A.C. (1999). Fiber fractions (NDF, ADF and ADL) were determined according to Van Soest *et al.,* (1991), hemicellulose and cellulose were calculated by difference. Amino acids analysis for (GBVH) was analyzed according to A.O.A.C. (2012).

Blood samples.

Blood samples were taken from juggler vein at the beginning and end of the experimental period (3 does / group). Samples were centrifuged at 3000 rpm for 20 min to obtain blood plasma. The supernatant was frozen and stored at -20°C to subsequent analysis. Plasma total proteins assay was determined according to Gornal *et al*., (1949). Albumin plasma was determined according to Doumas *et al*., (1971), urea according Fawcett and Scott (1960), total cholesterol was determined according to Richmond (1973). AST was determined according to Young, (1990) and ALT activities were determined according to Reitman and Frankel (1957). The plasma globulin was calculated by the differences.

Statistical analysis:

Statistical processes of experimental data were carried out using the General linear Models adapted by SAS (2000). Significance of the difference in values was calculated by using Duncan's (1955). Data for yoghurt manufactured were carried out using SPSS computer program (SPSS, 1999) at $p<0.05$.

RESULTS AND DISCUSSION

Chemical composition of feedstuffs and rations

Chemical composition of different feedstuffs and rations are presented in Table (1). It is of interest to note that the chemical composition of both (CH and GBVH) is practically similar for DM, CP and CF percentages. There were differences between CH and GBVH in OM, EE, NFE and Ash percentages. These results are in agreement with those reported by Preston (2002) and Mekasha *et al*., (2002). Results of chemical composition showed that slightly differences among experimental rations (R0 up to R4) in percentages of (DM, CP and EE), with the highest values of CF and CP (26.21 and 16.40%, respectively) in ration R4. On the other hand, the percentages of OM, EE and NFE are gradually decreased from R0 to R4 with higher values 89.20, 4.55

and 46.96% respectively, in control ration. On contrary, CF% increased gradually from R0 to R4, and the highest average (26.21%) was found with R4. The chemical composition of CFM was appeared to be within the normal range that published in the literatures. Gross energy of experimental rations were nearly similar so, all tested rations were iso- Nitrogeneses and iso caloric.

Table 1. Chemical composition of ingredients and experimental rations (% on DM basis).

Item	DM	OM	CP	CF	EE	NFE	Ash	GE
CFM	87.46	92.27	16.54	12.53	5.59	57.61	7.73	19.3
CH	84.81	86.22	16.05	29.67	4.26	36.24	13.78	18.1
GBVH	85.54	82.19	16.27	29.50	2.54	33.88	17.81	17.0
Calculated composition of experimental rations								
R0	86.05	89.20	16.28	21.41	4.55	46.96	10.80	18.6
R1	86.19	88.52	16.32	22.92	4.32	44.93	11.48	18.5
R2	86.26	88.13	16.35	23.83	4.18	43.77	11.87	18.4
R3	86.33	87.71	16.37	24.71	4.04	42.59	12.29	18.3
R4	86.45	87.04	16.40	26.21	3.81	40.62	12.96	18.1

CFM=Concentrated feed mixture contained in percentages ; 37% yellow corn, 30% undecorticated cotton seed, 20% wheat bran, 6.5% rice bran, 3% molasses, 2.5% limestone and 1% common salt. CH=Clover hay GBVH=Green bean veins hay, R0= Ration contain 100% CH, R1= Ration contain 25% GBVH replaced from CH, R2= Ration contain 50% GBVH replaced from CH, R3= Ration contain 75% GBVH replaced from CH, R4= Ration contain 100% GBVH and GE (MJ/kg DM)=Gross energy according to MAFF (1979).

Chemical analysis of cell well constituents in clover hay (CH) and green bean veins hay (GBVH) are presented in Table (2). The results showed that nearly similar values of all cell well constituents in (CH) and (GBVH). Similar results were obtained by Hussien, (2009).

Table 2. Chemical analysis of cell well constituents in CH and GBVH (as fed %)

Item	NDF	ADF	ADL	Hemicellulose	Cellulose
CH	45.45	32.38	8.20	13.07	24.18
GBVH	45.49	32.42	9.20	13.07	23.22

Amino Acids analysis in GBVH was presented in Table (3). In general, the amino acids composition confirm that GBVH demonstrated shortage of sulfur amino acids methionine and cystine which recorded (0.15 and0.18% respectively). While, such by-product has remarkably higher amounts of acidic amino acids, aspartic acid (1.05%) followed by glutamic acid (0.93%). These results are nearly similar to those obtained by Hussein, (2009). While, Leucine, Proline, Alanine and Phenylalanine were recorded moderate values (0.66, 0.50, 0.050 and 0.46% respectively)

Table 3. Amino Acids analysis in GBVH

Amino acids	%	Amino acids	%
Aspartic (ASP)	1.05	Isoleucine (ILE)	0.40
Therionine (THR)	0.37	Leucine (LEU)	0.66
Serine (SER)	0.37	Tyrosine (TYR)	0.35
Glutamic (GLU)	0.93	Phenylalanine (PHE)	0.46
Proline (PRO)	0.50	Hisitidine (HIS)	0.19
Glycine (GLY)	0.38	Lysine (LYS)	0.43
Alanine (ALA)	0.50	Argnine (ARG)	0.45
Valine (VAL)	0.53	Cysteine (CYS)	0.18
Methionine (MET)	0.15		

Digestion coefficients and feeding values of experimental rations:

Nutrients digestibility and feeding values of experimental rations are presented in Table (4). Integrated GBVH with experimental rations resulted in improving the digestibility of DM and OM with R1, R2 and R3 rations as compared to those of control ration (R0) but the differences among them did not significant. On the other hand, R4 differed significantly (P<0.05) with R1, R2 and R3 rations and had the lowest values of DM and OM digestibility and also there was insignificant differences between control ration (R0) and (R4). The differences among the experimental rations were not significant respecting the digestibility of CP and CF being the highest value was associated with 75% GBVH(R3). The lowest values of digestibility coefficients of CP and CF were found in R4. The lowest digestibility coefficients of EE and NFE were observed in R4 and differed significantly (p<0.05) with other groups. While, there were no significant differences among the other tested rations (R1, R2 and R3) and the control one (R0). Similar trend among dietary treatments was found with TDN values with the lowest one being associated with R4 and differed significantly with other groups. The DCP% did not affected significantly by integrated all levels of GBVH with experimental rations with the highest value (11.26%) at R3. The integration of GBVH with the experimental rations by 100% as roughage resulted to significantly decreasing all nutrient digestibilities and feeding values of feed and that might be attributed to the contained some anti-nutritional factors in GBVH such as phytate, phytic acid, oxalate, tannins and saponin. Hussien (2009) found that anti-nutritional factors in GBVH such as phytate, phytic acid, oxalate, tannins and saponin were recorded (1.13, 1.04, 10.98, 2.01 and 8.2 g/100g DM), respectively. Definitely, most the untraditional vegetable by-products could be favorable used in partial replacement with (for instance) good quality fodder like clover hay in order to not more than 30 up to 50% as a replacement rate. The increasing rate of replacement up to 100% led to a decreases in feed utilization of ration and its digestibility.

Table 4. Digestion coefficients and feeding values of experimental rations.

Item	Experimental rations					±SE
	R0	R1	R2	R3	R4	
Digestibility %						
DM	54.29^{ab}	58.97^{a}	58.72^{a}	58.98^{a}	44.70^{b}	±3.54
OM	57.96^{ab}	61.90^{a}	61.30^{a}	61.71^{a}	48.44^{b}	±3.44
CP	62.40	60.99	66.85	68.81	62.80	±3.16
CF	48.94	51.57	49.55	57.03	43.91	±3.95
EE	77.68^{a}	75.79^{a}	75.22^{a}	76.51^{a}	66.91^{b}	±1.80
NFE	58.61^{a}	66.05^{a}	64.22^{a}	60.33^{a}	43.99^{b}	±3.77
Feeding values , %						
TDN	56.74^{a}	59.59^{a}	58.69^{a}	58.76^{a}	45.99^{b}	±3.14
DCP	10.16	9.96	10.93	11.26	10.30	±0.52

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

On the other hand, the utilization of dietary energy depends not only on the profile of nutrients made available from a particular feed but also from

nutrients made available from other feeds those involved in a ration. So this kind of interaction between the different ingredients of the ruminants rations nutritionally being known as an associative effects of feeds in ruminants (Hahtanen, 1991). The present results are in agreement with those obtained by Fayed (2014) who replacing 0, 25 , 50 , 75 and 100%, of clover hay by the mixture of tomato and apple pomace by- product using lambs and Galal *et al*., (2016) who experimented 0 , 30 , 70 and 100% of clover hay in replacing by strawberry vines hay with lactating goats. They were found that the highest values of digestibility of nutrients were occurred with the replacement rate at 30-50% and started to decrease at the higher levels up to 100%.

Milk yield and its composition:

Data of daily milk yield and its composition are presented in Table (5). Results showed that actual and 4% FCM yields were insignificant higher with the two low levels of GBVH (R1 and R2) and significant higher with 75% GBVH ration R3 than those of control one (R0). Meanwhile, the lowest value was found with R4 (982.5g/h/d) regarding the actual milk yield, but the difference between R4 and R0 did not significant respecting the 4% FCM. Improving the digestion coefficients of most nutrients and feeding values with the tested rations R1 to R3 was reflected on more milk yield and 4%-FCM produced by does fed such rations. Concerning DM intake dispite there were very slight differences among the experimental rations, data showed significant differences among some dietary treatment especially between R0 and R4.

The obtained results (Table 5) indicated significant differences among the experimental rations respecting milk chemical composition percentages in which inclusion GBVH in goats rations, had a positive impact on fat, lactose and total solids percentages. While, protein and solid-not-fat contents were significant decreased with rations having the low levels of GBVH (R1 and R2) and insignificant decreased with the rations having the high levels of GBVH (R3 and R4) compared with control one (R0). Milk ash content significant higher with R1 (1%) than that of control ration (R0) and most of the other tested ration. Regarding milk fat yield, its value was significant higher with 75%- GBVH ration than that of control one, while insignificant higher than those of the other tested rations. Otherwise milk protein yield was insignificant higher than that of control one (R0) and significant higher than those of the other tested rations (Table 5). Nutritional strategies that optimize function can be considerably maximize milk yield and its components. Such strategies that favourable influence milk components include adequate rumen degradable protein and adequate amounts of forage NDF in the diet especially for early lactation of dairy animals (Varga and Ishler, 2007). Specifically, concentration of fat in milk can vary over a range of about 3 percentage units through diet manipulation, whereas protein concentration can be varied about 0.6 units (Bachman, 1992 and Varga and Ishler, 2007). The present results of milk yield and its composition are in consistent with those obtained by Salem and Abd El-Galil (2014) who tested the effect of clover silage bean forage waste silage or their mixture that incorporated in the rations of lactating buffaloes.

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

Item	Experimental rations					±SE
	R0	R1	R2	R3	R4	
DM intake, g/ h/d	1308	1310	1311	1312	1314	
Daily milk yield, g/ h/d	1040.75^{bc}	1063.0^{bc}	1176.5^{ab}	1238.0^{a}	982.5^{c}	±47.31
Daily 4%-FCM, g/ h/d	838^{bc}	972^{bc}	980^{ab}	1062^{a}	901^{c}	±46.55
Milk composition:						
Fat ,%	2.70^{c}	3.43^{a}	2.89^{bc}	3.06^{b}	3.42^{a}	±0.098
Fat yield, g	28.15^{b}	36.46^{a}	34.0^{ab}	37.83^{a}	33.89^{ab}	±1.960
Protein, %	2.84^{a}	2.33^{b}	2.30^{b}	2.70^{a}	2.67^{a}	±0.101
Protein yield, g	29.59^{ab}	24.73^{b}	27.15^{b}	33.27^{a}	26.39^{b}	±1.760
Lactose, %	4.49^{bc}	4.35^{c}	4.67^{ab}	4.35^{c}	4.72^{a}	±0.069
Total solids, %	10.76^{b}	11.11^{ab}	10.53^{c}	10.93^{abc}	11.37^{a}	±0.172
Solids not fat , %	8.06^{a}	7.69^{b}	7.64^{b}	7.86^{ab}	7.94^{ab}	±0.098
Ash %	0.73^{bc}	1.00^{a}	0.68^{bc}	0.81^{ab}	0.55^{c}	±0.080

a, b, c and d means is the same row for each parameters with different superscripts are significantly different P<0.05).
Fat corrected milk (4%) for goats calculated according to following equation: 4%-FCM = milk yield (0.4+0.15 fat%)

Dams and their off spring performance.

Data presented in Table (6) showed that the effect of experimental rations on does and their offspring performances. Obtained results indicated insignificant differences between the tested groups and control group in all dams parameters except litter weight at weaning which showed significant difference ($p<0.05$) between R0 and R3 which recorded the highest value (14.8kg). Results here also indicated that there were no significant effect due to the tested rations on all offspring growth performance measurements being higher values of birth weight, weight at 1st month, weight at 2nd month, daily gain from birth to 1st month and daily gain from birth to 2nd month which recorded (4.5kg, 10.6kg, 14.2kg 203.13g and 161.56g) with R2 than those of the other treatments. While, R4 had the highest of daily gain from 1st to 2nd month (133.33 g). It could be observed that very scanty differences among treatments in respect of all offspring performance measurements in particular birth weight of kids and this response greatly due to the very short period (only one month before parturition) in which dam goats start to fed the dietary treatments. So this very short period of feeding did not considerably affected on birth weight and daily gain during the suckling period for kids. These results are in agreement with the findings obtained by Saleh (2004) and Hanafy *et al*., (2011) who

start to feeding ewse their dietary treatments just before around 1-2 month before parturition.

Blood parameters.

Means of some blood plasma parameters are presented in Table (7). At the beginning of experimental period, the tested rations did not affect significantly on all blood parameters except total cholesterol which affected significantly (P<0.05) with the highest value (139mg/dl) in R2 and lowest value (71.67mg/dl) in R0. At the end of experimental period, plasma total protein of 75% GBVH – ration only was significant lower than that of R2 ration and the other test rations did not differ than that of control one. Singh *et al*., (2013) noticed that dietary protein and energy levels are the most effective factors related to the blood plasma picture. Serum total protein and its fractions are considered as biological index reflecting health and productive performance of animal (Singh and Jha, 2009). Blood plasma AST and ALT were not significantly affected by tested rations. Results indicated that liver are in healthy status and also its functions did not affected by treatments. The present values of AST and ALT showed normal activity of the animal hepatic tissue and consequently the integration of GBVH by-product in the present study could be used without any adverse effect on the liver functions. In general, the obtained concentrations of blood constituents are within the normal ranges for healthy goats which reported by (Gihad *et al*., (1987) and Kim *et al*., (2012).

Table 6. Effect of feeding different experimental rations on dams and their off spring performance.

Item	Experimental rations					±SE
	R0	R1	R2	R3	R4	
Dams performance.						
Initial weight (kg)	44.40	43.80	45.40	40.80	42.60	±1.77
Weight at birth (kg)	39.20	39.20	40.80	38.20	37.00	±1.84
Weight at 1st month(kg)	39.20	41.40	42.80	41.00	39.60	±1.72
Weight at 2nd month(kg)	41.60	39.80	40.00	39.80	38.20	±1.48
Litter size at birth (LSB)	1.00	1.00	1.00	1.20	1.00	±0.089
Litter weight at birth (kg)	4.07	4.07	4.50	4.84	4.15	±0.34
Litter weight at weaning (kg)	11.40^{b}	12.20^{ab}	14.20^{ab}	14.80^{a}	12.60^{ab}	±0.89
Offspring performance.						
Birth weight, kg	4.07	4.07	4.50	4.01	4.15	±0.26
Weight, kg/ 1st month	8.30	9.10	10.60	9.00	8.60	±0.72
Weight, kg/ 2nd month	11.40	12.20	14.20	12.80	12.60	±0.97
Daily gain, g from birth to 1st month	140.93	167.66	203.13	166.33	148.20	±22.92
Daily gain, g from 1st to 2nd month	103.33	103.33	120.00	126.66	133.33	±18.52
Daily gain, g from birth to 2nd month	122.13	135.50	161.56	146.50	140.77	±15.67

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

Table 7. Blood plasma parameters as affected by feeding experimental rations.

Item	Experimental rations					±SE
	R0	R1	R2	R3	R4	
At the beginning of experimental period						
Total protein (g/dl)	8.50	8.13	8.43	7.83	7.96	±0.70
Albumin (g/dl)	2.30	2.40	2.28	2.49	1.94	±0.20
Globulin (g/dl)	6.20	5.74	6.15	5.34	6.02	±0.78
ALT (U/L)	21.97	22.50	25.50	24.20	21.03	±1.45
AST (U/L)	36.27	38.93	34.03	38.43	37.87	±3.05
Urea (mg/dl)	29.83	32.53	30.33	34.33	27.20	±3.57
Total cholesterol (mg/dl)	71.67^{b}	119.67^{a}	139.0^{a}	122.0^{a}	110.0^{a}	±9.75
At the end of experimental period						
Total protein (g/dl)	8.80^{ab}	9.13^{ab}	9.43^{a}	6.50^{b}	8.77^{ab}	±0.84
Albumin (g/dl)	1.84	2.40	2.14	2.26	1.69	±0.30
Globulin (g/dl)	6.96	6.73	7.29	4.24	7.08	±0.99
ALT (U/L)	25.87	25.53	23.20	23.67	28.10	±3.19
AST (U/L)	31.63	39.00	29.00	29.70	39.00	±3.47
Urea (mg/dl)	39.20	33.23	29.07	30.23	44.13	±4.42
Total cholesterol (mg/dl)	99.00	170.33	153.00	164.00	142.33	±21.48

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

Composition and some properties of the prepared yoghurt.

Table (8) revealed that acidity and pH of the yoghurt made from geat's milk of the different experimental groups were unaffected significant. The yoghurt of control group had an average acidity of 0.84% which changed to 0.85, 0.84, 0.83 and 0.83% for R1, R2, R3 and R4, respectively. The corresponding pH values were 4.64, 4.58, 4.71, 4.60 and 4.63 with insignificantly differences, respectively. Higher total solids (%) of yoghurt was obtained on R1 and R3 (15.60 and 15.11) followed by R4 (14.24) while, the lowest two values were obtained on R2 (12.77) and R0 (12.07) with significantly differences (P<0.05) only between the values of tested rations R1and R3 with control one (R0). Protein content of yoghurt was unaffected significantly by the different tested rations. While, fat content was significant higher with the teasted rations R1, R3 and R4 than that of control one, being 3.33 , 3.55 , 3.40 , 3.60 and 3.47% for treatments R0 , R1 , R2 , R3 and R4

respectively. Ash (%) of yoghurt of different groups were 0.79, 0.82, 0.71, 0.80 and 0.88% for R0, R1, R2, R3 and R4 respectively, with significantly differences ($P<0.05$) among some tested rations and control.

These results could be attributed to the different feeding of tested rations on milk production. The manufacture of fermented goat's products such as set-style yoghurt faces a problem of over–acidification due to a low buffering capacity of goat's milk (Rysstad and Abbrahamsen, 1983). It is probably due to the impact of fat content on the growth and activity of lactic acid bacteria in yoghurt (Shaker *et al*., 2000). These results are in agreement with the findings of Mehanna, *et al*. (2000) and El-Nagar and Brennan (2001).

Table 8. Effect of tested rations on fresh yoghurt composition from goat's milk.

Property	Experimental rations				
	R0	R1	R2	R3	R4
Acidity	0.84±0.01	0.85±0.02	0.84±0.01	0.83±0.03	0.83±0.02
pH	4.64±0.03	4..58±0.02	4.71±0.02	4.60±0.03	4.63±0.05
TS	$12.07±0.51^{b}$	$15.60±0.11^{a}$	$12.77±0.49^{b}$	$15.11±0.32^{a}$	$14.24±0.71^{ab}$
Protein	3.02±0.11	3.28±0.02	3.11±0.02	3.29±0.06	3.29±0.17
Fat	$3.33±0.09^{c}$	$3.55±0.10^{ab}$	$3.40±0.12^{c}$	$3.60±0.12^{a}$	$3.47±0.12^{b}$
Ash	$0.79±0.01^{b}$	$0.82±0.01^{ab}$	$0.71±0.02^{c}$	$0.80±0.02^{b}$	$0.88±0.02^{a}$

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

Curd tension (CT) and curd syneresis (CS).

The values of CT were significantly affected by tested rations of goat's milk. Table (9) show that CT of the fresh yoghurt had an average values of 49.22, 65.23, 55.87, 63.61 and 51.02 g respectively, from R0 up to R4 with significant differences among them ($P<0.05$). The values of CS for R0, R1, R2, R3 and R4 were 1.98, 1.47, 1.82, 1.34 and 2.37 g respectively, after 10 min for each 115g of fresh yoghurt, with significantly differences among dietary treatments). The corresponding values after 60 min were 4.75, 4.13, 4.23, 4.01 and 4.75 g respectively, for each115g of fresh yoghurt with significantly differences ($P<0.05$) among treatments. Such increase in CT could be attributed to the increase of TS due to the positive effect of the tested rations. Different ingredients were used in the literature but not sucrose- to increase TS content which in turn increased CT of the resultant yoghurt or zabady (El-Nawasany, 2012). These results generally demonstrates the high influence on texture caused by the differences in casein content and micelle structure on milk goats which used in manufacture (Vargas *et al*., 2008). These, consequently increased the curd tension and decreased syneresis of the resulting yoghurt (Martin-Diana *et al*., 2003). Fat content significantly affected the curd tension and whey syneresis of yoghurt. In general, yoghurts made from R0, R2 and R4 goat's milk had significantly lower curd tension and higher whey syneresis than the yoghurts made from R1 and R3 milk. This may be due to the increase of total solids on R1 and R3 which exhibit positive interactions of fat globules in yoghurt that considering as a reason for great curd tension and lower syneresis of this treatment (Pereira *et al*., 2006 and Aziznia *et al*., 2008).

Table 9. Effect of tested rations on curd tension (CT, g) and curd syneresis (CS, g/15 g) of the fresh yoghurt.

Property	Experimental rations				
	R0	R1	R2	R3	R4
CT	$49.22±2.46^{c}$	$65.23±2.01^{a}$	$55.87±3.07^{b}$	$63.61±0.88^{a}$	$51.02±0.65^{bc}$
CS after:					
10 min	$1.98±0.09^{b}$	$1.47±0.06^{c}$	$1.82±0.23^{b}$	$1.34±0.25^{c}$	$2.37±0.32^{a}$
20 min	$3.30±0.24^{a}$	$3.01±0.04^{b}$	$3.09±0.40^{a}$	$3.03±0.29^{a}$	$3.39±0.34^{a}$
30 min	$4.27±0.34^{a}$	$3.33±0.02^{b}$	$3.45±0.46^{a}$	$4.02±0.29^{a}$	$4.19±0.36^{a}$
60 min	$4.75±0.35^{a}$	$4.13±0.15^{b}$	$4.23±0.28^{b}$	$4.01±0.27^{b}$	$4.75±0.36^{a}$

*** Average (a and b… etc) within the same row with different superscripts differed significantly (P≤0.05).**

Organoleptic evaluation of yoghurt

Data in table (10) showed scoring points given for the organoleptic properties of the fresh yoghurt made from milk of goats fed the of experimental rations. Flavour had 59.6, 59.9, 59.8, 59.9 and 59.8 out of 60 with slightly differences among treatments. All the yoghurt samples were free from bitterness, foreign, cooked and unclean flavours since the yoghurt samples ranked the maximum attainable scores for such flavours. General appearance had scores of 9.5, 9.7, 9.3, 9.7 and 8.5 out of 10 for R0, R1, R2, R3 and R4, respectively, with only the values of R2 and R4 were lower significantly than that of control. The corresponding values for firmness was of 9.3, 9.5, 9.3, 9.6 and 8.9 out of 10, whereas smoothness had scores of 9.5, 9.4, 9.2, 9.7 and 9.1 out of 10 and likewise the wheying-off property had scores values of 9.3, 9.6, 9.2, 9.7 and 8.9 out of 10 respectively, where almost the differences among treatments regarding firmness, smoothness and wheying off appeared to be nonsignfifcant. This good scorning of the organoleptic properties of the fresh yoghurt of R1 and R3 tested groups may be due to peculiarities of goat's milk fatty acid composition which play an important role in the development of goat flavour, leading to changes in characteristics (Contarini and Povola, 2002 and Chilliard *et al*., 2003). This variation in flavour, appearance and texture between yoghurt from milk experimental rations are due to goat's milk has slightly higher acidity, lower casein content, with a very low proportion or absence of αs1 casein. All these factors influence the rheological properties of the coagulum in goat's milk that is almost in semi liquid (Vegarud *et al*., 1999).

Table 10. Effect of experimental rations on scorning of the organoleptic properties of fresh yoghurt.

Property	Experimental rations				
	R0	R1	R2	R3	R4
Flavour (60)	59.6±0.25	59.9±0.25	59.8±0.13	59.9±0.10	59.8±0.20
Appearance (10)	9.5±0.15[a]	9.7±0.12[a]	9.3±0.26[b]	9.7±0.15[a]	8.5±0.37[c]
Firmness (10)	9.3±0.21[a]	9.5±0.11[a]	9.3±0.34[a]	9.6±0.16[a]	8.9±0.22[b]
Smoothness (10)	9.5±0.17[a]	9.6±0.10[a]	9.2±0.33[a]	9.7±0.15[a]	9.1±0.32[a]
Wheying-off (10)	9.3±0.26[a]	9.6±0.21[a]	9.2±0.29[a]	9.7±0.15[a]	8.9±0.30[b]

*** Average (a and b) within the same row with different superscripts differed significantly (P≤0.05).**

Feed efficiency and economical efficiency of experimental diets.

The results of nutrients intake, feed conversion for milk production and economic efficiency of the experimental rations are presented in Table (11). The DMI g/h/d and TDNI g/h/d were slightly affected by ration groups, despite there were some significant differences among some dietary treatments of the trial, being the highest (1314g/h/d) of DMI was found in R4. While, the highest one for TDNI (781g/h/d) was obtained in R1 which differed significantly ($p<0.05$) only with R4 which had the lowest value (604g/h/d). The tested rations had insignificant effect on DCPI g/h/d with the highest value (148g/h/d) that associated with R3 and the lowest value (130g/h/d) seemed to be with R1. The feed conversation (kg DM/kg milk) was significant improved due to the tested rations which formulated with 25, 50 and 75% GBVH ingredient, compared with control one being the 100% GBVH – ration (R4) had the poorest feed conversion value among the entire treatments. Despite TDN/kg milk and g DCP/kg milk did not affected significantly by tested rations. Date of economic efficiency showed that the highest (4.51 L.E.) feeding cost/h/d L.E was found in control ration (R0) and the lowest one (3.39 L.E.) was found in (R4). While R3 had the lowest value (3.02 L.E.) of feeding cost/kg milk, among the experimental rations versus the control diet that had the highest value (4.33 L.E.). The best economic efficiency was observed in R3 which recorded (143%) compared with control ration and the other tested rations. The improvement of economic efficiency for diets contained GBVH could be related to the high feed conversion as well as to the positive effect of including GBVH on feeding value and decreasing feeding cost /h/d.

Table 11. Effect of experimental rations on feed intake, feed efficiency and economical efficiency.

Item	Experimental rations					±SE
	R0	R1	R2	R3	R4	
Feed intake						
DMI, g /h /d	1308	1310	1311	1312	1314	
TDNI, g /h /d	742[a]	781[a]	770[a]	771[a]	604[b]	±41.19
DCPI, g /h /d	133	130	143	148	135	±6.78
Feed efficiency						
Kg DM / Kg milk	1.26[b]	1.23[c]	1.12[d]	1.06[e]	1.34[a]	±0.003
Kg TDN / Kg milk	0.714	0.735	0.654	0.623	0.616	±0.036
g DCP /Kg milk	127.84	122.70	121.82	119.37	137.82	±6.17
Feeding cost/h/d ,LE	4.51	4.16	3.95	3.74	3.39	
Feeding cost/ kg milk, LE	4.33	3.91	3.36	3.02	3.45	
Economic efficiency	100	110	129	143	125	

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

CONCLUSTION

From the results obtained in this study it is concluded that green bean veins hay could be successfully and economically used as partially replacement by up to 75% with clover hay for dairy goats without any adverse effects on their productive performance and peculiarly such dietary treatments causing a favorable effect on yoghurt quality grade. Further studies are needed on commercial scale for better utilization with available different agriculture by-products which will be reflected on the improvement of livestock holder income in Egypt.

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تأثير العلائق المحتوية على دريس عروش الفاصوليا الخضراء علي إنتاج اللبن وتركيبه وجودة الزبادي في الماعز الحلاب

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أجريت هذه ادراسة لمعرفة مدى تأثير إستبدال دريس البرسيم بدريس عروش الفاصوليا الخضراء في علائق الماعز الدمشقى الحلاب علي معاملات هضم العناصر الغذائية ومحصول اللبن وتركيبه وبعض قياسات الدم وجودة الذبادي المصنع من ألبانها. تم إستخدام عدد ٢٥ عنزة دمشقى حلابة بمتوسط وزن جسم ٤٢.٨±١.٥ كجم في موسم الولادة الثالث والرابع قسمت عشوائيا بالتساوى إلى خمس مجموعات متشابهه (٥حيوانات لكل مجموعة) حيث أعطيت واحدة من خمس علائق تجريبية: المجموعة الأولى :(ع٠):عليقة المجموعة الضابطة تتكون من العلف المركز ودريس البرسيم (٥٠:٥٠%) بينما العلائق المختبرة (ع١، ع٢ ، ع٣ ، ع٤) إعطيت علائق محتوية علي(٢٥ ، ٥٠ ، ٧٥ ، ١٠٠%) دربس عروش الفاصوليا الخضراء كإستبدال من دريس البرسيم في العليقة الضابطة علي التوالي. أوضحت النتائج المتحصل عليها للتحليل الكيماوي لكل من دريس البرسيم ودريس عروش الفاصوليا تشابه كبير في نسب كلا من البروتين الخام والألياف الخام. لاتوجد فروق معنوية بين العليقة (ع٠) والعلائق المختبرة (ع١ ، ع٢ ، ع٣) ومعاملات هضم والقيمة الغذائية (المادة الجافة والمادة العضوية والبروتين الخام والألياف الخام ومستخلص الأثير والكربوهيدرات الذائبة والمركبات المهضومة الكلية والبروتين الخام المهضوم). وعلي العكس من ذلك سجلت المجموعة (ع٤) والمحتوية علي أعلي نسبة من دريس الفاصوليا أقل القيم لمعاملات الهضم والمركبات المهضومة الكلية . بينما البروتين المهضوم الكلي لم يتأثر معنويا بالمعاملات الغذائية المختلفة وسجلت المجموعة (ع٣) أعلي القيم . محصول اللبن الحقيقي واللبن المعدل لنسبة ٤% دهن أرتفع معنويا مع المجموعة التي تغذت علي ٧٥% عروش الفاصوليا (ع ٣) وكان الأرتفاع غير معنوي مع المجاميع (ع١ ، ع٢) مقارنا مع المجموعة (ع٠) ولكن المجموعة التي غذيت علي ١٠٠% من دريس عروش الفاصوليا (ع٤) أعطت أقل إنتاج من اللبن مقارنة بالمجاميع الأخري . معظم المجاميع المختبرة تفوقت معنويا علي المجموعة المقارنة في نسبة الدهن في اللبن بينما سجلت نسبة البروتين إتجاه عكسي . حدث تحسن بسيط في نسبة الجوامد الكلية في معظم المجاميع التجريبية مقارنة بالمجموعة الضابطة مع وجود فروق معنوية بين (ع٢ ، ع٤) مقارنة مع (ع٠). لا توجد فروق معنوية بين المجاميع المختبرة والعليقة الضابطة في صفات الأمهات ما عدا مجموع وزن الفطام . سجلت المجموعة (ع٢) أعلي المتوسطات لصفات النتاج لوزن الجسم عند الميلاد ، عند الشهر الأول والثاني ومتوسط الزيادة اليومية من الميلاد حتي الشهر الأول ومن الميلاد حتي الشهر الثاني وكانت كالتالي ٤.٥ كجم ، ١٠.٦كجم ، ١٤.٢كجم ٢٠٣.١٣ جم ١٦١.١جم علي التوالي. البروتينات الكلية في بلازما الدم عند نهاية التجربة لم تتأثر معنويا بالمجاميع المختبرةوسجل أعلي متوسط (٩.٤٣ جم/١٠٠مل) في (ع٢) وأقل متوسط (٦.٥ جم /١٠٠مل) في (ع٣) . لم توثر المجاميع المختبرة معنويا علي تركيز كلا من الجلوبيولين ALT◌ ، AST واليوريا والكوليستيرول الكلي . كلا من الحموضة ، الـ pH ونسبة البروتين في الزبادي لم تتأثر معنويا بالمجاميع المختبرة بينما حدث تحسن في نسب كلا من نسبة الدهن والجوامد الكلية مقارنة مع المجموعة الضابطة. المجموعة ع١ ، ع٣ كانت لها أحسن الصفات الطبيعية للزبادي المصنع من للبن الماعز. أظهرت النتائج أن معدل التحويل الغذائي والكفاءة الأقتصادية الأعلي في المعاملات ع٢ ، ع٣. وتلخص النتائج أن أستبدال دريس البرسيم بدريس عروش الفاصوليا الخضراء حتي نسبة ٧٥% أدي إلي تحسن بعض معاملات الهضم وإنتاج اللبن وبعض نسب مكوناته وبعض صفات أداء الأمهات والنتاج وكلك الكفاءة الأقتصادية.