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EFFECT OF SOME MEDICAL HERBS ON PRODUCTIVE PERFORMANCE OF LACTATING ZARAIBI GOATS

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SUMMARY

Thirty does of Zaraibi goats were chosen at the third and fourth season of lactation, and randomly divided into five similar groups (6 does for each) according to their live body weight (33.75 ±0.42 kg) and fed the experimental rations for 4 months (one month before parturition to 3 months after parturition) as an experimental period to investigate the effects of including rosemary or laurel herbs as natural feed additives in their rations, on digestibility, productive performance, milk production and some blood parameters of goats. Rosemary dry leaves (RDL) or laurel dry leaves (LDL) were added to the concentrate feed mixture (CFM) portion of the rations at levels of 0, 0.5, 1, 0.5 and 1% along the whole duration of the experiment. Each group was assigned randomly to feeding one of experimental rations where R1(control): received 60% CFM +40% berseem fresh (BR), R2: 60% CFM +40% BR+ 0.5% rosemary dry leaves (RDL), R3: 60% CFM +40% BR+ 1% RDL and R4: 60% CFM +40% BR+ 0.5% laurel dry leaves (LDL), R5: 60% CFM +40% BR+ 1% LDL. The feed allowances were calculated according to NRC (2007) for goats. Five digestibility trials were performed to evaluate the nutrient digestibilities and feeding values of the experimental rations. Results indicated that chemical composition of RDL and LDL were contained (5.78, 7.86), (21.09, 22.73), (7.87, 8.01), (57.83, 56.84), (7.43, 4.56) % for CP, CF, EE, NFE and ash, respectively. The essential oil content in LDL was markedly higher than that found in RDL (2.60 vs. 2.00%, respectively). The addition of RDL (both levels) and LDL (low level) led to an insignificant improvement in the digestibility of nutrients in comparison with those of the control one (R1). Otherwise the high level LDL (R5) caused significant increases in all nutrient digestibilities compared with those of control (R1). Similar trend was observed with the feeding values as TDN& DCP. Live body weight and change in body weight of Zaraibi does during late pregnancy and suckling periods was improved by supplementation of the two experimental herbs. Milk yield during suckling (period) was reached the peak at the 6th week of lactation in all treatments. Daily milk yield of the four tested rations (R2, R3, R4 & R5) were significantly higher ($P<0.05$) compared with that of control one (R1), being the highest value was occurred with R5 (1.420 kg). Mostly, no significant differences were noticed among experimental rations in all milk constituents except those of fat and total solids percentages which appeared to be significant higher in most tested rations than those of control one (R1). Live body weight of kids at birth didn't significantly affected by dietary treatments, while weaning weight, total weight gain and average daily gain were significant higher with R3 and R5 tested rations than those of control one (R1) and the other tested ones (R2 & R4). No significant differences among treatments in respect of blood total protein, albumin, globulin, ALT, AST, urea and HDL-c concentrations were observed, while total lipid, glucose, triglyceride, total cholesterol, creatinine and LDL-c concentrations were somewhat decreased with tested rations particularly on R5 ration compared with those of control one. Concerning blood plasma TAC, its values were insignificant increased with the low level RDL and LDL rations R2 & R4, but significant increased with the high level RDL and LDL rations R3 & R5 compared with the value of control (R1). The TDMI and TDNI were slightly higher in all tested rations (R2 up to R5) than those of control one (R1) with pre-partum and post-partum stages. Economic return was tangibly improved by feeding the tested rations that contained the experimental herbs, especially with those having 1% RDL and LDL in comparison with control one and the other tested ones. It could be concluded that feeding on rations contained RDL or LDL (i.e. 1% of CFM), could be recommended for lactating Zaraibi goats due to the positive effect on productive performance, health status and profitability.

Keywords: *Goats, medical herbs, productive performance, milk production, digestibility, blood parameters, economic.*

INTRODUCTION

Livestock plays a very important role as an integral part of farming and rural life in Egypt; providing food and the critical cash reserve and income for farmers. The lack of sufficient feeds to meet the nutritional requirements of the existing animal population is one of the most critical problems of animal production.

Many studies had been focused on evaluating the potential use of plant extracts as an alternative for antibiotics to improve feed efficiency in ruminants. Plants having an array of diverse secondary metabolites that when extracted and used could be exert antimicrobial activities against undesirable rumen microbes (Benchaar *et al*., 2008). Aromatic plants such as oregano, rosemary, sage, basil *etc.*, contain many biologically active compounds, mainly polyphenolics, which have been found to possess antimicrobial, antioxidant, antiparasitic, antiprotozoal, antifungal, and anti-inflammatory properties. Therefore, aromatic plants and their extracts have the potential to become new generation substances for enhancing human and animal nutrition and health (Christaki *et al*., 2012). Herbal plants have gained much attention as alternative growth promoters to antibiotic. Various medicinal plants and their extracts have been used as feed additives due to their various health-promoting effects such as being anti-oxidative, antimicrobial, anti-inflammatory and growth stimulants (Özer *et al*., 2007 and El-far *et al.*, 2014). Previous studies have reported that medicinal plants and their extracts could be included in ruminant diets to improve nutrient digestibility, rumen fermentation, immune function, milk production, and composition (Kholif *et al.*, 2012 and Hendawy *et al.,* 2019). Additionally, feed additives derived from plants can be included in animal diets to improve their productivity and the quality of animal products. Among these natural additives, aromatic plants and their extracts of essential oils have been examined for their advantages over the antibiotics as growth promoters. Most species of these plants had free from any antinutritional agents and generally recognized as safe in poultry nutrition (Brenes and Roura, 2010). Many herbs and spices can be found worldwide, with many originating from the Mediterranean area, either in the wild or cultivated such as rosemary, oregano, sage and thymus (Negi, 2012). Plant secondary metabolites such as saponins and tannins (hydrolysable and condensed) have been extensively assessed for their antimicrobial effects and their potential to modulate ruminal fermentation and improve nutrient utilization in ruminants (Benchaar *et al.*, 2007). Information on essential oils is still limited, but some reviews in this area (Calsamiglia *et al*., 2007 and Benchaar *et al*., 2008) have been described the potential of some essential oils to favorably modify rumen microbial fermentation. Rosemary (*Rosmarinus officinalis* L.) is an evergreen perennial shrub belonging to the *Lamiaceae* family which mostly originated in southern Europe, North Africa, and the Mediterranean region. Rosemary is nowadays cultivated worldwide and presents several pharmacological activities such as anti-inflammatory, anti-bacterial, and antioxidant (Sedighi *et al*., 2015 and Satyal *et al*., 2017) and its leaves are commonly used as a seasoning food. The essential oils of rosemary plant are appearing in colorless or pale-yellow liquid with discernable scent (Rašković *et al*., 2014). Its chemical composition can differ according to the soil, farming practices, and extraction method (Borges *et al.,* 2017). According to Cleff *et al.* (2012) and Takayama *et al.* (2016), the major compounds of this oil have been including 1,8-cineol, α-pinene, and limonene. Due to its vital contents of anti-bacterial, antioxidant and other, potentially it widely used in the pharmaceutical, cosmetics, and food industries (Affholder *et al.*, 2013). In addition, many phenolic diterpenes such as carnosol, carnosic acid, rosmanol, epirosmanol, isorosmanol, methyl carnosate, and rosmarinic acid might be had added positive effects in sheep diet (Cobellis *et al*., 2015). Other authors demonstrated that 1,8-cineole (29.52%) and comphor (15.57%) were represent the main compounds in rosemary essential oils (Khayyal *et al.,* 2021). Also, *Laurus nobilis* L. is known as bay leaf, sweet bay, bay laurel, Roman laurel or daphne, and known AL Ghar in Arabic island of the *Lauraceae* family and is remain an evergreen Mediterranean shrub whose leaves have traditionally been used in cuisines and folk medicine due to their beneficial health effects, which can nowadays be scientifically explained by various biological activities of the leaf extracts. Phytochemical analysis has shown that such plant containing a lot of valuable compounds such as volatile and non-volatile oils, flavonoids, tannins, sesquiterpenic alcohols, alkaloids, minerals and vitamins (Patrakar *et al*., 2012 and Abu-Dahab *et al*., 2014). In addition 1,8-cineole (51%) and α-terpinyl acetate (10%) were considerably being the main compounds in *Laurus nobilis* essential oils (Peris and Blázquez, 2015). Many of these vital activities can be attributed to phenolic compounds which existing in *L. nobilis* leaves and also due to including flavonoids, phenolic acids and tannins (proanthocyanidins). The main target of this study was to investigate the effects of adding two levels of either rosemary or laurel on productive performance, digestibility and some blood parameters of lactating Zaraibi goats.

MATERIALS AND METHODS

The experimental work of this study was carried out during the last month of does pregnancy (October) up to next mating season (February) at Sakha Animal Production Research Station, Kafer El-Sheikh Governorate, belonging to Animal Production Research Institute (APRI), Agriculture Research Center (ARC), Ministry of Agriculture, Egypt, and the chemical analysis was carried out at laboratories of APRI, ARC.

Preparation of medicinal herbs:

An ample amount of air-dried medicinal herbs (rosemary or laurel) which included leaves and some small stems were purchased from a commercial company at Al-Azhar Street, Cairo Governorate and ground in a hummer mill and stored in bags until use. Samples of the two tested additives were prepared for chemical analysis and also the essential oils in both rosemary and laurel dry leaves were determined. The distillation of the essentials oil was conducted as described by the British Pharmacopoeia (1963). The essential oils obtained from, rosemary and laurel dry leaves were analyzed using DsChrom 6200 Gas Chromatograph equipped with a flame ionization detector for separation of volatile oil constituents (Hoftman, 1976). These samples were analyzed in the laboratories of the Medicinal herbs Department, Horticulture Research Institute, ARC.

Experimental animals and feeding:

Feeding trial was conducted using thirty does of Zaraibi goats which chosen at the third and fourth seasons of lactation, with an average live body weight 33.75 ±0.42 kg using a randomized complete block design. The trial was lasted 4 months (one month before parturition up to 3 months after parturition) as an experimental period. Does were randomly divided into five similar groups (6 does for each). Rosemary and laurel leaves were supplemented into the concentrate feed mixture (CFM) portion of does rations at levels of 0, 0.5, 1, 0.5 and 1%, respectively. Each group was assigned randomly to feeding one of experimental rations where R1(control): received 60% CFM +40% berseem (BR), R2: 60% CFM +40% BR+ 0.5% rosemary dry leaves (RDL), R3: 60% CFM +40% BR+ 1% RDL and R4: 60% CFM +40% BR+ 0.5% laurel dry leaves (LDL), R5: 60% CFM +40% BR+ 1% LDL. The amount of CFM was offered twice daily at 8.00 a.m. and 4.00 p.m. in two equal portions while the amount of roughage was offered once a day in the morning. Animals were housed in five shaded yards and they were weighed biweekly. The feed allowances were calculated according to NRC (2007) for goats. Drinking water was available at all times. The experimental animals were in good health conditions and free from external and internal parasites and kept in pens under similar conditions. Samples of the feed ingredients were analyzed for crude protein (CP), crude fiber (CF), ether extract (EE) and ash. Proximate analysis was performed according to AOAC methods (2007). Feed ingredients of the CFM (as fed) are consisted of 40% yellow corn, 39% wheat bran, 15% sunflower meal, 3% molasses, 2% limestone and 1% salt. Chemical analysis of feedstuffs and calculated chemical composition of the experimental rations are presented in Table 1. Essential oils and the other active constituents of the medicinal herbs as fed are illustrated in Table 2.

Milking parameters:

Does weighed at one month and two weeks pre-partum and then every two weeks post partum and also kids were weighed directly after 15 hr. of kidding and then weighed at 15, 30, 45, 60, 75 and 90 days of age and accordingly daily weight gain was calculated. Kids were weaned at 90 days of their age. For measuring milk yield of dams, kids were separated out of their dams after the second meal of the day at 4.00 pm till the next day morning at 8.00 am, then they weighed before and after suckling, in order to calculate milk weight by difference and then added to amount of milk which obtained from the does after completely hand milked until stripping. Milk samples were taken for chemical analysis of fat, protein, total solid (TS), solid not fat (SNF) and ash%, according to the methods of Ling (1963) and lactose was calculated by difference.

Digestibility trials:

Five digestibility trials were done at the end of the feeding trial simultaneously on the same animals of feeding trial (3 does in each group) to determine the digestion coefficients and feeding values of the experimental rations using acid insoluble ash (AIA) technique (Van Keulen and Young, 1977). Feces samples were collected from the rectum once daily for 5 days and composited for each doe and then representative samples were prepared and dried at 60 ^{o}C for 72 hours. Samples of feed (CFM, berseem, rosemary and laurel leaves and feces were ground through 1 mm screen on a Wiley mill grinder and then have been analyzed for crude protein (CP), crude fiber (CF), ether extract (EE) and ash according to AOAC (2007).

Blood parameters:

Blood samples were withdrawn from jugular vein in heparinized tubes at the end of collection period of the digestibility trials from the does. The blood samples were centrifuged for 15 min. at 4000 r.p.m. then clear serums were separated and stored at -20^{0C} until the time of analysis. Various chemical parameters were colorimetrically determined using commercial kits; following the same steps as described by manufacture. Total protein was measured as described by the Biuret method according to Henry and Todd (1974) and albumin was assayed according to Doumas *et al.* (1971) while globulin was calculated by subtracting the albumin value from the total protein value. Liver functions were assessed by measuring the activities of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) according to Reitman and Frankel (1957). Urea and creatinine were measured according to Berthelot (1959) and Faulkner and King (1976), respectively. Glucose was determined by quantitative enzymatic-colorimetric method that outlined by Trinder (1969). Total lipid, Tri-glycoside, total cholesterol and high density lipoproteins (HDL-c) were estimated according to Zollner and Kirsch (1962), Naito (1989), Tietz (1995) and Nauk *et al.* (1997), respectively. The low density lipoprotein (LDL-c) was calculated: as LDL=TC-HDL-(TG/5) according to Friedewald *et al*. (1972) and total antioxidant capacity (TAC) according to Koracevic *et al*. (2001).

Statistical analyses:

Data were analyzed using the general linear models procedure of SAS (2004). 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 of ij, μ= overall mean of Yij. Ti= effect of i (treatments). eij = the experimental random error.

RESULTS AND DISCUSSION

Chemical composition:

Chemical analysis of feedstuffs and calculated chemical composition of the experimental rations are presented in Table (1). Chemical composition of the experimental rations (R1, R2, R3, R4 and R5) was closely comparable to those using commonly in practical field of goats feeding. Also, the values of chemical composition of BR are within the normal range that widely recorded in the literature. While the compositional values of RDL were found as 5.78, 21.09, 7.87, 57.83 and 7.43% (on DM basis) for CP, CF, EE, NFE and ash, respectively. Also, the corresponding values of LDL were found to be 7.86, 22.73, 8.01, 56.84 and 4.56%. These values of chemical analysis of the RDL and LDL were closely comparable to which recorded by many authors who reported that the values of analysis could be influenced by several factors, such as the prevailing environmental conditions, harvest season, plant parts and other agronomic practices. The estimation of Gasmi-Boubaker *et al.* (2009) had estimated that the chemical composition of *Rosmarinus officinalis* that growing in the pastures of central Tunisia was contained 8.36, 34.5, 45.9 and 7.75% for CP, ADF, NDF and ash, respectively. Also, Moujahed *et al.* (2011) reported that chemical composition of *Rosmarinus officinalis* was recorded 5.8% CP, and 6.2% ash, while El-Wardany *et al.* (2015), Badawi *et al*. (2016) and Bakr *et al.* (2016) found that the chemical composition of *Rosmarinus officinalis* was within the following ranges 4.10-5.80% for CP, 13.37-21.71% CF, 9.23-16.32% EE and 5.23-6.20% for ash (on DM basis). Recently, Khayyal *et al.* (2021) reported that the chemical composition of rosemary dry leaves was contained 6.23, 22.72, 8.48, 53.61 and 8.96% for CP, CF, EE, NFE and ash, respectively (on DM basis).

Table (1): Chemical analysis of feedstuffs and calculated chemical composition of the experimental rations (on DM basis, %).

Item	DM	OM	CP	CF	EE	NFE	Ash
Feedstuffs:							
Concentrate feed mixture (CFM)	89.65	95.33	14.49	8.00	3.86	68.97	4.67
Berseem (BR)	89.66	91.46	14.09	25.95	2.52	48.90	8.54
Rosemary dry leaves (RDL)	92.00	92.57	5.78	21.09	7.87	57.83	7.43
Laurel dry leaves (LDL)	92.54	95.44	7.86	22.73	8.01	56.84	4.56
Experimental rations:							
R1	89.65	93.78	14.33	15.18	2.32	60.11	6.22
R2	89.33	93.76	14.30	15.26	2.33	60.16	6.24
R3	89.61	93.76	14.27	15.24	2.36	59.52	6.24
R4	89.56	93.78	14.30	15.23	2.34	59.79	6.22
R5	89.62	93.79	14.28	15.25	2.36	59.71	6.21

R1: group that fed the CFM+ berseem (control ration). R2, R3, R4 and R5 groups that fed the CFM with adding rosemary dry leaves or laurel dry leaves at rate of 0.5,1, 0.5 and 1%, respectively + berseem.

Respecting the chemical composition of laurel dry leaves, AL-Hashimi and Mahmood (2016) found that chemical composition of bay leaves (*Laurusnobilis* L.) as protein, oil, ash and carbohydrate were 7.62, 8.5, 3.63, 50.83%, respectively, while Khayyal *et al.* (2021) reported that the chemical composition of laurel dry leaves was contained 8.25, 23.86, 8.41, 54.54 and 4.94% (on DM basis) for CP, CF, EE, NFE and ash, respectively. Generally, RDL and LDL are rich in most nutrients and some bio- compounds which could be used as an excellent feed additive in goat rations.

Essential oil and active constituents:

Total essential oils and its active constituents of the rosemary or laurel leaves are presented in Table (2). The essential oil in LDL was markedly higher than that in RDL (2.60 vs. 2.00%, respectively) and both are within the normal range that widely recorded in the literature. The biggest constituent among the essential oils was 1,8-cineole which reaching up to 37.49% in the leaf of RDL vs. 40.86% in LDL. The concentrations of essential oils and its active constituents of the RDL and LDL are closely comparable to which suggest by other authors. Mulas *et al.* (1998) found that the essential oil content of rosemary leaves ranged between 0.8 to 2.6 % and the same results have been reported by Wolski *et al.* (2000) who found that the content of essential oil of rosemary leaves was ranged from 1.5 to 2.0%, where its constituent concentrations might be differ from place to another due to some variations due to species, soil, weather, agronomical practices and the technical methods of extraction. Zaouali and Boussaid (2008) found that essential oil extracted from *Rosmarinus officinalis* was rich in 1,8-cineol, while Moujahed *et al.* (2011) found that *Rosmarinus officinalis* was contained 0.43% essential oil that fractionated into 1-8 cineol (44.2%), camphor (12%), α-pinen (11.6%), Camphen (4%), α-thyjen (2.2%) and α-terpineol (1.7%). In more specifically, Rodrigues *et al.* (2020) reported that the chromatography analysis showed 100% of terpenes in essential oils of rosemary composition with extra 20 compounds could be identified as α-pinene (8.13%), limonene (21.99%), 1,8-cineole (33.70), and camphor (27.68%). α- thujene (0.11%), Camphene (1.68%), α-terpinene (0.45) and γ-terpinene (0.39) where these values being similar with those reporting by (Fernandes *et al.*, 2013 and Borges *et al*., 2017). While, Khayyal *et al.* (2021) found that the oil was representing 1.6% of the rosemary dry leaves and their main constituents were 1,8-cineole (29.52%), camphor (15.57%), borneol (12.80%), α-pinene (7.02%), Ɣ-terpinene (4.18%), comphene (4.96%), limonene (1.53%), linalool (0.86%), and α-terpineol (4.83%). On other estimations, the content of essential oils of the LDL has been varied widely from 0.5 to 4.3% and having highly contents of 1,8-cineole (30-70%), linalool (0.9-26.9%) and α-terpinyl acetate (4.50-25.7%) as determined by many researchers (Bahmanzadegan *et al*., 2015, Caputo *et al*., 2017 and Taban *et al*., 2018). Moreover, Basak and Candan (2013) reported that *Laurus nobilis* L. leaves had contained significant amount of essential oils that consisted of 1,8-cineole (68.82%), (S)-*α*-pinene (6.94%), α- pinene (1.70%), Ɣ-terpinene (1.61%), α-terpinene (2.02%), L-linalool (0.43), terpinene-4-ol (1.77%), camphene (1.01%) and R-(+)- limonene (3.04%). Essential oils in rosemary and laurel dry leaves have being exhibit pharmacological properties, such as antibacterial, antimicrobial, antifungal, and antiparasitic substances where those considerably improving the productive efficiency of animals.

Table (2): Essential oils and the other active constituents of the medicinal herbs (as fed).

Item	Medicinal herbs			
	Rosemary dry leaves		Laurel dry leaves	
Essential oils, %	2.00		2.60	
Constituents of essential oils, %:				
α- pinene	12.0811	α- Thujene	8.3201	
Comphene	6.1932	α- pinene	13.3672	
B-pinene	4.4484	**1.8 cineole**	**40.8604**	
Limonene	2.8981	Ɣ-terpinene	3.9287	
1.8 cineole	**37.4970**	Linalool	0.9023	
Ɣ-terpinene	1.5312	Myrcenol	5.7632	
Linalool	0.5566	Menthone	3.0960	
Comphor	14.8137	Terpinene-4-ol	13.2199	
α- terpineol	2.0558	Santalone	1.0116	
Borneol	12.4377	Carveol	1.4414	
B-caryophyllene	1.0060	Cuminaldehyde	0.9838	
Total	95.5188	Total	92.8946	

Physically, essential oils have low-molecular-weight that might be easily permeate the cell membranes and hence potentially participate in metabolic processes in the body (Lee *et al.*, 2018). Likewise, Fidan *et al*. (2019) found that the oil content was representing 3.25% of the laurel leaves and the main constituents were 1,8-cineole (41.0%), α-terpinyl acetate (14.4%), sabinene (8.8%), methyl eugenole (6.0%), β-linalool (4.9%), and α-terpineol (3.1%). Khayyal *et al.* (2021) found that the oil content was representing 3.0% of the laurel dry leaves and its main constituents were determined as 1,8-cineole (38.91%), α-thujene (6.31%) α-pinene

(17.02%), Ɣ-terpinene (1.78%), terpinene-4-ol (15.05%), linalool (1.33%), α-terpineol (4.83%), myrcenol (2.05%), menthone (5.13%), santalone (1.54%) and carveol (1.51%).

Nutrient digestibilities and feeding values:

Digestion coefficients and feeding values of the experimental rations are presented in Table (3). Results revealed that the digestibility of most nutrients of tested rations R2, R3 and R4 were insignificant increased compared those of control one (R1), while all nutrient digestibilities of tested ration (R5) that have 1% LDL supplement were increased significantly in comparison with those of control one (R1). Similar trend was observed with the feeding values as TDN and DCP amongst dietary treatments of the experiment. This might be due to the polyherbal biostimulants which increasing the activities of ruminal micro-flora through saving some vital metabolic compounds such as trace minerals, vitamins, hormones and enzymes which are necessarily required for micro-flora to maximize nutrient digestibilities, absorption and metabolic processes (Aboul-Foutouh *et al.,* 2000). Essential oils are low-molecular-weight and therefore, they might be easily permeate the cell membranes and hence participate in metabolic processes in the body (Lee *et al*., 2018). The digestibility of all nutrients and feeding values were insignificant higher with LDL-ration (1%) compared with those of RDL ones. This might be due to some variations in essential oil concentrations between RDL and LDL and also might be owing to its different contents of the active substances that can improve the digestibility, metabolic processes and immune stimulant action of animals (Sabra and Metha, 1990). Emphasizing into the present results, Fernandez *et al.* (1997) showed that commercial products of blended essential oil compounds could be inhibited the degradation of protein in the rumen, thus potentially increasing the protein supply to the post-ruminal tract for different enzymatic processes in intestine. Likewise, El-Bordeny (2011) reported that diet contained 1,8-cineole; α-pinene and β-myrcene could be working as dietary micro factors to stimulate rumen micro-flora to be in more efficient for producing vitamins and enzymes which are required to optimizing the digestibility, absorption and the whole metabolic functions. Likewise, previous studies have been revealed that medicinal plants and their extracts might be preferable to included in ruminant diets to improve nutrient digestibilities, rumen fermentation and immune function (Kholif *et al.,* 2012 and Hendawy *et al.,* 2019). The obtained results are partially in agreement with those recorded by Tekippe *et al*. (2013) and Lin *et al*. (2013) who reported that the digestibility of feeds was not affected by essential oils in most of nutrients. Otherwise, Galbat *et al.* (2014) reported that lactating goats' rations supplemented with polyherbal mixture from seeds of four herbal plants as natural additives showed the best improvement of nutrients digestibility compared with those of ration that free from these additives (control). Synergistically with the present results, Sahraei *et al.* (2014) revealed that nutrient digestibilities of DM, NDF, ADF and CP did not significantly affected by rations contained different levels (0, 100, 200 and 400 mg $d^{-1}$of rosemary essential oils using male sheep. Differences between the results may be due to the difference in blend of oils or dosages used in different studies. Generally, Bakr *et al.* (2016) with NZW rabbits and Allam and El-Elaime (2020) sheep have been reported that the rosemary leaves could be improved all nutrients digestibility (DM, OM, CP, CF, EE and NFE) and feeding values as TDN, DCP compared with those of control ration. Lastly, results here are similar with the findings obtained by Khayyal *et al.* (2021) who reported that the digestibility of most nutrients and feeding value as DCP were insignificant improved with increasing the level of RDL and LDL in sheep rations, while TDN value was significantly ($P<0.05$) improved with increasing the level of LDL in ration compared with that of control one.

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

Item	Experimental rations					±SE
	R1	R2	R3	R4	R5	
Digestibility, %:						
DM	64.47^{b}	66.88^{ab}	67.74^{a}	67.19^{ab}	68.73^{a}	±0.857
OM	68.68^{b}	69.05^{ab}	69.94^{ab}	69.36^{ab}	70.40^{a}	±0.497
CP	62.50^{b}	64.11^{ab}	65.46^{ab}	64.65^{ab}	66.51^{a}	±1.095
CF	49.79^{b}	50.24^{ab}	52.35^{ab}	50.75^{ab}	53.47^{a}	±0.961
EE	72.31^{b}	73.04^{ab}	74.38^{ab}	73.81^{ab}	75.12^{a}	±0.686
NFE	74.18	74.27	74.72	74.45	74.88	±0.547
Feeding values, %:						
TDN	65.50^{b}	65.86^{ab}	66.77^{ab}	66.20^{ab}	67.24^{a}	±0.471
DCP	8.96^{b}	9.17^{ab}	9.34^{ab}	9.25^{ab}	9.50^{a}	±0.149

a and b means in the same row with different superscripts are significantly ($P\leq0.05$) different. SE=standard error.

Live body weight and change in body weight of lactating goats:

Live body weight and change in body weight of lactating goats fed the experimental rations are presented in Table (4). Live body weight of does at pre-partum and also at partum were insignificant differences amongst all dietary treatments being the values of body weight change between pre and at partum did not significant different among the dietary treatments too. Respecting the body weight and its changes over the suckling period (90-d), almostly there were insignificant increases in the values of most tested treatments based on the control one, either on 45-d or 90-d weights. Discernibly, the change in body weight of does at 90-d of post-partum would be markedly improved for all tested rations (1.66 up to 2.00 kg). These improvements could be due to the effect of essential oils on digestion, absorption, and utilization of dietary nutrients (Abouelezz *et al.*, 2019 and Nehme *et al.*, 2021). The values of body weight of does after parturition were decreased (ranged from 26.50 kg in R1 to 28.33 kg in R5) then sharply decreased (post-parturition) to the minimum ones at day 45th in all groups. In general, body weight and its changes were decreased by -7.33, -7.50, -6.34, -5.00 and -5.34 kg for R1, R2, R3, R4 and R5, respectively from pre-partum up to at partum. The decreases in body weight after parturition are clearly due to removal of fetus and its attachments. Accordingly, in the present study, body weight and its changes were sharply decreased to -5.00, -4.00, -2.83, -3.50 and -1.83 kg for R1, R2, R3, R4 and R5, respectively after parturition and containing in this trend up to 45 days of lactation, then began to increase later up to 90-d of lactation season as shown in (Table 4). That is matched with the natural and physiological trend in lactating animal where body weight being decreases after parturition in corresponding increasing milk yield up to reaching to the peak of milk yield. The same trend was observed by Ahmed *et al.* (2008) with Zaraibi does during the late pregnancy and lactation periods. As a natural trend of dairy animals after parturition, Devendra (1979) recorded a decline in body weight of high yielding goats during the first month post-partum. Moreover, Ahmed (1999) found that dairy Zaraibi goats fed 100% NRC had decreased LBW from 13 to 22% at day 60th post-parturition. Abdelhamid *et al.* (2011) reported that improved live body weight of does, live body weight at birth and weaning for kids of dairy Zaraibi goats when fed *Rosemarinus officinalis ration*.

Table (4): Effect of experimental rations on live body weight (kg) and change in body weight of lactating goats during experimental period.

Item	Live body weight						
	Pre-partum	At-partum	Post-partum (during suckling)				
	30 days Initial	0 days	Change 0d- Pre-partum	45 days	Change 45d-At-partum	90 days	Change 90d- At-partum
R1	33.83	26.50	-7.33	21.50^{b}	-5.00^{b}	27.83	1.33
R2	34.17	26.67	-7.50	22.67^{b}	-4.00^{ab}	28.33	1.66
R3	33.67	27.33	-6.34	24.50^{ab}	-2.83^{ab}	29.17	1.84
R4	33.33	28.33	-5.00	24.83^{ab}	-3.50^{ab}	30.00	1.67
R5	33.67	28.33	-5.34	26.50^{a}	-1.83^{a}	30.33	2.00
±SE	±1.86	±1.59	±1.36	±1.21	±0.942	±1.21	±0.890

a and b means in the same column with different superscripts are significantly ($P \leq 0.05$) different. SE=standard error.

Daily milk yield biweekly:

Daily milk yield biweekly of Zaraibi goats fed the experimental rations during suckling period are illustrated in Table (5) and Figure (1). The obtained results of suckling period (early lactation) indicated that daily milk yield was reached into its peak at the 6th week of lactation in R1, R2, R3, R4 and R5 rations. In this respect, Shehata *et al.* (2007) decided that the peak of daily milk yield of Zaraibi goats recorded at 2nd to 6th week of lactation then it gradually declined till the end of lactation season. The positive effect of medicinal herbs on milk yield may be due to the essential oils and its active constituents (Table 2). Milk yield was significant higher with all tested rations during most of lactation weeks compared with that of control one. The daily milk yield was the highest (1.445 kg) with R5, followed by R4 (1.425 kg) then R3 (1.415 kg) and R2 (1.375 kg) and lastly the control (R1), which recorded the lowest value (1.225 kg) over the 45-d of suckling period, with significant difference between all tested rations and control one. The positive effect on milk yield was observed also by Abdelhamid *et al*. (2011) who using some medicinal herbs with lactating Zaraibi goat rations. The improvement in milk yield in the present study might be due to the significant positive effect of medicinal herbs on digestion coefficients of most nutrients and feeding values (as TDN and DCP). The same results and conclusion were mentioned by Mohamed *et al*. (2003) when using medicinal herbs such as *Rosemarinus* in small ruminant rations. Milk yield of the four tested rations (R2, R3, R4 & R5) were significantly higher ($P<0.05$) compared with that of control one (R1), being the highest value was occurred with R3 and R5 (at 1% level) that also significantly differ with R1. Results of the current study are in harmony with those obtained by Shehata *et al*. (2004) who reported that the daily feed intake might be increased by herbs supplementation to support the greater milk yield. Closely, previous studies have been concluded that medicinal plants and their extracts could be beneficially included in ruminant diets to improve milk production, and composition (Kholif *et al.*, 2012 and Hendawy *et al.*, 2019).

Table (5): Effect of experimental rations on average daily milk yield biweekly of goats during suckling period.

Item	Experimental rations					±SE
	R1	R2	R3	R4	R5	
Average daily milk yield biweekly, kg at:						
7days	0.880^{c}	1.043^{b}	1.105^{b}	1.098^{b}	1.223^{a}	±33.47
15 days	1.037^{c}	1.208^{b}	1.266^{ab}	1.356^{a}	1.346^{a}	±31.68
30 days	1.168^{b}	1.318^{ab}	1.435^{a}	1.367^{a}	1.318^{ab}	±51.99
45 days	1.225^{b}	1.375^{a}	1.415^{a}	1.425^{a}	1.445^{a}	±43.27
60 days	1.125^{b}	1.315^{a}	1.365^{a}	1.325^{a}	1.375^{a}	±49.84
75 days	1.050^{b}	1.220^{a}	1.240^{a}	1.285^{a}	1.245^{a}	±25.76
90 days	0.920^{c}	1.072^{b}	1.154^{ab}	1.100^{b}	1.220^{a}	±32.32

a , b and c means in the same row with different superscripts are significantly (P≤0.05) different. SE=standard error.

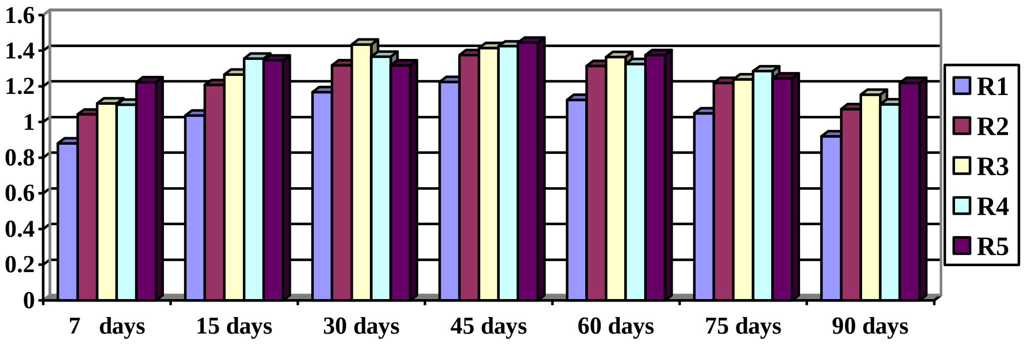

Figure (1): Effect of experimental rations on daily milk yield (biweekly) of goats during suckling period.

Daily milk yield and milk composition:

Daily milk yield (DMY) and milk composition for Zaraibi goats fed the experimental rations are presented in Table (6). Average daily milk yield of all tested rations (R2, R3, R4 & R5) were significantly higher ($P<0.05$) compared with that of control one (R1), being the highest value was occurred with R5 (1.420 kg) followed by R3& R4 (1.398 kg) then R2 (1.332 kg) and lastly the lowest one was occurred with the control R1 (1.156). Similar trend was obtained among dietary treatments respecting daily yield of 4%-FCM. These results might be due to the improvements occurred in metabolic processes in response to the experimental additives. Concerning milk composition, fat and total solids percentages were significant higher with most tested rations than those of control one. Otherwise, mostly the concentrations of protein, lactose, solids not fat and ash almost didn't affected by the tested rations vs. control one. In matching with milk yield, fat yield and protein yield were significant higher for all tested rations than those of control one, with the highest value occurred with R5 respecting fat yield and R4 and R5, respecting protein yield. Similar trend among dietary treatments were observed in respect of yields for lactose, total solids and solids not fat. These increases might be due to essential oils in medicinal herbs which have been developed for using as an alternative for growth promoters and antimicrobial agents which potentially improve the quality of animal products (Abdelnour *et al*., 2018). On unmatched with the present results, Galbat *et al.* (2014) reported that milk yield of dairy goats was slightly higher ($P<0.05$) when supplemented their ration by dried mixture from seeds of four herbal plants compared with that of control group those fed ration free from such supplement. The same authors added that animals fed supplemented rations had higher ($P<0.05$) milk protein, total solid and solid not fat contents than those of control.

Table (6): Effect of experimental rations on daily milk yield, milk composition and milk constituent's yield of goats.

Item	Experimental rations					±SE
	R1	R2	R3	R4	R5	
Daily milk yield, Kg	1.156^{c}	1.332^{b}	1.398^{a}	1.398^{a}	1.420^{a}	±0.021
4% FCM, Kg	0.948^{d}	1.159^{c}	1.241^{bc}	1.277^{ab}	1.336^{a}	±0.030
Milk composition, %:						
Fat	2.80^{c}	3.14^{b}	3.25^{b}	3.43^{ab}	3.60^{a}	±0.107
Protein	2.71^{bc}	2.74^{abc}	2.58^{c}	2.95^{a}	2.85^{ab}	±0.070
Lactose	4.26^{b}	4.30^{ab}	4.49^{a}	4.28^{b}	4.11^{b}	±0.069
Total solids	10.48^{b}	10.90^{ab}	11.02^{a}	11.38^{a}	11.27^{a}	±0.160
Solid not fat	7.78	7.75	7.74	7.90	7.66	±0.104
Ash	0.71	0.72	0.70	0.72	0.70	±0.027
Milk constituents yield, g:						
Fat	32.35^{d}	41.74^{c}	45.46^{bc}	47.91^{ab}	51.17^{a}	±0.002
Protein	31.29^{c}	36.50^{b}	36.02^{b}	41.16^{a}	40.48^{a}	±0.001
Lactose	49.29^{c}	57.30^{b}	62.84^{a}	59.62^{ab}	58.43^{b}	±0.001
Total solids	121.11^{c}	145.18^{b}	154.07^{ab}	158.71^{a}	160.03^{a}	±0.003
Solid not fat	89.95^{c}	103.30^{b}	108.21^{ab}	110.09^{a}	108.86^{ab}	±0.002

a , b and c means in the same row with different superscripts are significantly ($P \leq 0.05$) different. SE=standard error.

Fat correct milk (4%) was calculated according to Gaines (1923) using the following equation: FCM = 0.4* milk yield (kg) + 15.0 *fat yield (kg).

Offspring performance and dam production:

Offspring performance and prolificacy traits of dams fed the experimental rations are presented in Table (7). Results of body weight at birth of kids were slightly increased with all tested rations based on control one. Also, litter size per dam was typically comparable among the dietary treatments except that of R3 group which appeared to be significant higher (1.66) than the rest of treatments. Otherwise, weaning weight, total weight gain and daily gain values of kids were higher significantly with only the two high supplemented rations (R3& R5) than those of control one, while no significant differences in the mentioned items between both R2 & R4 and the control (R1).

Table (7): Effect of experimental rations on offspring performance and dam production.

Item	Experimental rations				
	R1	R2	R3	R4	R5
No. of dam kidded	6	6	6	6	6
No. of kids	8	8	10	8	8
Offspring performance:					
Litter size/dam at birth	1.33^{b}	1.33^{b}	1.66^{a}	1.33^{b}	1.33^{b}
Birth weight	2.67±0.118	2.73±0.118	2.80±0.106	2.78±0.118	2.82±0.118
Weaning weight (90 d)	14.29^{c}±0.350	14.67^{c}±0.350	15.84^{b}±0.313	15.00^{bc}±0.350	16.86^{a}±0.350
Total weight gain	11.62^{c}±0.348	11.94^{c}±0.348	13.04^{b}±0.312	12.22^{bc}±0.348	14.04^{a}±0.348
Average daily gain, g	129.11^{c}±0.004	132.67^{c}±0.004	144.89^{b}±0.003	135.78^{bc}±0.004	156.00^{a}±0.004
Relative improve, %	100	102.83	109.70	105.18	120.88
Dam production:					
Litter weight at birth	3.55^{b}±0.169	3.63^{b}±0.169	4.65^{a}±0.151	3.70^{b}±0.169	3.75^{b}±0.169
Litter weight at weaning	19.00^{c}±0.498	19.51^{c}±0.498	26.29^{a}±0.446	19.95^{c}±0.498	22.42^{b}±0.498
Total litter at weight gain	15.45^{c}±0.497	15.88^{c}±0.497	21.64^{a}±0.444	16.25^{c}±0.497	18.67^{b}±0.497
Average daily gain, g	171.67^{c}±0.006	176.44^{c}±0.006	240.44^{a}±0.005	180.56^{c}±0.006	207.44^{b}±0.006
Relative improve, %	100	102.78	140.13	105.24	121.02

a, b and c means in the same row with different superscripts are significantly ($P \leq 0.05$) different. SE=standard error.

Clearly the highest and favorable values were associated with R5-ration. Similar results related to the birth and weaning weights are reported by Shehata *et al.* (2007) who fed Zaraibi does ration which supplemented with some medicinal herb of chamomile flowers. Study was concluded that pre-partum to weaning supplementation of phytoadditive increased kids growth rates and weaning weights (Mirzaei *et al*., 2011).

Blood parameters:

Results of blood parameters of lactating Zaraibi goats fed the experimental rations are presented in Table (8). Data revealed that the two levels of RDL and LDL had no significant effects on the concentrations of total protein, albumin, globulin, ALT, AST, urea and HDL-c based on control that free from such supplements. The blood parameters are intimately related to the metabolic processes and influenced by the external environment including feeding, climate and management factors. The concentration of total protein was slightly increased with increasing the level of RDL and LDL in rations and these slightly increases might be due to indirect response to protein quality, protein intake of RDL, LDL and essential oils which contain deferent levels of constituents specially 1,8 cineol vital compound. The obtained results are in agreement with those recorded by Hassan and Hassan (2009) who emphasized that medicinal plants used as a feed additives in the rations of lambs might be functioned as an alternative for growth promoters. The same authors added that serum urea N has been related to efficiency of N usage whereas this might be employed as an indicator higher for efficiency utilization of the available nutrients in the diets particularly those related to protein and energy. Results here are in agreement with the findings obtained by Galbat *et al.* (2014) who showed no significant changes in AST, ALT, creatinine and urea levels whereas such results indicated the healthy effect of poly herbal medicinal plants mixture which supplemented to goat's diets. Also, in agreement with the results here, Sahraei *et al.* (2014) showed that the supplementation with rosemary essential oil had no significant effect on plasma concentrations of total protein and albumin. On the other hand, the concentrations of glucose, total lipids, tri-glyceride, total cholesterol and LDL-c in blood plasma were almostly significant decreased with increasing the level of RDL and LDL up to 1% in the tested rations. The obtained results are in agreement with those recorded by Abdel-Azeem *et al.* (2018) who reported that the supplementation of bay laurel leaves into rabbits diets led to a significant decrease in blood plasma glucose, cholesterol, triglycerides, total lipids, low-density lipoproteins, AST and ALT as compared to those of control one. While, Sahraei *et al.* (2014) showed that the supplementation of sheep rations with rosemary essential oil had no effect on plasma concentrations of glucose. The content of TAC was increased significant only with the high level of each RDL and LDL (1%) in the tested rations in comparison with that of control one. Specifically, rosemary oil exhibits an effective antioxidant activity due to its containing of considerable amounts of limonene, α-pinene, camphor, and (Z)-linalool oxide (Jayasena and Jo, 2014). The obtained results are in agreement with those recorded by Basyony and Azoz (2017) who reported that dietary supplementation of bay laurel leaves improved significantly the antioxidant status of doe rabbits during the pregnancy and lactation periods as well as their offsprings. Similarly, Abdel-Azeem *et al.* (2018) showed that bay laurel leaves markedly increased seminal plasma total antioxidant capacity (TAC) for New Zealand White rabbit's bucks. Likewise, plasma total antioxidant capacity was substantially higher in the rabbits receiving bay leaves in their diets compared with those have no receive it (Casamassima *et al.,* 2016). Presumably, Khayyal *et al.* (2021) indicated that the effects of adding either rosemary dry leaves or laurel dry leaves into sheep rations showed no significant differences among treatments in respect of all blood metabolites except for glucose, total lipid, tri-glyceride, total cholesterol and LDL-c which markedly improved with increased the level of RDL or LDL in rations. Also, comparable results had obtained by Elazab *et al.* (2022) who reported that the supplementation of rosemary and ginger essential oils into growing NZW rabbit diets showed a significant decreases in blood plasma glucose, cholesterol, triglycerides, total lipids, low-density lipoproteins, AST and ALT as compared to those of control one. They were added that total antioxidant capacity increased in the plasma of rabbits whose treated with rosemary at dose 0.5% than that of control group. Generally, Galbat *et al.* (2014) reported that supplementation of dried mixture from seeds of four herbal plants into a ration of goats had resulted blood parameters remain within the normal range and that means the addition of such additives had no adverse effect on blood components. In the present study, the reduction in blood cholesterol and triglyceride concentrations of goats, rations which treated with rosemary and laurel dry leaves could be associated with the reduction of hepatic lipid accumulation or the inhibition of the hepatic biosynthesis of cholesterol where these conclusion and explanation have been emphasized recently by (Bahr *et al.,* 2021). Furthermore, on other explanation of cholesterol status where its reduction might be due to the regulating effect of terpene derivatives in the essential oils on sterol regulatory element-binding protein-1c, which lead to decreases transcription and accelerated degradation of HMG-CoA reductase (statins) as the main cholesterol synthesis pathways (Lai *et al.,* 2016 and Bahr *et al.,* 2021). Extra explanation for reducing cholesterol and triglycerides is representing in stimulating the conversion of cholesterol to bile acids which are excreted from the body through the enterohepatic circulation (Jun *et al.*, 2012 and Hu *et al.*, 2015). Definitly Rodrigues *et al.* (2020) reported that each of 100 mg/kg essential oil from rosemary (EORO) could significantly reduce the levels of total cholesterol, triglycerides, and LDL. Consistent with these findings, Aser and AL-Abachi (2021) showed that after 4 weeks of treating rats by 250 mg\kg body weight of bay leave extracts, there was significant decreases in fasting blood glucose, triglyceride, total cholesterol, LDL, VLDL, ALT, AST, alkaline phosphatase, and a significant increases in HDL and body weights. One extra study, laurel plant that have considerably vital compounds could be improved lipid metabolism, enhancing liver and kidney functions, as also reduced triglycerides, cholesterol, and low-density lipoprotein (LDL) cholesterol, and rises the value of high-density lipoprotein (HDL) cholesterol in patients with type 2 diabetes in rats (Al Chalabi *et al*., 2020). Elazab *et al.* (2022) reported that the supplementation of the essential oils of rosemary plant at doses of 0.25 and 0.5% into growing New Zealand White rabbits diets had significantly reduced, the levels of cholesterol in muscle and plasma, as well as triglycerides in plasma hence rosemary essential oils attenuated the oxidant and antioxidant balance in the treated animals.

Table (8): Blood parameters of lactating goats fed the experimental rations.

Item	Experimental rations					±SE
	R1	R2	R3	R4	R5	
Total protein, g/dl	7.14	7.16	7.18	7.15	7.23	±0.083
Albumin, g/dl	3.79	3.77	3.64	3.69	3.71	±0.066
Globulin, g/dl	3.35	3.39	3.54	3.46	3.53	±0.106
ALT, IU/L	22.55	20.24	21.74	20.35	21.57	±1.256
AST, IU/L	45.49	45.62	43.08	43.40	43.29	±1.160
Urea, mg/dl	36.05	35.21	34.54	35.24	34.28	±1.185
Creatinine, mg/dl	1.23^{a}	1.23^{a}	1.03^{b}	1.18^{ab}	1.04^{ab}	±0.062
Glucose, mg/dl	99.90^{a}	83.41^{b}	78.91^{bc}	86.05^{b}	75.33^{c}	±2.561
Total lipid, mg/dl	435.60^{a}	425.80^{ab}	394.67^{ab}	401.67^{ab}	379.00^{b}	±16.42
Tri-glyceride, mg/dl	98.80^{a}	85.55^{b}	80.84^{b}	86.75^{b}	79.74^{b}	±2.481
Total cholesterol, mg/dl	148.22^{a}	134.11^{ab}	131.49^{ab}	132.47^{ab}	127.56^{b}	±5.732
HDL-c, mg/dl	71.56	71.74	72.45	72.02	72.87	±1.256
LDL-c, mg/dl	56.90^{a}	45.26^{ab}	42.88^{ab}	43.10^{ab}	38.74^{b}	±5.420
TAC, mmol	0.819^{b}	0.874^{b}	1.20^{a}	1.01^{ab}	1.15^{a}	±0.084

a, b and c means in the same row with different superscripts are significantly (P≤0.05) different. SE=standard error.

Daily feed intake and feed conversion efficiency:

The measurements of daily feed intake, change of body weight and feed conversion efficiency of experimental rations are presented in Table (9). Results revealed that the final live body weight were insignificantly (P≤0.05) increased with the 0.5 and 1% of RDL and LDL in tested rations (R2 up to R5) in comparison with that of control one (R1), over the whole experimental period. The improvements of body weight for goats fed on all tested rations might be due to the vital compounds in the experimental supplements that considerably compatible with the metabolic process needs for animals. Also, essential oils extracted from these plant species certainly play a role in the in rumen fermentation to improve utilizability of digesta in ruminants (Benchaar *et al.*, 2007) and have antibacterial, antiseptic and antioxidant properties which favorably improving the whole metabolic processes (Lee *et al*., 2004). Concerning feed intake (at pre/ post parturation), the quantities of TDMI, TDNI and TDCPI were somewhat higher in all tested rations (R2 up to R5) than those of control one (R1), and obviously R3 and R5 rations that had 1% RDL or LDL, appeared to be represent the best ones among all the experimental rations. Considerably, this trend of feed intake among the dietary treatments might be attributed to the clear differentiation in palatability between RDL and LDL supplements. Concerning feed conversion measurements, its values were markedly affected by the dietary treatments where improvements were recognised at all tested rations compared with those of control one. Shehata *et al*. (2004) found that adding medicinal herbs such as chamomile had positive effect on daily DM intake during late pregnancy and lactation (suckling, mid and late lactation) periods. Likewise, results obtained by Çabuk *et al.* (2006) indicated that the supplementation of a mixture of herbal essential oils to the diet of broilers could be improved feed conversion ratio. The results of the current study are in harmony with those obtained by Badawi *et al.* (2016) and also by several previous findings which have been showed that adding medicinal plants and herbs to the diets of rabbits, chicks, sheep, cows and buffaloes could be improved their feed intake and nutrient digestibilities (Aboul-Fotouh *et al.*, 1999 and EL-Ayek, 1999), feed conversion (Allam *et al.*, 1999, Aboul-Fotouh *et al.*, 1999, Salem and El-Mahdy, 2001, Hassan and Hassan, 2009, Al Rubaee, 2018 and Khayyal *et al.*, 2021). Previously, many findings proved that the herbal essential oil mixtures might be considering as a potential growth promoter for innovative nutritional management and dependently improving the animal's performance. These could be interpreted that the essential oil and their mixtures could positively working as an activation agent for the intestinal microflora and thus digestibility state accordingly. Abdelhamid *et al.* (2011) reported that during late pregnancy period of lactating goats daily feed intake as % BW and g/ kg $w^{0.75}$ tended to increase with using medicinal herbs (*Rosemarinus officinalls*) as an additive in their rations based on the control ration. The same trend was observed also with daily DM intake during suckling period among the tested treatments especial during mid-suckling period. Abdel-Azeem *et al.* (2018) reported that supplemented diet of bucks with bay laurel leaves could be caused an insignificant positive effect on their body weight; however, feed intake was significantly ($P \leq 0.05$) increased compared with the group of bucks that given the control diet. Such increase in feed intake of group fed diet including bay laurel leaves compared to that of control one might be due to the stimulating effect of bay laurel leaves on the gastrointestinal system by enhancing diet palatability and utilizability. The dietary supplementation of rosemary essential oils improved the growth performance of rabbits and the feed conversion ratio, where these improvements could be due to the effect of essential oils on digestion, absorption, and utilization of dietary nutrients (Abouelezz *et al*., 2019 and Nehme *et al.*, 2021). Furthermore, Khayyal *et al.* (2021) reported that DMI, TDNI and TDCPI were markedly increased with increasing the levels of the two herbs (rosemary & laurel) in the tested rations, based on control one, being the high level (1%) of herbs appeared to be more affecting than the low one on feed intake. Lastly, Elazab *et al.* (2022) reported that supplemented of rosemary essential oil at doses of 0.25 and 0.5% into growing NZW rabbits diets showed a significant increases respecting the final body weight at dose of 0.5% treatment compared with that of control group, while daily feed intake was decreased (P= 0.005). Meanwhile, the feed conversion ratio was improved significantly (P= 0.001) with 0.5% rosemary dose compared to the control group.

Table (9): Effect of experimental rations on daily feed intake and feed conversion efficiency of lactating goats.

Item	Experimental rations					±SE
	R1	R2	R3	R4	R5	
Feed intake, head/day (as fed):						
Pre-partum (one month):						
Live body weight, kg	33.83	34.17	33.67	33.33	33.67	±1.86
CFM, Kg	0.730	0.742	0.737	0.726	0.739	
Berseem (BR), Kg	2.435	2.475	2.455	2.420	2.460	
As DM basis, Kg:						
DMI, Kg	1.217	1.237	1.228	1.210	1.231	
TDNI, Kg	0.797	0.815	0.820	0.801	0.828	
DCPI, Kg	0.109	0.113	0.115	0.112	0.117	
Post-partum (3 months):						
Initial live body weight, kg	26.500	26.667	27.333	28.333	28.333	±1.59
Final live body weight, kg	27.833	28.333	29.167	30.000	30.333	±1.37
CFM, Kg	0.571	0.576	0.593	0.613	0.616	
Berseem (BR), Kg	1.900	1.920	1.980	2.04	2.055	
As DM basis, Kg:						
DMI	0.951	0.960	0.989	1.021	1.027	
TDNI	0.623	0.632	0.660	0.676	0.690	
DCPI	0.0852	0.0880	0.0924	0.0944	0.0975	
Feed conversion efficiency:						
Kg DM / Kg milk (4% FCM)	1.003	0.828	0.797	0.800	0.769	
Kg TDN / Kg milk (4% FCM)	0.657	0.545	0.532	0.529	0.516	
Kg DCP / Kg milk (4% FCM)	0.090	0.076	0.074	0.074	0.073	

Differences within the same row were not significant. *SE=standard error.*

Economic evaluation:

Data of economic evaluation that presented in Table (10) showed that daily feed cost (L.E.) was somewhat increased with increasing the level of both RDL and LDL in the tested rations compared with that of control one. The favorable economic values were occurred with R5, followed by R3 in comparison with the lowest one (R1). Ultimately the whole outcomes were obviously reflected on economic efficiency, where the highest profitability being associated with R3 and R5 and the moderate ones are placed with the R2 and R4-ration, while the lowest values were outputted by R1 ration. The highest economical return and relative economical return (LE) were resulted by feed additives (RDL and LDL) that supplemented at 1% level, compared with those of control one. The present results are in harmony with those recorded by Abdelhamid *et al.* (2011) who reported that improved economic efficiency of dairy Zaraibi goats which fed ration supplemented with *Rosemarinus officinalis additive*. Similarly, Fayed and Azoz (2018) indicated that the bay laurel leaves (*Laurus nobilis* L.) supplementation into the diets of rabbits at different levels had the best economic return over the control diet that free from such supplement. Likewise, Allam and El-Elaime (2020) recorded that supplementing rosemary leaves into the diet of growing lambs had increased markedly the economic efficiency based on the control ration. Moreover, Khayyal *et al.* (2021) reported that economic efficiency was tangibly improved by feeding the tested rations that contained the some herbs, especially with that having 1% laurel dry leaves in comparison with control one and the other tested ones.

Table (10): Effect of experimental rations on economic evaluation of lactating goats.

Item	R1	R2	R3	R4	R5
Economic evaluation:					
Daily feed cost, L.E.	2.90	3.02	3.27	3.42	3.53
Price of daily milk, L.E. (4% FCM)	9.48	11.59	12.41	12.77	13.36
Feed cost / kg milk, L.E. (4% FCM)	3.06	2.61	2.64	2.68	2.64
Economical return, L.E.	6.58	8.57	9.14	9.35	9.83
Economic return improvement, %	100	130.24	138.91	142.10	149.39

Based on prices of the Egyptian market during the experimental period (2020). The price of one ton of CFM, berseem and one kg of rosemary, laurel and raw milk were 4800, 800, 24, 25 and 10 L.E., respectively.

CONCLUSION

In conclusion, rosemary or laurel dry leaves could be used as a natural feed additives in rations of lactating goats with positive effect on nutrient digestibility, some blood parameters, productive performance and economic efficiency, when they adding at 1% level of their concentrate feed mixture portion.

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تأثير بعض الأعشاب الطبية على الأداء الإنتاجي للماعز الزرايبي الحلاب

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تم إختيار ٣٠ أنثي من الماعز الزرايبي في الموسم الثالث والرابع من الرضاعة، وقسمت عشوائيًا إلى خمس مجموعات متشابهة (٦ إناث لكل مجموعة) وفقًا لوزن الجسم الحي (٣٣,٧٥± ٤٢,. كجم) وتم تغذيتها علي العلائق التجريبية لمدة ٤ شهور (شهر قبل الولادة و٣ أشهر بعد الولادة) كفترة تجريبية لبحث تأثير الأعشاب الطبية من أوراق إكليل الجبل أو الغار كإضافات غذائية طبيعية في علائق الماعزعلى قابلية الهضم والأداء الإنتاجي وإنتاج اللبن وبعض مقاييس الدم للماعز. تم إضافة أوراق إكليل الجبل وأوراق الغار الجافة إلي خليط العلف المركز عند مستويات ٠، ٠,٥، ١، ٥, و ١٪ في علائق الماعز طوال مدة التجربة. تم توزيع كل مجموعة عشوائيا لتغذيتها علي إحدي العلائق التجريبية وهي ر١ (الكنترول): ٦٠٪ علف مركز+ ٤٠٪ برسيم طازج (عليقة كنترول)، بينما العلائق المختبرة ر٢ ، ر٣ ، ر٤، ر٥: ٦٠٪ علف مركز+٤٠٪ برسيم طازج+ إضافة أوراق إكليل الجبل وأوراق الغار الجافة إلي خليط العلف المركز عند مستويات ٠، ٠,٥، ١، ٥, و ١٪. تم حساب العلائق وفقا ل NRC (2007) للماعز. كما تم إجراء خمس تجارب هضم لتقييم مدي قابلية الهضم وقيم التغذية للعلائق التجريبية. أشارت النتائج إلي إحتواء التركيب الكيماوي لأوراق إكليل الجبل أوأوراق الغار الجافة علي (٥,٧٨، ٧,٨٦)، (٢١,٠٩، ٢٢,٧٣)، (٧,٨٧، ٨,٠١)، (٥٧,٨٣، ٥٦,٨٤)، (٧,٤٣، ٤,٥٦)٪ لكل من البروتين الخام والألياف الخام ومستخلص الإثير والكربوهيدرات الذائبة والرماد علي التوالي. كان محتوى الزيت العطري في أوراق الغار اكثر من المحتوي الموجود في أوراق إكليل الجبل تقريبا (٢,٦، ٢,٠٪، علي التوالي) وذلك ضمن المستوي الطبيعي المسجل علي نطاق واسع في المراجع. أدي إضافة مستويين من كل من إكليل الجبل والغارإلي تحسن غير معنوي لنتائج معاملات هضم معظم العناصر الغذائية وخاصة عند مستوي ١٪ من أوراق إكليل الجبل مقارنة بمجموعة الكنترول. أدي زيادة مستوي ١٪ من أوراق الغار في العلائق (ر٥) إلي التحسن في هضم جميع العناصر الغذائية مقارنة بالكنترول (ر١). كذلك زيادة قيم التغذية لمجموع المركبات الغذائية الكلية المهضومة المأكولة، المهضوم من البروتين بصورة ملحوظة مع جميع العلائق المختبرة (ر٢ إلي ر٥)، مقارنة بالعليقة الكنترول، قبل الولادة و بعد الولادة. تحسن وزن الجسم الحي والتغير في وزن الجسم للأمهات خلال فترة أواخر الحمل وفترات الرضاعة عند إضافة الأعشاب الطبية المختبرة. أعلي زيادة لإنتاج اللبن كانت في الاسبوع السادس لجميع المعاملات. إرتفاع معدل إنتاج اللبن للأربع علائق مختبرة مقارنة بالعليقة الكنترول بينما أعلي إنتاج كان مع المعاملة ر٥ (١,٤٢٠كجم). وجد اختلافات طفيفة في التركيب اللبن مابين المعاملات بإستثناء محتواة من نسبة الدهن و الجوامد الكلية والتي بدت أعلي معنوية في معظم المعاملات المختبرة مقارنة بالكنترول (ر١). لم يتأثر وزن الجسم الحي للمواليد بشكل كبير بالعلائق التجريبية، في حين كان وزن الفطام ومعدل زيادة الوزن الكلي ومتوسط الزيادة اليومية أعلى بشكل ملحوظ مع المعاملات ر٣ ، ر٥ المختبرة مقارنةً بالمعاملة الكنترول (ر١) والأخرى المختبرة (ر٢، ر٤). لم يلاحظ وجود فروق معنوية بين المعاملات فيما يتعلق بتركيزات البروتين الكلي، الألبومين، الجلوبيولين، وظائف الكبد، اليوريا، الكوليستيرول عالي الكثافة في الدم، بينما انخفضت الدهون الكلية والجلوكوز والدهون الثلاثية والكوليسترول الكلي والكرياتينين والكوليستيرول منخفض الكثافة إلى حد ما مع المعاملات التجريبية خاصة مع المعاملة ر٥ مقارنة مع الكنترول. كما زادت القدرة الكلية لمضادات الأكسدة في بلازما الدم بصورة طفيفة مع انخفاض مستوى كل من أوراق إكليل الجبل (ر٢) والغار (ر٤)، ولكن زاد التحسن مع ارتفاع مستوى أوراق إكليل الجبل (ر٣) والغار (ر٥) مقارنةً بالمعاملة الكنترول (ر١). تحسن المادة الجافة الكلية المأكولة ومجموع المركبات الغذائية الكلية المهضومة المأكولة للعلائق المختبرة ر٢ إلي ر٥ مقارنة بالعليقة الكنترول (ر١) في فترة ما قبل الولادة وبعدها. وقد تحسن العائد الإقتصادي بشكل ملحوظ مع العلائق التي تحتوي على النباتات الطبية وخاصة مع ١٪ من أوراق أكليل الجبل أو أوراق الغار الجافة مقارنة مع الكنترول والعلائق التجريبية الأخري. يمكن الاستنتاج أنه يمكن التغذية على العلائق المحتوية علي أوراق إكليل الجبل أوالغار الجافة (١٪ إضافة الي العلف المركز)، يمكن التوصية بها الماعز الزرايبي الحلاب لما لها من تأثير إيجابي علي الأداء الإنتاجي والحالة الصحية بالإضافة إلي زيادة الربحية.