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Effects of some medical and aromatic plant seeds on growth performance, milk yield and its composition of Rahmani and Chios sheep

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Abstract

The study was carried out to evaluate the effect of dried mixture of four herbal plant seeds as feed additives and some environmental factors on growth performance, milk yield and its composition of Rahmani and Chios sheep. Fifty four pregnant Rahmani and Chios ewes, during the last periods of pregnancy were divided into 3 groups (8 Rahmani and 10 Chios ewes each) using complete random block design. Group2 (G2) and group3 (G3) were supplemented with polyherbal combination at the rate of 3 and 6 g/100kg-1 LBW, respectively. Ewes without polyherbal combination served as a control (CTR). Body weight and ADG of G2 lambs was significantly ($P<0.05$) higher than G1 and control. Variations among genetic groups regarding body weights, TG and ADG were highly significant ($P<0.01$). Male lambs were significantly heavier ($P<0.05$ or $P<0.01$) than female except at birth, male lambs have attained TG heavier ($P<0.01$) than female lambs. There was a significant ($P<0.01$) effect of medical and aromatic plant seeds on colostrum yield at birth, 12, 24 and 36 hours, TMY and ADMY was affected significantly. There were significant difference between the two breeds in the production of milk per week, TMY and ADMY. Sex of lambs had a significant ($p<0.05$) effect on milk produced at the 2nd, 6th, 7th, 8th and 9th weeks of lactation. TMY and ADMY was affected significantly by sex of lambs. TMY and ADMY was ($P<0.01$) greater in ewes rearing twin lambs compared with ewes rearing singles. Colostrum fat and energy was affected ($P<0.05$) by treatments. As well as, milk components except lactose are ($P<0.01$) affected. Colostrum ingredient, except TS were not significantly affected by breed of ewes. TS level significantly increased in colostrum of Chios than Rahmani ewes. The ewe breed had a significant ($P<0.01$) effect on fat, TS, ash, SNF and milk energy. All colostrum components were not significantly affected by age of ewes. But, TS, ash and energy of milk were affected ($P<0.01$) by age of ewes. Milk constituents were affected significantly ($P<0.01$) by different lactation stages. The results of this study indicated that the inclusion of some medical and aromatic plant seeds as feed additives in Rahmani and Chios diet improves growth performance, feed intake and milk yield.

Keywords: medical and aromatic plant seeds, growth performance, milk yield, Rahmani and Chios sheep.

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1. Introduction

Milk production in local sheep breeds is so poor that their offspring are barely sufficient. Improving milk production in local sheep breeds is very important as the growth rates of lambs are affected. Some medicinal and aromatic plants have been found to have an effect on milk production and hence growth rates, herbal feed additive affects improve nutrient utilization and absorption or the stimulation of the immune system. The possible mechanisms of action of herb in the animal for growth promotion include changes in the intestinal microbiota, increased digestibility and nutrient absorption (Maenner *et al.,* 2011) enhanced nitrogen absorption, improvement of the immune response morphological and histological modifications of the gastrointestinal tract and antioxidant activity. Finally herbs can contribute to the nutrient requirements of the animals and stimulate the endocrine system and intermediate nutrient metabolism. Beneficial effects of herbs or botanicals in farm animals may arise from activation of feed intake and secretion of digestive secretions, immune stimulation (Ganguly, 2013), anti-bacterial (Huyghebaert *et al.,* 2011), coccidiostatic (Swiatkiewicz, 2012), anthelmintic, antiviral or anti-inflammatory activity (Muanda *et al.,* 2011) and antioxidant properties (Muanda *et al.,* 2011). Attempts to use the natural materials such as medicinal plants could be widely accepted as feed additives to improve the efficiency of feed utilization and animal's productive performance, several studies showed that adding medicinal plants and herbs to the diets of cows, buffaloes and sheep improved their feed intake, nutrient digestibility and milk production (Allam *et al.,* 1999; Salem and El-Mahdy, 2001). The objective of the present study was to determine the effects of using some medical and aromatic plant seeds as feed additives and some environmental factors on some productive traits such as growth performance of Rahmani and Chios lambs. Comparison between both breeds in terms of milk yield and its composition was also of interest.

2. Materials and methods

This study was carried out at the experimental farm station belonging to the Animal Production Department, Faculty of Agriculture, Al-Azhar University (Assuit Branch), Assiut, Egypt during the period from May/June 2012 to July / August 2013.

2.1 Preparation of herbal supplements

Individual herb was procured from local market and assessing their quality in consultation with ayurvedic practitioners and drug manufacturers. Each herb was pulverized separately. The Polyherbal biostimulator feed additives was prepared after mixing powderized herbs in specific proportion. The Polyherbal supplemen-tation contained 50 % Fenugreek (*Trigonella foenum-Graecum* L.), 30 % Caraway *(Carum carvi* L.*)*, 10 % Fennel (*Foeniculum vulgare*) and 10 % Dill (*Anethum graveolens*). The seeds of medicinal and aromatic plants were crushed and mixed with starch and making capsules, each 1gm contains: 500mg fenugreek, 300mg caraway, fennel 100mg, 100mg dill seeds.

2.2 Animals and experimental design

This study involved data from Rahmani sheep (R) and Chios sheep (C). A total of 54 ewes (24 R and 30 C) were bred and produced 59 lambs (20 R and 39 C) however 59 lambs born alive and 6 lambs died after birth of which 53 were raised to weaning. Animals were housed under semi-open sheds. Ewes were mated for the first time at age of one year and rams at two years. All ewes grazed Egyptian clover (Berseem) during winter and crop residues available besides the green maize (Darawa) during summer plus concentrate mixture at the rate of 0.5 kg/head/day which was gradually increased to 0.750 kg/head/day during late pregnancy and lactation periods. Concentrate mixture contains 140 g crud protein /kg ration. The concentrate pelleted diet contained 68 % ground corn, 15 % wheat bran, 15 % decorticated cotton seed meal, 1.5 % limestone and 0.5 % salt. Fresh water and mineralized salt blocks were freely available all time. At lambing, new born lambs were kept with their dams in lambing pens. Dams were weighted at the 4th day after parturition. Birth weight was recorded within 24 hours from birth to the nearest gram. At the beginning of the second week of suckling period, the lambs were separated from their dams twice daily, each lasted two hours. Lambs were gradually fed on a starter (ground corn 70 %, wheat bran 13 %, soya bean 15 %, limestone 1.5 % and salt 0.5 %), Berseem (*Trifolium alexandrinum*) was available during winter and green maize plants (Darawa) were available during summer. Fifty four pregnant Rahmani and Chios ewes, upon reaching their last trimester (last eight weeks of gestation) were divided into three treatment groups each containing 8 Rahmani and 10 Chios ewes. The incidence of pregnancy in the experimental animals was determined using Real-Time Ultrasound (Karen *et al.*, 2015), then pregnant ewes were transferred to large pens (3m x 5m). Ewes were allocated to one of three dietary treatments in a randomized block design from eight weeks pre-lambing, as well as twelve additional weeks after parturition. The dietary treatments were balanced for ewe live weight, age and physiological condition. The ewes had an average weight of 48 kg (range of 46.5–49.5 kg) prior to the start of the trial. At the time of breeding all ewes were vaccinated and de-wormed. Ewes were maintained on pasture for the first 75 days of pregnancy and on 16% CP alfalfa and concentrate ration between 75 and 110 days of gestation. One week prior to the start of the study, ewes were gradually introduced to the experimental diets. Treatment group1 served as a control group and was fed a CFM and wheat straw according to NRC (1985) requirements (CTR). Treatment group2 was fed CFM + wheat straw + medical and aromatic seeds mixture by 3 g/100 kg live body weight (G_1), and treatment group3 was fed CFM + wheat straw + medical and aromatic seeds mixture by 6 g/100 kg live body weight (G_2).

2.3 Growth performance

Lambs were weighed within one hour of birth and at fortnightly intervals from two weeks of age until weaning. Weights were measured in the morning before feeding. Average daily gain was calculated according to the following equation:

$$ADG = (\text{Finish weight} - \text{Start weight}) / \text{Age (days)}.$$

2.4 Colostrum production

The lambs were separated from their mother after birth; the colostrum yield was determined by hand milking and allowing lambs to suckle the residue of colostrum and calculating the differences between pre-and post-suckling weights of lambs, plus colostrum collected manually, the colostrum yield of each ewe was recorded at 1, 12, 24 and 36 hour after parturition. Colostrum weight was recorded; a 50 ml aliquot was retained and kept in glass vial containing 1 g of potassium dichromate as preservative and stored at - 20°C until required for determination of fat, protein, total solids and solids non-fat.

2.5 Milk yield

Milk yield was recorded at weekly interval starting from the second week of lambing till the 15th week using lamb-suckling technique plus hand milking. Lambs were separated from their mothers at 4.0 p.m on the day before measuring milk production. In the following day, lambs were weighted at 8 a.m., and left to suckle their dams till satisfaction, then reweighed and kept away from their mothers, while the residual milk in the udder of each dam were hand milked and weighted. At 4 p.m., the lambs were weighted again before and after suckling and the residual milk in udder were also hand-milked and weighted. The amount of milk consumed by each lamb in the morning and afternoon was calculated by the difference between weight recorded before and after suckling. To a ewes̕ hand-milked yield (in the morning and afternoon), the daily milk intake by her suckling lambs was added to give an estimate of her 24-hr milk production. The 24-hr milk production per each ewe was multiplied by 7 to give the estimate of weekly milk production. This was carried out each week from parturition to weaning. After weaning all ewes were hand-milked twice daily (8 a.m. and 4 p.m.) and their milk production was measured on one day every week until individual yield dropped below 100 g/day, when milking was terminated.

2.6 Milk composition

Milk samples were collected for chemical analysis during early lactation (1st month), mid lactation (2th month), and late lactation (3nd month) and pooled into one sample per ewe. Acidity and pH were measured. Percentages of fat, ash and protein were determined (Ling, 1956), total solids (B.S.L, 1951), Milk energy values were calculated from the chemical composition using the following equation, according to Economides (1986):

$$\text{Calorific value (Mj/kg)} = 1.94 + 0.43\ x.$$

Where, x = fat %.

2.7 Statistical analysis

All results were statistically analyzed using the general linear model (GLM) procedure of SAS (1996). Treatment, breed, sex, birth type and age of dam were included as main effects in the model. The dependent variables included body weight, average daily gain, colostrum yield, milk yield and composition. Significant differences among individual means were analyzed by Duncan's multiple range tests (Duncan, 1955). Model used for analyzing lamb performance traits, milk yield and its composition was as follows:

$$Y_{ijklmn} = \mu + T_i + B_j + S_k + P_l + A_m + e_{ijklmn}$$

Where: Y_{ijklmn} = studied trait, μ = overall mean, T_i = fixed effect of the i^{th} treatment (i = 1, 2 and 3) where 1= G1 (control), 2=G_1 (treatment2) and 3=G_2 (treatment3)**.,** B_j = fixed effect of the j^{th} breed (j = 1 and 2) where 1= Rahmani and 2= Chios lambs)., S_k = fixed effect of the k^{th} sex of lamb (k =1and 2) where 1= male and 2=female)**.,** P_l= fixed effect of the l^{th} lamb birth type (l =1and 2) where 1=single and 2=twin)**.,** A_m = fixed effect of the m^{th} age of dam (m = 1, 2, 3 and 4) where. 1 = 2yr–old or less, 2 = 2.5 – 3.5 yr–old, 3 = 3.5 – 4.5 yr–old and 4 = $\leq$ 4.5 yr–old or over, e_{ijklmn} = random error particular of the $_{ijklmn}$ *th* observation and assumed to be independently randomly distributed (0 and δ^2).

3. Results and Discussion

3.1 Growth performance of lambs (body weight and daily gain)

Data presented in Table (1) showed the effect of some factors on body weight from birth to weaning of Rahmani and Chios lambs. The results showed that there were significant ($p<0.05$) in body weight differences at birth, at three months and weaning, but it was not significant ($p>0.05$) at one and two months of age. This increase in body weight of treated groups compared with control may be attributed to increased digestion or increased utilization of food. These results are in agreement with those reported by El-Ghousein Safaa (2010) found that addition of Chamomile flowers (CF) or Nigella sativa seeds (NSS) to basal diet improved ($P<0.05$) weaning weight and average daily gain of lambs compared to non-supplemented control diet. The results in the Table (1) show that treatment with medicinal and aromatic plant seeds at a rate of 6gm/100 kg live body weight would improve the daily growth rate (145.71 gm) compared to the control group (134.86 gm/daily) or other group treated with 3gm/100 kg live body weight (137.52 gm/daily). Results in Table (1) showed that the average daily gain (ADG) and total gain of lambs fed with medicinal and aromatic plant seeds at a rate of 6gm/100 kg live body weight was significantly ($P<0.05$) higher than those fed with 3gm/100 kg LBW. This may be due to the higher nutrients digestibility coefficients recorded for the experimental groups than the control group, which led to increase the absorbed nutrient or medicinal plants supplementation may be have stimulating effect on the rumen functions and digestion, and animal fed supplemented medicinal plant ration didn't suffer from the internal parasites which help in increasing efficiency of nutrient utilization and consequently led to more gain. Kraszewski *et al*. (2002) stated that supplements of medicinal plants mixture improved daily body weight gain. Birth weight of Chios was relatively heavier than that the corresponding averages reported by Mousa (1991) (3.06 kg) and Hamdon (1996) (3.25 kg). The differences in birth weights between the findings of this study and those reported in the literature may be attributed to the breed differences in terms of their prenatal of growth potential. Variations among genetic groups regarding body weights were highly significant (P<0.01). Chios lambs had a heavier body weight than Rahmani lambs at 2, 3 months and weaning age. The genotype of the ewe affects early growth of her lambs through her mothering ability and milk yield. These results are in accordance of those reported by Abd-Allah (2012) and Abd-Allah *et al.*, (2012) in different breeds of sheep and their crosses. They found that genetic groups significantly (P<0.01) affected body weight of lambs recorded at different ages. Least square means, standard error and tests of significant for factors affecting average daily gain (g) and total gain are illustrated in Table (1). Genetic groups were significant (P≤0.01) from birth to weaning, Chios lambs had higher average daily gain and total gain than Rahmani lambs, and the difference was highly significant all over the experimental period. From these results it can be noticed that during the period from birth to weaning variations among genetic groups were highly significant (P≤0.01) on ADG and total weight gain. These results are in accordance of those reported by, Hamdon (1996) and Abd-Allah (2005). They observed that genetic group were highly significant (P≤0.01) affected average daily gain. Male lambs were significantly heavier (P<0.05 or P<0.01) than female lambs at all months age except at birth. Body weight of male compared to female lambs was (4.00 vs. 3.88 kg), (8.05 vs. 7.48kg), and (11.53 vs. 10.42 kg), (14.14 vs. 12.81) and (16.96 vs. 15.51 kg) at birth, one, two, three months and weaning age, respectively. Similar results were obtained by Abd-Allah (2009) who found that sex effect on body weight increased in its importance with advance in age. This may be due to increasing the secretion of sex hormones with advance in age. Bata (1982) reported that sex effect on body weight at 8 weeks of age was highly significant. Male lambs had significantly (P<0.01) higher average daily gain compared to females (142.48 vs. 129.8 g/d) from birth to weaning. Male lambs have attained total gain significantly heavier (P<0.01) than female lambs (14.96 vs. 13.63 kg) (Table 1).These results are relatively in agreement with those found by Anilkumar *et al.* (2011). Birth type had a not significant effect on body weight during the period studied (Table 1). Single born lambs have maintained their weight superiority up to weaning and beyond. The results indicated that single lambs generally excelled the twins in their body weight recorded at birth, one, two, three months and weaning age by 0.22, 0.36, 0.6, 0.85 and 0.85 kg, respectively. The same results were reported by Anilkumar *et al*. (2011). This difference arises because of the competition between the twins for their dam's milk and their smaller size at birth (Fall *et al.*, 1982). In this study, lambs born as singles had maintained their weight superiority at birth throughout the study period.

Table (1): Least squire means ± standard errors of some factors affecting body weight and daily gain from birth to weaning of Rahmani and Chios lambs.

Items	Birth weight (kg)	1st month wt. (kg)	2nd month wt. (kg)	3rd month wt. (kg)	Weaning wt. (kg)	ADG (g)	Total gain (kg)
Treatment	*	NS	NS	*	*	*	*
CTR*	3.24 ± 0.16[b]	7.60 ± 0.24	10.80 ± 0.32	12.99 ± 0.40[b]	17.40 ± 0.44[b]	134.86 ± 5.36[b]	14.16 ± 0.51[b]
G1	3.70 ± 0.80[ab]	7.99 ± 0.21	11.00 ± 0.32	13.42 ± 0.46[ab]	18.14 + 0.51[b]	137.52 ± 4.50[b]	14.44 ± 0.45[b]
G2	3.88 ± 0.16[a]	7.70 ± 0.21	11.12 ± 0.37	14.01 ± 0.41[a]	19.18 ± 0.45[a]	145.71 ± 4.45[a]	15.30 ± 0.45[a]
Breed of lambs	**	NS	**	**	**	**	**
Rahmani	4.25 ± 0.19[a]	7.76 ± 0.19	10.21 ± 0.29[b]	12.27 ± 0.37[b]	16.78 ± 0.41[b]	119.33 ± 5.07[b]	12.53 ± 0.41[b]
Chios	3.63 ± 0.11[b]	7.77 ± 0.15	11.74 ± 0.24[a]	14.68 ± 0.30[a]	19.70 ± 0.34[a]	153.05 ± 3.21[a]	16.07 ± 0.34[a]
Sex of lambs	NS	*	**	**	**	**	**
Male	4.00 ± 0.13	8.05 ± 0.16 [a]	11.53 ± 0.22[a]	14.14 ± 0.30[a]	18.96 ± 0.34[a]	142.48 ± 3.62[a]	14.96 ± 0.34[a]
Female	3.88 ± 0.15	7.48 ± 0.18 [b]	10.42 ± 0.28[b]	12.81 ± 0.36[b]	17.51 ± 0.40[b]	129.81 ± 4.11[b]	13.63 ± 0.39[b]
Type of birth	NS	NS	NS	NS	NS	NS	NS
Single	4.05 ± 0.11	7.86 ± 0.14	11.13 ± 0.22	13.70 ± 0.28	18.45 ± 0.31	137.14 ± 2.96	14.40 ± 0.31
Twins	3.83 ± 0.19	7.50 ± 0.26	10.53 ± 0.39	12.85 ± 0.49	17.60 ± 0.56	131.14 ± 5.39	13.77 ± 0.57
Age of dam	NS	NS	NS	NS	NS	NS	NS
> 2 year	3.88 ± 0.14	7.51 ± 0.30	10.55 ± 0.29	13.10 ± 0.37	17.90 ± 0.41	133.52 ± 6.73	14.02 ± 0.66
2.5 – 3.5 year	4.16 ± 0.25	7.88 ± 0.19	11.45 ± 0.47	13.88 ± 0.59	19.27 ± 0.66	143.90 ± 3.92	15.11 ± 0.41
3.5 – 4.5 year	4.16 ± 0.22	7.70 ± 0.26	10.51 ± 0.40	13.23 ± 0.51	17.64 ± 0.55	128.38 ± 5.75	13.48 ± 0.55
> 4.5 year	3.56 ± 0.19	7.96 ± 0.26	11.38 ± 0.41	13.69 ± 0.51	18.14 ± 0.56	138.85 ± 5.61	14.58 ± 0.56

Total gain (kg) = (weaning weight- Birth weight), ADG= (weaning weight- birth weight/105 day) x1000, *= ($P<0.05$), ** = ($P<0.01$), NS = ($P>0.05$), [a, b]: Means within the same classification followed by different letters differ significantly ($P<0.05$), CTR= control group.

Several workers reported similar effect of type of birth on body weight at different ages Morsy (2002) and Mandal *et al* (2003). Average daily gain of single born lambs was higher than twin born lambs from birth to weaning, while the difference was not significant. This confirms the influence birth type on birth weight and subsequent growth performance of lambs. These results are in agreement with those reported by Morsy (2002). The effect of age of dam on body weights from birth to weaning was not significant. Least square means for age of dam in Table (1) showed that lambs born by ewes of 2 year old or less were lighter at different ages, while lambs born by ewes of 4.5 year–old or less were higher at birth than those born by ewes of 4.5 years–old or more. But the differences were not significant. These results agree with those reported by Hassan and EL–Feel (1988) found that age of dam was not significant on lambs' body weight at all periods studied. Age of dam had no significant effect on total gain and average daily gain of lambs during the period from birth to weaning. Lambs born from ewes of 2.5 to 3.5-year old had a faster pre-weaning growth rate than those born from younger or older ewes. These results may be attributed to the strong influence of the mothering ability of the dams on their offspring before weaning, as they greatly depended on their dams milk yield. The present results are in agreement with results of Barghout and Abd El-Aziz (1986) reported that the effect of age of dam on daily gain of lambs was not significant.

3.2 Colostrum and milk yield and its composition

Tables (2, 3, 4 and 5) shows least squares means and standard errors for Colostrum and milk yield and its composition as influenced by treatments, ewe breed, sex of lambs, type of birth and age of dam.

3.2.1 Colostrum and milk yield

According to the effect of medical and aromatic plant seeds on colostrum and milk yield which are shown in Tables (2 and 3), the following important points can be observed: There was a significant increase ($p<0.01$) in colostrum yield between control and treated groups at birth, 12, 24 and 36 hours after parturition. There was a significant ($P<0.01$) effect of medical and aromatic plant seeds on total milk yield during the experimental period between control and treated groups. The least square mean for milk yield of lactating ewes is presented in Table 3. Milk record was done for 15 consecutive weeks, The average total milk yield (Kg/h) and average daily milk yield (g/h/d) for animals in control, G1 and G2 groups were 53.59±1.86, 73.20±1.58 and 74.63±1.75 kg/h and 510.4±17.7, 697.2±15.1 and 710.7±16.7 g/h/d, respectively. The animals in group G2 recorded slightly higher milk yield than G1 group. But, the difference between G1 and G2 was not significant. The superiority percentage of G1 and G2 groups over control group in milk production was positive and equal to 36.6 and 39.3 %, respectively. There was a significant different ($p<0.01$) among treated groups in milk yield which increased by increasing medical and aromatic plant seeds levels from 3 g/100kg LBW to 6 g/100kg LBW compared with control group. Herbal preparations could help in optimizing ruminal fermentation, thus increasing the nutrients available for milk production. In order to restore animal productivity and to optimize milk production in individual animals for better profits, medical plant seeds have been used as a galactagogue for lactating ruminants (El-Saadany *et al.,* 2008). This improvement in milk production can be attributed to better udder health and hormonal changes towards galactopoisis. The results in Table (2 ad 3) indicate that there were no significant differences between the two breeds in the amount of colostrum produced after parturition, while there were significant (P<0.01 or P<0.05) differences between the two breeds in the production of milk per week, total milk yield (TMY) and average daily milk yield (ADMY) as shown in the Table (3). Chios ewes had greater (P<0.01) average daily milk yield, and total milk yield than Rahmani ewes.

Table (2): Least squire means ± standard errors of some factors affecting colostrum yield in Rahmani and Chios ewes.

Items	At birth (g)	12 hour (g)	24 hour (g)	36 hour (g)	Total Colostrum (kg)
Treatment	**	**	**	**	**
CTR	162.3 ± 41.4^{b}	218.3 ± 38.7^{b}	297.9 ± 46.3^{b}	356.9 ± 44.5^{b}	1.04 ± 0.16^{b}
G1	257.7 ± 24.9^{b}	366.2 ± 23.3^{a}	472.1 ± 27.9^{a}	574.1 ± 26.7^{a}	1.67 ± 0.09^{a}
G2	323.6 ± 26.7^{a}	412.0 ± 25.0^{a}	514.1 ± 29.9^{a}	606.2 ± 28.7^{a}	1.86 ± 0.10^{a}
Breed of ewes	NS	NS	NS	NS	NS
Rahmani	251.9 ± 25.7	337.3 ± 24.1	441.02 ± 28.8	530.35 ± 27.6	1.56 ± 0.09
Chios	243.8 ± 20.0	327.1 ± 18.7	415.04 ± 22.4	494.42 ± 21.5	1.48 ± 0.08
Sex of lambs	NS	NS	NS	NS	NS
Male	251.9 ± 20.3	324.7 ± 19.0	416.4 ± 22.7	499.4 ± 21.8	1.50 ± 0.08
Female	243.8 ± 24.7	339.7 ± 23.1	439.7 ± 27.6	525.3 ± 26.5	1.55 ± 0.09
Type of birth	NS	NS	NS	NS	NS
Single	222.4 ± 36.8	300.4 ± 34.5	404.1 ± 41.2	490.8 ± 39.6	1.42 ± 0.14
Twins	273.3 ± 14.9	363.9 ± 13.9	451.9 ± 16.7	533.9 ± 16.0	1.62 ± 0.06
Age of ewes	NS	NS	NS	NS	NS
> 2 year	285.1 ± 44.0	376.1 ± 41.2	464.5 ± 49.2	543.6± 47.2	1.67 ± 0.17
2.5 – 3.5 year	280.8 ± 22.2	356.5 ± 20.8	466.7 ± 24.9	548.8 ± 23.9	1.65 ± 0.08
3.5 – 4.5 year	205.7 ± 42.2	304.8 ± 39.5	398.7 ± 47.2	491.5 ± 45.4	1.40 ± 0.16
> 4.5 year	219.8 ± 40.4	291.3 ± 37.9	382.2 ± 45.3	465.7 ± 43.5	1.36 ± 0.15

*= (P<0.05), **= (P<0.01), NS= (p>0.05). ^{a,b} Means within the same classification followed by different letters differ significantly (P<0.05)

Rahmani ewes produced 580.1 g daily and 60.90 kg, while Chios ewes produced 698.84 g daily and 73.38 kg in 105 days, respectively. The differences between breeds were highly significant (P<0.01). The present figure of Chios was lower than that reported by Mousa (1991) who found that TMY and LL were 143.2 kg in 142 days. These results may be attributed to inbreeding in Chios flock from 1988 till now and nutritional requirements recommended by APRI (2000) were not suitable. Hamdon (2005) reported that breed differences in TMY and LL were highly significant (P<0.01). Through the weekly recorded of milk output, it is clear that Rahmani and Chios ewes reached maximum yield at sex weeks of lactation (6.86 kg/week for Rahmani and 8.55 kg/week for Chios). After attaining the peak, milk yield decreased gradually till the end of the lactation period. The same trend was reported by Morsy (2002). Mousa (1991) and Hassan (1995) reported that after the peak, lactation declines more or less rapidly depending on the breed.

The amount of colostrum produced after birth up to 35 hours was not significantly affected by the sex of lambs (Table 2), while the sex had a significant (p<0.05) effect on the amount of milk produced at the 2nd, 6th, 7th, 8th and 9th weeks of lactation, also had a highly significant (P<0.01) effect at 5th weeks of lactation. Total milk yield and average daily milk yield was affected significantly by sex of lambs (Table 3). The same results were reported by Wohlt *et al.* (1981) found that ewes suckling single female offspring produced similar quantities of milk to ewes suckling single male offspring. Least square means and standard error of average daily milk and total milk yield in Rahmani and Chios ewes rearing single or twin lambs are shown in Tables (2 and 3). Birth type affected (P<0.01) average daily milk yield and total milk yield. Average daily milk was greater (P<0.01) in ewes rearing twin lambs (716.48 g/day) compared with ewes rearing singles (572.67 g/day). Total milk yield was greater (P<0.01) in ewes rearing twin lambs (75.23 kg) compared with ewes rearing singles (60.13 kg). These results attributed to the ability of twin lambs to empty the udder of their dams completely especially of the early lactation period. More frequent sucklings were observed by twins compared to single lambs. Similar results were reported by Hassan (1984) who found that the differences due to type of birth were highly significant. However, Hassan (1995) indicated that ewes rearing twins produced more milk (74.8 kg) than those reared single lambs (71.2 kg), during 138 days and 136 days, respectively. Similar results were obtained by Hamdon (2005). The effect of age of dam on colostrum yield, milk yield at different weeks, average daily milk yield and total milk yield was not significant (Tables 2 and 3), Except for milk yield produced at 10th, 11th and 12th weeks where the effect was significant.

Table (3): Least squire means and their standard error of some factors affecting milk yield at different weeks of lactation in Rahmani and Chios sheep.

Items	1st week	3rd week	5th week	7th week	9th week	11th week	13th week	15th week	TMY	ADMY
Treatment	**	**	**	**	**	**	NS	**	**	**
CTR	2.95 ±0.11^{c}	3.91 ±0.19^{b}	4.78 ±0.34^{b}	5.04 ±0.23^{b}	3.93 ±0.12^{b}	3.15 ±0.12^{b}	1.77 ±1.21	1.47 ±0.11^{b}	53.6 ±1.86^{b}	510.4 ±17.7^{b}
G1	3.56 ±0.10^{a}	4.91 ±0.16^{a}	7.65 ±0.29^{a}	6.91 ±0.19^{a}	5.50 ±0.10^{a}	4.29 ±0.10^{a}	2.62 ±1.03	1.87 ±0.10^{a}	73.2 ±1.58^{a}	697.2 ±15.1^{a}
G2	3.09 ±0.11^{b}	5.05 ±0.18^{a}	7.08 ±0.32^{a}	7.37 ±0.22^{a}	5.62 ±0.11^{a}	4.19 ±0.11^{a}	4.87 ±1.14	1.48 ±0.11^{b}	74.6 ±1.75^{a}	710.7 ±16.7^{a}
Bread of ewes	NS	**	**	**	**	**	NS	*	**	**
Rahmani	3.13 ±0.08	4.28 ±0.14^{b}	6.01 ±0.25^{b}	5.89 ±0.17^{b}	4.61 ±0.09^{b}	3.47 ±0.08^{b}	2.36 ±0.89	1.49 ±0.08^{b}	60.9 ±1.37^{b}	580.1 ±13.0^{b}
Chios	3.28 ±0.07	4.97 ±0.13^{a}	7.50 ±0.23^{a}	6.98 ±0.16^{a}	5.42 ±0.08^{a}	4.27 ±0.08^{a}	3.82 ±0.81	1.72 ±0.07^{a}	73.4 ±1.24^{a}	698.8 ±11.8^{a}
Sex of lambs	NS	NS	**	*	*	NS	NS	NS	*	*
Male	3.36 ± 0.19	4.82 ± 0.22	7.83 ± 0.22	6.86 ± 0.19	5.57 ± 0.16	4.00 ± 0.14	3.76 ± 0.14	1.75 ±0.09	72.8 ±2.02	693.3 ±14.9
Female	3.06 ± 0.22	4.42 ± 0.25	5.68 ± 0.25	6.02 ± 0.22	4.46 ± 0.18	3.76 ± 0.16	2.43 ± 0.16	1.47 ±0.12	61.7 ±1.97	587.6 ±19.3
Type of birth	**	**	*	**	**	**	**	NS	**	**
Single	2.68± 0.15	4.11± 0.17	6.82± 0.17	5.94± 0.15	4.11± 0.12	3.31± 0.11	2.70± 0.11	1.50±0.09	60.13±1.37	572.7 ±14.9
Twins	3.74± 0.30	5.14± 0.34	7.69± 0.35	6.94± 0.31	5.93± 0.25	4.45± 0.23	3.49± 0.21	1.72±0.12	75.23±1.97	716.5 ±13.1
Age of ewes	NS	NS	NS	NS	NS	**	NS	NS	NS	NS
> 2 year	3.47±0.15	4.68±0.25	6.46±0.45	6.09±0.30	4.72±0.16	3.69±0.15^{b}	1.08±1.59	1.50 ±0.15	63.7 ±2.45	606.8 ±23.4
2.5 – 3.5 year	3.15±0.09	4.72±0.16	6.43±0.28	6.64±0.19	5.22±0.10	4.15±0.09^{a}	4.25±1.01	1.63 ±0.09	69.6 ±1.56	662.8 ±14.9
3.5 – 4.5 year	3.11±0.12	4.70±0.21	7.20±0.37	6.49±0.25	5.19±0.13	3.89±0.13^{ab}	3.56±1.31	1.61 ±0.12	68.8 ±2.02	655.1 ±19.3
> 4.5 year	3.08±0.12	4.40±0.20	6.92±0.36	6.54±0.25	4.94±0.13	3.75±0.12^{ab}	3.45±1.28	1.64 ±0.12	66.5 ±1.97	633.1 ±18.8

*= (P<0.05), **= (P<0.01), NS= (p>0.05). ^{a,b} Means within the same classification followed by different letters differ significantly (P<0.05).

However, ewes aged (2.5-3.5 years) give relatively higher milk yield (69.59 kg) than younger or older ones. Ewes aged (>2 years old) gave the lowest milk yield (63.71 kg), followed by the last group aged (>4.5 year old or more). These results are in general agreement with Mousa (1991) who reported that there were no detectable effects of age of dam on either suckled or total milk production.

3.2.2 Colostrum and milk composition

Tabulated representatives of colostrum and milk constituents has been presented in tables (4 and 5), the average fat % content of colostrum for ewes in control group, G1 and G2 was 9.367±0.504, 10.13±0.47 and 12.17± 0.78, respectively. The variation in fat content was statistically significant ($P<0.01$) among the treatment groups. The significant effect of colostrum fat is similarly followed by a significant effect ($P<0.05$) on energy. Other components of colostrum, such as total solids, ash and solid not fat were not significantly affected by the supply of medicinal and aromatic plant seeds (Table 4). Khattab *et al.* (2001) investigated the effect of using *Nigella sativa* oil in dairy buffaloes (at the final stage of pregnancy) and showed higher total fat, total protein and ash content in the colostrum of the treated group of animals compared to the control group, while lactose values were nearly similar in the two groups. All milk components are significantly ($P<0.01$) affected by the supply of medicinal and aromatic plant seeds, except milk content of lactose (Table 5). Average protein% content in milk were 4.22, 4.52 and 4.48 in control group, G1 and G2, respectively with highly significant ($P<0.01$) differences among the groups. Fat percentage data in milk (Table5) shows that during supplementation and post supplementation period, fat % was slightly higher in G1 (5.79), followed by G2 (5.78), compared to control group (5.45). These results suggest that in addition to galactopoietics effect polyherbal supplementation also improved fat %, but as fat % is inversely proportional to milk production, therefore at higher supplementation rate fat improving property was offset by galactopoietics effect. Similarly, energy was associated with an increase in fat %. It was also observed that there were significant ($P<0.01$) differences in the percentage of total solids, ash and SNF between the treated groups and the control group, there was an increase in the percentage of these components in the treated groups compared to the control group. The results were in conformity with the findings of Kumar (2009), reported improvement in fat % of cows supplemented during pre and post-partum period. Aboul–Fotouh *et al.* (2000) studied the effects of *Cymbopogon citratus* + *Eucalyptus globulus*, *Achillea millefolium*, *Cymbopogen citrates* and *Eucalyptus globulus*, as feed additives in the rations of Egyptian lactating buffaloes. Results indicated that milk yield and 4% FCM were significantly higher with medicinal plants supplemented diets compared to the control. Also, the yield of milk components (SNF, fat, protein and lactose) were higher with medicinal plants diets than the control. Mirzaei *et al.* (2012) showed that milk protein and fat were higher in dairy goats fed diets with polyherbal biostimulator feed additives containing *Nigella sativa*, *Asparagous racemosous, Cuminum cyminum, Leptadenia reticulate* and *Pueraria tuberose*, when compared to the control group.

Table (4): Least squire means ± standard errors of some factors affecting chemical composition of colostrum in Rahmani and Chios ewes.

Item	Protein	Fat	Ash	TS	SNF	Energy
Treatment	NS	**	NS	NS	NS	*
CTR	14.39 ±0.57	9.367±0.50[b]	2.33 ± 0.20	30.73 ±1.28	21.37 ± 1.44	5.97 ± 0.22[b]
G1	15.17 ±0.53	10.13±0.47[ab]	2.04 ± 0.19	33.35 ±1.19	23.22 ± 1.34	6.29 ± 0.20[ab]
G2	14.57 ±0.89	12.17±0.78[a]	2.09 ± 0.31	35.10 ±1.98	22.92 ± 2.23	7.18 ± 0.34[a]
Breed of ewes	NS	NS	NS	*	NS	NS
Rahmani	14.53 ±0.55	10.1 ±0.49	2.06±0.20	31.78 ±1.23[b]	21.66 ±1.38	6.29 ±0.21
Chios	14.89 ±0.43	11.0 ±0.38	2.24±0.15	34.34 ±0.96[a]	23.34 ±1.07	6.67 ±0.16
Age of dam	NS	NS	NS	NS	NS	NS
> 2 year	15.31 ±0.94	8.79 ±0.83	2.15 ± 0.33	30.01 ± 2.11	21.21 ± 2.37	5.72 ± 0.36
2.5 – 3.5 year	14.78 ±0.48	9.77 ±0.42	2.24 ± 0.17	33.99 ± 1.06	24.22 ± 1.20	6.14 ± 0.18
3.5 – 4.5 year	14.46 ± 0.90	11.9 ± 0.80	1.97 ± 0.32	34.16 ± 2.02	22.24 ± 2.27	7.07 ± 0.34
> 4.5 year	14.30 ± 0.87	11.7 ± 0.76	2.24 ± 0.31	34.07 ± 1.94	22.33 ± 2.18	6.99 ± 0.33

*= (P<0.05), **= (P<0.01), NS= (p>0.05). [a,b] Means within the same classification followed by different letters differ significantly (P<0.05).

It is clear, Table 4, that colostrum ingredient, except total solids, were not significantly affected by breed of ewes. Consequently, energy did not differ significantly in response to breed of ewes. Total solids was significantly (P<0.05) affected by breed, where TS level significantly increased in colostrum of Chios than Rahmani ewes (Table 4). These results correspond to the results obtained by CsapÓ *et al.* (2011) working on different dairy cow breeds, they reported that there were not notable differences between breeds regarding the dry matter, crude protein, and amino acid content of colostrum samples obtained on the first, third, and fifth days of lactation. The chemical composition of the milk produced from the Chios and Rahmani sheep is shown in Table (5). Protein and lactose were not significantly affected by breed variation. The percentage of fat, TS, ash, SNF and milk energy were 5.77, 15.38, 0.78, 9.61 and 4.42, respectively for Rahmani ewes, while those of Chios ewes were 5.58, 15.15, 0.8, 9.57 and 4.34 , respectively (Table, 5). The ewe breed had a significant (P<0.01) effect on the percentage of these components. Hamdon (2005) reported significant differences among breeds regarding percentage fat. On the other hand, Hassan (1995) found that differences among genotypes in fat % were not significant. Ploumi, *et al.* (1998) found that the SNF % ranged between 6.81–13.9 % for Chios milk. In contrast, Hassan (1995) showed that the SNF% was 12.12 and 12.34 % for Ossimi and Saidi milk, respectively, but the breed difference was not significant. Protein percentage, total solids, acidity, pH and ash were not significantly affected by breed. These results agree with those of Maharem (1996) on Awassi and Barki ewes, showed that genotype differences were non-significant. Also, Morsy (2002) found that ewe breed had no significant effect on protein percentage of milk for Chios, Ossimi and their crosses. The higher milk energy of Rahmani ewes were due to their higher fat percent. The same results were reported by Morsy (2002) on Chios and Ossimi ewes and Hamdon (2005) on Chios and Farafra ewes. Least squire means and standard error of colostrum constitutes as affected by ewe age illustrated in Table (4), all colostrum components were not significantly affected by age of ewes. It was noted that there were slight differences in the proportions of these components according to the age of ewes. Similar results obtained by Abd-Allah (2013) on primiparous and multiparous Rahmani ewes, found that no significant differences in the chemical composition of the colostrum due to parity. The results in Table (5) indicate that, some milk components were not significantly affected by the age of ewes such as protein, lactose and solid not fat (SNF). While other components such as fat, T.S, ash and energy were significantly (P<0.01) affected by age of ewes. Fat percentage was lower (P<0.01) in older ewes compared with that of younger ewes. These results may be attributed to negative association between milk production and fat percentage, where ewes at this age produced high milk than other groups. The same trend was observed with milk energy, where milk energy was low (P<0.05) in ewes aged (≤5yr-old) compared with younger ewes. On the other hand, no significant differences were observed of ewe age on percentage of TS, SNF, protein, acidity, PH and ash. Hassan (1995) reported that age of ewe had no significant effect on fat, TS and SNF percentage.

Table (5): Least squire means and their standard error of some factors affecting milk composition from Rahmani and Chios ewes.

Item	Protein	Lactose	Fat	Ash	TS	SNF	Energy
Treatment	**	NS	**	**	**	**	**
CTR	4.22 ± 0.02^b	4.38 ± 1.22	5.45 ± 0.02^b	0.73 ± 0.005^b	14.78 ± 0.03^b	9.33 ± 0.01^b	4.28 ± 0.01^b
G1	4.52 ± 0.02^a	4.36 ± 1.18	5.79 ± 0.02^a	0.83 ± 0.005^a	15.50 ± 0.03^a	9.72 ± 0.01^a	4.43 ± 0.01^a
G2	4.48 ± 0.02^a	4.43 ± 1.22	5.78 ± 0.02^a	0.82 ± 0.005^a	15.51 ± 0.03^a	9.72 ± 0.01^a	4.43 ± 0.01^a
Breed of ewes	NS	NS	**	**	**	*	**
Rahmani	4.41 ± 0.01	4.42 ± 1.02	5.77 ± 0.02^a	0.78 ± 0.004^b	15.38 ± 0.02^a	9.61 ± 0.01^a	4.42 ± 0.01^a
Chios	4.40 ± 0.01	4.37 ± 0.92	5.58 ± 0.02^b	0.80 ± 0.004^a	15.15 ± 0.02^b	9.57 ± 0.01^b	4.34 ± 0.01^b
Age of dam	NS	NS	**	**	**	NS	**
> 2 year	4.44 ± 0.02	4.28 ± 1.67	5.73 ± 0.03^a	0.79 ± 0.007^a	15.24 ± 0.04^a	9.60 ± 0.02	4.40 ± 0.01^a
2.5 – 3.5 year	4.38 ± 0.02	4.43 ± 1.11	5.70 ± 0.02^a	0.78 ± 0.004^b	15.29 ± 0.03^{ab}	9.60 ± 0.01	4.39 ± 0.01^a
3.5 – 4.5 year	4.39 ± 0.02	4.38 ± 1.44	5.62 ± 0.03^b	0.79 ± 0.006^a	15.18 ± 0.03^c	9.56 ± 0.02	4.35 ± 0.01^b
> 4.5 year	4.39 ± 0.02	4.50 ± 1.46	5.65 ± 0.03^a	0.80 ± 0.006^a	15.34 ± 0.03^b	9.61 ± 0.02	4.37 ± 0.01^a
Lactation stage	**	NS	**	**	**	**	**
1st period	4.29 ± 0.02^c	4.45 ± 1.14	5.53 ± 0.02^c	0.77 ± 0.005^b	15.04 ± 0.03^c	9.51 ± 0.01^c	4.32 ± 0.01^c
2nd period	4.35 ± 0.02^b	4.45 ± 1.14	5.60 ± 0.02^b	0.78 ± 0.005^b	15.18 ± 0.03^b	9.58 ± 0.01^b	4.35 ± 0.01^b
3rd period	4.56 ± 0.02^a	4.30 ± 1.14	5.88 ± 0.02^a	0.82 ± 0.005^a	15.56 ± 0.03^a	9.68 ± 0.01^a	4.47 ± 0.01^a

1st period (from birth to 40 days after parturition); 2nd period (from 40 days to 80 days after parturition); 3rd period (from 80 days after parturition to weaning), *= (P<0.05), **= (P<0.01), NS= (p>0.05). [a,b] Means within the same classification followed by different letters differ significantly (P<0.05).

The variations in milk protein, lactose, TS, fat, SNF, and ash contents in different lactation stages are presented in Table (5). Milk protein (%) was found to be significantly (*P*<0.01) higher in the late (4.56) stage than the mid (4.35) and early lactation stage (4.29). Milk fat content (%) was found to be significantly (*P*<0.01) lower in the early (5.53) and mid lactation (5.60) stages than the late lactation stage (5.88). The content of TS, ash and SNF was found to be significantly (*P*<0.0) higher in the late lactation (15.56, 0.82 and 9.68) stage than the early (15.04, 0.77 and 9.51) and mid lactation (15.18, 0.78 and 9.58) stages. In contrast, the content of lactose (4.45 to 4.30 %) did not vary significantly among the different lactation stages. A significant effect of lactation stage on TS and fat content was comparable with the previous findings in buffalo (Şekerden, 1999). The highest TS and fat contents were found in the late lactation stage, which might be due to low milk yield. The results indicated that the variation in TS was actually influenced by the variation in milk fat. In the present study, lactose content did not vary significantly throughout the lactation. Lactose is the main determinant of milk volume. A close relationship between lactose synthesis and the amount of water drawn into milk makes lactose a stable milk component (Pollott, 2004).

4. Conclusions

The results of this study indicated that the inclusion of some medical and aromatic plant seeds as feed additives in Rahmani and Chios diet: - Improves growth performance, feed intake and milk yield. From the results obtained, it could be concluded that supplementing lactating ewes' diets with medicinal plant is highly recommended as a new step in the field of animal production in Egypt for improving productive performance of lactating ewes, regarding milk yield and composition.

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