

EFFECT OF ADDING A MIXTURE OF GROUND MEDICINAL PLANTS TO THE DIETS OF SUCKLING LAMBS ON THEIR PERFORMANCE.

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SUMMARY

The present study was conducted to investigate the effect of using mixture of ground *Eucalyptus globules* leaves, *Nigella sativa* and chamomile flower as natural feed additives, on lambs health and performance. For this purpose, Twenty four newly born lambs were randomly divided into three groups; their weights were recorded at birth then each two weeks interval. Lambs in the groups were left to suckle their mothers, in addition to one of the experimental creep diets (as creep feeding), which the first group (G1) fed diet without medicinal plants mixture (MPM) and serves as a control diet, second group (G2) fed diet contains 0.5% MPM, and the third group (G3) fed diet contains 1.0% MPM. The creep diets were offered daily started at 7th days of age until weaning. Blood samples were taken at 7 and 60 days of age. The results showed that glucose level was high at 7 days of age and decreased at 60 days of age in different groups. Blood serum glucose concentration was significantly lower ($P \leq 0.05$) for the groups received creep diets supplemented by MPM (G2 and G3) compared to the control group (G1), which the values represent 63.24 and 73.75 % for G2 and G3 versus G1. Insignificant differences ($P > 0.05$) were observed in serum total protein, albumin, globulin and A/G ratio, also insignificant differences ($P > 0.05$) were observed in serum urea-N concentration and enzymes activity of ALT and AST as well as triiodothyronin (T3). On the contrary, significant increased ($P \leq 0.05$) was noticed in weaning weight, total gain and average daily gain for the group received creep diets contain 0.5 % MPM (G2) compared to the control group (G1), while insignificant increased ($P > 0.05$) for G2 compared to the group received creep diet containing 1% MPM (G3). It could be concluded that adding medicinal plants mixture to creep feeding diets improves suckling lambs' performance without any side effects on physiological body function of lambs.

Keywords: *suckling lambs, medicine plants mixture, growth, serum constituents*

INTRODUCTION

The most limiting factors affect newly born lambs growth, the gap between the lambs' nutrient requirements and the amount of nutrients supplied by milk and pasture, which tends to increase especially in flocks cases and the incomplete immune system of lambs, which suffering from pathogenic microbes and internal and external parasites. The nursing lambs' requirements increased as age and weight increased, and ewe milk is not enough as the major source of nutrition. It is more efficient to feed the lamb directly than to feed the ewes for milk production. Therefore, the creep feeding helps in supplementing mothers milk, Saleh et al. (2002).

Young lambs are very sensitive to what they eat, and will not consume stale or contaminated feed. The principle behind creep feeding is to stimulate lambs to eat and promote weight gain. Natural feed additives are important materials that can improve animal performance. Singh et al. (1993) stated that using medicinal herbs and seeds as feed additives for ruminants seemed to be a recent global trend. *Eucalyptus globulus* leaves contain essential oils used as an antiseptic, antispasmodic and stimulant agent in bronchitis, asthma and minor respiratory complaints and the flowers of chamomile or their tea are used in treat stomach and gastro-intestinal disorders, and as anti-inflammatory, antispasmodic, ulcer-protective, calmativ, carminative, tonic and stimulant Mahran, (1967), Abou Zeid, (1992), El-Amary, (1993) and Juergens et al. (2003). Moreover Hmamouchi et al. (1992), Medina et al. (1992 and 2001) and Trivedi and Hotchandani (2004) found that *Eucalyptus globulus* oil has antibacterial activities against 9 microorganisms including *Escherichia coli*, salmonella type, klebsiella spp, *Streptococcus aureus*, Proteus sp, and pseudomonas spp) and Magro et al. (2006) showed that chamomile had fungistatic activity against *Aspergillus candidus*, *Aspergillus niger*, *Penicillium* sp. and *Fusarium culmorum*. Also *Nigella sativa* and its essential oil provides an important source of antioxidant (Al-Saleh et al., 2006), and had antimicrobial effect Trivedi and Hotchandani (2004). *Eucalyptus globulus* leaves, flowers of chamomile and *Nigella sativa* have been listed as a natural feed additive in Europe since 2003, Community Register of Feed Additives 1831-03 (2008).

Therefore, the objective of this study was to evaluate effect of creep diets supplemented by ground mixture of chamomile, *Nigella sativa* seeds and *Eucalyptus globulus* leaves on the productive performance of suckling lambs.

MATERIALS AND METHODS

Twenty four newly born male lambs were obtained from the experimental farm project at Nuclear Research Center, Atomic Energy Authority at Inshas, Egypt.

Lambs were randomly divided into three similar groups, eight lambs each. Their weights were recorded at birth (within 24 hours post partum) then each two weeks. Lambs in the groups were left to suckle their mothers, in addition to one of the experimental diets as creep feeding, as found in Table (1).

Table (1): The formulation of concentrate feed mixture (CFM), and its proximate analysis.

Item	T1 (control)	T2 (0.5%)	T3 (1.0%)
Crushed yellow corn	43.9	43.4	42.9
Sugar beet pulp	20	20	20
Soybean meal	15	15	15
Wheat bran	18	18	18
Common salt	1	1	1
Mineral mixture*	0.5	0.5	0.5
Dicalcium phosphate	1.5	1.5	1.5
Vit AD ₃ E	0.1	0.1	0.1
Mixture of medicinal plants	0.0	0.5	1.0
Total	100	100	100
Chemical composition on DM basis % :			
Dry matter	92.51	92.40	92.45
Organic matter	93.22	92.73	92.24
Ash	6.78	7.27	7.76
Crude protein	15.86	15.93	15.95
Either extract	2.31	2.50	2.74
Crude fiber	8.44	8.62	8.90
Nitrogen free extract (NFE)	66.61	65.68	64.65

*Mineral mixture: each kg containing zinc 7200mg, copper 1800mg, iron 1800mg, manganese 3600mg, cobalt 18mg, iodine 110mg, selenium 18mg, sodium 74.3g, the carrier material (calcium carbonate) up to 1000g

The ground medicinal plants mixture (MPM) was prepared by adding 4:2:4 parts of chamomile flower, *Nigella sativa* seeds and *Eucalyptus globulus* (EG) leaves, respectively. Creep feeding system was applied by apply creep construction, where lambs were kept with their mothers in the same pens, which divided into two parts by using many vertical bars, the distances between bars were 13 cm, to allow lambs to feel that they are not trapped and the lambs could pass through the openings between bars but preventing mothers to get into the creep. The experimental groups were fed the creep diets without or with 0.5 % and 1% MPM for G1 (control group), G2 and G3, respectively. The concentrate feed mixtures (creep diets) offered daily in the morning for lambs, started at 7th day of age until weaning to each group. Creep intake was measured daily and the mean consumed of creep feeds through experiment period were average 170.3, 173.2 and 156.1 g/head/day for G1, G2 and G3, respectively. Chemical compositions of mothers' milk are presented in Table (2).

Table (2): Chemical composition of ewes milk used in feeding suckling lambs.

Item	% as fed
Total solids	16.62
Protein	3.54
Solid not fat	9.47
Fat	7.15
Ash	0.94
Lactose	4.99

Ewe's milk samples were analyzed for fat according to Garber methods, total solids, total protein and ash content according to Ling (1963). While lactose and solids not fat were calculated. Chemical compositions of the ingredients were carried out according to A.O.A.C (1990).

Blood samples were collected from the jugular vein at 7 and 60 days of age from each animal into a clean dried glass culture tubes after addition of sodium florid. Blood serum was separated after two hour then centrifuged at 3000 rpm for 15 min and serum was separated into vials, which stored at -20°C until analyses. Glucose was determined immediately according to (Trinder, 1969). Serum total protein was determined according to Weichseibaum, (1946), albumin was determined according to Dumas *et al.* (1971); globulin was calculated by difference between total protein and albumin, while urea was determined according to Henry *et al.* (1974). ALT and AST were determined as described by Reitman and Frankel (1957).

Blood serum were assayed for thyroid hormones (T3) with radioactive ¹²⁵I by radio immunoassay (Diagnostic Products Corporation Lose Angeles, California, USA), gamma counter measured the radioactivity (Feldkamp and Smith, 1987).

Statistical analysis of data was carried out using one-way classification and the data were analyzed according to statistical analysis system (SAS) User s Guide, (1999). The differences between means were tested using Duncun's Multiple Range test (Duncun, 1955). The following model was used to analyze the data of gain, average daily gain and blood serum constitute:

$$Y_{ij} = U + T_i + e_{ij}$$

Where: X_{ij} = represents observation, μ = overall mean, T_i = effect of treatment (experimental groups), e_{ij} = experimental error.

RESULTS AND DISCUSSION

Lambs blood serum constituents:

Effect of creep diets supplementation by MPM at rate 0.5 and 1% on some blood serum constituents in suckling lambs are shown in Table (3). The blood samples were collected at 7 days, which the treatment takes no place and at 60 days, which the treatment may be take place. The data showed that glucose level was high at 7 days of age and decreased at 60 days of age in different groups. Blood serum glucose concentration was significantly lower ($P \leq 0.05$) for the groups received creep diets supplemented by MPM (G2 and G3) compared to the control group (G1), which the values represent 63.24 and 73.75 % for G2 and G3 compared to G1. This may be attributed to lambs rumen of groups G2 and G3 are more develop than lambs' rumen of G1, which led to increase dependence on VFA's, consequently decreased blood glucose. The blood glucose concentration of infant ruminants was similar to that of non-ruminant animals, as the animal grows, glucose level was declined to the adult level, while the rumen was developed and attained cellulytic fermentation. The two processes did not seem to be interdependent, as blood glucose was declined even though the development of ruminant function was prevented (Van Soest, 1982). Adding ground chamomile flower to lambs diets increase total bacteria count (El-Bordeny *et al.*, 2008) and improve rumen fermentation (Allam *et al.*, 1999, Ali *et al.*, 2005 and El-Bordeny *et al.*, 2008). Also adding ground *Eucalyptus globulus* leaves to animal ration improve rumen fermentation (Allam *et al.*, 1999 and Saleh and El-Ashry, 2007).

Table (3): Some blood serum constituents of lambs fed different experimental rations.

Item	All lambs at 7 days of age	At 60 days of age		
		control	0.5%	1.0%
Glucose (mg/dl)	122.9 ±19.58	99.8 ^a ±10.21	63.1 ^b ±7.02	73.6 ^b ±7.02
Total protein (g/dl)	8.77 ±0.27	8.01 ±0.38	8.26 ±0.34	7.67 ±0.28
Albumin (g/dl)	3.35 ±0.13	3.58 ±0.18	3.66 ±0.13	3.53 ±0.08
Globulin (g/dl)	5.42 ±0.18	4.43 ±0.34	4.60 ±0.41	4.14 ±0.24
A/G ratio	0.62 ±0.02	0.81 ±0.08	0.80 ±0.09	0.85 ±0.12
Urea-N (mg/dl)	17.35 ±4.38	20.19 ±1.71	21.88 ±2.69	27.39 ±1.40
AST (u/l)	29.49 ±4.03	46.81 ±9.74	43.27 ±14.93	54.59 ±14.91
ALT (u/ml)	12.45 ±1.31	18.18 ±1.75	17.25 ±1.90	16.35 ±1.95
T ₃ (ng/dl)	3.75 ±0.17	4.35 ±0.74	4.65 ±0.81	4.50 ±0.63

^{ab} Means in the same row having different superscripts per each item differ significantly (P<0.05).

Insignificant increases (P>0.05) were noticed in serum total protein, albumin and globulin concentration for G2 compared to the control group (G1) and G3. The present values of total protein ranged from 7.67 to 8.77 g/dl, which it is slightly higher than the normal range reported by Merek (1991) which ranged from 5.9 to 7.8 g/dl, this may be due to effect of measuring method. While the values of albumin and globuline concentration in the present study are within the normal range reported by Merek (1991) which albumin concentration ranged from 2.7 to 3.7 g/dl and globuline concentration ranged from 3.2 to 5 g/dl. The same trend was reported by El-Ashry, *et al.* (2006) and El-Bordeny (2006). They found that serum total protein and albumin were increased by adding EG leaves and chamomile to buffalo calves starter. The same observation was observed by Saleh and El-Ashry (2007) when added EG leaves to lambs ration. Moreover, Hekal, *et al.* (2005) reported that addition of EG leaves to cow calves ration increased serum total protein and albumin. Bush (1991) reported a positive correlation between plasma protein and albumin concentration and protein absorbed and synthesized.

Insignificant increase (P>0.05) in blood urea-N concentration for different experimental groups at 60 days of age compared to the value at 7 days of age. This may be attributed to increase protein intake as a result to increase intake of creep diet and /or rumen development. Also insignificant increases in blood urea-N concentration were observed for G2 and G3 compared to control group. The present values are within the normal range reported by Merek (1991) from 10.3 to 26 mg/dl except G3 was slightly higher. The present results disagree with El-Ashry, *et al.* (2006) and El-Bordeny (2006). They found that serum urea-N decrease with adding chamomile or EG leave to calves starter.

Also data of Table (3) showed that concentration of ALT and AST enzymes were within the normal range reported by Merek (1991) from 14.8 to 43.8 ALT U/L and from 49 to 123.3 AST U/L. And the differences among the different experimental groups were not significant (P>0.05). The same trend was observed by Allam *et al.* (1999) and El-Ashry, *et al.* (2006), El-Bordeny (2006) and Saleh and El-Ashry (2007). Also the data revealed that the enzymes activity increased from 7 days of age to 60 days of age, and this may be due to increase metabolic activity in the body.

The data of Table (3) also showed that level of triiodothyronine (T₃) insignificantly increased (P>0.05) from 7 days of age to 60 days of age. Also insignificant increase was observed in T₃ for G2 and G3 compared to control group (G1). The same trend was

observed by Saleh and El-Ashry, 2007 when added EG leaves to lambs ration and Abou-Taleb, *et al.* (2003). They found that T3 level was increased with increasing level of EG leaves in Japanese quail diet.

Lambs performance:

Effect of supplementing creep diet with MPM on suckling lambs performance is presented in Table (4). The data showed insignificant differences ($P>0.05$) in means birth weight among the different experimental groups. Significant increase ($P<0.05$) was noticed in weaning weight, total gain and average daily gain for the group received creep diets contain 0.5 % MPM (G2) compared to the control group (G1), while insignificant increased ($P>0.05$) for G2 compared to the group received creep diet containing 1% MPM (G3). The second group represents about 137.04, 147.26 and 147.25% versus G1, and G2 versus G3 represent about 113.57, 117.12 and 117.16 %, while G3 versus G1 represent about 120.67, 125.73 and 125.68 % for weaning weight, total gain and average daily gain, respectively.

Table (4): Growth performance of lambs fed different experimental rations.

Item	T1 (control)	T2 (0.5%)	T3 (1.0%)
Experimental feeding period, day	75	75	75
No. of lambs	8	8	8
Birth weight (kg)	3.28±0.22	3.45±0.22	3.44±0.22
Weaning weight (kg)	13.50 ^b ±1.51	18.50 ^a ±1.72	16.29 ^{ab} ±0.39
Gain (kg)	10.22 ^b ±1.43	15.05 ^a ±1.72	12.85 ^{ab} ±0.41
Average daily gain (g)	136.3 ^b ±19.03	200.7 ^a ±22.91	171.3 ^{ab} ±5.45

^{a,b} Means in the same row having different superscripts per each item differ significantly ($P<0.05$).

These results revealed that adding MPM improve lamb performance. El-Bordeny *et al.*,2005, observed that adding EG and CC and Ch to calve starter improve calves performance and health also El-Bordeny *et al.*,2008 noticed that adding ground Chamomile flower at different rate to sheep ration improve rumen fermentation , digestion and performance. This result agreed with the results obtained by Maged (2004) and Ali *et al.* (2005) in concerning average daily gain, which they found that ration supplemented by chamomile increased average daily gain and improved feed conversion efficiency and they attributed that improvement to the positive effect of chamomile on lamb health, where the chamomile act as anti-inflammatory, antispasmodic, ulcer-protective, calmative, carminative, tonic, stimulant and used to treat stomach and gastro-intestinal disorders (Abou Zeid, 1992).

The optimum levels of MPM supplementation were 0.5 %. Above this level, the improvement in lambs' performance tends to decreased. This may be due to enhancing the digestion and metabolism by a certain level of the essential oils included in the medicinal plants. Above that level an adverse effect on digestion and metabolism takes place. El-Ashry *et al.*, 2006 observed that adding medicinal plant to the diet improve IVDMD and IVOMD up to certain level then tend to decrease, and revealed that to effect of level of the essential oils included in the medicinal plants.

It could be concluded that adding mixture of ground *Eucalyptus globules* leaves, *Nigella sativa* and chamomile flower as natural feed additives, to lamb creep diets enhance

lambs health and performance without any side effects on physiological body function of lambs and may be rapidly improve lambs rumen. Also there is optimum level to use the medicinal plants as feed additives, in our study it was 0.5 % of the creep diet.

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تأثير إضافة مخلوط من مطحون النباتات الطبية إلى علائق الحملان الرضيعة على أدائها

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أجريت هذه الدراسة لبحث تأثير استخدام مخلوط من مطحون أوراق الكافور و حبة البركة و زهرة البابونج 1:1:1 كإضافات ملقحة طبيعية لتحسين صحة و أداء الحملان الرضيعة . و لهذا الهدف استخدم في هذه الدراسة أربع وعشرون من الحملان حديثة الولادة تم تقسيمهم إلى ثلاث مجموعات (8 ذكور في كل مجموعة). غذيت كل مجموعة على إحدى العلائق المركزة المختبرة بالإضافة إلى لبن الأم. غذيت المجموعة الأولى على عليقه لا تحتوي على مخلوط النباتات الطبية (كمليقه مقارنة)، في حين غذيت المجموعة الثانية على عليقه مركزة تحتوي على (0.5%) من مخلوط النباتات الطبية والمجموعة الثالثة غذيت على عليقه مركزة تحتوي على (1%) مخلوط النباتات الطبية. استمرت التجربة من الولادة إلى الفطام مدة خمس و سبعون يوماً ، تم خلالها وزن الحملان عند الميلاد ثم بعد ذلك كل أسبوعان حتى الفطام ، كما تم أخذ عينات دم من الحملان عند 7 و 10 يوم وتم تحليل بعض مكونات الدم. كانت أهم النتائج التي تم الحصول عليها هي :

- 1- زيادة مستوى بروتينات سيرم الدم وكذلك مستوى الألبومين و الجلوبيولين في المجموعة الثانية بالمقارنة بالمجموعة الأولى والثالثة و لكن الفروق كانت غير معنوية عند 0.5%.
- 2- انخفاض مستوى جلوكوز الدم وارتفاع مستوى اليوريا في الدم مع التقدم في العمر للحملان في الجاميع الثلاثة.
- 3- لم يلاحظ أي فروق معنوية بين المجموعات من حيث محتوى الدم من إنزيمات الكبد الناقلة لمجموعات الأمين وهرمون الغدة الدرقية ثلاثي اليود.
- 4- تحسن أداء حملان المجموعة الثانية بالمقارنة بالمجموعتين الأولى والثالثة من حيث معدل الزيادة اليومية والوزن عند الفطام عند مستوى معنوية 0.5%.
- 5- لوحظ أن المجموعة الثالثة أعلى في الزيادة اليومية ووزن الفطام عن المجموعة الأولى
- 6- استخدام مخلوط النباتات الطبية في التغذية الإضافية ابتداء من الأسبوع الثاني أدى إلى تحسن أداء الحملان وزيادة الوزن عند الفطام ، وكذلك أدى إلى تحسن في أداء الحملان الرضيعة من حيث الوزن المكتسب وبعض مكونات الدم.

من هذه الدراسة يمكن التوصية باستخدام مخلوط النباتات الطبية بكفاءة في علائق المجترات الرضيعة حيث ينصح باستخدام مستوى 0.5% من مخلوط النباتات الطبية لتحسين أداء الأغنام النامية من حيث معدلات النمو اليومية وزيادة وزن الفطام مما يكون له أثر جيد على حالة الحيوان بعد الفطام.