Egyptian J. Nutrition and Feeds (2005) 8 (2) : 127-137

EFFECT OF USING CHAMOMILE (*Mtricaria chamomilla*) FLOWERS AS FEED ADDITIVES ON PERFORMANCE OF GROWING LAMBS UNDER DESERT FARMING SYSTEMS

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(Received 2/3/2005, accepted 25/7/2005)

SUMMARY

Thirty growing Barki male lambs weighed 28.55 ± 0.42 kg used in a feeding trial that lasted 100 days. Animals were divided into three similar groups (10 lambs each) to study the effect of supplementing lamb rations by chamomile flowers on their performance. The feeding system of lambs was based on grazing lower portion of alfalfa remaining after cattle grazed the fodder, cracked barley grains at level of 2% from live body weight (LBW) with *ad libitum* wheat straw as control group (G1). Chamomile flowers were added at levels of 2 and 4 g/head/day to the control ration in the other two groups (G2 and G3), respectively. By the end of feeding trial, three digestibility trials were carried out using nine Barki lambs (3 lambs each) to evaluate the previous rations by using acid insoluble ash (AIA) technique. Rumen liquor and blood samples were collected at the last day of digestion trials. Results indicated that, most of nutrient digestibilities and nutritive values (expressed as TDN, DCP and ME) were significantly increased ($P< 0.05$) by adding chamomile to lamb rations in both G2 and G3 compared to G1 (control). Moreover, CP and CF digestibilities, as well as DCP value were significantly increased ($P< 0.05$) with increasing chamomile level in lamb rations. No significant differences were observed in rumen pH values among the feeding groups. Ammonia-N concentration decreased ($P< 0.05$), while VFA concentration increased ($P< 0.05$) in treated groups (G2 and G3) compared to control group (G1). Total plasma proteins and hemoglobin concentrations were significantly higher ($P<0.05$), while cholesterol concentration was significantly lower ($P<0.05$) in the blood of lambs fed treated rations (G2 and G3) than those fed control ration (G1). Furthermore, albumin, globulin and urea concentrations were slightly increased, meanwhile the enzymes activity (GOT and GPT) were slightly decreased by increasing the chamomile level in treated rations. Average daily gain (ADG) was significantly higher ($P<0.05$) for lambs fed treated rations (G2 and G3) than those fed control ration (G1). However, no significant differences were observed between the two treated groups (G2 and G3). Moreover, feed conversion efficiency (expressed as DM, TDN and DCP, kg/ kg gain) of treated groups were better than those in the control group. Feed cost decreased by 9.04 and 7.63 %, whereas economical efficiency improved by 10.03 and 8.26 % for treated groups (G2 and G3, respectively) compared to control group (G1).

Keywords: *growing lambs, digestibility, rumen activity, blood, chamomile flowers.*

Issued by The Egyptian Society of Nutrition and Feeds

INTRODUCTION

Using medicinal herbs and plants (MH&P) for human has been known since the old civilization of ancient Egyptians. The use of natural feed additives such as MH&P for ruminants can improve feed efficiency, economical efficiency and animal performance. However, using chemical compounds especially antibiotics and hormones may cause unfavorable side effects, hence the cumulative effect of these compounds induced deterrent effects on human health. So, using a natural feed additives has been important to minimize these adverse effects (Aboul-Fotouh *et al.*, 1999 and Abd El-Latif *et al.*, 2004). Singh *et al.* (1993) showed that using medicinal herbs and seeds as feed additives for ruminants seemed to be a recent global trend. Moreover, Abou-Zeid (1986) reported that, chamomile can be used for cold relief, anti-fever, spasms relief, anti-mouth and stomach ulcers and anti-fungal diseases. Mericli (1990) recorded that chamomile has anti-inflammatory, anti-septic and spasmolytic activities. Using some medicinal herbs in ruminant rations such as chamomile (*Matricaria chamomille*) may have a role in improving immunity and performance of growing animals (El-Sayed and Hashem, 2000; Abdelhamed *et al.*, 2002 and Mohamed *et al.*, 2003). Furthermore, Zeid and Ahmed (2004) reported that, using chamomile in goat diets had a positive effect on productive performance, feed conversion and economical efficiency, while it reduced the water intake by 13.65% compared to control group. Moreover, Maged (2004) indicated that adding 2g chamomile/head/day to rations of growing Rahmani lambs improved all nutrient digestibilities, feeding values, animal growth, feed efficiency and consequently its rearing economics, but water consumption was decreased. These results indicate that using chamomile flowers in small ruminant rations seems to be more suitable under desert conditions when water resources are somewhat restricted. Shehata *et al.* (2004) indicated that yields of milk, fat and protein, also fat, protein and lactose percentages were increased by addition of chamomile flowers, with tendency to be greater for the high than low chamomile level in goat rations. El-Hosseiny *et al.* (2000) observed that adding chamomile flowers in growing goat diets reduced of serum cholesterol, total lipids and triglycerides concentrations, while protein and globulin concentrations increased.

This research was conducted under desert farming systems to study the effect of using chamomile flowers as a natural feed additives at level of 2 or 4 g /head/day to rations of growing Barki lambs on growth performance, nutrient digestibilities, nutritive value, feed conversion and economical efficiency. Some rumen liquor values and blood parameters were also studied.

MATERIALS AND METHODS

This study was carried out on the sheep flock at South Tahrir in the Desert Development Center belonging to the American University in Cairo. The chemical analysis was carried out in the laboratory of Animal Nutrition of the Department of Animal Production, Faculty of Agriculture, Kafr El-Sheikh, Tanta University. Thirty Barki lambs weighed 28.55 ± 0.42 kg were used in a feeding trial that lasted 100 days. Animals were divided into three similar groups (10 lambs each) to study the effect of supplementing lamb rations by chamomile flowers on their performance. The feeding system of lambs in the control group (G1) was based on

grazing lower portion of the remaining alfalfa after grazing most of fodder by cattle, then animals were fed as group feeding on cracked barley grains at level of 2% from their LBW with *ad libitum* wheat straw in three separate pens (pen / group). Chamomile flowers were added to the concentrate at levels of 2 and 4 g /head/day with the control ration in G2 and G3, respectively. The daily grazing period was three hours and the quantity of fodder consumed was about 2.5 kg / lamb during the morning period. Fodder intake was estimated according to cut and weight of different specific areas that grazed by cattle. Chamomile was mixed with 10 g of ground barley grains and spread daily as powder over cracked barley grains as reported by Ahmed *et al* (2001). Animals were fed according to NRC (1988) requirements. Fresh water and trace mineralized salt blocks (Biomix 112, Biochema, Cairo, Egypt) were available all the day. Each kg of Biomix 112 contain: S 6000 mg, Fe 3500 mg, Zn 3000 mg, Mn 3000 mg, Mg 1000 mg, Ca 800 mg, Se 6 mg, Molasses 500mg).

Animals were weighed before morning feeding on two consecutive days at beginning and end of the feeding trial and once biweekly during the experimental period. The amount of concentrate was changed biweekly according to change in the live body weight (LBW). Samples of feed ingredients and feces were taken for chemical analysis according to AOAC(1990). Furthermore, chamomile oil concentration was estimated by high pressure liquid chromatography according to Bush *et al* (1979). Feed intake, feed conversion efficiency and economical efficiency were calculated. At the end of feeding trial, nine Barki lambs were used in carrying out three digestion trials (3 lambs each) to evaluate the previous rations by using acid insoluble ash (AIA) technique as a natural marker (Van keulen and Young, 1977). By the last day of the digestibility trials, rumen liquor samples were taken 3 hrs after the morning feeding by a rubber stomach tube. Ruminal pH value was determined directly by using Beckman pH meter. However 1 ml concentrated saturated mercuric chloride was added to the rest of sample to stop the microbial activity, filtered through a double layers of cheesecloth and stored in polyethylene bottles in freezer until analysis.

Total volatile fatty acids (VFA's) concentration was estimated by using steam distillation method (Warner, 1964). Ammonia-N (NH_3-N) concentration was determined by using magnesium oxide (MgO) as described by AOAC (1990). Blood samples withdrawn at the same time of rumen liquor collection from the jugular vein into clean tubes. Ethylene diaminetera acetate (EDTA) was added as anticoagulant. Blood samples were centrifuged at 3500 r.p.m. for 15 minutes to obtain plasma, then samples were stored at -20°C until analysis. Blood hemoglobin, total plasma proteins, albumin, urea, GOT, GPT and cholesterol concentrations were determined according to the methods described by Varley (1976). However, globulin concentration was calculated by difference between total proteins and albumin.

The data were statistically analyzed using General Linear Models Procedure (one way ANOVA model) adapted by SPSS (1997), while appropriate means were separated using Duncans's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

1-Chemical composition

Data shown in Table 1 represent the chemical composition of different feed ingredients and calculated chemical analysis of tested rations. Results indicated that, the chemical compositions of barley and lower

portion of alfalfa are in agreement with the findings of Mahmoud *et al.* (1998) and (2003). They reported that, chemical compositions of barley (on DM basis) were averaged 12.49-13.04, 6.08-8.01, 1.39-1.98, 74.93-76.70 and 2.59- 2.79 % for CP, CF, EE, NFE and ash, respectively. The corresponding values for lower portion of alfalfa were 13.14, 33.51, 1.42, 42.34 and 9.59 %. Data obtained in the present study revealed that, the lower portion of alfalfa contained lower CP (12.95%) and higher CF (34.25%) than those found for the whole plant of alfalfa, it was 18.59% for CP and 22.42% for CF (Mahmoud *et al.*, 1998).

Chemical composition of wheat straw was nearly similar with the results reported by Bendary *et al.* (2002) and El-Saadany *et al.* (2003). They found that wheat straw contain 2.09-3.24% CP, 37.23-38.95% CF, 0.71-0.94% EE, 46.03-48.22% NFE and 10.03-12.56% ash. There are many factors may be affecting on chemical composition of different feedstuffs such as plant age, soil type, fertilizations, etc.

2-Digestibility and nutritive values

Nutrient digestibilities and nutritive values of the different tested rations are presented in Table 2. Nutrient digestibilities of all nutrients (except of EE) and nutritive values (expressed as TDN, DCP and ME) were increased (P< 0.05) by adding chamomile flowers to lamb rations in G2 and G3 compared to G1 (control). However, digestibility of CP and CF, as well as DCP value were increased (P< 0.05) by increasing chamomile level in treated rations (G2 and G3). These results are in harmony with those observed by Mohamed *et al.* (2003), who found that, most of nutrient digestibilities were significantly improved by adding chamomile to sheep rations, which was due to the residual of effective groups in the chamomile. Moreover, Maged (2004) reported that, the feeding values (TDN and DCP) and nutrient digestibilities of lamb rations were increased (P< 0.05) with increasing the chamomile level in two treated rations (1 or 2 g /head/d) compared to untreated control ration.

Zeid and Ahmed (2004) found that adding chamomile in buck rations increased (P< 0.05) nutrient digestibilities and nutritive values (TDN and DCP) of treated rations compared to the control. Furthermore, Mericli (1990) mentioned that the chamomile act as anti dusentaria, bacteria and worms, which decrease losses of digested feed due to parasites and save digested nutrients to improve production. Results obtained might indicate the stimulation of rumen micro-flora activity through one of the following: 1) decreasing number and activity of antagonistic organisms, 2) saving some micro factors to rumen micro-flora as (micro elements, vitamins, hormones, enzymes or unknown factors) which are required to the efficient digestion, absorption and metabolism and available as effective groups or components in medical plants, 3) decreasing hazards of some harmful heavy metals and 4) minimizing effectively hazards of mycotoxins by inhibition of fungi growth and alfatoxins production (Allam *et al.*, 1999 and Mohamed *et al.*, 2003)

3-Rumen activity

Results of rumen activity including pH values, ammonia nitrogen (NH_3-N) and total volatile fatty acids (VFA's) concentrations are presented in Table 3. No significant differences were observed in ruminal pH values among the feeding groups. These results agreed with Youssef *et al* (1998) and Allam *et al.* (1999), who reported that pH value of rumen liquor was not significantly affected by medicinal plants supplementation. On the contrarily, NH_3-N concentration was decreased (P< 0.05),

Table (1) : Chemical composition of the feed ingredients and tested rations (calculated) consumed by Barki lambs.

Ingredients	DM, %	DM composition, %						GE, Mcal/ kg DM**
		OM	CP	CF	EE	NFE	Ash	
Barley grains	93.25	97.27	12.75	7.82	1.92	74.78	2.73	4.33
Wheat straw	95.35	89.35	2.78	38.45	1.58	46.54	10.65	3.83
Alfalfa(lower portion)	30.25	90.10	12.95	34.25	1.56	41.54	9.90	4.02
Tested rations(calculated) *								
G1	47.41	93.26	11.77	22.95	1.65	56.89	6.74	4.13
G2	48.42	93.29	11.77	22.82	1.66	57.04	6.71	4.14
G3	48.37	93.26	11.74	22.94	1.66	56.92	6.74	4.13

*G1-Barley grains + Wheat straw with grazing lower portion of alfalfa (control), G2-Control +2 g Chamomile***, G3- Control + 4 g Chamomile. ** GE (Mcal / kg DM) = CP x 5.65 + CF x 4.15 + EE x 9.40 + NFE x 4.15 (Blaxter, 1968). *** Chamomile flowers contain 0.48 % oil with grade very good and of blue color with grade excellent.

Table (2) : Average of nutrient digestibilities and nutritive values of different tested rations consumed by Barki lambs.

Items	Feeding groups			SEM**
	G1	G2	G3	
Digestibility coefficients, %				
DM	64.52^{b}	68.47^{a}	69.46^{a}	0.805
OM	69.41^{b}	73.56^{a}	74.49^{a}	0.842
CP	70.38^{c}	74.21^{b}	76.65^{a}	0.952
CF	56.00^{c}	63.26^{b}	65.54^{a}	1.466
EE	77.51	78.22	78.66	0.309
NFE	74.39^{b}	77.42^{a}	77.53^{a}	0.621
Nutritive values, %				
TDN	66.33^{b}	70.26^{a}	71.10^{a}	0.794
DCP	8.28^{c}	8.73^{b}	9.00^{a}	0.110
ME, Mcal/ kg DM*	2.39^{b}	2.53^{a}	2.56^{a}	0.028

^{a,b,c} Means within a row with different superscripts are significantly different at ($P<0.05$)
*ME, Mcal / kg DM = (TDN x 3.6) /100 (Ranjhan, 1980) and (Church and Pond, 1982).
** SEM: Standard error of mean.

Table (3) : Average values of rumen liquor parameters of Barki lambs consumed different tested rations.

Items	Feeding groups			SEM
	G1	G2	G3	
p H	5.84	5.66	5.76	0.04
NH_3-N, mg/100 ml	41.75^{a}	34.85^{b}	34.06^{b}	1.20
VFA` s, meq /100 ml.	12.65^{b}	13.84^{a}	13.59^{a}	0.21

^{a,b} Means within a row with different superscripts are significantly different at ($P<0.05$).

while VFA's concentration increased (P< 0.05) in treated groups (G2 and G3) compared to control (G1). These results are in accordance with those reported by Allam *et al.* (1999) with goats and Mohamed *et al.* (2003) with sheep. Maged (2004) revealed that, VFA's concentration was significantly increased, while NH_3-N concentration reduced in rumen fluid of sheep fed rations supplemented with chamomile (1 or 2 g/head/day) compared to the control group. Lower NH_3-N concentration might be attributed to action of medicinal herbs (Chamomile, Nigella sativa and Fenugreek) as buffers or regulators in absorbing and releasing NH_3-N in the rumen (Zeid, 1998). These advantages may give a favorable condition in the rumen for useful microorganisms activity for best utilization of ruminal ammonia to be converted into microbial protein for lambs in treated groups (G2 and G3). Also, improvement of VFA's obtained in treated groups might indicate chamomile action in a stimulating rumen micro-flora activity.

4-Blood constituents

Data of blood constituents of lambs fed different tested rations are presented in Table 4. Total plasma proteins and hemoglobin concentrations were significantly higher (P<0.05), however cholesterol concentration was significantly lower (P<0.05) in the blood of lambs fed treated rations (G2 and G3) than those in control (G1). Furthermore, concentration of albumin, globulin and urea were slightly increased, while the enzymes activity (GOT and GPT) were slightly decreased by increasing the chamomile level in treated rations (G2 and G3) but these differences were insignificant. Higher plasma proteins, albumin, globulin and urea may be related to increase protein intake for treated groups than control. These findings were in harmony with those reported by many authors (El-Hosseiny *et al.*, 2000 and Shehata *et al* 2004 with goats, also Mohamed *et al*, 2003 and Maged, 2004 with sheep). They indicated that supplementation of chamomile increased total plasma proteins, albumin, globulin and hemoglobin concentrations. In contrast, cholesterol, GOT and GPT concentrations were decreased. The obtained values of blood constituents were within the normal range values given by Kaneko (1989) and Mohamed and Ibrahem (2003) for healthy growing lambs.

5- Growth performance and feed conversion

Growth performance and feed conversion efficiency data are presented in Table 5. Average daily gain (ADG) was 181, 211 and 214 g/head/day. These results cleared that, ADG was higher (P<0.05) for treated groups (G2 and G3) than control (G1). However, no significant differences were observed between the two treated groups including chamomile (2 or 4 g/head/d). Improving ADG might be due to increase of DM consumed and feed units intake (expressed as TDN, ME and DCP) by lambs in treated groups compared to the control group. Moreover, feed conversion efficiency (expressed as DM, TDN and DCP, kg / kg gain) for treated groups were better than untreated control group. Feed cost values were 3.54, 3.22 and 3.27 LE / kg gain for G1, G2 and G3, respectively. The corresponding values of economical efficiency were 3.39, 3.73 and 3.67. These results indicated that, feed cost decreased by 9.04 and 7.63 %, whereas economical efficiency improved by 10.03 and 8.26 % for treated groups (G2 and G3), respectively compared to the control group (G1). These results are in harmony with findings obtained by Maged (2004), he indicated that adding chamomile flower (2 g/head/d) to ration of Rahmani lambs increased (P<0.05) ADG and improved feed conversion efficiency by 8.38 % and economical efficiency by 7.28 %. Furthermore, El-

Table (4) : Average values of some blood constituents of lambs consumed different tested rations.

Items	Feeding groups			SEM
	G1	G2	G3	
Total plasma proteins, g%	6.73[b]	7.35[a]	7.50[a]	0.115
Albumin, g%	4.00	4.30	4.28	0.006
Globulin, g%	2.73	3.05	3.22	0.108
Urea, mg%	25.73	27.25	26.75	0.508
Hemoglobin, g%	11.35[b]	12.38[a]	12.60[a]	0.200
GOT, IU/L	40.50	37.50	38.50	0.952
GPT, IU/L	20.50	19.50	18.50	0.857
Cholesterol, mg %	137.00[a]	120.00[b]	115.00[b]	3.141

[a,b] Means within a row with different superscripts are significantly different at (P<0.05).

Table (5) : Average values of feed intake, daily gain, feed conversion and economical efficiency of Barki lambs consumed different tested rations.

Item	Feeding groups			SEM
	G1	G2	G3	
Experimental period, day	100	100	100	-
Lambs No.	10	10	10	-
Initial body wt.(IBW), kg	28.22	29.00	28.44	0.42
Final body wt. (FBW), kg	46.32[b]	50.10[a]	49.84[a]	0.53
Total gain, kg	18.10[b]	21.10[a]	21.40[a]	0.28
Daily gain, g	181[b]	211[a]	214[a]	4.04
DM intake, kg/ head/ day				
From barley grains	0.695	0.738	0.730	-
From wheat straw	0.167	0.195	0.200	-
From lower portion of alfalfa	0.750	0.750	0.750	
Total DM intake, kg/ head/day	1.612	1.683	1.680	-
TDN intake, kg/ head/day	1.070	1.182	1.194	-
ME intake, Mcal/ head/day	3.853	4.258	4.301	-
DCP intake, kg/ head/day	0.133	0.147	0.151	-
Feed conversion efficiency, kg/ kg gain				
DM	8.906	7.973	7.839	-
TDN	5.912	5.599	5.572	-
DCP	0.735	0.696	0.705	-
Feed cost, LE/ head/ day	0.64	0.68	0.70	-
Feed cost, LE/ kg gain	3.54	3.22	3.27	-
Economical efficiency *	3.39	3.73	3.67	-

[a,b] means in the same row with different superscripts differ significantly at (p<0.05).

The price list of one ton barley grains and wheat straw were 800 and 200 LE., respectively and price of one kg for both chamomile and LBW was 7 and 12 LE, respectively (based on year 2003 prices). * Economical efficiency = price of one kg LBW (LE/kg gain) / feed cost (LE/kg gain).

Consumed lower portion of alfalfa was not calculated in feed cost and economical efficiency.

Baba (1971) and Chevallier (1996) observed that, the positive effect of some medicinal herbs and plants on animal performance may be attributed to the role of these additives as anti-diarrhea, anti-dysentery, anti-bacterial, protozoacidal, expellant to worms and antiseptic which decreased losses of digested feed due to parasites and save digested nutrients to improved production.

Additionally, this positive effect was indicated by many authors (Zeid, 1998; Abou- Ammou and EL-Hossieny, 1999; El-Saadany *et al*, 2001 and Salem and El-Mahdy, 2001). They reported that, adding medicinal herbs and plants especially chamomile to sheep and goat rations improved ADG, feed conversion efficiency whereas it decreased feed cost compared to unsupplemented ration. Better DM and TDN efficiency may be due to higher metabolizable energy and more efficient utilization for growth (Blaxter, 1968).

It is concluded that using chamomile flowers as natural feed additives especially at level of 2 g/head/day in rations of growing Barki lambs had a beneficial effect on animal performance. It improved nutrient digestibilities, nutritive value, growth rate, feed conversion and economical efficiency, whereas feed cost decreased for treated groups compared to untreated control group.

ACKNOWLEDGMENT

The authors are grateful to Dr. Mahasen Sedky Prof. of medicinal plants (ARC) for her help in the analysis of chamomile oil by high pressure liquid chromatography (HPLC) and Dr. Said Kilany and Eng. Adel Shalabi (DDC) for their assistance.

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تأثير استخدام زهور البابونج كإضافات غذائية على أداء الحملان النامية تحت النظم الصحراوية

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استخدم فى هذه الدراسة ٣٠ حولى برقى نامى متوسط وزنه ٢٨,٥٥ ± ٠,٤٢ كجم لإجراء تجربة نمو لمدة ١٠٠ يوم حيث قسمت الحيوانات إلى ثلاثة مجموعات متساوية(١٠ حملان بكل مجموعة) لدراسة تأثير استخدام زهور البابونج على أداء الحملان النامية. كان نظام التغذية المتبع يعتمد أساسا على رعى الحملان على بقايا البرسيم الحجازى المتخلفة بعد رعى الأبقار ، ثم غذيت الحملان بعد ذلك على حبوب الشعير المجروشة بمعدل ٢ ٪ من وزنها مع تبن القمح حتى الشبع بالنسبة لمجموعة المقارنة الأولى (مج١) أما المجموعتان الثانية و الثالثة (مج٢&مج٣) فقد غذيت مثل مجموعة المقارنة بالإضافة إلى ٢ ، ٤ جم من زهور البابونج يوميا على التوالى. فى نهاية تجربة النمو تم اختيار ٩ حملان عشوائيا (٣ حملان بكل مجموعة) لإجراء ٣ تجارب هضم لتقييم العلائق السابقة كما تم اخذ عينات من سائل الكرش و الدم. و أوضحت الدراسة النتائج الآتية:-

١- ازدادت معظم معاملات هضم المركبات الغذائية و كذلك القيمة الغذائية المتمثلة فى مجموع المركبات الغذائية المهضومة (TDN) و البروتين الخام المهضوم (DCP) و الطاقة القابلة للتمثيل (ME) معنويا (على مستوى ٥٪) بإضافة زهور البابونج لعلائق الحملان فى مج٢&مج٣ مقارنة بمجموعة المقارنة (مج١) كما ازداد معامل هضم كل من البروتين الخام و الألياف الخام وكذلك قيمة البروتين الخام ا لمهضوم معنويا(على مستوى٥٪) بزيادة مستوى زهور البابونج فى العليقة.

٢- لم يلاحظ أي اختلافات معنوية بين المجموعات المختلفة فى درجة حموضة سائل الكرش ولكن انخفض تركيز نيتروجين الامونيا بينما ازداد تركيز الأحماض الدهنية الطيارة معنويا(على مستوى ٥٪) فى المجموعات المعاملة (مج٢&مج٣) مقارنة بمجموعة المقارنة (مج١).

٣- ازداد تركيز بر وتينات البلازما الكلية و الهيموجلوبين بينما انخفض تركيز الكوليسترول معنويا(على مستوى ٥٪) فى المجموعات المعاملة مقارنة بمجموعة المقارنة. كما ازداد تركيز الألبومين و الجلوبيولين و اليوريا بينما انخفض تركيز GOT&GPT قليلا بزيادة مستوى البابونج فى العليقة و لكن هذه الاختلافات كانت غير معنوية.

٤- ازداد معدل النمو معنويا(على مستوى ٥٪) فى المجموعات المعاملة (مج٢&مج٣) مقارنة بمجموعة الكنترول (مج١) ولكن لم يلاحظ أي اختلافات معنوية بين المجموعات المغذاة على ٢ أو٤ جم بابونج .

٥- تحسنت الكفاءة التحويلية للغذاء (DM,TDN,DCP لكل كجم نمو) بالنسبة للمجموعات المعاملة (مج٢&مج ٣) مقارنة بمجموعة المقارنة (مج١). كما تحسنت الكفاءة الاقتصادية بنسبة١٠,٠٣ ، ٨,٢٦ ٪ بينما انخفضت تكلفة الغذاء لكل كيلو جرام نمو بنسبة ٩,٠٤ ، ٧,٦٣ ٪ بالنسبة للمجموعات المعاملة (مج٢&مج ٣) على التوالى مقارنة بمجموعة الكنترول (مج١).

مما سبق يوصى بإضافة زهور البابونج لعلائق الحملان النامية خاصة بمعدل ٢ جم/ راس يوميا لما لها من تأثير مفيد على مستوى أداء الحيوانات و زيادة الكفاءة الاقتصادية نتيجة لتقليل تكلفة الغذاء لكل كيلو جرام نمو.