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INFLUENCE OF FEEDING RAHMANY LAMBS ON RATIONS CONTAINED DIFFERENT LEVELS OF CHAMOMILE FLOWERS.

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SUMMARY

To study the effect of supplementing Rahmany lamb rations with different levels of chamomile flowers (*matricaria chamomilla*) on their performance, twenty growing male lambs weighed 20.55± 0.51 kg, were divided into four similar groups (5 lambs each). Feeding of lambs were based on *ad lib.* amounts of commercial concentrate feed mixture (CFM) + wheat straw as control group (G1), while chamomile flower were added at rates 0.5 , 1.0 and 1.5 % of the CFM to G2, G3 and G4, respectively. Feed intake gradually increased with increasing chamomile level in the ration. Also gradual increase in total bacterial count, rumen liquor TVFA's and ammonia concentration were observed with increasing level of chamomile inclusion in the ration at zero and 3 hrs after feeding. At 6 hrs after feeding G3 showed higher TVFA's and ammonia concentration than the other groups. Significant higher rumen liquor pH for G1 and G2 was noticed compared to G3 and G4. Digestibility of DM, OM, CP and NFE were gradually increased as the level of chamomile in the ration increased. CF digestibility and calculated TDN values were insignificantly affected by supplementation. Supplementing rations with chamomile slightly increased average daily gain, total income and net return.

Keywords: *chamomile flowers, growing lambs, rumen activity, nitrogen balance, growth performance and economic efficiency.*

INTRODUCTION

Feed additives are important materials that can improve the efficiency of feed utilization and animal performance. However, the use of chemical products especially those of antibiotics and hormones may cause unfavorable effects. Many attempts in the field of animal nutrition are being done to achieve an increase in animal production and thereby profit (Abdou, 2001). Using medicinal herbs and plants (MH&P) with humans has been known since the old civilizations. Old drugs industry depended upon the raw material of MH&P and their extracts, which always proved safe. Inversely many synthesized chemicals caused many hazards to animals, plants and human. The world Health

organization (WHO) encourages using MH&P to substitute or minimize the use of chemicals through the global trend to go back to nature *(Allam et al., 1999)*. Singh et al. (1993) showed that using medicinal herbs and seeds as feed additives for ruminants seemed to be a recent global trend. Chamomile (*matricaria chamomilla*) has been listed as a natural feed additives in Europe since 2004 (Community Register of Feed Additives 2008). Moreover Abou Zeid (1992) and Avallone *et al.* (2000) reported that chamomile can be used for cold relief, anti-fever, spasms relief, anti-mouth and stomach ulcers and anti-fungal diseases. Also they reported that, the flowers of chamomile or their tea are used to treat stomach and gastro-intestinal disorders, and as anti-inflammatory, antispasmodic, ulcer-protective, calmative, carminative, tonic and stimulant. Using some medicinal herbs in ruminant rations such as chamomile *(matricaria chamomilla)* may have a role in improving immunity and performance of growing animals (El-Sayed and Hashem, 2000; Abdelhamid *et al.*, 2002; Mahmoud *et al.*, 2003 and El-Bordeny *et al.*, 2006). Furthermore, Zeid and Ahmed (2004) reported that, adding chamomile to goat diets had a positive effect on productive performance, feed conversion and economical efficiency. Maged (2004) reported that adding chamomile to ration of growing Rahmany lambs improved all nutrient digestibilities, feeding values, animal performance and feed efficiency. This research was conducted to study the effect of using different level of chamomile in rations of growing Rahmany lambs as feed additives on nutrients digestibility, N balance, rumen parameters, total bacteria count, animal performance and economic efficiency.

MATERIALS AND METHODS

The present study was carried out in the experimental station of Faculty of Agriculture, Al-Azhar University, Assuit branch. The chemical analysis was carried out in the laboratory of Animal Nutrition Department, Faculty of Agriculture, Ain Shams University and laboratory of Department of Animal and Clinical Nutrition, Faculty of Veterinary medicine Assiut University.

Experimental animal and feeding:

Twenty growing Rahmany male lambs with mean initial live body weight of 20.55± 0.51 kg were divided into four similar groups, five animals each. The animals were randomly assigned to receive one of the four rations for 112 day. Control group (G1) was fed ad lib quantities of concentrate feed mixture (CFM) + wheat straw, while chamomile flower powder was mixed with CFM at level either 0.5, 1.0 or 1.5 % in rations of G2, G3 and G4 respectively. The animals were fed in groups, and residual amount of CFM and straw was weighed and the intakes were calculated. Each group was kept in separate shaded pen. Fresh water and salt blocks were available for each group. The chemical composition of feed ingredients used in the experiment is shown in Table (1).

Metabolic trials:

At the end of the experimental period, four animals from each group were used in metabolic trail by using metabolic cages to determine nutrients digestibility, nitrogen balance and feeding values. Sample of rumen fluids were collected from each animal at zero, 3 and 6 hr post feeding by stomach tube at the end of the digestibility trials.

Table (1): Chemical composition of feed ingredients (% on DM basis).

Item	wheat Straw	CFM*	G1**	G2**	G3**	G4**
Dry matter	93.22	90.60	91.45	91.44	91.44	91.47
Organic matter	89.2	87.50	88.05	88.05	88.04	88.06
Crude protein	1.79	13.20	9.49	9.53	9.56	9.42
Crude fiber	39.71	13.15	21.78	21.70	21.63	21.94
Ether extract	0.45	3.30	2.37	2.38	2.39	2.36
Ash	10.8	12.50	11.95	11.95	11.96	11.94
Nitrogen free extract	47.25	57.85	54.41	54.44	54.47	54.34
Price (LE/ ton)	320	1200	914.19	916.57	919.16	908.67

** CFM: commercial concentrate feed mixture*

*** The diets are mixed from CFM and wheat straw with different levels of chamomile flowers*

Analytical methods:

The proximate analysis of different feedstuffs fecal and urine samples were analyzed according to the A.O.A.C. (1990). Rumenal pH determined using a digital pH meter, NH3-N was determined according to Conway (1963) TVFA's concentration were determined by steam distillation as described by Warner (1964).

Statistical methods:

The data were analyzed according to statistical analysis system (SAS, 1999) by using the general linear model procedure of completely random design (GLM). Differences among treatments were analyzed by Duncan multiple range tests (Duncan, 1955).

RESULTS AND DISCUSSION

Feed intake:

Data of feed intake presented in Table 2 indicated gradually increase in feed intake as concentrate, roughage, DM, TDN, CP and DCP with increasing chamomile level in the ration, where the highest value was recorded for G4 followed by G3 then G2 and the lowest value was recorded for G1. This may be attributed to that: 1) the groups fed ration supplemented by chamomile showed higher growth rate and recorded higher mean body weight consequently had the higher feed intake. 2) The chamomile flower contains essential oils, which may be simulating feed intake. The same trend was observed by El-Bordeny *et al.* (2005) on buffalo calves who found that adding chamomile (0.1 g/kg body weight) in calf's starter increased feed consumption from starter. On the other hand the present results disagree with Allam *et al.* (1999) who found that adding chamomile by rate 60 mg / kg of live body weight in ration of Zaraibi bucks led to slight decrease in feed intake compared to control treatment.

Table (2): Effect of chamomile supplementation on nutrients intake.

Item	G1	G2	G3	G4	Mean
CFM g/day*	790	823	847	883	835.75
Wheat straw g/day*	380	391	397	437	401.25
DMI g/day	1070	1110	1137	1207	1131
TDNI g/day	671	720	747	805	736
CPI g/day	111.1	115.6	118.9	124.4	117.5
DCPI g/day	72.32	80.65	83.22	89.10	81.3

* *on fresh basis*

Rumen activity:

Gradual increase in total bacterial count per one ml rumen liquor was observed with the increased level of chamomile inclusion in the ration at zero and 3 hrs after feeding (table 3). The highest significant ($P \leq 0.05$) value was recorded for G4 followed by G3 then G2, while the lowest count was recorded for G1. On the contrary G1 and G2 recorded the highest total bacterial count compared to G3, while insignificantly differed with G4 at 6 hrs after feeding. This may be due to the effect of chamomile essential oils on rumen ecosystem, which stimulate rumen microflora, and led to increase total bacterial count. El-Bordeny (2006) reported that chamomile contain three main essential oils (chamazulene, farnesol and beta farnesene). Povilaityte *et al.* (2000) and El-Bordeny (2006) postulated that chamomile have some aroma and antioxidant properties, which had positive effect on rumen fermentation and rumen microflora.

Table (3): Effect of chamomile supplementation on total bacteria count, TVFA's, NH_3-N concentration and pH of rumen liquor.

Item	G1	G2	G3	G4	Overall Mean	±SE
			Rumen liquor TVFA's, meq/100 ml			
Zero time	7.55	8.37	8.43	9.01	8.34^{c}	0.368
3 hr after	9.97	9.99	10.90	11.60	10.61^{a}	0.331
6 hr after	9.04	8.70	9.78	8.86	9.10^{b}	0.199
Mean	**8.85^{b}**	**9.02^{b}**	**9.90^{a}**	**9.63^{a}**	**9.35**	
			Rumen liquor NH_3-N, mg/100ml			
Zero time	17.93	18.21	18.48	18.56	18.29^{c}	0.328
3 hr after	25.53	25.74	27.78	27.91	26.74^{a}	0.428
6 hr after	20.85	22.24	22.65	21.83	21.89^{b}	0.259
Mean	**21.44^{c}**	**22.06^{b}**	**22.04^{a}**	**22.70^{a}**	**22.31**	
			Rumen liquor pH			
Zero time	6.87	6.76	6.47	6.45	6.64	0.128
3 hr after	5.65	5.94	5.71	5.51	5.70	0.165
6 hr after	6.43	6.38	6.37	6.25	6.36	0.103
Mean	**6.32^{a}**	**6.36^{a}**	**6.18^{b}**	**6.06^{b}**	**6.23**	
			Rumen liquor total bacterial count, per/ml			
Zero time	$2.03X10^{5\,b}$	$2.04X10^{5\,b}$	$1.69X10^{6\,ab}$	$3.5X10^{7\,a}$	$9.27\ X10^{6}$	$0.25X\ 10^{5}$
3 hr after	$4.4X10^{9\,b}$	$4.6X10^{9\,b}$	$2.84X10^{10ab}$	$3.77X10^{11\,a}$	$1.04xX10^{11}$	$0.35\ X\ 10^{6}$
6 hr after	$3.31X10^{10a}$	$3.43X10^{10a}$	$1.8X10^{8\,b}$	$2.17X10^{9\,ab}$	$1.74X10^{10}$	$0.30\ X\ 10^{5}$
Mean	**$1.25X10^{10}$**	**$3.9X10^{10}$**	**$9.53X10^{9}$**	**$1.26X10^{11}$**	**$4.68X10^{10}$**	

a, b , c Means of treatments within the same row with different superscript letters are differ ($P \leq 0.05$).
a, b, c Means of time within overall mean column with different superscript letters are differ ($P \leq 0.05$).

Also gradual increase was noticed in rumen liquor TVFA's and NH_3-N concentration with the increasing chamomile level in the ration at 0 and 3 hrs after feeding (table 3), but at 6 hrs after feeding G3 showed the highest concentration than the other groups. Concerning the overall mean TVFA's and NH_3-N, G3 and G4 showed the higher ($P \leq 0.05$) concentration than G1 and G2. Also the data indicated that TVFA's and NH_3-N concentration started low at 0 hrs then increased to the highest level ($P \leq 0.05$) at 3 hrs after feeding then decreased at 6 hrs after feeding. these results may be due to the effect of increase total bacteria count and its activity, these advantages may give a favorable condition in the rumen for useful microorganisms activity (as indicated from data of total bacterial count) for best utilization of ruminal NH_3-N and TVFA's to be converted into microbial protein in G2, G3 and G4. Also increase rumen TVFA's may prove the chamomile action in stimulating rumen microflora activity. The data of rumen liquor pH in Table 3 indicated that the mean value of G1 and G2 showed significantly higher ($P \leq 0.05$) values compared to G3 and G4, but all values were within the normal range. These results disagree with (Youssef *et al.* 1998; Allam *et al.*, 1999 and Ali *et al.*, 2005), who reported that pH values of rumen liquor was not significantly affected by chamomile supplementation,

The obtained results of rumen parameters may be attributed to stimulate rumen microflora activity through one or more of the following: 1) Decreasing number and activity of antagonistic organisms. 2) Saving some important micro factors to rumen micro-flora as micro-elements, vitamins, enzymes or unknown factors which are required to the efficient digestion, absorption and metabolism and available as effective groups or components in MH&P. 3) Decreasing hazards of some harmful heavy metals as lead by chelation with them (Allam *et al.* 1999; and Mohamed *et al.*, 2003).

Digestibility and nutritive values:

Digestibility coefficient of DM, OM, CP and NFE were gradually increased ($P \leq 0.05$) with the increase in level of chamomile in the ration (table 4). Group 4 had higher ($P \leq 0.05$) DM, OM, CP and NFE digestibilities than the control group (G1). The same trend was observed in DCP content, where G3 and G4 showed higher ($P \leq 0.05$) values than G1 and G2. This may be attributed to the increase in total bacterial count with increased level of chamomile additives in lamb rations, which led to increase nutrient digestibility parallel with increase biosynthesis of microbial protein, which led to increase CP digestibility and rations DCP content. These results are in harmony with those observed by Mohamed *et al* (2003) and Ali *et al.* (2005), who found that most of nutrient digestibilities were significantly improved by adding chamomile to lamb rations, which was attributed to the residual of effective groups (essential oils) in chamomile. Moreover, Maged (2004) reported that, the feeding values (TDN and DCP) and nutrient digestibilities of lamb rations were significantly increased with increasing chamomile level in the two treated rations (1 or 2 g /h/d) compared to untreated control ration. Also Zeid and Ahmed (2004) on buck and El- Ashry *et al* (2006) on buffalo calves, found that supplement ration with chamomile increased ($P \leq 0.05$) nutrient digestibilities and nutritive values of treated rations compared to the control. Furthermore, Mericili (1990) mentioned that the chamomile act as anti dusentaria, bacteria and worms, which decrease losses of digested feed due to parasites and save digested nutrient to improve production. The same trend was observed by El-Bordeny (2006) when added chamomile to ration of buffalo calves. On the contrary insignificant differences in CF digestibility, calculated values of TDN and ME, Mcal /kg DM were observed (Table 4).

Table (4): Effect of chamomile supplementation on nutrients digestibilities and feeding values.

Item	G1	G2	G3	G4	Mean	±SE
DM %	66.12^{b}	67.66^{ab}	68.88^{a}	68.93^{a}	67.90	0.476
OM %	67.10^{c}	68.44^{bc}	69.74^{ab}	71.13^{a}	69.10	0.748
CP %	71.60^{c}	74.80^{b}	76.10^{ab}	77.36^{a}	74.97	0.617
CF %	57.89	60.29	52.99	56.12	56.82	3.331
EE %	66.08^{ab}	60.58^{b}	69.68 a	65.45^{ab}	65.45	7.156
NFE %	67.28^{b}	68.58^{ab}	69.42^{ab}	70.62^{a}	68.98	0.648
TDN %	61.42	62.77	61.98	63.20	62.34	0.845
DCP %	6.83 ^{b}	7.22 ^{a}	7.35 ^{a}	7.38^{a}	7.2	0.058
ME, Mcal/kg DM	2.23	2.28	2.23	2.26	2.25	0.029

*a, b , c Means of treatments within the same row with different superscript letters are differ (P≤0.05). ME, Mcal/kg DM = (TDN*3.6)/100 according to Ranjhan, (1980) and Chrch and Pond, (1982)*

Nitrogen balance :

The data presented in Table 5 clearly indicated that insignificant differences were noticed in N intake due to effect of chamomile supplements to lamb rations, however slight decrease (P≥0.05) in fecal and urinary N excretion was noticed in the groups supplemented by chamomile, also G2 and G4 showed slight higher (P≥0.05) N digested compared to control group. On the other hand the groups received rations containing chamomile had higher (P≤0.05) N balance and showed better N retention / intake N ratio than the control group (G1). This may be due to 1) increase CP digestibility (table 3), 2) decrease N secretion in urine in the group supplemented by chamomile, which led to increase retained nitrogen in the body. This finding may prove that chamomile supplementation improve efficiency of Nitrogen utilization.

Table (5) : Effect of chamomile supplementation on nitrogen balance

Item	G1	G2	G3	G4	Mean	±SE
Nitrogen intake, g/day	16.76	17.76	15.01	16.10	16.40	1.148
Fecal nitrogen, g/day	4.78	4.48	3.58	3.65	4.12	0.354
Digested nitrogen , g/day	11.98	13.28	11.423	12.447	12.28	0.8157
Urinary nitrogen , g/day	5.97	5.60	4.4767	4.56	5.15	0.444
Nitrogen balance, g/day	6.00^{b}	7.68 ^{a}	6.95 ^{ab}	7.89 ^{a}	7.13	0.46
Retained nitrogen / intake N, %	36.11 ^{c}	43.31 ^{b}	46.24 ^{ab}	49.06 ^{a}	43.66	1.39
Average daily gain g/day*	185^{b}	235^{a}	215^{a}	244^{a}	220	7.3

a, b & c Means of treatments within the same row with different superscript letters are differ (P≤0.05).

** The average daily gain values revealed the values during the metabolic trials at the end of the experimental period, which the average daily gain during this period was higher than the total average daily gain during the experimental period.*

Growth performance and feed conversion:

Slight and gradual increase (P≥0.05) in average daily gain (ADG) (table 6) observed to be parallel to increase level of chamomile supplementation. The insignificant improving of ADG may be attributed to increase feed intake, nutrient digestibilities and nitrogen retention in the groups supplemented by chamomile (tables 4 and 5). On the other hand insignificant differences among the different groups were observed in feed conversion efficiency (expressed as DM. TDN, CP and DCP, kg/kg gain). 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 ADG. The same authors disagree in concern of feed conversion, which they found that ration supplemented by chamomile 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).

Table (6): Effect of chamomile supplementation on animal performance

Item	G1	G2	G3	G4	Mean	±SE
Average daily gain, g/d	130.4	137.6	143.0	157.4	142.1	8.6
DM con., kg/kg gain	8.121	8.118	7.916	7.668	7.945	0.499
TDN con., kg/kg gain	5.146	5.233	5.224	5.114	5.179	0.325
CP con., g/kg gain	838.96	843.02	831.47	790.34	824.77	52.00
DCP con., g/kg gain	554.60	586.12	581.96	566.07	572.13	36.24

Economic efficiency:

Gradually, increasing ($P \geq 0.05$) in total weight gain, total feed cost, total income and net return observed to be parallel with increased level of chamomile additives in lamb rations (table 7). On the other hand the gross economic efficacy and relative economic efficacy increased for G4 compared to the other groups by about 13.47 % vs control group. This may be attributed to that chamomile supplementation increased average daily gain parallel with the insignificant differences in feed conversion (table 6). These results agreed with the results obtained by Maged (2004) who reported that adding chamomile to lamb rations significantly improved economical efficiency by 7.28%.

Table (7): Effect of chamomile supplementation on economic efficiency.

Item	G1	G2	G3	G4	Mean	SE
Initial weight, kg	20.6	20.0	20.8	20.8	20.55	0.509
Final weight, kg	35.2	35.4	36.8	38.4	36.45	.894
Total gain, kg	14.6	15.4	16.00	17.6	15.9	0.959
Total feed cost, EGP	130.2	137.9	140.9	148.2	139.29	
Daily feed cost, EGP/day	1.16	1.23	1.26	1.32	1.24	
Kg gain cost, EGP/kg	8.917	8.955	8.806	8.421	8.906	0.551
Kg gain price, EGP	16	16	16	16	16	
Total income, EGP	233.6	246.4	256.00	281.6	254.4	15.34
Daily income, EGP	2.09	2.20	2.29	2.51	2.27	0.137
Net return, EGP	103.38	108.52	115.11	133.45	115.11	15.346
Economic efficacy %	79.42	78.68	81.68	90.01	82.64	10.96
Relative EE %	100	99.07	102.86	113.34	103.82	

EGP: Egyptian pound *Relative EE: relative economic efficiency*

It is concluded that supplementing lamb rations with 1.5 of chamomile flower as a natural feed additives improved nutrients digestibilities, nitrogen retention, average daily gain and economic efficacy.

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تأثير تغذية الحملان الرحماني على علائق تحتوي على مستويات مختلفة من زهرة البابونج على الأداء

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لدراسة تأثير إضافة مستويات مختلفة من زهرة البابونج إلى علائق حملان الرحماني على أدائها، تم تقسيم ٢٠ حمل تزن في المتوسط ٢٠,٥٥ + ٠,٥١ كجم على أربعة مجموعات متشابهه (٥حيوانات في كل مجموعة). غذيت هذه الحيوانات في اغذية جماعية على مخلوط علف مركز بمستوى ٢ ٪ من وزن الجسم + كميات غير محددة من تبن القمح كعليقة ضابطة (كنترول)، بينما تم إضافة نسبة ٠,٥ أو ١,٠ أو ١,٥ ٪ من العلف المركز للمجموعات الثانية و الثالثة و الرابعة على التوالي. في نهاية التجربة تم اختيار ٤ حملان عشوائيا من كل مجموعة لتقدير معاملات الهضم و ميزان الازوت وأخذ مقاييس سائل الكرش باستخدام صناديق الهضم. وكانت النتائج المتحصل عليها كالتالي.

لوحظ زيادة تدريجية في كمية المأكول من العناصر الغذائية المختلفة موازيا بزيادة نسبة زهرة البابونج في العليقة. كما تم تسجيل زيادة تدريجية في الأعداد الكلية لبكتريا سائل الكرش مصاحبا لزيادة مستوى زهرة البابونج عند مستوى معنوية ٥ ٪ وسجلت المجموعة الرابعة أعلى قيمة، صاحب ذلك زيادة تدريجية أيضا في تركيز كلا من الأحماض الدهنية الطيارة الكلية و الامونيا كنتيجة طبيعية لزيادة أعداد البكتريا في الكرش. كما لوحظ زيادة تدريجية في معدلات هضم المادة الجافة، المادة العضوية، البروتين الخام والمستخلص الخالي من الازوت ومحتوى العليقة من البروتين المهضوم مصاحبا لزيادة مستوى زهرة البابونج عند مستوى معنوية ٥ ٪ بينما لم يلاحظ أي اختلافات معنوية في معدلات هضم الألياف و محتوى العلائق من المركبات الكلية المهضومة والطاقة الممثلة لكل كجم من وزن العليقة . كما أن إضافة زهرة البابونج إلى علائق الحملان أدى إلى زيادة معدلات النمو اليومية وزيادة الكفاءة الاقتصادية بحوالي ١٣٪ بالمقارنة بالمجموعة الأولى ولكنها كانت غير معنوية عند مستوى ٥٪. ومما سبق يوصى بإضافة زهرة البابونج لعلائق الحملان الرحماني بمعدل ١,٥ ٪ من العلائق المركزة لما لها من تأثيرات ايجابية على معدلات الهضم و احتجاز الازوت في الجسم وأداء الحيوان والكفاءة الاقتصادية.