

IMPACT OF USING CHAMOMILE FLOWERS AS A FEED ADDITIVE ON GROWTH PERFORMANCE, DIGESTION COEFFICIENTS, BLOOD PROFILE AND PUBERTY OF FARAFA SHEEP

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SUMMARY

Thirty Farafra male lambs, during the growing period, were divided into three equal groups (10 each, average body weight 13.06 ± 0.15 kg). Animals of G1, G2 and G3 (groups) received 0, 5 and 10g chamomile/100kg BW/day; respectively as a feed additive. The obtained results showed that the effect of using chamomile flowers on daily feed intake (g/head) as DM and TDN were highly differing. Also, the values of DM intake ($\text{g/kgw}^{0.75}$) tended to increase (84.53, 85.42 and 86.44 $\text{g/kgw}^{0.75}$) with increasing level of chamomile (0, 5 and 10 g/100kg BW) in lambs' rations (G1, G2 and G3; respectively). The digestion coefficients of all nutrients were improved with increasing the level of chamomile in diets. The differences were significant in digestion coefficients of DM, CF, CP and NFE. The highest values of digestibility of all nutrients were recorded with the high level of chamomile. Regarding blood profile, the results indicated that addition of chamomile had positive effect on most blood parameters (hemoglobin, total protein, globulin, glucose and triglyceride). But, serum creatinine, cholesterol and activities of enzymes were higher in control ration compared with the two chamomile groups (G2 and G3). Daily body weight gain records weren't differed significantly between G2 and G3 (229.29 and 233.57 g/d) while both were significantly higher than G1 (211.90 g/d). Moreover, some positive effects were observed on testes volume and testes circumference as a result of adding chamomile to lambs' ration. Accordingly, it could be concluded that using chamomile in rations of Farafra sheep has positive effects not only on improving digestion coefficients, but also on improving growth performance, economic efficiency and puberty without any adverse effects on blood metabolic parameters.

Keywords: *Sheep, chamomile flowers, growth performance, blood profile, puberty and economic efficiency.*

INTRODUCTION

The use of herbal and herbal remedies for human has been known since the time of ancient Egyptian civilization. Various attempts have been made to use natural materials such as herbal medicines, which are commonly accepted as feed additives, to improve feed efficiency and productivity of livestock such as sheep, goats, cattle and cows (Shehata *et al.*, 2007; Maged, 2004; Abdelhamid *et al.*, 2011, and El-Kholany *et al.*, 2017).

Obviously, using chamomile flowers in animal feeding had a positive effect on productive performance, improving ruminal fluid environment and digestion coefficients as well as reducing the cholesterol and total lipids, while triglycerides, protein and globulin in growing goats were increased as result of adding chamomile flowers to the diets (El- Hossieny *et al.*, 2000) and improving some enzymes

activity (ALT, AST) in blood (Maged 2004, and 2011). Reducing the incidence of digestive disturbances such as diarrhea and bloat and consequently minimizing the mortality rate of the offspring (Shehata *et al.*, 2007), improvement of immunity and detoxification of the aflatoxin (Tawfik *et al.*, 2005).

Usually, these positive effects can be attributed to active ingredients like flavonoids, coumarins, aromatic oils (alpha bicarbonate, ginseng and chamazulene) found in chamomile flowers, which allow better tonic function than antifungal agents inflammatory and anti-spasm (Ody Penelope, 1993).

The aim of this work to investigate the effect of adding chamomile flowers to the diet of sheep on daily feed intake, digestion coefficients and growth performance, puberty, and economic efficiency.

MATERIALS AND METHODS

Experimental animals and management:

The treatments started after weaning lambs (8 weeks). Each group were 10 lambs and the average initial body weights were 12.91, 13.07 and 13.21 kg for G1, G2 and G3; respectively. Lambs weighed fasting weekly at the morning. Each group housed in a semi-roofed barn (3×4 meters). The rations were offered twice daily at 9 am and 3 pm as a group feeding. Water was available all the day for animals.

Experimental rations:

Allowances adjusted according to body weight every two weeks, according to NRC (1985). The three groups fed basal ration formed of concentrate feed mixture (CFM), berseem hay (BH) and bean straw (BS) (as 3:2:1; respectively). The CFM consisted of 20% un-decorticated cottonseed meal, 41% yellow corn, 5% soybean meal, 21% wheat bran, 5% rice bran, 4% molasses, 2.5% limestone, 1.0% common salt and 0.5 minerals mixture. The control group (G1) fed the basal diet only, G2 supplemented with 5 g chamomile/100 kg BW daily and G3 received 10 g chamomile/100 kg BW daily. The digestion trial was done during the last 10 days of the experiment on six animals from each group. The feces samples were collected before the morning feeding. The feed and manure samples were preserved until they were analyzed. The chemical analysis of CFM, BH and BS according to AOAC (1995) are shown in Table (1).

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

Item	DM	OM	CP	CF	EE	NFE	Ash
Concentrate feed mixture	92.19	91.63	15.02	16.54	3.38	57.10	7.93
Berseem hay	90.13	85.94	12.76	26.85	2.52	43.58	14.32
Bean straw	89.5	86.0	5.5	37.9	1.2	41.4	14.0

Blood parameters:

Two blood samples were collected from the jugular vein of six lambs of each group, at the end of the experiment. One sample was immediately used for hematological estimation. The other blood sample was centrifuged at 4000 rpm for 20 minutes. An aliquot of serum was used for enzyme determination while the other part was frozen at -20 °C until the other biochemical analysis. Commercial kits were used for all blood measures.

Statistical analysis:

Data were statistically analyzed by the least squares methods described by likelihood program of SAS (2003). Differences among means were determined by Duncan's New Multiple Range Test (Duncan, 1955). The following statistical model was used:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where, Y_{ij} = the studied trait, μ = the overall mean, T_i = the effect of treatment $i = (1, \dots, 10)$, e_{ij} = the experimental error.

RESULTS AND DISCUSSION

Daily feed intake:

The effect of experimental treatments on daily DM intake is presented in Table (2). The effect of using chamomile flowers on daily feed intake as TDN was highly. The values of TDN intake (g/head/day) were 1027.04, 1042.13 and 1048.21 for G1, G2 and G3; respectively. No differences were noticed among groups in DM intake as (g/head) or (g/kgW^{0.75}), the same result was observed on CP intake as g/head and g/kgW^{0.75} as shown in Table (2). Similar trends were observed by Khattab *et al.* (2018) when adding chamomile flowers at the same levels in rations of Farafra ewes.

Table (2): Effect of chamomile levels on feed intake (g/head/day).

Item	G1	G2	G3
DM	1521.96	1542.82	1549.47
CP	188.83	191.10	191.92
TDN	1027.04	1042.13	1048.21
DM, g/KgW ^{0.75}	84.53	85.42	86.44
CP, g/KgW ^{0.75}	10.96	11.21	11.06
TDN, g/KgW ^{0.75}	75.73	72.02	69.64

G1: Control, G2: 5g chamomile, G3: 10g chamomile.

Moreover, Shehata *et al.* (2004) found that addition of chamomile during pregnancy and lactation periods had positive effect on daily feed intake. The same authors stated that the daily DM intake may increase by medicinal herbs to support the greater milk yield as reported by Ahmed (1999).

Growth performance:

Table (3) and Figure (1) illustrated the daily body weight gain (DBWG) that improved significantly by adding chamomile, being 211.90, 229.29 and 233.57 g for G1, G2 and G3, respectively. Similar results were observed by Tawfik *et al.* (2005) and El-Kholany *et al.* (2017) when using chamomile in rations of growing sheep and Baladi calves; respectively. In the same line, Abdelhamid *et al.* (2004) investigated the effect of adding chamomile flowers to rations of growing Rahmani sheep on growth performance and they found positive effects on daily body gain.

Generally, this positive effect may be attributed to the effect of chamomile as a medicinal herb as anti-diarrhea, anti-dysentery, anti-bacterial, anti-protozoa anti-acidity, expellant to worms and antiseptic which decrease losses of digested feed (by parasites) and save digested nutrients to improve the production levels as reported by El-Baba, (1971), Chevallier (1996), Abdelhamid *et al.* (2004) and Shehata *et al.* (2007).

Table (3): Effect of chamomile levels on average live body weight (LBW):

Item	G1	G2	G3	± SE
Average weaning weight (initial weight) (Kg)	12.91	13.07	13.21	0.05
Average final weight (Kg)	39.61 ^b	41.96 ^{ab}	42.64 ^a	0.34
Total live body weight gain (Kg)	26.70 ^b	28.89 ^a	29.43 ^a	0.26
Daily body weight gain (g)	211.90 ^b	229.29 ^a	233.57 ^a	1.43

a and b: Means in the same row with different superscripts are significantly differ ($P < 0.05$). SE= standard error

G1: Control, G2: 5g chamomile, G3: 10g chamomile.

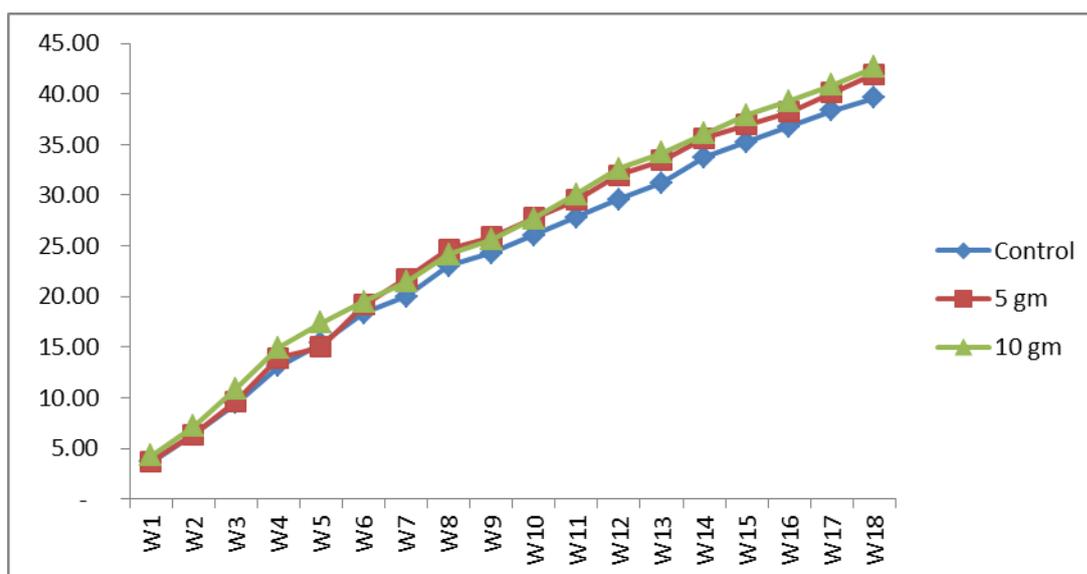


Figure (1): The growth weight of lambs in the experimental treatments.

Digestion coefficients:

Percentage of digestion coefficients (Table 4) of all nutrients were significantly improved with high level of chamomile treatments (G3) than G2 and control group (G1) except OM, EE and NFE digestibility were not significant. The low level of chamomile caused slightly increase in values of digestion coefficients for all nutrients than control group.

Table (4): Effect of chamomile levels on digestion coefficients (%).

Item	G1	G2	G3	± SE
DM	67.03 ^b	68.31 ^b	70.04 ^a	0.45
OM	70.30	71.45	72.39	0.51
CF	60.51 ^b	62.35 ^{ab}	63.40 ^a	0.79
CP	71.55 ^b	73.60 ^{ab}	74.83 ^a	0.62
EE	77.40	78.20	79.50	0.41
NFE	72.90	74.44	75.03	0.72

a and b: Means in the same row with different superscripts are significantly differ (P<0.05). SE= standard error
G1: Control, G2: 5g chamomile, G3: 10g chamomile.

The improvement in digestibility of all nutrients with the presence of both chamomile treatments may be attributed to the role of the active ingredients that function as an antiseptic against the antagonistic flora and stimulate the digestive enzymes and processes (Abou-Zeid, 1986; Khanna *et al.*, 1993 and McIntyre, 1995).

Abdelhamid *et al.* (2004) who showed that most digestion coefficients and feeding values were higher as a result of using chamomile flowers in diets with Rahmani lambs. In other study on Zaraibi bucks, the highest values of digestion coefficients of all nutrients were recorded by the high level of chamomile whereas, the lowest values were detected with unsupplemented ration (El-Kholany *et al.*, 2015).

Blood Profile:

Data of hemato-biochemical parameters of growing lambs fed different experimental rations are presented in Table (5). The obtained results showed that hemoglobin (HB), RBC's, and glucose, were slightly increased without significant differ by increasing level of chamomile (0, 5 and 10 g) in the

rations. While, serum total protein, albumin, and globulin tended to increase with chamomile addition (G2 and G3) and the differences were not significant in albumin only.

Table (5): Effect of chamomile levels on blood parameters.

Item	G1	G2	G3	± SE
Red blood cells (RBC's) ×10 ⁶ /ml	10.80	10.71	10.72	0.57
Hemoglobin (HB), g/dl	11.30	11.52	11.61	0.58
Glucose (mg/100ml)	58.72	60.53	61.30	1.79
Total Protein (g/100ml)	6.08 ^b	7.12 ^a	7.25 ^a	0.12
Albumin (g/100ml)	3.74	3.87	3.96	0.25
Globulin (g/100ml)	2.34 ^b	3.35 ^a	3.39 ^a	0.22
Creatinine (mg/100ml)	1.23 ^a	1.17 ^b	1.13 ^b	0.07
GOT(AST), u/l	64.61 ^a	57.75 ^{ab}	56.02 ^b	1.03
GPT (ALT), u/l	23.73 ^a	21.61 ^{ab}	19.07 ^b	1.30
Triglyceride (mg/100ml)	55.29	54.59	53.05	2.71
Cholesterol (mg/100ml)	81.42 ^a	77.66 ^b	76.79 ^b	2.50

*a and b: Means in the same row with different superscripts are significantly differ (P<0.05). SE= standard error
G1: Control, G2: 5g chamomile, G3: 10g chamomile.*

Moreover, serum cholesterol, triglyceride, creatinine and activities of AST and ALT were higher significantly with the control ration (G1) compared with chamomile groups (G2 and G3) while, the difference was insignificant (P>0.05) in triglyceride values.

These results are in agreement with Shehata *et al.* (2004) and Abdelhamid *et al.* (2011). Tawfik *et al.* (2005) found that serum total lipids and cholesterol as well as the enzyme activity (AST and ALT) were reduced as a result of adding chamomile in sheep rations.

Recently, Ahmed *et al.* (2019) showed that most of the haematochemical parameters were not significantly affected (P>0.05) by the tested regime containing three different levels of chamomile (1, 2, and 3 g/h/d). However, cholesterol and activities of ALT and AST enzymes were reduced while serum total protein, glucose, and phosphorus were increased, resulting in the addition of chamomile to the regime.

Puberty:

Puberty of male growing Farafra sheep in relation to chamomile levels is presented in Table (6) and Figure (2). The obtained results revealed that both testes volume and testes circumference tended to increase ((P<0.05) with increasing level of chamomile (0, 5 and 10 g) in the rations. Thus, the age at puberty was better (P<0.05) with adding chamomile compared with the control (unsupplemented ration). These results are due to the improvement that observed in digestibility and growth performance.

Table (6): Effect of chamomile levels on puberty, testes volume and testes circumference.

Item	G1	G2	G3	± SE
Age at puberty (day)	303.8 ^a	282.25 ^b	286.83 ^b	1.04
Testes volume (ml)	143.2 ^a	154.5 ^b	156.00 ^b	0.37
Testes circumference (mm)	214.8 ^a	221.5 ^{ab}	231.67 ^b	0.93

*a and b: Means in the same row with different superscripts are significantly differ (P<0.05). SE= standard error
G1: Control, G2: 5g chamomile, G3: 10g chamomile.*

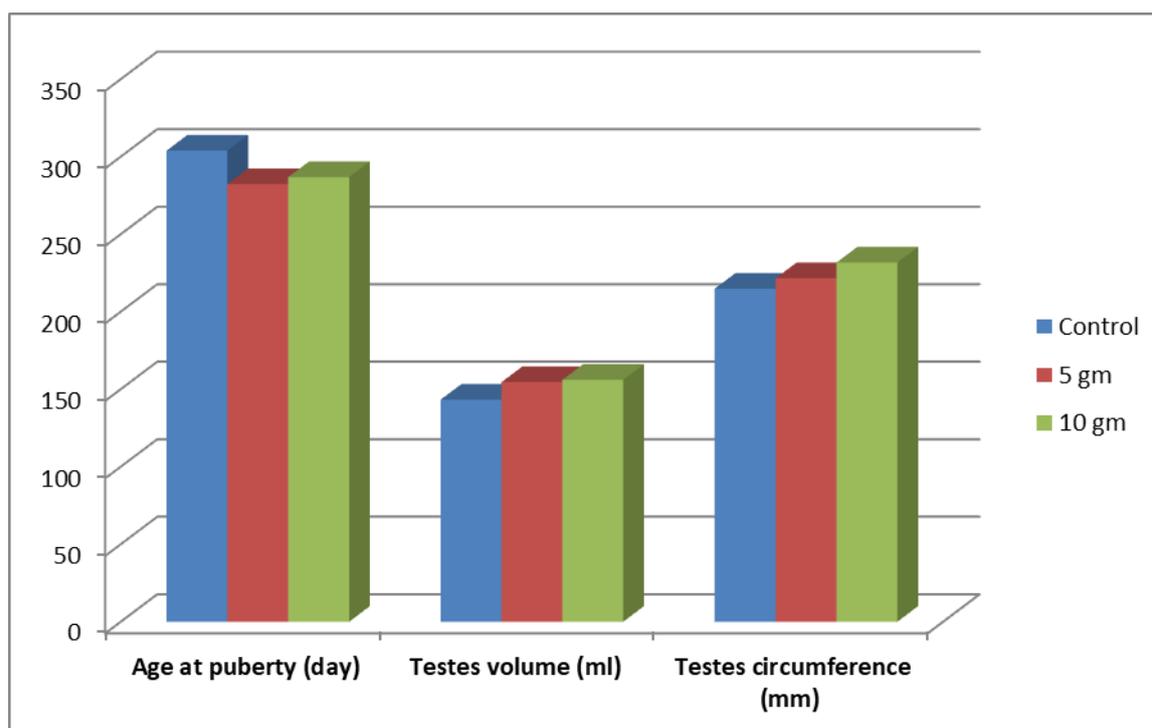


Figure (2): Effect of chamomile levels on Puberty, testes volume and testes circumference

Economic efficiency:

Economic efficiency (EE), are presented in Table (7). The price of feed intake per kg live body weight gain was higher with the control G1 (24.78) than G2 and G3. The addition of chamomile to lambs rations reduced feed cost/kg body weight gain for 23.07 to 22.73 LE. Therefore, the economic efficiency was increased with the increasing level of chamomile in lamb's ration (2.42, 2.60 and 2.64 for G1, G2 and G3; respectively). The economic efficiency was improved for two chamomile supplemented rations (G2 and G3) by 7.4 and 9.1%; respectively, compared with G1. Similar results were observed by El-Saadany *et al.* (2003) they observed that using some medicinal herbs (*Nigella sativa* and chamomile) as feed additives in cow ration increased the economic return by about 21 and 23%, respectively than the control.

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

Item	G1	G2	G3
Daily feed intake (g/h)as fed:			
Concentrate feed mixture, g/h	750	750	750
Berseem hay, g/h	500	500	500
Bean straw, g	250	250	250
Chamomile flowers, g/100kg	-	5	10
Price of additive, LE/gm	-	0.20	0.40
Cost of consumed feed, LE/h	5.25	5.29	5.31
Body gain, g/h.	211.90	229.29	233.57
Price of weight gain, LE/h	12.714	13.767	14.014
Feed cost/ kg gain, LE/h	24.78	23.07	22.73
Economic efficiency, %	2.42	2.60	2.64
improvement	100	107.4	109.1

Concentrate price = 4.2 LE/kg – Berseem hay price = 3.4 LE/kg – Bean straw = 2 LE/kg - live animal price = 60 LE/kg, G1: Control, G2: 5g chamomile, G3: 10g chamomile.

CONCLUSION

It could be concluded that using of chamomile flowers as a feed additive in Farafra sheep had a positive effect on digestion coefficients, growth performance and puberty.

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تأثير استخدام زهرة البابونج (كاموميل) كإضافة غذائية على النمو ومعاملات الهضم وصورة الدم والبلوغ الجنسي لأغنام الفرازة

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تم استخدام 30 من حملان الفرازة (ذكور) بعد الفطام وقسمت لثلاث مجموعات متساوية عشوائيا (مج1 ، مج2 ، مج3) وغذيت طبقا لمقررات NRC لعام 1985 مع إضافة صفر ، 5 ، 10 جم كاموميل لكل 100كجم وزن حي للمجموعات الثلاثة على التوالي. وكانت أهم النتائج لتأثير الكاموميل على المأكول اليومي (جم / رأس) منسوبا للمادة الجافة والمركبات المهضومة الكلية كان تأثيرا معنويا ، ايضا سجل تحسن فى المأكول اليومي للمادة الجافة (84.53 ، 85.42 ، 86.44 جم / كجم حيز جسم تمثيلى) مع زيادة مستوى الكاموميل (صفر ، 5 ، 10 مجم / 100 كجم وزن حي يوميا) فى علائق الحملان (مج1 ، مج2 ، مج3 على التوالي) وفى المقابل لم يحدث تأثير فى المأكول اليومي من البروتين (جم / رأس أو جم / كجم حيز جسم تمثيلى). و أظهرت النتائج تحسنا واضحا فى معاملات هضم المعاملات الغذائية مع معاملتى الكاموميل (مج2 ، مج3) مقارنة بمجموعة المقارنة والأختلافات كانت معنوية فى معاملات هضم المادة الجافة والبروتين الخام والألياف الخام والمستخلص الخام من الأزوت. أيضا سجلت القيم الأفضل فى كل معاملات الهضم مع المستوى المرتفع من الكاموميل.

فيما يتعلق بقياسات صورة الدم فقد ظهر تحسن ايجابى فى قياسات الهيموجلوبين والبروتين الكلى والجلوبيولين والجلوكوز والألبومين والدهون الثلاثية مع إضافة الكاموميل فى العلائق ، وأيضاً سجلت القيمة الأعلى مع عليقة المقارنة فى قياسات اليوريك والكوستيرول والأنزيمات مقارنة بمعاملتى الكاموميل (مج2 ، مج3) وكانت الأختلافات معنوية.

أما بالنسبة لمعدلات النمو فى الحملان ، فقد سجلت أعلى قيمة مع مج3 (233.57 جم) ثم مج2 (229.29 جم) وأخيرا سجلت أقل قيمة مع مج1 (211.90 جم) والأختلافات كانت غير معنوية بين مجموعتى الكاموميل المختبرة (مج2 ، مج3). أيضا سجلت النتائج نفس الاتجاه بالنسبة الى الزيادة الوزنية الكلية والوزن الحى النهائى ، وأيضاً ظهرت نتائج ايجابية فى قياسات وحجم الخصية وعمر البلوغ الجنسى والكفاءة الاقتصادية.

يستخلص من الدراسة أن استخدام الكاموميل فى علائق الأغنام الفرازة أثناء فترة النمو له تأثير ايجابى ليس فقط على معاملات الهضم لكل العناصر الغذائية بل أيضا فى تحسين الأداء الأنتاجى والبلوغ الجنسى والكفاءة الاقتصادية وبدون تأثيرات سلبية على الحيوان.