EFFECT OF FEEDING A MEDICINAL HERB, CHAMOMILE FLOWER, ON PRODUCTION AND HYGIENE OF GOAT MILK PRODUCTION

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SUMMARY

This research was conducted to evaluate effects of the dietary level of Chamomile flowers on hygienic quality of goat milk. Ninety pregnant Zaraibi does (three successive lactations and average BW of 57 kg) were divided into three equal groups and fed diets according to NRC (1981) recommendations that contained 0, 5 and 10 g chamomile/100 kg BW/day.

Chamomile reduced somatic cell count during the 3-months suckling period and thereafter during the lactation period. The SCC was higher in all groups during suckling than lactation and averaged 459,000. 251,000 and 145,000 for the 0, 5 and 10 g chamomile levels, respectively.

Chamomile increased milk yield and influenced the tested hemato-biochemical parameters, but without significant change in milk composition.

***Keywords**: dairy goat, milk production, medicinal herb, somatic cell count.*

Abbreviations Key: Albumin=Alb. Alkaline phosphatase-AlkPh, Cholesterol=Ch. Creatinine=Cr. Globulin=Gl, Glucose=Glu, Glutamic oxaloacetic transaminase=GOT. Glutamic pyruvic transaminase=GPT, Hematocrite=Hct, Hemoglobin=Hb, Mean cell hemoglobin concentration=MCHC, Red blood cells=RBC's, Somatic cell count=SSC, Total bilirubin=Tb, Total protein=TP, Triglyceride-Tri, White blood cells=WBC's

INTRODUCTION

The use of medicinal herbs and plants for humans has been well known since the old civilizations of ancient Egyptians. However, using medicinal herbs and seeds as feed additives for ruminants seems to be a recent global trend (Singh *et al*., 1993).

The use of herbal galactogogues is known to have beneficial effects on milk production (Singh *et al*., 1991; Tiwari *et al*., 1993). Allam *et al*. (1999) observed that using medicinal herbs such as chamomile in dairy goat diets had a positive effect on milk production and feed conversion efficiency as well. Moreover, serum cholesterol and total lipids were reduced while triglycerides, protein and globulin in goats were increased as a result of adding chamomile flowers to the diet (El-Hosseiny *et al*., 2000). The same authors observed that using chamomile in doe diets (60 mg/kg BW) reduced mortality rate of born kids to zero during the suckling period compared with rates of 6.67 to 13.33% for other medicinal herbs. This suggests that chamomile may have a role in improving immunity and performance of kids.

Somatic cell counts (SCC) in milk of normal goats are much higher than in milk of normal cows, especially in late lactation (Caruolo, 1974; Grootenhuis, 1980; Okada, 1960; Petterson, 1981; Smith and Roguinsky, 1977). The relatively high somatic cell count in milk of goats may be associated with reduced milk quality.

Therefore, the present study was conducted to evaluate effects of addition of chamomile flowers to the diets of Egyptian Nubian goats (Zaraibi) on SCC and milk quality.

MATERIALS AND METHODS

This study was carried out in 2001 and 2002 at the El-Serw Experimental Station of the Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

Ninety Zaraibi does (within three seasons of lactation, 50-60 months of age, average BW of 57 kg and in the last month of pregnancy) were divided into three equal groups, 30 does each, considering body weight, milk yield and twinning rate. The experiment began ten weeks before parturition and continued until the ninth month of lactation. Each group was housed in a semi- roofed barn (8 x 6 x 5 meters). Animals were weighed at the beginning of the experiment and biweekly. Does received diets in groups.

Zaraibi does in groups G1, G2 and G3 received a daily feed supplement of 0, 5 and 10 g chamomile/100 kg BW, respectively. Chamomile flowers were mixed with approximately 10 g of ground concentrate and spread daily as powder over the concentrate feed mixture, as reported by Chiquette *et al.* (1993) and Ahmed *et al.* (2001).

Amounts of concentrate and roughage fed were based on nutrient requirement recommendations of NRC (1981). Berseem hay (BH) and bean straw (BS) were fed to provide 35% of the CP requirement, while concentrate mixture provided the remained 65%. The dietary forage : concentrate ratio was 50:50. The concentrate feed mixture (CFM) consisted of 26% undecorticated cottonseed meal, 38% yellow corn, 20% wheat bran, 7% rice bran, 5% molasses, 2.5% limestone, 1% common salt and 0.5% mineral mixture. Samples of feeds were analyzed according to AOAC procedures (1988). The chemical analysis of the CFM, BH and BS is shown in Table (1). Water was available all times. Diets were offered twice daily at 8:00 am and 3:00 pm.

Daily milk yield was recorded for each doe. Representative milk samples (about 0.5% of total milk produced) were taken once monthly from each doe at both milkings. Samples were composited and analyzed for chemical composition according to Ling procedures (1963).

Blood samples were collected from the jugular vein before feeding (0 time) from five does of each group once at end of the experiment. Whole blood was immediately used for hematological estimation. Another blood sample was centrifuged at 4,000 rpm for 20 minutes. An aliquot of serum was used for enzyme determinations while the other part was frozen at – 20 ° C until the other biochemical analyses. Commercial kits were used for all blood measures.

Data were statistically analyzed by the Least Squares Method described by the Likelihood program of SAS (1994). Differences among means were determined by the Duncan's New Multiple Rang Test (Duncan, 1955)

RESULTS AND DISCUSSION

Daily feed intake

Daily DM intake (Table 2) showed, in most periods, a slight tendency to be increased by supplementation with chamomile, with the effect being greater for the 10 vs. 5 g level of chamomile. Moreover, when DM intake was scaled by metabolic body weight, these differences were diminished. The only exception was during mid-lactation when milk yield was highest, with DM intake scaled by $BW^{0.75}$ 4.93 and 6.69% greater for G-2 and G-3, respectively, than for G-1. The comparable differences among other periods ranged only from 0.30 to 2.87%. When intake estimates were scaled by BW, the increases were still high (e.g., 5.55 and 7.43% differences for G-2 and G-3, respectively, compared with G-1); other differences ranged from 0.24 to 1.21%. Feed intake may have been increased by chamomile supplementation to support the greater milk yield (Abdelhamid *et al.*, 1999).

Dry matter intake was lower in late lactation than during suckling and mid-lactation periods, which may have been mainly due to the sharp decline in milk yield within these periods. Similar results were observed by Ahmed *et al.* (2001), where DM intake ranged from 113 to 119 $g/kgw^{0.75}$ during early lactation from 1 to 90 days and decreased to 86 to 89 $g/kg\ BW^{0.75}$ during the period from 91 to 270 days.

Blood profile

Data of hemato - biochemical parameters are presented in Table 3. The obtained results indicated that chamomile had a significant effect on most parameters measured and that increasing the supplemented dose also had a significant effect. Such effects varied from being negative to positive. Chamomile significantly reduced the levels of Cho, GOT, GPT and AlkPh ($P<0.05$). Hct level also decreased but none significantly. Increasing the dose of chamomile elicited a greater decrease in GOT, AlkaPh. and Hct compared with the lower level, but only a slightly greater decrease in the Cho level was noted.

On the other hand, chamomile caused increases in Hb, RBC, WBC, MCHC, TP, Glo, Glu, Tri and Tb. All effects were significant ($P <0.05$) except for Hb and Tb. Increasing the dose of chamomile had increased the magnitude of change for all parameters measured, but only positive effects on WBC's. MCHC and Tri and negative changes in GOT and GPT were significant ($P <0.05$).

These results agree with those of El-Hosseiny *et al* (2000) who found that serum TP, Glo and Tri were significantly higher and serum total lipids and Cho were significantly lower as a result of presence of medicinal herbs and plants (especially chamomile) in goats rations. Generally, the obtained values are within the normal ranges reported by Kaneko (1989) for healthy goats and in line with findings of Zeid (1998) who used medicinal herbs and plants in goat rations.

Somatic cell counts

Chamomile significantly decreased SSC during all stages of lactation and the effect was greater for the higher chamomile level. The overall mean of SCC was highest (459,000 cells/ml) for G-1 (control) followed by G-2 (251,000 cells/ml) and lastly G-3 (145,000 cells/ml). Thus, chamomile supplementation reduced SCC by 73% when added at the rate of 5 g/100 kg BW and by 216% when added at the rate of 10 g/100 kg BW, compared with the control group.

It is of interest to note, as depicted in Figures 1 and 2, that estimates of SCC did not parallel changes in milk yield.

Table (1) : Chemical composition of feedstuffs consumed by Zaraibi does (% DM basis.

Feed	DM	OM	CF	CP	EE	NFE	Ash
Concentrate feed mixture	90.7	91.3	16.1	15.0	3.2	56.9	8.7
Berseem hay	88.7	87.0	29.9	11.1	2.4	43.7	13.0
Bean straw	89.5	86.1	37.9	5.5	1.2	41.4	14.0

Table (2): Effect of level of chamomile supplementation on dry matter intake*, kg.

	Treatments		
	G-1	G-2	G-3
DM intake during gestation			
g/d	1566	1589	1611
g/kg $BW^{0.75}$	73.1	73.4	73.8
**DM intake during early lactation (from 1-90 days) ** **			
g/d	2197	2221	2243
g/kg $BW^{0.75}$	127.5	127.8	128.6
DM intake during mid lactation (from 91-180 days)			
g/d	1911	2017	2053
g/kg $BW^{0.75}$	113.6	119.2	121.2
DM intake during late lactation (from 181-270 days)			
g/d	1285	1302	1308
g/kg $BW^{0.75}$	74.4	75.3	75.3

G-1: Control, G-2: 5 g chamomile level, G-3: 10 g chamomile level
* Group feeding ** Suckling period

Table (3): Blood Profile of Zaraibi does as affected by the experimental treatments.

	Treatments				
	G-1	G-2	G-3	SE	Sig.
Hb, g/dl	9.01^{b}	9.92^{a}	10.04^{a}	0.19	*
Hct, %	32.6	32.0	30.4	0.64	NS
RBC's, $x10^{6}$/ul	9.60^{b}	10.39^{a}	10.51^{a}	0.15	*
WBC's, $x10^{3}$ /ul	8.22^{b}	9.02^{b}	12.0^{a}	0.54	**
MCHC, %	27.74^{c}	31.02^{b}	33.08^{a}	0.68	**
TP, g/100ml	6.79^{b}	7.48^{a}	7.45^{a}	0.10	**
Alb, g/100ml	3.99	4.22	4.15	0.05	NS
Glo, g/100ml	2.80^{b}	3.26^{a}	3.30^{a}	0.09	*
Urea ,mg/100ml	39.6	42.8	41.0	0.84	NS
Cr, mg/100ml	1.28	1.26	1.32	0.03	NS
Glu, mg/100ml	56.64^{b}	62.2^{a}	60.8^{a}	0.87	*
Tri, mg/100ml	78.40^{c}	89.20^{b}	99.60^{a}	2.91	**
Cho, mg/100ml	109.60^{a}	92.2^{b}	89.4^{b}	2.94	**
Tb, mg/100ml	0.26	0.30	0.28	0.02	NS
GOT, u/l	121^{a}	114^{a}	99^{b}	3.33	**
GPT, u/l	28^{a}	26^{ab}	20^{b}	1.42	*
AlkPh, u/l	133.8^{a}	115.2^{ab}	109.2^{b}	4.39	*

a to c of the same row with different superscripts are significantly different (P<0.05).

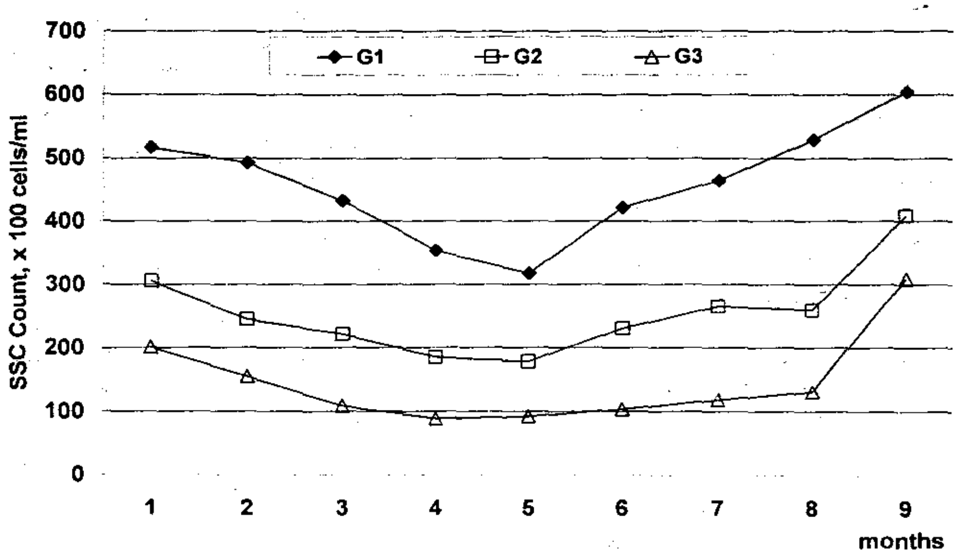

Figure 1: SCC in different groups as affected by chamomile level.

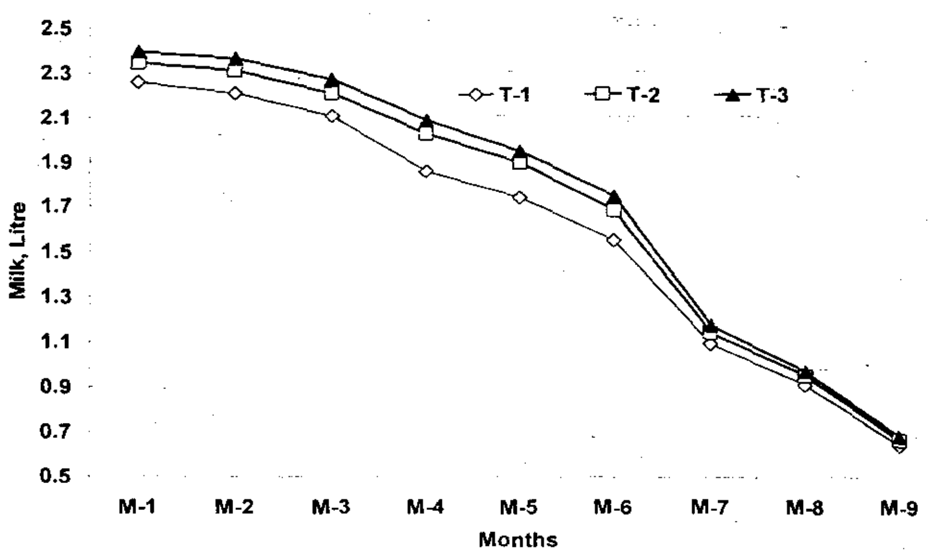

Figure 2 : Milk yield in the control and chamomile treated groups.

Lactation peaked in the first month of lactation, though the previous period is not presented in Figure 2, and then decreased gradually for all groups as lactation advanced to the ninth month. Conversely, SCC increased at the start of lactation then decreased gradually until the fifth month, then increased until the ninth month. The periods with high SCC count were: birth; initial suckling of the udder; preparation for conception; new gestation. Thus, it seems that SCC is a product of some internal factors rather than only influence by bacterial infection. Also, SCC does not seem a function of the amount of milk produced but rather is more related to the biological status of the body.

Differences in SCC among animals were high in the control group, ranging from 48 to 1,820 x10^3 cells/ml and with an overall mean of 459 x10^3 cells/ml, which is comparable to the physiological median level established for goats of 415,000 cells/ml (Pernthaner *et al.*, 1991). Moreover, variability in SCC among flocks is high and has ranged from 420 to 2,719 x10^3 cells / ml (Gonzalo *et al.*, 1994).

Chamomile supplementation (Figure 3) minimized variation among animals in SCC in addition to reducing the count. As an example, chamomile at 10 g/100 kg BW (G-3) resulted in 53% of does with 101,000-200,000 cells/ml, while the rate of 5 g/100 kg BW corresponded to 55.6% of does with 201,000-400,000 cells/ml.

This noticeable effect on reducing SCC and consequently improving milk quality might be attributed to active ingredients (like flavonoids, coumarins, cyanogenic glycosides and salicylattes) in chamomile that function as anti-inflammatory, antiseptic, antispasmodic, antihistamine and sedative agent (Ody Penelope, 1993; McIntyre, 1995).

SSC was generally higher during the first month of lactation and suckling, and then gradually decreased to a minimum in the 4th and 5th months in mid-lactation. Thereafter, SCC increased again gradually to a maximum at the end of lactation (9th month). In agreement with the present result, Boumgartner *et al.* (1992) found that SCC was closely related to the period of lactation, being the highest during the 6th week following parturition then decreased to the 24th week of lactation and then being high at the end of lactation. Regi *et al.* (1991) reported elevated SCC in late lactation when milk yield is low. Baro *et al.* (1994) and Bedo *et al.* (1995) found that SCC correlated negatively with milk yield.

Milk production

Yield of milk and all measured components (Table 4) tended to be increased by the addition of chamomile, with changes tending to be greater for the high than low level of addition. Daily milk yield was increased by 6.0 and 8.9% for G-2 and G-3 compared with the control. Yields of fat and protein as g/d were increased ($P < 0.05$) by the high chamomile level.

In a recent study on milk production, Allam *et al.* (1999) studied the effect of using some medical plants and herbs as feed additives and found that daily milk was improved with chamomile by more than 10% compared with either the other herbs or the unsupplemented diet. The same authors reported that chamomile treatment had highest yields of fat, protein and total solids and improved feed utilization efficiency.

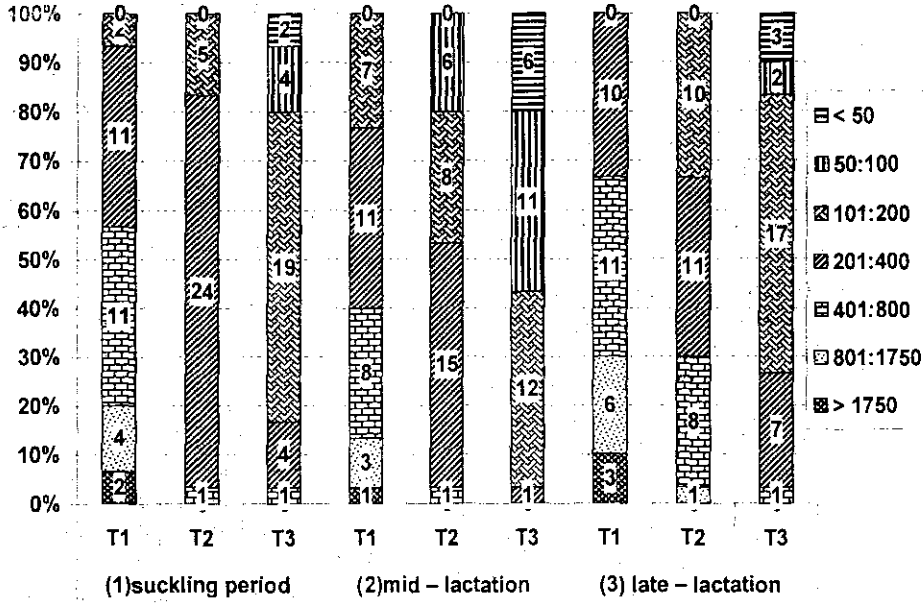

Figure 3: Distribution of does according to their SSC based on the international standard classes.

Table (4): Effect of level of chamomile supplementation on milk yield and constituent concentration.

Items	Treatments			SE	Sig.
	G-1	G-2	G-3		
Daily milk yield , kg	1.60	1.69	1.74	0.03	ns
Fat, %	4.33	4.48	4.56	0.06	ns
Protein, %	3.07	3.10	3.23	0.02	ns
Lactose, %	4.49	4.50	4.65	0.02	ns
Total solids, %	12.63	12.85	13.22	0.08	ns
Solids non fat, %	8.31	8.37	8.63	0.04	ns
Ash, %	0.75	0.76	0.79	0.02	ns
Av. fat yield, g/d	69.09 ^{b}	75.85 ^{ab}	79.39 ^{a}	1.20	*
Av. protein yield, g/d	48.95^{b}	52.52 ^{ab}	56.20 ^{a}	0.58	**

a-c: Means in the same row with different superscripts are significantly different (P<0.05)

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أثر إضافة زهرة البابونج لغذاء الماعز الزرايبى على إنتاجية اللبن وجودته الصحية

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هدف هذا البحث إلى التعرف على أثر إضافة زهرة البابونج لغذاء الماعز على اللبن المنتج ودرجة جودته. تم إستخدام تسعون عنز زرايبى حلابة أكملت ثلاث مواسم حليب ومتوسط وزنها ٥٧ كيلوجرام حيث قسموا لثلاث مجموعات متساوية عذيت تبعا لمقررات NRC (1981) مع إضافة ٠، ٥، ١٠ جرامات من البابونج لكل ١٠٠ كجم وزن حى للمجموعات الثلاث بالتوالى.

نتج عن إضافة البابونج إنخفاض عدد الخلايا الجسدية باللبن سواء خلال فترة الرضاعة التى أستمرت ثلاثة أشهر أو عقبها خلال فترة الحليب. وبصفة عامة كان تعداد الخلايا الجسدية أعلى خلال الرضاعة عن فترة الحليب، حيث وصل تعدادها ٤٥٩٠٠٠ ، ٢٥١٠٠٠، ١٤٥٠٠٠ لمستويات الإضافة صفر ، ٥ ، ١٠ جرام بالتتالى.

نتج عن إضافة البابونج زيادة فى كمية اللبن المنتج كما كان له أثر على مقاييس الدم التى قدرت ولكنها لم تصل لحد المعنوية من حيث التأثير على مكونات اللبن، وقد تم مناقشة ذلك تفصيلا داخل البحث المنشور.