EFFECT OF FEEDING CHAMOMILE BY-PR0DUCT (*MATRICARIA CHAMOMILLA)* ON PERFORMANCE OF LACTATING BUFFALOES.

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SUMMARY

The effects of chamomile by-product (flower after oil extraction) on lactating buffaloes diets were nutritionally evaluated through digestibility, feeding values and lactation trials. Nine Lactating buffaloes weighed 550 ± 10 kg in average at the 3^{rd} to 5^{th} parity of lactation were used. Feeding trial was initiated at 45 ± 3 days post partum, where each buffalo was served as its own control and the experimental diets were fed in successive duration. The treatments were D_1 (control) composed of 50% concentrate mixture (CM) + 25% berssem hay (BH) + 25% wheat straw (WS). The 25% berseem hay and 25% of wheat straw of the control ration (D_1) were each replaced at 25, 50 and 100% by chamomile by-product in D_2, D_3 and D_4, respectively. The results revealed that buffaloes fed diets containing chamomile by-product showed the highest values of digestibility coefficients and feeding values compared with control ration. Also, buffaloes when fed D_4 showed the highest milk yield and its composition followed by those fed D_3, D_2 and D_1 (control ration), respectively. From economical point of view the chamomile by-product containing diets reduced feeding costs needed to produce 1 kg 4% FCM especially that contained 50% chamomile by-product (D_4) and 25% chamomile by-product (D_3). It could be concluded that chamomile by-product can safely, successfully and economically replace up to 100% of both berseem hay and wheat straw in rations of lactating buffaloes.

Keywords: *chamomile by-product; buffalo; feeding values; milk yield; milk composition.*

INTRODUCTION

Today the medicinal plants are grown in several areas of Egypt especially in village of Fayoum and Beni Sueif city. Attempts to use the natural materials as alternative growth promoters such as medicinal plants are widely accepted. Regarding such plants, chamomile has some properties as antiseptic, antibacterial activities against harmful microorganisms, treatment of gastro-intestinal complaints and tonic (Mahran, 1967; Hmumochi *et al.*, 1992; El-Emary, 1993 and Tozyo *et al.*, 1994). Also, some studies indicated effects on live weight gain and feed efficiency (Zied, 1998). On the other hand, some studies indicated that the medicinal herbs (chamomile) decreased the feed cost when added for ration (Zied, 1998 and Allam *et al.*, 1999). In Egypt the chamomile by-product (flower after oil extraction) is one of these aromatic plants by-products which could be used in animal rations, about 53347 feddans are cultivated by aromatic plants produce 84795 ton/year in Egypt (*Agricultural Economics 2005)*. Aromatic plants contained 81.32 to 87.54 % dry matter (DM), 9.7 to 13.52 % crude protein (CP), 23.67 to 46.24 % ether extract (EE) and 4.70 to 12.34 % ash (Wideneki *et al.*, 1998). Some studies used aromatic plants by-products supplementation in calves, cow and sheep rations (Wojcik *et al.*, 1984, Tiwari *et al.*, 1996 and Djouvinov *et al.*, 1997). The main objective of this study was to evaluate the inclusion of chamomile by-product as a replacement of berseem hay and wheat straw with different percentages of 25, 50 and 100 % of lactating buffalo's diets and study its effects on the digestibilities, nutritive values, milk yield and its composition and finally economical evaluation.

MATERIALS AND METHODS

The present study was carried out at the experimental Station of Animal Production Department, Faculty of Agriculture, Fayoum University, Egypt.

Feeding trial:

Nine Egyptian Lactating buffaloes weighed 550 ± 10 kg in average at the 3rd to 5th parity of lactation were used. The effect of four diets was tested (diets D1, D2, D3 and D4 in Table 1) on milk yield and its components. The berseem hay and wheat straw of the control ration (D1) were replaced by 25, 50 and 100% by chamomile by-product in D2, D3 and D4, respectively. The experiment was initiated at 45 ± 3 days post partum, where each buffalo was served as its own control using swing over method according to Abou-Hussein (1958) starting and ending with feeding the control diet (D1). Each period consisted of three weeks transition period followed by one week test period. Covariance analysis was made to control error and adjusted treatments means to be comparable followed Steel and Torrie (1980). Animals were fed according to the allowances recommended by (Shehata, 1971). Buffaloes were milked twice daily at 08.00 and 19.00 hrs. Fresh water was offered freely. Feed intake and milk yield were recorded per each Buffalo/day. Representative milk samples of connective evening and morning milking were taken refrigerated and kept for chemical analyses. Milk samples were analyzed for fat, protein, ash and total solids (TS) (Ling, 1963) and lactose (Barnett and Abd El-Tawab, 1957); 4 % fat corrected milk (FCM) was calculated according to Gaines (1923) equation.

Table (1): Formula of the experimental rations used in feeding trial, on dry matter basis.

Item	Diets			
	D_1	D_2	D_3	D_4
Concentrate mixture (CM) %	50	50	50	50
Berseem hay (BH) %	25	18.75	12.5	--
Wheat straw (WS) %	25	18.75	12.5	--
Chamomile by-product (CC) %	--	12.50	25	50

Digestibility trials:

During the milk collection period for each treatment, the nutrient digestibility and feeding values were determined by choosing three buffaloes randomly, using acid insoluble ash (AIA) technique of Van Keulen and Young (1977). Samples of feeds and feces were analyzed according to A.O.A.C. (1990). Gross energy (GE) of feeds was calculated after Nehring and Haenlien (1973).

Feed efficiency of the tested diets was calculated and expressed in terms of DM, TDN and DCP, which required for producing one kg of adjusted FCM.

Statistical analysis:

Complete randomized design was used for digestibility trials. Analysis of covariance was used for milk data to control errors due to lactation curve and to adjust treatment means. The general linear model procedure adapted by SPSS (1997) was used according to the following model:

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

Where Y_{ij}, is the dependent variable;μ, is the overall mean; T_i, is the effect of treatment; eij, is the residual error. The new least significant difference (LSD) was used when the treatments effect was significant (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Chemical composition of ingredients and the tested diets:

Chemical composition of chamomile by-product, Berssem hay, wheat straw, Concentrate mixture and tested diets are presented in Table (2). Chamomile by-product contained more crude protein, ether extract, ash, gross energy and NFE but it had less crude fiber. The tested diets and the control one have nearly similar chemical composition.

Digestibility coefficients and feeding values:

Nutrients digestibility and feeding values of tested diets are presented in Table (3). Digestibility coefficients of all nutrients and feeding values were significantly different. Comparing the tested diets, the general trend showed higher nutrients digestibility and feeding values with D4 compared with other diets, while D1 (control diet) was the lowest. Regarding energy feeding values and DCP%, the best values were with D4 followed by D3 and D2, while D1 (control diet) was the lowest. These results are in agreement with those reported by Wojcik *et al.* (1984), Allam *et al.* (1999), El-Saadany *et al.* (2003) and Mohamed and Ibrahem (2003). Mericli (1990) mentioned that the chamomile acts as antidusentaria bacteria or warms, which decrease losses of digested feed due to parasites and save digested nutrients to improve production. Also, Abou-Zied (1988) indicated that effective substances in chamomile act as an antiseptic against the antagonistic flora and stimulate the digestive enzymes and processes.

Table (2): Chemical analyses of ingredients and the tested diets (on DM basis) fed to lactating buffalo.

Item	DM %	Chemical composition, % on DM basis						
		OM	CP	EE	CF	NFE	Ash	GE, Mcal/kg
Ingredients:								
CM*	91.90	90.64	16.65	3.59	16.43	53.97	9.36	4.26
BH	91.40	87.32	14.00	2.63	30.85	39.84	12.68	4.13
WS	92.76	87.21	3.18	1.65	39.46	42.92	12.79	3.96
CC	90.00	85.55	10.44	2.22	25.55	47.34	14.45	4.05
Diets:								
D_1	91.99	88.95	12.62	2.86	25.79	47.67	11.05	
D_2	91.73	88.74	12.85	2.88	24.69	48.42	11.26	
D_3	91.47	88.52	13.08	2.89	23.39	49.17	11.48	
D_4	90.95	88.10	13.55	2.91	20.99	50.66	11.91	

Table (3): Digestion coefficients and feeding values of the tested diets (on DM basis) fed to lactating buffalo.

Item	Experimental rations				±SE
	D1	D2	D3	D4	
Digestion coefficients %					
OM	66.45^{c}	69.35^{b}	70.97^{b}	74.31^{a}	1.57
CP	71.21^{c}	73.22^{b}	74.51^{b}	76.84^{a}	1.99
EE	73.78^{c}	72.71^{c}	76.52^{b}	79.14^{a}	2.11
CF	58.47^{c}	59.89^{bc}	61.47^{b}	63.57^{a}	1.49
NFE	74.28^{c}	75.21^{c}	77.68^{b}	80.18^{a}	1.87
Feeding values %					
TDN	64.22^{c}	65.32^{c}	67.29^{b}	69.56^{a}	1.32
DCP	8.99^{c}	9.41^{b}	9.75^{b}	10.41^{a}	0.46

Averages in the same row with different superscripts are different ($P \leq 0.05$).

Milk yield and its composition:

Unadjusted and adjusted data of milk yield and its composition as affected by chamomile by-product diets are presented in Tables 4 and 5. The actual data (unadjusted) are not comparable as they were obtained. So to eliminate errors, the rate of milk decrease was considered to compare the effect of the tested diets in adjusted position.

Table (4): Unadjusted milk yield and its chemical composition as affected by the tested diets.

Item	Diets			
	D1	D2	D3	D4
Unadjusted milk yield:				
Kg/day	6.12	6.54	6.38	6.61
Milk composition g/kg milk:				
Fat	62.24	63.51	63.28	65.84
Protein	41.57	41.42	41.95	41.64
Lactose	52.61	52.53	53.24	53.97
SNF	103.19	102.92	104.05	103.99
Ash	9.01	8.97	8.86	8.38
Energy, kcal/kg milk*	1024.94	1035.33	1038.76	1062.08

* *Kcal/kg milk = 92.25 Fat%+49.15 SNF% - 56.4 (McDonald et al., 1978).*

Adjusted data in Table 5 showed the positive effect of the presence of chamomile by-product in the diets compared to with control diet regarding milk yield, 4 % FCM, fat, protein, lactose, ash, solid not fat and energy content. Diet 4 that contained 50% chamomile by-product had better effect than the diets contained 25% and 12.5% chamomile by-product. The superiority of chamomile by-product diets than control diet was observed since the differences were significant (P≤0.05). Results of digestibility's and nutritive values may explain the higher milk yield and its components with chamomile by-product containing diets than those of control diet. These results are in accordance with those obtained by **Wojcik** *et al.* (1984), Djouvinov *et al.* (1997) and Mohamed and Ibrahem (2003). Also, Fritz *et al.* (1992), Allam *et al.* (1999) and El-Saadany *et al.* (2003) who found that adding chamomile to dairy animals rations improved milk yield (10%) and its components.

Table (5): Adjusted milk yield and its chemical composition as affected by the tested diets.

Item	Diets				±SE
	D1	D2	D3	D4	
Milk yield, kg/day	5.02^c	5.54^c	6.57^b	7.33^a	0.02
FCM, kg/day	6.69^c	7.49^c	8.86^b	10.17^a	0.06
Milk components, g/day:					
Fat	312.44^d	351.85^c	415.75^b	482.61^a	4.52
Protein	208.68^c	229.47^c	275.61^b	305.22^a	4.27
Lactose	264.10^c	291.02^c	349.79^b	395.60^a	5.62
SNF	518.01^d	570.18^c	683.61^b	762.25^a	5.78
Ash	45.23^b	49.69^b	58.21^a	61.43^a	0.19
Milk energy, Mcal/day	5.15^d	5.74^c	6.82^b	7.79^a	0.01

Averages in the same row with different superscripts are different (P< 0.05).

***Feed intake, feed efficiency and Economical evaluation*:**

Daily feed intake, feed efficiency and economical evaluation of tested diets are presented in Table (6). Insignificant differences were observed between control diet and the other diets containing chamomile by-product in total dry matter intake and the values of energy and protein, while, feed efficiency recorded significant differences (P≤0.05) for diets containing chamomile by-product compared with control diet regarding DM, TDN and DCP. Comparing the diets that contained the chamomile by-product, D4 had better effect than D3 and D2.

Table (6): Daily feed intake, feed efficiency and economic efficiency of cows fed the experimental rations.

Item	Diets				±SE
	D1	D2	D3	D4	
Feed intake					
DM, kg/head	12.14	11.86	11.66	11.22	0.24
TDN, kg/head	7.80	7.75	7.85	7.80	0.13
DCP, kg/head	1.09	1.12	1.14	1.17	0.02
Feed efficiency, /kg 4% FCM					
DM, kg	1.81^a	1.58^b	1.32^c	1.10^d	0.03
TDN, kg	1.17^a	1.03^b	0.89^c	0.77^d	0.007
DCP, g	162.93^a	149.53^b	128.67^c	115.04^d	2.11
Economic efficiency					
CM as fed, kg/head/d	6.74	6.68	6.66	6.43	
BH as fed, kg/head/d	3.32	2.46	1.53	---	
WS as fed, kg/head/d	3.29	2.44	1.52	---	
Chamomile by-product, kg/head/d	---	1.48	3.11	6.26	
Input cost, LE	16.08	15.20	14.34	12.79	
Feed cost/kg FCM, LE	2.40	2.03	1.62	1.26	
Relative feed cost/kg FCM	100	85	66	53	

Feed cost L.E/ton of concentrate feed mixture (CM), berseem hays (BH), wheat straw (WS) and Chamomile by-product (CC) were 1600, 1000, 600 and 400 respectively.

Averages in the same row with different superscripts are different (P≤ 0.05).

As evident from Table (6) the presence of chamomile by-product in the diets reduced the price of feed needed to produce 1kg 4 % FCM especially that contained 50% chamomile by-product (D4) and 25% chamomile by-product (D3). The relative costs of feed consumed/Kg 4% FCM were 100, 85, 66 and 53 for D1, D2, D3 and D4 respectively.

It could be concluded that chamomile by-product can safely, successfully and economically replace up to 100% of both berseem hay and wheat straw in rations of lactating buffaloes.

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تأثير إضافة مخلفات شيح البابونج على أداء الجاموس الحلاب.

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أجريت هذه الدراسة لمعرفة تأثير تغذية مخلفات شيح البابونج على معاملات الهضم والقيم الغذائية والغذاء المأكول وأيضا تأثيره علي إنتاج اللبن ومكوناته في الجاموس الحلاب. تم استخدام تسع حيوانات من الجاموس الحلاب متوسط وزنها 550 ± 10 كجم (في موسم الحليب الثالث إلى الخامس). بدأت التجربة عند 45 ± 3 يوم بعد الولادة واستمرت التجربة لمدة 112 يوم. غذيت الحيوانات على العلائق المختبرة في فترات متتالية بنظام عودة إلى ذي بدء. وتتمثل هذه العلائق في عليقة المقارنة وتتكون من 50% علف مصنع + 25% دريس برسيم + 25% تبن قمح، العليقة الثانية تتكون من50% علف مصنع + 18.75% دريس برسيم + 18.75% تبن قمح + 12.5% مخلفات شيح البابونج ، العليقة الثالثة تتكون من 50% علف مصنع + 12.5% دريس برسيم + 12.5% تبن قمح + 25% مخلفات شيح البابونج ، العليقة الرابعة تتكون من 50% علف مصنع + 50% مخلفات شيح البابونج. وأوضحت النتائج ما يلي:

سجل الجاموس الذى تغذى على علائق محتوية على مخلفات شيح البابونج أعلى قيم في معاملات الهضم والقيم الغذائية مقارنة بعليقة الكنترول. أظهر الجاموس الذي تغذى على العليقة الرابعة والعليقة الثالثة ارتفاع في محصول اللبن و مكوناتة و تليهما العليقة الثانية ثم عليقة الكنترول. أوضح التقييم الاقتصادي انخفاض تكاليف إنتاج كيلو جرام البن المعدل 4% دهن مع الجاموس الذي تغذى على العلائق المحتوية على مخلفات شيح البابونج و خاصة العليقة الرابعة المحتوية على 50% مخلفات شيح البابونج والعليقة الثالثة المحتوية على 25% مخلفات شيح البابونج. ونستنتج من هذه التجربة انه يمكن استبدال دريس البرسيم وتبن القمح بنسبة100% بمخلفات شيح البابونج بنجاح مع علائق الجاموس الحلاب حيث انه يقلل من استخدام دريس البرسيم المرتفع في ثمنه وبذلك يخفض من تكلفة العلائق ويؤدى إلى زيادة العائد الاقتصادي .