EFFECT OF USING ANISE AND DILL SEEDS AS FEED ADDITIVES ON PERFORMANCE OF LACTATING BUFFALOES

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ABSTRACT:

The medicinal seeds of *Pimpinella anisum* (anise) and *Anethum graveolens* (dill) as feed additives in lactating buffaloes rations were nutritionally evaluated through digestibility and lactation trials. Eight lactating buffaloes with average live body weight of 575±10 kg (three in their 3rd and the rest in 4th lactation seasons) were used. Lactation trial were initiated at 45±3 days post partum, where each buffalo served as its own control and the experimental rations were fed in successive duration. The treatments were (R_1) control, (R_2) control+50 g anise seeds, (R_3) control+50 g dill seeds and (R_4) control+25 g anise seeds+25g dill seeds. The control ration consisted of 50% concentrate mixture + 30% berseem hay+20% wheat straw.

The results revealed that buffaloes fed rations containing medicinal seeds showed the highest values of digestibility coefficients and feeding values compared with those fed the control ration. Also, R_4 showed the highest milk yield and its composition followed by R_3, R_2 and R_1 (control ration). From economical point of view the medicinal seeds containing rations reduced feeding costs needed to produce 1 kg 4% FCM especially those received 25 g anise seeds + 25 g dill seeds rations (R_4).

Key words: Anise, dill, digestibilities, feeding values, milk yield, milk composition, buffaloes.

INTRODUCTION:

The shortage in animal feeds in Egypt is a considerable problem in animal production. So, the use of feed additives can help in improving efficiency of feed utilization and animal performance. Medicinal and aromatic plants play a significant role in the life of people and are present in innumerable forms. These plants are used as raw material for medicines, perfumery, spices and in the food industry. These plants have some properties as anti-oxidant, anti-septic, anti-microbial, anti-spasmodic and anti-biotical activity **(El-Emary, 1993; Tozyo *et al.*, 1994; Chevallier, 1996 and El-Degway, 1996).**

Medicinal seeds as feed additives to ruminant rations seems to be a recent trend globally. The use of medicinal seeds as a milk stimulant for lactating animals is known to have beneficial effect on milk production **(Tiwari *et al.*, 1993 and Singh *et al.*, 1993). Albert-Puleo (1980), El-Saadany *et al.*, (1999)** reported that *Pimpinella anisum* (anise) and *Anethum graveolens* (dill) seeds might be useful as a milk stimulant for lactating animals.

This study aimed to investigate the effect of adding two medicinal seeds (*Pimpinella anisum* and *Anethum graveolens*) seeds in the lactating buffaloes rations on milk yield and its composition. Also, their effect on digestibilities, feeding values, feed intake and economical evaluation were considered.

MATERIALS AND METHODS:

The present study was conducted at the Experimental Station of Animal Production Department. Faculty of Agriculture, Fayoum, Cairo University, Egypt.

Lactation trials:

Eight lactating buffaloes, an average live body weight of 575 ± 10 kg in their 3rd (three buffaloes) and 4th (five buffaloes) lactation seasons were used. Lactation trials were initiated at 45±3 days post partum, where each buffalo was served as its own control as described by **Simpson *et al.* (1995).** Four dietary treatments were used. Such treatments were the control (R_1), control+50 g anise seeds (R_2), control+50 g dill seeds (R_3) and control + 25 g anise seeds+25 g dill seeds (R_4) as presented in Table (1). The offered daily feeds were assessed to cover the maintenance and the production requirements **(Shehata, 1971).** Animal were fed individually on experimental rations that presented in Table 1, using twenty one days as preliminary period and seven days as collection period per each treatment. The concentrate mixture (CM) was individually weighed for each animal and offered twice daily during milking times at 700 and 1900 hour, while roughages were offered at 800 and 1400 hour after accessing the animals to fresh water.

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

Items	Rations			
	R_1	R_2	R_3	R_4
Concentrate mixture (CM)* %	50	50	50	50
Berseem hay (BH) %	30	30	30	30
Wheat straw (WS) %	20	20	20	20
Anise g/head/day	--	50	--	25
Dill g/head/day	--	--	50	25

* The concentrate mixture (CM) composed of 30% undecorticated cotton seed cake, 10% corn, 33% wheat midlings, 11% rice germ, 9% wheat bran, 3.5% molasses, 2.5% limestone and 1% common salt.

The daily supplemental medicinal plant were mixed with CM twice daily. Buffaloes were healthy and on the same managerial conditions. Daily feed intake and milk yield were recorded individually and milk samples of connective evening and morning milking were taken, refrigerated and chemically analyzed. Milk samples were analyzed for fat, protein, ash, solids not-fat (SNF) and total solids (TS) **(Ling, 1963)** lactose **(Barnett and Abd El-Tawab, 1957),** 4% fat corrected milk (FCM) was calculated using **Gaines (1923)** equation. Samples for CM, berseem hay (BH), wheat straw (WS) and medicinal seeds were analyzed for dry matter (DM), crude protein (CP), ether

extract (EE), crude fiber (CF) and ash according to **A.O.A.C (1990),** nitrogen free extract (NFE) was calculated by differences .

Digestibility trials:

At the collection period per each treatment, the nutrient digestibility and feeding values were determined by chossing 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) and digestible energy (DE) of feeds were calculated after **Nehring and Haenlien (1973).**

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 to be comparable similar to that reported by **(Simpson *et al.*, 1995 and Abel-Caines *et al.*, 1997).** The general linear model procedure adapted by **SPSS (1997)** was used and the new least significant differences (LSD) was used when the treatments effect was significant **(Steel and Torrie, 1980).**

RESULTS AND DISCUSSION:

Biological activities and chemical composition of medicinal seeds:

Table (2) show that the biological activities of anise and dill seeds used in experimental rations. Such plants are annual plants from the family Apiaceae (Umbelliferae) and widely cultivated in Egypt. Anise and dill seeds are used in cosmetics, pharmaceutical, perfumery and as a food additive. Extensive research has been conducted on the chemical composition and biological activities of volatile oils of anise and dill **(Boulous, 1983; Rashwan, 1998; Kmiecik *et al.*, 2001; Kmiecik *et al.*, 2002).** Table (3) showed that the chemical composition of ingredient and calculated control ration used in lactation trial. Anise and dill seeds contained the highest ether extract (EE), crude protein (CP) and crude fiber (CF) and the lowest nitrogen free extract (NFE) and ash. The medicinal seeds were fed in grams per head (Table 1), so, they will not affect the chemical composition of the experimental rations.

Table (2). Effective groups and the biological activities of the experimental medicinal seeds.

Common, English and Scientific name	Effective group	Biological activities	Authors
Ynson, Anise, *Pimpinella anisum*	Anisic, Anethole, Methylchavicol and Limonene	anti-septic, anti-spasmodic, carminative, diuretic, expectorant, stimulant, stomachic, galactagogue, laxative, insecticide and parasiticide	Abou-zied, 1988; El-Degway, 1996 and Wagner, 1980
Shapt, Dill, *Anethum graveolens*,	Carvone, Eugenol, Limonene, Terpinene and Myristicin	anti-spasmodic, bactericide, carminative, digestive, disinfectant, emmenagogue, hypotensive, stimulant and stomachic	Abou-Zied, 1988; El-Degway, 1996

Table (3). Chemical composition of ingredients and calculated value for ration used in lactating trial.

Items	DM%	% on DM basis						GE, Mcal/kg
		OM	CP	EE	CF	NFE	Ash	
CM	90.67	89.22	15.12	3.56	16.75	53.79	10.78	--
BH	88.43	88.08	14.71	2.63	26.15	44.59	11.92	--
WS	92.76	88.14	2.95	1.53	39.81	43.85	11.86	--
Anise	91.72	90.86	18.95	20.65	24.36	26.90	9.14	--
Dill	91.36	91.84	19.27	21.73	22.72	28.12	8.16	--
Control ration	90.42	88.66	12.56	2.87	24.18	49.05	11.34	4.13

Nutritive evaluation:

Table (4) showed the results of digestibility coefficients and nutritive values of the experimental rations. All additives of medicinal seeds increased significantly ($P \leq 0.05$) all digestibility coefficients and nutritive values compared to those of control ration (R_1). The medicinal seeds mixture (R_4) improved non significantly all digestibility coefficients and nutritive values compared to rations containing each of the medicinal seeds alone (R_2, and R_3). The positive effect of medicinal seeds may be due to their effect on rumen fermentation and through the buffering regulation of rumen microbes and nutrient absorption through the lower gut for their biological activities that indicated in Table 2.

Table (4). Digestibility coefficients and nutritive values of the experimental rations used in lactating trial, (on DM basis).

Item	Rations				±SE
	R_1	R_2	R_3	R_4	
Digestibility coefficients %:					
DM	67.43^b	71.36^a	72.84^a	72.92^a	0.45
OM	71.12^b	74.23^a	73.95^a	75.39^a	0.42
CP	71.54^b	74.91^a	75.21^a	77.24^a	0.50
EE	56.63^b	59.28^a	60.15^a	61.36^a	0.39
CF	65.88^b	68.35^a	69.18^a	69.82^a	0.46
NFE	74.65^b	77.97^a	77.38^a	79.14^a	0.52
Nutritive values:					
TDN, %	65.21^b	68.01^a	68.02^a	69.36^a	0.27
DE, Mcal/kg DM	2.84^b	2.97^a	2.97^a	3.03^a	0.08
DCP, %	8.99^b	9.41^a	9.45^a	9.70^a	0.13

Average in the same row having different superscripts differ significantly ($P \leq 0.05$).

These results agree with that of **Wagner (1980), Al-Yahya (1986), Abou-Zied (1988) and El-Degway (1996).** They mentioned that *Pimpinella anisum* and *Anethum graveolens* have stomachic, tonic, anti-spasmodic and digestive effects. Also, these results agree with **(El-Saadany *et al.*, 1999 and Baiomy, 1999)** (working on mixture of medicinal seeds containing anise) who found increased in digestibilities and feeding values of feed when anise was added.

Table (5) shows the effect of medicinal seeds additives on feed intake. Data indicated that animals fed the medicinal seeds mixture (R_4) showed the highest values of feed intake followed by those fed medicinal seeds alone (R_2

and R_3) and then the control ration (R_1), respectively. These results show the improvement in nutrients digestibilities as stated by **El-Saadany *et al.* (1996).**

Milk yield and its components:

Table (5) shows the unadjusted data for milk yield and its components while the data in Table (6) shows the adjusted data. The unadjusted data are not comparable due to the effect of lactation curve. Therefore data in (Table 6) are comparable due to subjecting it to covariance analysis **(Steel and Torrie, 1980).** Adjusted data showed the positive effect of the presence of medicinal seeds in the rations compared to with control ration regarding milk yield, 4% fat corrected milk (FCM), fat, protein, lactose, ash, solid not fat (SNF) and energy content. Ration 4 that contained the medicinal seeds mixture had better effect than the other rations contained the medicinal plant alone (R_3 and R_2). The superiority of feed additives rations than control ration was observed since the differences were significant ($P \leq 0.05$). Results of digestibilities and nutritive values in Table 4 may explain the higher milk yield and its components with medicinal seeds containing rations than those of control ration. Also, **Rashwan, 1998** found that serum total lipids was increased with anise added for New Zealand rabbit ration may explain the higher milk fat. These results agree with that of **Wagner (1980), Al-Yahya (1986), Abou-Zied (1988) and El-Degway (1996).** They mentioned that anise and dill have digestive effects, stimulant and emmenagogue. Also, these results agree with **El-Saadany *et al.*, 1996; El-Saadany *et al.*, 1999 and Baiomy, 1999** (working on mixture of medicinal seeds containing anise) who found that adding anise to dairy animals rations improved milk yield and its components.

Table (5). Feed intake and unadjusted milk yield and its components as affected by the experimental rations.

Items	Rations				±SE
	R_1	R_2	R_3	R_4	
DM intake:					
Total (kg/head/day)	12.39	12.95	12.86	13.14	0.14
Total % of LBW	2.15	2.25	2.24	2.29	--
TDN, g/kg LBW	11.34	11.83	11.83	12.06	0.11
DCP, g/kg LBW	1.56	1.64	1.64	1.69	0.04
Unadjusted milk yield:					
Kg/head/day	5.92	6.75	6.67	6.91	--
Milk composition%:					
Fat	6.62	6.71	6.74	6.83	--
Protein	3.95	4.02	3.92	4.07	--
Lactose	4.52	4.79	4.85	4.93	--
Ash	0.83	0.74	0.72	0.71	--
SNF	9.36	9.63	9.56	9.75	--
TS	15.98	16.34	16.30	16.58	--
Energy, kcal/kg milk*	1014.34	1035.91	1035.24	1052.88	--

* Energy, kcal/kg milk = 92.25 fat% + 49.15 SNF% - 56.4 (McDonald *et al.*, 1978). LBW, live body weight. SNF, solids not fat. TS, total solids. SE, standard error.

Table (6). Adjusted daily milk yield and its components as affect by the experimental rations.

Items	Rations				±SE
	R_1	R_2	R_3	R_4	
Milk yield, kg	5.72^c	6.82^b	6.95^b	7.47^a	0.16
FCM yield, kg	7.21^c	9.40^b	9.73^b	10.64^a	0.23
Fat, g	328.33^c	444.66^b	463.57^b	510.20^a	6.02
Protein, g	216.79^c	263.93^b	270.36^b	295.81^a	3.54
Lactose, g	249.39^c	313.04^b	324.67^b	360.05^a	4.21
Ash, g	41.18^c	51.83^b	52.13^b	59.76^a	0.35
SNF, g	510.22^c	632.90^b	649.83^b	718.61^a	8.66
Energy, Mcal	5.21^c	6.83^b	7.08^b	7.82^a	0.03

FCM, 4 % fat corrected milk.

Average in the same row having different superscripts differ significantly ($P \leq 0.05$).

Economical evaluation and conclusion:

As evident in Table (7) the presence of medicinal seeds seeds in the ration reduced the price of feed needed to produce 1 kg 4% FCM especially that contained seeds of both the medicinal seeds tested (R_4). The relative costs of feed consumed/kg 4% FCM were 100, 83, 80 and 75 for R1, R2, R3 and R4 respectively. These results were in harmony with those of **El-Saadany *et al.* (1999) and Baiomy, (1999).** They found that using medicinal seeds as a feed additive decreased feed cost/head/day by 18.17% than control.

Table (7). Economical evaluation of the experimental rations.

Items	Rations			
	R_1	R_2	R_3	R_4
Intake as fed (kg/day):				
Concentrate mixture	6.83	7.14	7.09	7.25
Berseem hay	4.20	4.39	4.36	4.46
Wheat straw	2.67	2.79	2.77	2.83
Medicinal plant (g/head/day)	---	50	50	50
4% FCM yield (kg/head/day)[1]	7.21	9.40	9.73	10.64
Cost of feed consumed (L.E/day)[2]	8.23	8.90	8.84	9.04
Cost of kg 4% FCM (L.E./day)[3]	1.14	0.95	0.91	0.85
Relative feed cost/kg 4% FCM	100	83	80	75

1, adjusted 4 % FCM yield

2, the price of one ton (L.E) of concentrate mixture, berseem hay, wheat straw and medicinal seeds were 850, 450, 200 and 6000 respectively.

3, cost of kg 4 % FCM (L.E./day) = cost of feed consumed/average daily 4 % FCM yield

In conclusion the rations containing medicinal seeds (anise and dill) added together or alone (as 50g of each or 25+25g of both) could be used economically and successfully for lactating buffaloes to improve digestibilities, feeding values, feed intake, milk production and economic efficiency.

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تأثير استخدام بذور الينسون والشبت كإضافات غذائية على أداء الجاموس الحلاب

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أجريت هذه الدراسة لمعرفة تأثير بذور الينسون والشبت كإضافات غذائية فى علائق الجاموس الحلاب من خلال إجراء تجارب هضم وتجربة لبن. استخدمت ثمانية حيوانات من الجاموس الحلاب متوسط وزنها ٥٧٠ ± ١٠ كجم (ثلاث جاموسات في موسم الحليب الثالث والباقي في الرابع). بدأت التجربة عند ٤٥ ± ٣ يوم بعد الولادة وغذيت على العلائق المختبرة فى فترات متتالية. وتتمثل هذه العلائق فى عليقة المقارنة، عليقة المقارنة + ٥٠ جم بذور ينسون، عليقة المقارنة + ٥٠ جم بذور شبت، عليقة المقارنة + ٢٥ جم بذور ينسون + ٢٥ جم بذور شبت وتكونت عليقة المقارنة من ٥٠% علف مركز + ٣٠% دريس برسيم + ٢٠% تبن قمح. وأوضحت النتائج ما يلى:
- الجاموس الذى تغذى على علائق محتوية على النباتات الطبية أظهرت النتائج ارتفاع معنوى فى قيم معاملات الهضم والقيم الغذائية مقارنة مع عليقة المقارنة.
- أظهرت النتائج إن الجاموس الذي تغذى على العليقة الرابعة والمحتوية على مخلوط النباتات الطبية ارتفع محصول اللبن ومكوناته تليها العليقة الثالثة والثانية ثم الأولى على التوالى.
- يتضح من وجهة النظر الاقتصادية أن استخدام النباتات الطبية المختبرة فى علائق الجاموس الحلاب بمفردها أو مخلوطة معا يزيد من كفاءة إنتاج اللبن.