Nutrients digestibility and blood constituents of dairy buffaloes fed diet supplemented with flaxseed

Kholif S.M.[1], Morsy, T. A.[1], Abedo, A.A.[2], El-Bordeny, N.E.[3], Abd El-Aziz, M.[1] and Abdo, M.M.[1]

[1]Dairy Science Dept., National Research Center, Cairo, Egypt.
[2]Animal Production Dept., National Research Center, Cairo, Egypt.
[3]Animal Production Dept., Faculty of Agric., Ain Shams Univ., Egypt.

62nd Annual EAAP Meeting, August 29th – September 2nd 2011, Stavanger, Norway
Session 12, Theatre 4

OBJECTIVE

The present work aimed to

Study the effect of flaxseed supplementation on:

* Nutrients digestibility.
* Feeding value.
* Some blood constituents.

for dairy Egyptian buffaloes.

INTRODUCTION

* Scientific research has shown several health benefits for n-3 fatty acids (Omega-3) to humans; including:

- Decrease the incidence of cancer.
- Decrease the cardiovascular diseases.
- Decrease hypertension.
- Decrease arthritis.
- Improve visual acuity.

(Wright *et al*., 1998).

* Milk fat contains low concentration of omega-3 fatty acids, while contains high content of saturated fatty acids, particularly palmitic acid (C16:0), which has hypercholesterolemic properties (Kennelly, 1996).

* Increasing of α-linolenic acid (ALA), an omega-3 fatty acid, and other polyunsaturated long-chain fatty acids with reducing the proportion of palmitic acid can be considered an attractive way to modify milk fat composition, **which** would increase human consumption of milk and dairy products **as a functional food**.

* Flaxseed contains a high oil content (40% of total seed weight), with α-linolenic acid constitute approximately 55% of total fatty acids of the oil (Petit, 2003).

* Feeding flaxseed to dairy cows reduces short-chain fatty acids (SCFA) and medium chain fatty acids (MCFA), while increase long-chain fatty acids (LCFA) contents in milk fat (Mustafa *et al*., 2003).

* Also, feeding flaxseed generally results in the lowest omega-6 to omega-3 FA ratio in milk fat (Petit, 2002), which may improve milk FA profile and result in better human health.

MATERIALS AND METHODS

- Twenty-one lactating Egyptian buffaloes weighed 561±10 Kg in average were used in this trial.
- Buffaloes are considered the main source of milk in Egypt.
- Buffalo milk contains higher fat content than cow milk and less cholesterol

* Animals were divided into three groups.

* Animals were fed on TMR:

1- without flaxseed (control).
2- fed diet with 17 g flaxseed (low level).
3- fed diet with 34 g flaxseed/Kg DM (high level).

* The all diets were formulated to be iso-caloric and iso-nitrogenous.

* The experiment was extended from calving to 16th week of lactation.

Table 1. The experimental diets formulation.

Item	Flaxseed supplementation,%		
	0 (control)	**1.7**	**3.4**
Ingredient, g/Kg			
Berseem	330	330	330
Rice straw	275	275	275
Yellow corn	61	51	41
Soybean meal	83	76	69
Wheat bran	200	200	200
Sunflower meal	20	20	20
Urea	5	5	5
Crushed flaxseed	**0**	**17**	**34**
Calcium carbonate	3	3	3
Minerals and Vitamins mix.	23	23	23

Table 2. Chemical composition of the experimental diets.

Item	Flaxseed supplementation,%		
	0 (control)	**1.7**	**3.4**
Component, g/Kg DM			
Dry matter	901.1	900.5	900.6
Organic matter	896.6	896.9	897.1
Crude protein	162	161	162
Ether extract	37.2	39.1	41.0
Crude fiber	235.9	235.8	235.7
Neutral detergent fiber (NDF)	387	386	384
Acid detergent fiber (ADF)	231	230	229
NE_L (MJ/Kg DM)*	6.3	6.3	6.3

* Calculated using published values of feed ingredients (NRC, 2001).

Table 3. Fatty acids content of the experimental diets.

Item	Flaxseed supplementation,%		
	0 (control)	**1.7**	**3.4**
Fatty acids, g/Kg			
Saturated			
C14:0	10	10	10
C16:0	331	329	330
C18:0	50	46	41
C20:0	8	8	8
C22:0	11	10	10
C24:0	1	1	1
Total	**410**	**404**	**400**
Unsaturated			
C18:1	230	233	233
C18:2 n-6	242	244	245
C18:3 n-3	117	119	122
Total	**589**	**596**	**600**

* Three digestibility trials were applied during the last three days every month using three animals from each group.

- Fecal samples (approximately 100 g wet weight) were collected from the rectum and pooled for each buffaloes

- Feces were dried at 55 °C for 48 h, then ground to pass a 1 mm sieve in a feed mill and then kept for chemical analysis.

* Silica was used as an internal marker for determining the nutrients digestibility, using this formula:

$$Digestibility = 100 - \left[100 x \frac{\%\, indicator in\ feed}{\%\, indicator in\ feces} x \frac{\%\, nutrient in\ feces}{\%\, nutrient in\ feed} \right]$$

* Blood samples were collected from all buffaloes from the jagular vein at 4 hrs. after morning feeding to determine some blood constituents.

RESULTS

Table 3. Feed intake, nutrients digestibility and feeding values for dairy buffaloes fed diets supplemented with flaxseed.

Item	Flaxseed supplementation,%			SE
	0 (control)	**1.7**	**3.4**	
No. of animals	3	3	3	
Average body weight, Kg	561.2	560.9	561.1	2.37^{NS}
Dry matter intake, g/h/d	12.98	12.99	12.63	1.36^{NS}
Digestibility, %				
Dry matter	69.0	69.89	68.95	1.16^{NS}
Organic matter	69.0	70.75	70.04	1.33^{NS}
Crude protein	69.6	70.70	70.79	1.37^{NS}
Crude fiber	62.0	62.54	63.24	2.84^{NS}
Ether extract	66.05	67.54	67.08	0.34^{NS}
Nitrogen free extract	67.0	67.61	67.88	0.81^{NS}
Feeding value, %				
TDN	64.95	66.71	66.33	3.15^{NS}
DCP	11.33	11.39	11.48	1.50^{NS}

Table 4. Effect of flaxseed supplemented on some blood serum constituents for dairy buffaloes.

Item	Flaxseed supplementation,%			SE
	0 (control)	1.7	3.4	
Total protein, g/dl	6.60	6.91	6.58	0.16^{NS}
Albumin, g/dl	3.41	3.75	3.49	0.09^{NS}
Globulin, g/dl	3.19	3.16	3.09	0.14^{NS}
A/G ratio	1.08	1.21	1.13	0.05^{NS}
Total lipids, mg/dl	**297.8^{a}**	**283.1^{b}**	**292.1^{ab}**	**2.47^{*}**
Cholesterol, mg/dl	**145.8^{a}**	**132.8^{b}**	**124.7^{b}**	**2.87^{*}**
ALT, U/L	15.42	15.64	15.72	0.18^{NS}
AST, U/L	34.13	35.70	35.27	0.43^{NS}

CONCLUSION

Flaxseed supplementation to dairy buffaloes diet up to 3.4%:

- **Did not affected on nutrients digestibility and feeding values.**
- **Decreased blood total lipids and cholesterol.**
- **Did not affected on blood total protein, albumin, globulin, ALT and AST.**

Thank You

For Your Attention