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Short communication

Effect of the dietary inclusion of dried oregano (*Origanum vulgare* L.) on the characteristics of milk from Holstein × Zebu cows

E.C.Q. Lacerda[a], L.C. Bauer[a], J.S. Oliveira[b], F.F. Silva[b], S.A. Carvalho[a], M.S. Macedo[a], N.E. de Souza[c], J.I. Simionato[a,c,*]

[a] *Department of Basic and Instrumental Studies, State University of Southwest Bahia – UESB, Praça Primavera, 40, Itapetinga 45700-000, Bahia, Brazil*
[b] *Department of Rural and Animal Technology, State University of Southwest Bahia – UESB, Rodovia BA-415, S/N, Itapetinga 45700-000, Bahia, Brazil*
[c] *Department of Food Technology, Federal Technological University of Paraná – UTFPR, Rua dos Pioneiros, 3131, Londrina 86036-370, Paraná, Brazil*

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ABSTRACT

The objective of this study was to evaluate the effects of the inclusion of oregano in the diet of dairy cows on the physicochemical quality of raw milk and the sensory attributes of pasteurized milk. Twelve crossbred Holstein × Zebu cows were divided into three 4 × 4 Latin squares, and increasing amounts of oregano were added to their diet. Physicochemical analysis of density, cryoscopic index, protein, fat, lactose, total solids extract (TSE), and dry nonfat extracts (DNE) was performed for the raw milk samples. The microbiological quality of pasteurized milk samples was evaluated by performing total and fecal coliform tests. Adding oregano to the diet showed no influence (P>0.05) on the fat, TSE, protein, and cryoscopic index, with mean values of 3.78 g/100 g, 12.60 g/100 g, 3.24 g/100 g, and g −0535 °H, respectively. However, the levels of lactose, DNE, and density were influenced by the amount of oregano (OV) and ranged from 4.82 g/100 g to 4.64 g/100 g, 9.22 g/100 g to 8.88 g/100 g, and 1.033 g/mL to 1.032 g/mL, respectively. Based on microbiological analysis, all samples were considered suitable for consumption (<3.0 × 10^5 CFU/mL). The sensory attributes of aroma and flavor did not alter the preference (P>0.05). Only a small difference between treatments was observed in the flavor profile for the warmed-over flavor attribute. For the attributes of a sweet aroma, characteristic milk aroma, characteristic milk flavor, and sweet flavor, the intensity ranges were similar. The results showed no changes (P>0.05) in the main components of milk and, therefore, no effect on its sensory attributes. Thus, it is possible to incorporate dry oregano into cattle feed for the purpose of studying its influence on other parameters of milk composition.

Abbreviations: ADF, acid detergent fiber; CD, control diet; DM, dry matter; DNE, dry nonfat extract; NDF, neutral detergent fiber; OV, oregano; TDE, total dry extract; TSE, total solids.

* Corresponding author at: Department of Basic and Instrumental Studies, State University of Southwest Bahia – UESB, Praça Primavera, 40, Itapetinga 45700-000, Bahia, Brazil. Tel.: +55 77 91915217; fax: +55 4398083482.
E-mail addresses: jusimionato@gmail.com, jsimionato@utfpr.edu.br (J.I. Simionato).

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Table 1
Proportion of ingredients and chemical composition of the diet on a dry matter basis (g/Kg).

Item (g/100 g)	Levels of oregano included			
	CD	I	II	III
Ingredients				
Sugarcane	649.3	649.3	649.3	649.3
Corn	209.6	200.9	192.2	183.5
Soybeans	120.6	120.8	121.0	121.2
Oregano	0.00	8.40	16.9	25.4
Mineral salt[a]	9.00	9.00	9.00	9.00
Dicalcium phosphate	7.50	7.50	7.50	7.50
Limestone	4.10	4.10	4.10	4.10
Chemical analyses				
Dry matter (DM)	462.0	462.0	461.9	462.2
Organic matter (OM)	930.8	934.3	935.6	937.4
Neutral detergent fiber (NDF)	499.2	500.5	500.6	499.8
Ash-free NDF and protein	440.9	442.7	442.7	441.3
Acid detergent fiber (ADF)	275.0	280.1	284.1	274.3
Crude protein	168.4	168.8	168.0	168.2
Ether extract	20.3	21.2	21.2	21.6
Non fibrous carbohydrates	337.2	341.0	334.2	333.7

CD = control diet; I = 0.84 g/100 g of OV; II = 1.69 g/100 g of OV; III = 2.54 g/100 g of OV.
[a] Composition: calcium, 20.5 g/100 g; phosphorus, 10.0 g/100 g; magnesium, 15 g; sulfur, 12 g; sodium, 68 g; selenium, 32 mg; copper, 1650 mg; zinc, 6285 mg; manganese, 1960 mg; iodine, 195 mg; iron, 560 mg; cobalt, 200 mg.

1. Introduction

Many herbs and spices are excellent sources of phenolic compounds. These substances have shown high antioxidant potential and may be used as natural preservatives for food (Zheng and Wang, 2001). *Origanum vulgare* L. (oregano) is an herb with high antioxidant capacity compared with several other medicinal herbs (Dragland et al., 2003).

Modification of the rumen microbial population was addressed in a review by Benchaar and Greathead (2011). The study showed that certain herbs with antimicrobial activity can be used to modify rumen microbial populations to increase rumen fermentation efficiency and improve the utilization of nutrients. *In vitro* studies conducted by Tekippe et al. (2011) showed a sizable decrease in rumen methane production with OV supplementation within 8 h after feeding; this effect, however, must be interpreted with caution due to the large within- and between-animal variability in methane emission estimates. Petersen et al. (2011) showed that the concentrations of n-3 and n-6 FA in milk increased when cows were fed fresh herbs, due to an increased transfer rate from feed to milk. While there have been several studies on the flavor of cow's milk when essential oils are included in animal feed (Urbach, 1990; Lejonklev et al., 2013), there have been no studies with dried herbs.

The aim of this work is to investigate the effects of including dry oregano (*O. vulgare* L.) in the feed of dairy cows on the physicochemical quality of raw milk and the sensory characteristics of pasteurized milk.

2. Materials and methods

2.1. Animals and treatments

The experiment was carried out on the Paulistinha farm in the city of Macarani in the state of Bahia in Brazil with 12, Holstein × Zebu crossbred cows (the proportions of Holstein genes were estimated to range from 50 to 75%; the exact proportions for individual cows were unknown because many of the cattle did not have recorded pedigrees), in their third or fourth lactation. The experiment was divided into three 4 × 4 Latin squares. The cows received increasing levels of oregano in their diet on a dry matter basis. The treatments were control (CD), no OV; treatment I, with 0.84 g/100 g; treatment II, with 1.69 g/100 g; and treatment III, with 2.54 g/100 g.

The experiment consisted of four experimental periods lasting 21 days each. In the first 18 days, adaptation to the diet took place, and in the remaining three days, data were collected. The cows were housed in individual pens equipped with automatic waterers and troughs. Feed was offered in the form of a complete mix (15 Kg) twice a day at 6 a.m. and 3 p.m. The cows voluntarily consumed the feed; the percentage of refusal was 5–10%. The feed ingredients are shown in Table 1. The chemical analyses (NDF, DM, OM, ash-free NDF and protein, crude protein, and ether extract) were performed in accordance with the methods used by Silva and Queiroz (2002). To determine the non-fibrous carbohydrates, the method used by Detmann and Valadares Filho (2010) was used, in which crude protein, ash, ether extract, and neutral detergent fiber were first evaluated analytically, and then the difference between the whole and the parts was taken. The OM was determined by ignition of the dried material in a muffle furnace at 525 °C for 12 h. Crude protein was determined using the Kjeldahl method (Silva, 1990). DNE and ADF contents were determined by methods used by Van Soest et al. (1991).