Variation in the fatty acids profile of the meat by adding hempseed cake in the diet of multiparous cull cows

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The **AIM OF THIS WORK** was to study the effects of the inclusion of hempseed cake in multiparous cows diet on the fatty acids (FA) composition of their meat.

The hempseed cake , a byproduct of hempseed oil production process, is rich in fat (around 10% of the dry matter) and has a favorable fatty acids profile (unsaturated fatty acids for over the 80% of the total) *(Baldini et al. 2018)*. Therefore, its use may contribute to enhance the properties of bovine meat.

In this work, 18 multiparous cows were considered. They were divided into two groups fed on different diets (**Figure 1**). Within the same group, whether A or B, half cows were provided with hempseed cake (5% of the dry matter intake), while the rest was given a soybean meal instead.

Figure 1. Samples description

GROUP A (10 COWS) *diet based on hay*		GROUP B (8 COWS) *diet based on corn silage*	
(Diets provided to groups A and B were isoenergetic and isonitrogenous)			
Subgroup A1 «hempseed cake»	**Subgroup A2 «soybean meal»**	**Subgroup B1 «hempseed cake»**	**Subgroup B2 «soybean meal»**
Hempseed cake (0.8 kg per day) **Concentrate A*** (6.3 kg per day)	**Soybean meal** (0.5 kg per day) **Concentrate A*** (6.3 kg per day)	**Concentrate B1**** (4.3 kg per day)	**Concentrate B2***** (3.3 kg per day)
*Concentrate A 48% wheat 25% barley 20% bran 7% vitamin-mineral supplement		**Concentrate B1 46% corn flour 26% corn gluten 19% ***hempseed cake*** 9% vitamin-mineral supplement	***Concentrate B2 42.5% corn flour 30.3% corn gluten 15.4% ***soybean meal*** 11.8% vitamin-mineral supplement

MATERIAL AND METHODS

The total lipid fraction was extracted from samples of *m. longissimus thoracis* by following the procedure reported elsewhere (*Folch et al., 1957*). Fatty acids were esterified, methylated and quantified through GC-MS (GCMS 5977E, Agilent Thecnologies, **Figure 2**). The separation was performed through a HP 88 column (100 m x 0.25 mm x 0.25 µm).

The statistics was carried out by using the software R vers. 4.0.0 with a model that considered the experimental factor (hempseed cake vs soybean meal) as fixed, and the type of forage (whether hay or corn silage) as a block factor.

Figure 2. GCMS 5977E

RESULTS

The dataset of all the fatty acids analyzed is displayed in **Figure 3**. The results obtained for the hempseed cake group, considering the FA mainly present in the meat, i.e. palmitic (**C16:0**), stearic (**C18:0**)and oleic (**C18:1n-9c**) acid, as well as those favorable for the human health such as linolenic acid (**C18:3n-3**) and the total unsaturated fatty acids (**PUFA**) were comparable to those found for the soybean meal group (P>0.05). The **n-6/n-3** ratio was not affected by the use of hempseed cake either.

On the other hand, myristic acid (**C14:0**) turned out to be statistically higher for the group provided with hempseed cake (**Figure 4**). Therefore, as for C14:0, the quality of the meat was enhanced by providing the cows with hempseed cake.

Figure 3. Results of the quantification of the fatty acids in the meat

FA[1]	HC (%)	SM (%)	RMSE
C10:0	0.11	0.11	0.023
C14:0	**3.47 [a]**	**3.03 [b]**	**0.425**
C15:0iso	0.17	0.17	0.036
C15:0anteiso	0.25	0.17	0.126
C14:1n-9c	0.28	0.32	0.154
C15:0	0.39	0.40	0.060
C16:0iso	0.22	0.20	0.057
C16:0	**27.50**	**26.57**	**2.553**
C16:1n-7c	0.32	0.34	0.047
C16:1n-9c	3.12	2.76	0.677
C17:0anteiso	0.63	0.66	0.097
C17:0	1.06	1.11	0.213
C17:1	0.53	0.57	0.122
C18:0	**19.22**	**19.36**	**3.206**
C18:1t[2]	1.79	1.78	0.578
C18:1n-9c	**34.54**	**35.96**	**1.985**
C18:1n-7	1.02	1.05	0.198
cis-C18:1[3]	0.61	0.60	0.147
C18:2n-6t	0.57	0.55	0.119
C18:2n-6c	2.32	2.33	0.328
C19:1	0.11	0.11	0.039
C20:0	0.18	0.17	0.096
C18:3n-3	**0.37**	**0.35**	**0.087**
C20:1n-9	0.10	0.07	0.037
CLA c9,t11	0.21	0.26	0.120
C20:3n-6	0.11	0.12	0.045
SFA[4]	53.50	52.27	2.626
MUFA[5]	42.51	43.64	2.798
n-6 PUFA[6]	3.49	3.60	0.487
n-3 PUFA[7]	0.50	0.50	0.140
PUFA[8]	**3.99**	**4.09**	**0.518**
n-6/n-3	**7.95**	**7.50**	**3.286**

FA = Fatty acid, **HC** = Hempseed Cake Group, **SM** = Soybean Meal Group, **RMSE** = Root Mean Square Error

1 Fatty acids with a concentration lower than 0.1% have not been reported
2 trans-C18:1 as sum of t6-, t8-, t9-, t10-, t11-, t12-, t13, t14-18:1
3 cis-C18:1 as sum of c11-, c12-, c13-, c14-, c15-18:1
4 SFA (saturated fatty acids) considered: C10:0 + C12:0 + C13:0 + C14:0iso + C14:0 + C15:0 + C15:iso + C15anteiso + C16:0 + C16:0iso + C17:0 + C17:0iso + C17:0anteiso + C18:0 + C20:0
5 MUFA (mono unsaturated fatty acids) considered: C14:1n-9c + C16:1n-9t + C16:1n-9c + C16:1n-7c + cis-C16:1 + C17:1 + C18:1t11 + transC18:1 + C18:1n-9c + C18:1n-7 + cis-C18:1 + C19:1 + C20:1n-9
6 PUFA n-6 = C18:2n-6t + C18:2n-6c + C18:3 n-6 + CLA + C20:2n-6 + C20:3 n-6 + C20:4 n-6 + C22:4 n-6
7 PUFA n-3 = C18:3 n-3 + C20:2n-3 + C20:3n-3 + C20:5 n-3 + C22:5 n-3
8 PUFA (polyunsaturated fatty acids) = n-3 PUFA + n-6 PUFA

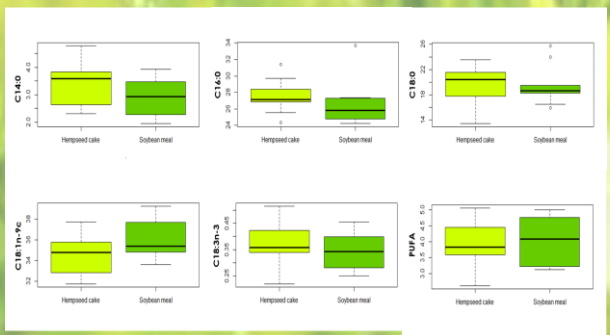

Figure 4. Box plots of the FA mainly present in the meat

In **conclusion**, from an overall point of view, the fatty acids profile was not improved by adding hempseed cake in the diet of Italian Simmental cull cows.

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