MEAT FROM ABERDEEN ANGUS STEERS FINISHED ON CONCENTRATE SUPPLEMENTED WITH ORGANIC SELENIUM (1): FATTY ACIDS COMPOSITION

Ali Saadoun[1, 2 *], Franko Graziano[1], María Cristina Cabrera[1, 2], Alejandra Terevinto[2], Marta del Puerto[2]

[1]Seccion Fisiología y Nutrición, Facultad de Ciencias, Universidad de la Republica.

[2]Departamento de Producción Animal y Pasturas, Facultad de Agronomía, Universidad de la Republica

*Corresponding author email: asaadoun@fcien.edu.uy

I. INTRODUCTION

Selenium is an essential micronutrient implicated in various physiological animal functions like growth, fertility, and immunity responses. Selenium is also a constituent of glutathione peroxidase, an essential enzyme in nutrients metabolism, and a first line of defense against the oxidation process [1] Furthermore, selenium also seems to interact with lipids metabolism. Indeed, studies found that a selenium deficiency could interfere with the normal conversion of α-linolenic (ALA) into eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids [2]. This produce an increased omega-6:omega-3 ratio in the liver of rats. This specific effect of selenium on fatty acids composition (supplementation versus controlled deficiency) could be an interesting way to modify the fatty acid profile in bovine meat, particularly in animals finished with concentrate. However, various reports showed that the supplementation with selenium in the diet do not always modified the fatty acid profiles of meat in beef, pig, and chicken [1].

Therefore, the aim of this study is to determine if the supplementation with organic selenium could modify in any way the fatty acids composition of meat of Aberdeen Angus steers finished on concentrate.

II. MATERIALS AND METHODS

The meat was from the *Longissimus dorsi* of ten AA steers (ten for each treatments, 24-28 months, 505-523 kg of final live weight), initially reared on pasture, and finished on concentrate supplemented with organic selenium for 110 days before slaughtering. The concentrate was sorghum silage whole plant and sorghum wet seeds (both high tannins variety), wheat bran and a minerals-vitamins complex having wheat bran as support and containing also urea and Monensin. The selenium content of control diet is of 0.10 mg Se/kg of dry matter, while supplemented concentrate contained a total of 0.30 mg Se/kg of dry matter. Supplemente Se was included as selenium-enriched yeast (ensuring an intake of 1.5 g of selenium /day/steer). After slaughtering, carcasses were kept refrigerated at 1-2 ºC for 36 hours *Postmortem* and then the *Longissimus dorsi* muscle (10-12th rib) was withdrawn and conserved vacuum packaged at – 20 ºC until analysis. Fatty acids determination have been done as previously described [1]. Results were statistically analyzed by t-Test using NCSS 2007 software. The Committee on Experimental Animals of the Universidad de la República, Montevideo, Uruguay (CHEA), approved the animal care and handling conditions.

III. RESULTS AND DISCUSSION

The Food and Drugs Administration and the European Food Safety Authority have approved and advised that the supplementation of selenium in complete feed for chicken, swine, turkey, sheep, cattle, and duck should not exceed a level of 0.30 ppm [1]. This limit has been respected here. In the present investigation, the content of selenium detected in meat was 0.48 ±0.01 and 0.64 ±0.02 mg/kg of wet tissue ($P<0.0001$) in control and supplemented group, respectively. In the present work, selenium do not showed remarkable differences in the fatty acids composition of the *Longissimus dorsi* muscle between selenium supplemented and no supplemented Aberdeen Angus steers finished on concentrate. The only significant effect is related to the reduction of arachidonic acid (C20:4n6) content in meat of supplemented animals. It seems that the use of organic selenium in our condition seems do not influence strongly the fatty acids composition of meat, except for arachidonic acid. In published reports, the effect of organic selenium on the fatty acids composition of bovine meat showed inconsistent results. In one hand increasing some fatty acids, particularly oleic acid and PUFA [3], and in other part no showing effect [4]. At the same time, the effect of organic selenium on the fatty acids composition of meat seems to be depending of the main source of fatty acids used to fed the animals [5].

Table 1: Fatty acids composition of *Longissimus dorsi* muscle of Aberdeen Angus steers finished on concentrate supplemented with organic selenium.

Fatty Acids	Control Means	SEM	Selenium + Means	SEM	Significance P=
C12:0	0.06	0.01	0.04	0.00	0.30
C14:0	2.99	0.26	2.55	0.10	0.13
C15:0i	0.11	0.02	0.09	0.01	0.21
C15:0ai	0.10	0.02	0.08	0.01	0.26
C14:1	0.54	0.08	0.49	0.03	0.63
C15:0	0.36	0.04	0.31	0.03	0.28
C16:0i	0.13	0.01	0.11	0.01	0.30
C16:0	29.4	0.88	28.6	0.55	0.42
C16:1	4.27	0.30	4.20	0.12	0.82
C17:0	0.94	0.04	0.87	0.06	0.40
C17:1	0.69	0.04	0.68	0.04	0.81
C18:0	14.1	0.62	14.5	0.23	0.52
C18:1	41.0	0.96	42.9	0.67	0.12
C18:2n-6 LA	2.17	0.19	1.94	0.18	0.39
C20:0	0.08	0.01	0.09	0.00	0.53
C20:1	0.17	0.02	0.20	0.01	0.32
C18:3n-3 ALA	0.28	0.03	0.21	0.02	0.06
CLA c9-t11 isomer	0.23	0.03	0.16	0.02	0.06
C20:3n-3	0.08	0.02	0.03	0.01	0.06
C20:3n-6	0.16	0.03	0.09	0.03	0.14
C20:4n-6 ARA	0.31	0.08	0.12	0.04	0.05
C20:5n-3 EPA	0.03	0.01	0.02	0.01	0.14
C22:5n-3 DPA	0.04	0.01	0.03	0.00	0.09
C22:6n-3 DHA	0.11	0.03	0.06	0.02	0.21
SFA	48.3	1.12	47.2	0.79	0.45
MUFA	46.7	0.92	48.5	0.72	0.15
PUFA	3.42	0.36	2.67	0.28	0.12
Unidentified Fatty acids	1.64	.....	1.66	.....	.....

Values are means as % of total detected fatty acids. SEM= standard error of mean. i= iso, ai=anteis
SFA=saturated fatty acids. MUFA=monounsaturated fatty acids. PUFA=polyunsaturated fatty acids

IV. CONCLUSION

In the condition of our investigation, the organic selenium seems to be without a clear influence on the fatty acids composition of meat from *Longissimus dorsi* muscle of Aberdeen Angus steers, finished on concentrate based on sorghum. More investigation should be done to clarify the controversial effect of selenium on the composition of fatty acids in bovine meat.

REFERENCES

[1] del Puerto, M., Cabrera, M.C. & and Saadoun, A. (2017). A Note on Fatty Acids Profile of Meat from Broiler Chickens Supplemented with Inorganic or Organic Selenium. International Journal of Food Science 2017, Article ID 7613069, 8 pages, 2017. doi:10.1155/2017/7613069.

[2] Schafer, K., Kyriakopoulos, S., Gessner, H., Grune, T. & Behne, D. (2004). Effects of selenium deficiency on fatty acid metabolism in rats fed fish oil-enriched diets. Journal of Trace Elements in Medicine and Biology 18: 89–97.

[3] Jianga, J., Tanga, X., Xueb, Y., Linb, G. & Xionga, Y.L. (2017). Dietary linseed oil supplemented with organic selenium improved the fatty acid nutritional profile, muscular selenium deposition, water retention, and tenderness of fresh pork. Meat Science 131: 99–106.

[4] Netto, A.S., Zanetti, M.A., Del Claro, G.R., Pires de Melo, M., Garcia Vilela, F. & Bertonha Correa, L. (2014). Effects of Copper and Selenium Supplementation on Performance and Lipid Metabolism in Confined Brangus Bulls. Asian Australasian Journal of Animal Science 27: 488-494.

[5] Pereira, A.S. C, Veiga dos Santos, M., Aferri, G., Pereira da Silva Corte, R.R., da Luz e Silva, S., de Freitas Júnior, J.E., Leme, P.R. & Palma Rennó, F. (2012). Lipid and selenium sources on fatty acid composition of intramuscular fat and muscle selenium concentration of Nellore steers. Revista Brasileira Zootecnia 41: 2357-2363.