MEAT FROM ABERDEEN ANGUS STEERS FINISHED ON PASTURE WITH SUPPLEMENTATION, CONCENTRATE, OR PASTURE (2): ACTIVITY OF LIPID METABOLISM ENZYMES.

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Abstract – The results showed an apparent effect of the feeding system on the activity of desaturases, namely Δ9, Δ5 and Δ6 desaturases. That could explain the differences of fatty acids composition of meat from *Longissimus dorsi* muscle in the investigation. It seems that steers fed concentrate present higher Δ9 desaturases activities than steers fed pasture, even with corn supplementation. That could explain the higher level of C14:1 and C16:1 fatty acids in meat of animals fed concentrate. Besides, the higher activities of Δ5 and Δ6 in meat from steers fed pasture supplemented with corn, could explain the higher level of most n-3 fatty acids such as C18:3n-3, EPA and DHA. No differences in the activities of elongase and thioesterase were observed.

Key Words – Δ9 desaturase, *Longissimus dorsi* muscle, Δ5+Δ6 desaturases.

I. INTRODUCTION

In South America there are different main production systems established to produce beef meat. One, based on pasture with or without supplementation, and the other based on concentrate, such as feed. There is some information about the quality and the nutritional value of these different kinds of meat [1, 2]. However, it is not easy to find information about the enzyme activities in meat, in association to the lipid metabolism, in those feeding systems. Therefore, the present study has been undertaken to compare estimated indexes for desaturases, elongases and thioesterases activities in meat from Aberdeen Angus steers fed on pasture, with and without grain supplementation, and on concentrate. The activities of those enzymes, estimated through the calculus of specific indexes from the fatty acids composition of meat, can be used as surrogates of the measure of the true enzyme activities in muscles [3].

II. MATERIALS AND METHODS

The meat was from the *Longissimus dorsi* of ten AA steers (24-28 months, 498-503 kg of live weight) reared and finished on pasture alone, pasture and supplement (corn grains) or finished on concentrate, the last two for 90 days before slaughtering. Concentrate was based on roughage/concentrate (30:60 on dry matter basis). Roughage consisted of whole plant sorghum silage, silo wet grain sorghum. Concentrate was soybean hulls and wheat bran, minerals sources, urea and ionophore. 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 at – 20 ºC until analysis. Fatty acids determination and the calculus of the indexes of enzymes activities were done according to the methods and procedures previously described [4]. Results were statistically analyzed by ANOVA one-way procedure using NCSS 2007 software.

III. RESULTS AND DISCUSSION

Based on the calculus of the different indexes [4,5], it seems that the activities of Δ9 desaturases studied here. could explain the differences observed in the fatty acids composition in the studied meat. Particularly a lower level for C14:1 and C16:1, in animals fed on pasture (even when supplemented), versus those fed on concentrate (Table 1). Neither elongase nor thioesterase presented significant differences between the three groups. Furthermore, the higher activity of Δ5+Δ6 desaturase activities could explain the higher level of the n-3 fatty acids in the meat from animals fed on pasture+supplement, and to a lesser extent for pasture alone, in comparison to concentrate. The same effect was not observed for the n-6 fatty acids (Table 1). Indeed, Δ5+Δ6 desaturases are the enzymes catalyzing the formation of long-chain n-6 and n-3 PUFA starting from the precursors C18:2n-6 and C18:3n-3 [3].

IV. CONCLUSION

There are feed-related differences between the activities of lipid metabolism enzymes in meat studied in the present investigation, particularly for the desaturation process. Although there are some results showing a clear effect of the feeding system on the activities of enzymes, more work is necessary to understand the implication of different regimes

in the regulation of enzymes related to lipid metabolism in meat of AA steers. The differential and precise feeding of beef could be a useful tool in the design of fatty acids composition of meat produced in South America and elsewhere.

Table 1. Indexes of lipid enzyme activities estimated from the fatty acids composition of the *Longissimus dorsi* muscle of Aberdeen Angus steers.

	Pasture+Suplement		Concentrate		Pasture		P
Indexes activities of lipid metabolism enzymes:							
Δ9 Desaturase C14:0	0.14b	±0.003	0.18a	±0.005	0.12b	±0.003	<0.002
Δ9 Desaturase C16:0	0.13b	±0.000	0.14a	±0.003	0.13b	±0.000	<0.004
Δ9 Desaturase C18:0	2.03b	±0.07	2.77a	±0.013	2.08b	±0.06	<0.001
Elongase index	0.73	±0.09	0.44	±0.02	0.64	±0.10	NS
Thioesterase index	10.06	±1.16	7.45	±0.34	8.88	±1.06	NS
Δ5+Δ6 Desaturase	17.9a	±1.08	12.9b	±0.47	13.1b	±1.42	<0.03
Fatty Acids composition:							
C12:0	0.08	±0.02	0.14	±0.01	0.08	±0.01	NS
C14:0	2.68	±0.52	4.16	±0.25	2.57	±0.97	NS
C15:0i	0.32	±0.04	0.23	±0.03	0.26	±0.02	NS
C15:0ai	0.33	±0.05	0.16	±0.04	0.29	±0.02	NS
C14:1	0.37b	±0.07	0.75a	±0.07	0.32b	±0.03	0.01
C15:0	0.69	±0.12	0.55	±0.05	0.65	±0.03	NS
C16:0i	0.20	±0.03	0.18	±0.01	0.23	±0.01	NS
C16:0	25.77b	±1.72	30.81a	±0.56	25.22b	±1.08	<0.05
C16:1	3.40b	±0.23	4.43a	±0.09	3.36b	±0.11	<0.01
C17:0	1.38a	±0.05	1.09b	±0.03	1.40a	±0.07	<0.01
C17:1	0.96a	±0.07	0.71b	±0.01	0.99a	±0.02	<0.02
C18:0	18.61a	±1.08	13.53b	±0.34	18.53a	±0.40	<0.01
C18:1	37.65	±1.13	37.44	±0.77	37.44	±0.13	NS
C18:2n-6 LA	2.49	±0.29	2.36	±0.05	2.83	±0.16	NS
C20:0	0.13	±0.04	0.05	±0.00	0.14	±0.01	NS
C18:3n-6	0.08a	±0.00	0.02b	±0.00	0.02b	±0.00	<0.03
C20:1	0.12	±0.01	0.15	±0.01	0.14	±0.01	NS
C18:3n-3 ALA	0.67a	±0.03	0.23c	±0.00	0.57b	±0.01	<0.01
CLA	0.42	±0.06	0.30	±0.02	0.43	±0.00	NS
C20:3n-3	0.11a	±0.01	0.03b	±0.00	0.09a	±0.00	<0.01
C20:3n-6	0.14a	±0.02	0.08b	±0.01	0.12ab	±0.01	<0.03
C20:4n-6 ARA	0.32	±0.06	0.24	±0.01	0.28	±0.01	NS
C20:5n-3 EPA	0.08a	±0.01	0.02b	±0.00	0.06a	±0.01	<0.01
C22:5n3 DPA	0.05	±0.01	0.04	±0.01	0.03	±0.00	NS
C22:6n-3 DHA	0.26a	±0.04	0.08b	±0.01	0.21a	±0.01	<0.02
Others	2.70	±0.16	2.23	±0.18	3.76	±0.81	…..

Values are means ±SEM. SAT. MUFA and PUFA mean saturated. monounsaturated and polyunsaturated fatty acids. respectively. P= level of signification. NS= no significant. Different lower cases within rows mean significant differences at level of $p<0.05$

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