EFFECTS OF GRADED INCLUSION LEVELS OF SORGHUM IN FINISHER DIETS FOR STEERS ON BEEF FATTY ACID PROFILES

Cletos Mapiye[a*], Farouk Semwogerere[a], Yonela Z. Njisane[a] and Bongani Ndimba[b]

[a]Department of Animal Sciences, Faculty of AgriSciences, Stellenbosch University, Private Bag X1, Matieland, 7602, South Africa.

[b]Infruitec-Nietvoorbij ARC Research Institute, Stellenbosch, Western Cape, 7600, South Africa.

*Presenting author email: cmapiye@sun.ac.za

I. INTRODUCTION

Coupled with the increase in the human population and the emergence of health-conscious consumers, meat production is constrained by climate-induced feed scarcity and price spikes. For example, the average global price for maize grain, the main energy source in livestock diets, rose by more than 50% from 2020 to 2023 [1]. This calls for a paradigm shift towards the use of climate-resilient feed resources. In this context, sorghum stands out for its climate resilience, and comparable nutritional composition and animal performance to maize [2]. More interestingly, sorghum has higher contents of polyphenols (0.25 – 11.5 g GAE/ kg DM) [3] and proportions of alpha-linolenic acid (ALA, C18:3n-3; 0.6 – 5% of total fatty acids, TFA [4]) than maize. Sorghum also has comparable proportions of linoleic (LA, C18:2n-6; 27 – 52% of TFA) and oleic (C18:1n-9; 30 – 50% of TFA) acids to maize (ALA, 0.6 – 1%; LA, 38 – 57%; oleic, 31 – 33% of TFA), respectively [4,5]. Sorghum polyphenols could protect dietary polyunsaturated fatty acids (PUFA) from rumen biohydrogenation (BH) and modify the rumen environment to favour the production of health-enhancing BH products such as rumenic acid and its processor vaccenic acid which will be absorbed in the small intestines and deposited in the muscle [6,7]. However, little, if any information, is known about the effect of feeding cattle sorghum-containing finisher diets on beef fatty acid (FA) composition. Thus, the FA composition of beef from steers-fed graded levels of sorghum as a replacement for maize was evaluated in the current study.

II. MATERIALS AND METHODS

Thirty-five Angus steers (n = 7) were randomly assigned to five finisher diets containing either 0, 100, 200, 300 or 400 g/kg DM of sorghum substituting white maize. The steers were slaughtered after a 90-day feeding trial preceding a 21d adaptation period. After 24 h postmortem, the left *Longissimus thoracis et lumborum* (LTL) for each animal was harvested from 9^{th} to 13^{th} rib for FA analysis. The lipid was extracted using chloro-methanol extraction, methylated with two-stage acid-base protocol and FAMEs analysed using a GC with a 100 m capillary column and a 175 °C temperature program. All the fatty acid data was handled with GLIMMIX procedure of SAS including diet as a fixed factor.

III. RESULTS AND DISCUSSION

Increased substitution of sorghum for maize in beef finisher diets did not affect ($P > 0.05$) beef fatty acid composition (Table 1). The lack of difference in the fatty acid profile of beef in the current study could be attributed to a slightly similar dietary fatty acid profile and low phenolic contents. The dietary polyphenols observed were below 20 g/kg DM known to influence rumen biohydrogenation and lipolysis [6,7].

Table 1: Profile of selected fatty acids (mg/100 g) of beef *Longissimus thoracis et lumborum* from steers fed finisher diets containing sorghum substituted for maize

Variable	Sorghum inclusion (g/kg DM) in the diet					SEM[1]	*P*-value
	0	100	200	300	400		Diet
∑Total fatty acid methyl esters	2114.2	2297.7	2267.7	2195.4	2241.6	247.23	0.987
∑Polyunsaturated fatty acids	118.2	115.5	113.9	112.0	111.2	10.22	0.990
∑*n*-6 Polyunsaturated fatty acids	90.4	88.1	88.2	85.7	84.6	9.33	0.993
18:2*n*-6	64.8	63.9	64.8	62.2	61.6	7.40	0.997
18:3*n*-6	2.2	2.3	2.3	2.2	2.2	0.20	0.993
20:3*n*-6	2.5	2.6	2.4	2.4	2.4	0.33	0.992
20:4*n*-6	19.5	17.9	17.6	17.6	17.2	2.70	0.981
22:4*n*-6	1.2	1.2	0.9	0.9	0.9	0.16	0.417
∑*n*-3 Polyunsaturated fatty acids	14.5	14.6	14.1	14.6	14.9	1.35	0.994
18:3*n*-3	10.5	11.0	10.3	10.7	10.9	1.26	0.995
22:5*n*-3	4.0	3.6	3.8	4.0	4.1	0.63	0.987
∑Conjugated linoleic acid	13.3	12.8	11.6	11.7	11.6	0.94	0.590
*c*9,*t*11-18:2	7.1	7.1	6.0	5.9	6.0	0.59	0.352
*t*10,*c*12-18:2	3.1	2.9	2.9	3.0	3.1	0.45	0.995
*c*11,*t*13-18:2	2.4	2.4	2.4	2.4	2.2	0.38	0.997
*t*9,*c*12-18:2	0.5	0.4	0.4	0.4	0.4	0.09	0.107
∑Monounsaturated fatty acids	1114.3	1175.9	1145.3	1169.2	1172.6	149.07	0.998
*c*9-16:1	70.2	72.1	71.4	72.6	72.2	10.75	0.999
*t*10/*t*11-18:1	40.2	38.3	40.1	41.9	42.6	6.41	0.991
*c*6-18:1	69.5	71.8	69.2	71.5	72.9	7.86	0.997
*c*9-18:1	896.0	954.5	926.2	946.3	947.3	137.62	0.998
∑Saturated fatty acids	881.8	1006.3	1008.5	914.2	957.8	117.39	0.921
12:0	2.2	3.0	2.5	2.7	3.1	0.41	0.508
16:0	545.1	658.9	652.8	557.8	566.4	83.80	0.785
18:0	221.5	218.0	228.2	236.0	265.1	26.50	0.732

∑: Summation; SEM: Standard error of means.

IV. CONCLUSIONS

Replacing maize with sorghum in finisher diets of steers had neutral effects on the health value of meat.

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