FATTY ACID COMPOSITION AND OXIDATIVE STABILITY OF *LONGISSIMUS THORACIS* MUSCLE IN GOATS FED DIFFERENT PARTS OF *ANDROGRAPHIS PANICULATA*

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Abstract –The fatty acid composition, color and oxidative stability of *Longissimus thoracis* (LT) muscle were examined in goats fed different parts of *Andrographis paniculata*. Over a 100 d trial, 24 Boer crossbred bucks were randomly assigned to diets containing 1.5% *Andrographis paniculata* leaf powder (APL), 1.5% *Andrographis paniculata* whole plant powder (APW) or no *Andrographis paniculata* (AP0). The goats were slaughtered and the LT was subjected to 7 d postmortem ageing. The AP0 meat had higher C14:0, C15:0 and C18:0 and lower monoenes than the APL and APW meat. The APW meat had higher C18:1*trans*11 than meat from other treatments. Regardless of the diet, the TBARS value increased while redness decreased over storage. The APW and APL meat had higher redness and lower TBARS compared with the AP0 meat. It can be concluded that dietary AP enhanced the unsaturated fatty acids, color and oxidative stability of LT muscle in goats.

Key Words – *Andrographis paniculata*, color, lipid oxidation.

I. INTRODUCTION

In recent times, ruminant meat quality perception by consumers has been negatively affected owing to its high saturated fatty acids (SFA) which has been implicated in the incidence of chronic diseases [1]. The high proportion of SFA in ruminant meat is due to the extensive biohydrogenation of unsaturated fatty acid (UFA) in the rumen, which could be altered by dietary herbs [2]. Dietary supplementation of leaves and whole plant of AP modified rumen microflora, reduced the concentration of SFA and increased the concentration of UFA in the rumen of goats [3]. However, there is dearth of information on the effect of different parts of AP on meat quality in goats. Thus, the objective of this study was to determine the effects of dietary supplementation of leaves and whole plant of AP on fatty acid composition, lipid oxidation and color of *longissimus thoracis* muscle in goats.

II. MATERIALS AND METHODS

Twenty-four Boer goats (4-5 months old, initial body weight of 20.29±0.18 kg) were randomly assigned to diets containing 1.5% *Andrographis paniculata* leaf powder (APL), 1.5% *Andrographis paniculata* whole plant powder (APW) or no *Andrographis paniculata* (AP0) and fed for 100 d. On the last day of the trial, the animal were fasted overnight and slaughtered following the Halal procedure. All analyses were conducted on *longissimus thoracis* (LT) muscle. Muscle fatty acid, color coordinates and lipid oxidation were determined following the method described by Adeyemi *et al*. [1]. The experiment followed a completely randomized design. Data obtained for fatty acids were analyzed by the GLM procedure of SAS. Data obtained for color and lipid oxidation was subjected to repeated analysis of variance. Means were separated using Tukey HSD test at significant level of $p<0.05$.

III. RESULTS AND DISCUSSION

The proportions of C12:0, C14:0 and C14:1 and C18:0 were higher in the AP0 meat compared with the APL and APW meat. This observation could possibly be due to the suppression of enzymes responsible for the synthesis of medium chain FA by AP. The APL and APW meat had lower proportion of C18:0 compared with the control meat. This finding could be due to the polyphenols in AP which inhibited the activities of microbes that are responsible for the conversion of *trans* C18:1 FA to C18:0. Similarly, dietary AP leaves reduced the concentration of C18:0 in goat meat [4]. The APW meat had higher *trans* C18:1 compared with the AP0 and APL meat. The concentration of CLA *cis*-9 *trans*-11 was greater in the APL and APW goats compared with AP0 goats. This observation is in tandem with the result of a companion trial [3], which showed that the rumen liquor of goats fed APL and APWP diets had a higher concentration of CLA *cis*-9 *trans*-11 compared with those fed the control diet. The TBARS value was not significantly

different among the treatments on day 0. On days 1 and 7, the meat from goats fed APL and APW diets had lower TBARS than the meat from the control goats. This observation could due to the antioxidant compounds in AP. Similarly, Karami *et al*. [4] observed that dietary supplementation of AP leaves reduced the TBARS value of *longissimus lumborum* muscle in goats. Regardless of the diet, the TBARS value increased over storage. This observation could be due to the breakdown of antioxidant defense system. Similar observation was observed during a 7 d postmortem ageing of *semimembranosus* muscle in goat [1]. The control meat had lower redness and higher lightness compared with the APL and APW meat. This finding could be attributed to the lower TBARS in the meat of goat fed AP diet.

Table 1 Effect of *Andrographis paniculata* on fatty acid composition (% of total FA) and quality of LT muscle in goats

	Diets					Diets		
Parameter	AP0	APL	APW	Parameter	days	AP0	APL	APW
C10:0	0.40	0.09	0.11		0	33.80	35.42	33.95
C12:0	0.96^{a}	0.77^{b}	0.92^{ab}	L*	1	38.12	38.55	39.88
C14:0	4.98^{a}	4.35^{b}	4.08^{b}		7	36.29	35.05	35.95
C14:1	0.41^{a}	0.40^{ab}	0.37^{b}		0	13.93^{x}	13.02	13.30
C15:0	0.60^{a}	0.40^{b}	0.39^{b}	a*	1	12.52^{bx}	12.41^{a}	13.30^{b}
C15:1	0.95	0.80	0.97		7	8.48^{cy}	11.71^{b}	12.57^{a}
C16:0	21.31	21.83	21.73		0	15.47^{by}	17.14^{a}	10.66^{cz}
C16:1	1.74^{b}	1.97^{a}	2.00^{a}	b*	1	14.27^{cy}	17.46^{ax}	16.09^{by}
C17:0	1.22^{a}	0.84^{c}	0.93^{b}		7	17.77^{ax}	14.32^{cy}	17.38^{bx}
C17:1	1.32^{b}	1.67^{a}	1.13^{b}		0	0.12^{az}	0.11^{ay}	0.11^{az}
C18:0	18.09^{a}	16.80^{b}	16.41^{b}	TBARS	1	0.21^{ay}	0.12^{by}	0.13^{bx}
C18:1n-9	31.35	32.65	34.03		7	0.26^{ax}	0.14^{cx}	0.17^{by}
C18:1trans11	2.99^{b}	2.68^{b}	3.59^{a}					
C18:2n-6	6.08	6.62	6.20					
CLAc9T11	0.55^{c}	0.60^{b}	0.65^{a}					
C18:3n-3	1.35	1.33	1.37					
C20:4n-6	3.53	3.36	3.11					
C20:5n-3	0.38^{c}	1.15^{a}	0.48^{b}					
C22:5n-3	1.24	1.03	0.98					
C22:6n-3	0.55	0.66	0.55					

$^{a, b, c}$ means having different superscript along the same row are significantly different ($p<0.05$). $^{x, y,}$ means having different superscript along the same column are significantly different ($p<0.05$). AP0=Basal diet; APL = Basal diet with 1.5% *Andrographis paniculata* leaves; APWP = Basal diet with 1.5% *Andrographis paniculata* L*= lightness; a*= redness; b* = yellowness. TBARS is expressed as mg malondialdehyde/ kg meat.

IV. CONCLUSION

The results of this study showed that dietary AP enhanced the unsaturated fatty acid content, oxidative stability and color of LT muscle in goats.

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