

EFFECT OF ANTIOXIDANTS SUPPLEMENTATION : *Andrographis paniculata*, TURMERIC AND VITAMIN E ON MEAT QUALITY OF CROSSBRED GOAT

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Abstract – This experiment was conducted to investigate the effects of antioxidants supplementation with *Andrographis paniculata* (AP), Turmeric (TU) and vitamin E (VE) on meat quality of crossbred goat. Twenty four male crossbred (Boer x Anglo-Nubian x Native) goats were randomly allotted in to four dietary groups, consisting of basal diet (control, CO) and basal diet supplemented with 0.5% *Andrographis paniculata* or 0.5% Turmeric or 400 mg/kg vitamin E. All goats were fed the corresponding concentrate diets at 1.5% of body weight and Napier grass *ad libitum*. After 120 days of feeding period, the goats were slaughtered and meat quality traits were determined using *longissimus dorsi* (LD) and *Semimembranosus* (SM) muscles. The results had shown that meat color (CIE L^* , a^* , b^* values) and drip loss were not affected by the dietary supplements. However, goat fed diet with VE had significantly lower cooking loss of LD muscle than the control group ($p < 0.05$). Goats fed diet with TU treatment exhibited lower shear force of LD muscle than others group ($p < 0.05$). Supplementation of dietary antioxidants AP, TU and VE decrease TBARS value of LD and SM muscles ($p < 0.01$). It was concluded that dietary antioxidants from vitamin E and natural herbs such as *Andrographis paniculata* and Turmeric have potential for improved antioxidant activity, tenderness and cooking loss in goat meat.

Key Words - Antioxidants, meat quality, crossbred goat

I. INTRODUCTION

Goats are the important protein sources of animal origin for human especially in southern Thailand. Goat meat is leaner than lamb and beef since it incorporates less subcutaneous, intramuscular fat and more internal fat [8]. The quality of meat depends on the characteristics of

the meat such as color, flavor and tenderness. However, autooxidation of lipids and the production of free radicals in meat result in oxidative deterioration and off-flavor development when exposed to oxygen or light [4]. Lipid oxidation in meat increase after 4 or 7 days of storage, although synthetic antioxidants are widely used in meat industry, the consumer concern over their toxicity indicated the search for natural sources of antioxidants [6]. Antioxidant supplementation in diet not only have a preventive effect on the health of animal, but also enhance the final product such as meat in line with now called functional food, due to the increasing consumer's awareness of health [2]. Vitamin E (α -tocopherol) is the most frequently used lipid soluble free radical scavenger administered as nutritional supplement [6, 9]. In recent years, many herb, species, and their extract have been successfully used to reduced lipid oxidation in meat and to improve the sensory characteristics and extend shelf-life. [3, 6]. The reports about antioxidant effect of vitamin E and natural herbs on meat quality parameters such as water holding capacity, color, tenderness and antioxidant activity in goats are rather limited. The present study attempts to investigate the effects of antioxidants supplementation with *Andrographis paniculata*, Turmeric and vitamin E on antioxidant activity and meat quality of crossbred goat.

II. MATERIALS AND METHODS

Animals and Samples collection

Twenty four male crossbred (Boer x Anglo-Nubian x Native) goats with a similar weight and age were randomly allotted in to four dietary

groups, consisting of basal diet (control, CO) and basal diet supplemented with 0.5% *Andrographis paniculata* or 0.5% Turmeric or 400mg/kg vitamin E (α -tocopheryl acetate). All goats were fed the corresponding concentrate diets at 1.5% of body weight and Napier grass *ad libitum*. After 120 days of feeding period, goats were fasted for 12 h with free access to water and slaughtered. Meat quality traits were determined using *longissimus dorsi* (LD) and Semimembranosus (SM) muscles. LD muscles were cut for measuring drip loss, cooking loss, shear force value and meat color (CIE L^* , a^* , b^* values).

Lipid oxidation was evaluated using the thiobarbituric acid reactive substances (TBARS) method. TBARS value expressed as mg malonaldehyde (MDA) equivalents per kg of fresh meat. LD and SM muscles were divided into three slices and individually placed in vacuum bag and stored at 4°C for period 1, 3 and 5 days postmortem before assay for antioxidant activity given by [1].

Statistical analysis

Data were analyzed by the analysis of variance (ANOVA) to test for the effects of dietary treatments effect. A Duncan's new multiple range test procedure was used to determine significant differences among means at a 5% level of significance.

III. RESULTS AND DISCUSSION

The result of meat quality are shown in Table 1. There were no differences in drip loss and meat color (L^* , a^* and b^*) among the dietary treatment groups. Lower cooking loss ($p < 0.05$) was observed in goat fed diet containing VE than the control group but not significant difference from AP and TU groups. TU improved tenderness in LD muscle, goats fed with diet containing of TU had lower shear force when compared with other groups ($p < 0.05$). This results are in agreement with those of [6] who found no differences in drip loss among of dietary supplementation antioxidants (VE, AP, TU).

The lipid oxidation of meat are shown in Table 2. TBARS values of meat trend to increase in both LD and SM muscles after day 1. In comparison

with the CO treatment all three diet antioxidant supplements in this experiment decreased the TBARS values of both LD and SM muscles ($p < 0.01$). Similarly, [1] reported dietary antioxidants supplementation with AP, TU and α -tocopherol decrease TBARS values in meat of crossbred goat kid. However, at day 5, the TBARS value of the TU treatment in SM muscle was lower than other treatments ($p < 0.01$).

IV. CONCLUSION

The results of this study indicate that supplementation with vitamin E and natural herbs such as *Andrographis paniculata* and Turmeric in diets have potential to improve antioxidant activity of goat meat. Furthermore, TU diet treatment also improve meat quality in term of tenderness.

Table 1. Drip loss, cooking loss, shear force and color of LD muscle in crossbred goat

Traits	CO	VE	AP	TU	P-value
Drip loss (%)	2.67	4.36	3.96	2.54	0.436
Cooking loss (%) ¹	37.09 ^a	31.34 ^b	33.83 ^{ab}	33.78 ^{ab}	0.045
Shear force (kg/cm ²) ²	5.61 ^a	5.59 ^a	5.06 ^a	4.13 ^b	0.004
Color					
L^*	33.48	33.94	33.02	33.55	0.814
a^*	11.34	12.07	11.22	11.07	0.428
b^*	12.63	13.78	12.20	12.51	0.157

¹a-b Means within a row with different superscripts differ significantly differ at $P < 0.05$

²a-b Mean within a row with different superscripts differ significantly at $P < 0.01$

Table 2. TBARS (mg MDA/kg meat) of LD and SM muscle in crossbred goat

Traits	CO	VE	AP	TU	P-value
LD					
1 day	0.607	0.590	0.675	0.582	0.246
3 days	0.805 ^a	0.790 ^a	0.695 ^b	0.632 ^b	0.001
5 days	1.02 ^a	0.892 ^b	0.867 ^b	0.877 ^b	0.001
SM					
1 day	0.775 ^a	0.595 ^b	0.645 ^b	0.552 ^b	0.002
3 days	0.855 ^a	0.835 ^a	0.650 ^b	0.640 ^b	0.001
5 days	1.035 ^a	0.845 ^b	0.790 ^b	0.675 ^c	0.001

^{a-c} Mean within a row with different superscripts differ significantly at $P < 0.01$

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