

# EFFECT OF TEA MARINADES ON FORMATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN CHARCOAL-GRILLED CHICKEN WINGS

Chong Wang, Chun-bao Li, Xing-lian Xu and Guang-hong Zhou\*

Key Laboratory of Meat Processing and Quality Control; Jiangsu Synergetic Innovation Center of Meat Processing and Quality Control; Nanjing Agricultural University; Nanjing, Jiangsu 210095, P. R. China

\*Corresponding author email: ghzhou@njau.edu.cn

**Abstract** –The effect of marinating meat with White tea, Black tea and Green tea (coded WT, BT, and GT respectively) on the formation of polycyclic aromatic hydrocarbons (PAHs) in charcoal-grilled chicken wings was evaluated. Antiradical activity of marinades (DPPH assay). GT exhibited the strongest scavenging activity (51%), followed by WT (46%) and BT (38%). Control and marinated meat samples contained the four PAHs named PAH4 by the EFSA and classified as suitable indicators for carcinogenic potency of PAHs in food. WT showed the highest inhibitory effect in the formation of PAH8 (53%), followed by GT (17%) and BT (15%). The inhibitory effect of tea marinades on PAH4 increased with the increase of their radical scavenging activity. WT marinade was the most efficient on reduction of PAH formation, providing a proper mitigation strategy.

**Key Words** –polycyclic aromatic hydrocarbons, chicken wing, tea marinades, antiradical activity

## I. INTRODUCTION

Polycyclic aromatic hydrocarbons (PAHs) are found in many common food. The highest PAH concentration is usually found in smoked and charcoal-grilled products which contribute significantly to the daily intake of these compounds<sup>[1]</sup>. The main factors that affect PAH concentrations in charcoal-grilled meat are the closeness to the heat source, the amount of fat in the raw product, and the cooking time<sup>[2]</sup>. According to the EU Scientific Committee on Food, the most suitable indicator for the carcinogenic potency of PAHs in food is the sum of four PAHs (PAH4)<sup>[1]</sup>. Meat marinating is a popular precooking method for improving the flavor of cooked meat, while reducing the formation of potentially harmful compounds<sup>[3]</sup>. In the present work the effect of different tea (Green (GT), black (BT), and white tea (WT)) marinades on PAH4 formation in grilled chicken wings was evaluated.

## II. MATERIALS AND METHODS

Chicken wings were obtained from a local supermarket in Nanjing, China. Tea infusions were prepared according to the conventional tea brewing method: taking 2 g of green tea and infusing with 250 mL of hot tap water (1 g/125 mL). Marinade conditions: marinating time was 4 h at 5°C, and the proportion of meat amount and marinade volume was 1:1 (g/mL). No other ingredients were added, besides tea. Cooking Conditions: A bed of charcoal was prepared and ignited in a garden-type grill. When all flames had subsided, pork samples were barbecued at 10 cm distance from the heat source. Samples were turned four times during grilling the total cooking time (8 min). After cooking, the samples were codified, frozen, and freeze-dried. Followed by determination of Marinades Radical-Scavenging in DPPH Reaction and analysis of PAHs. The results were statistically analyzed by analysis of variance. Comparison of mean values was made using the Duncan test with SPSS.

## III. RESULTS AND DISCUSSION

As shown in Figure 1, this three kinds of tea showed a different colour after brewing. The deepest colour of all teas is black tea, followed by white tea, and finally green tea. The DPPH radical-scavenging activities expressed as percent of inhibition of tea marinades before the addition of meat (Before) and after marinating (After) are shown in Figure 2. All teas exhibited radical-scavenging activity. As can be seen, the strongest DPPH-scavenging activity was found in the GT (50.7%), followed by WT (46.2%) and BT (45.7%) before marinating. After marinating, no significant changes were observed in radical-scavenging activity of GT and BT. However, a significant loss of antiradical capacity was observed in WT after meat marinating.

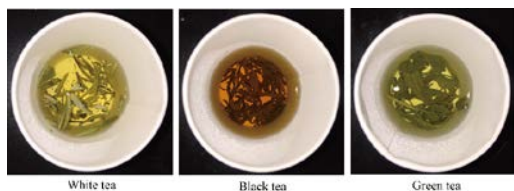


Figure 1. The comparison between with 3 kinds of tea

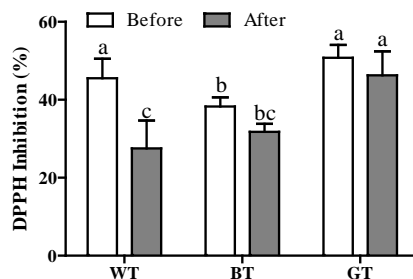


Figure. 2 DPPH radical scavenging activity of tea marinades before and after marinating.

PAH4 concentrations in charcoal-grilled chicken wings marinated during 4 h with different teas are shown in Table 1. As observed for unmarinated meat, PAH4 were also formed in marinated samples; however, their sum was lower in these samples when compared with control. With regard to the three types of teas used as marinades, the less effective in reducing the PAH4 content was BT (14.27 ng/g), followed by GT (13.95 ng/g). WT had the strongest inhibitory effect on the PAH4 in grilled chicken wings (7.90 ng/g), reducing by more than half of the PAH4 content of the control samples.

Table 1. PAH4 Formation on Charcoal-Grilled chicken wings Unmarinated (Control) and Marinated with White Tea (WT), Black Tea (BT) and Green Tea (GT)

PAH	PAHs (ng/g wet weight grilled meat)			
	Control	WT	BT	GT
BaA	3.84 ± 0.83 a	1.70 ± 0.51 b	3.55 ± 0.90 a	3.49 ± 0.29 a
Ch	7.04 ± 0.77 a	3.57 ± 0.59 b	5.39 ± 2.29 ab	6.02 ± 1.58 ab
BbF	3.28 ± 0.97 a	1.51 ± 0.48 b	3.11 ± 0.93a	2.43 ± 0.44 ab
BaP	2.68 ± 0.82 a	1.12 ± 0.12 b	2.22 ± 0.78 ab	2.01 ± 0.21 ab
ΣPAH4	16.84	7.9	14.27	13.95

Results are presented as the mean ± standard deviation, n = 5. Means with different letters in the same row are significantly different (p < 0.05).

#### IV. CONCLUSION

In conclusion, our data clearly showed that all selected marinades exhibited a reduction in total PAHs formation in chicken wings. The mechanism of formation of PAHs involves free radicals, it may be possible that antioxidant compounds from tea (especially WT) act as inhibitors in the free radical reaction pathways, through radical quenchers and free radical scavengers activity. Therefore, tea can be used as a good additive to inhibit the formation of PAHs and the intake of tea-marinated meat can be a suitable choice.

#### ACKNOWLEDGEMENTS

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