

INHIBITORY EFFECT OF HAWTHORN EXTRACT ON HETEROCYCLIC AROMATIC AMINES FORMATION IN CHICKEN BREAST MEAT

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Abstract – The study focused to assess the inhibitory effect of hawthorn extract at different levels (0, 0.5 and 1%) on the formation of HAAs in chicken breast meat cooked by pan cooking and oven cooking. All samples cooked at three different temperatures and were analyzed for 12 HAAs (IQ, IQx, MeIQ, MeIQx, 4,8-DiMeIQx, 7,8-DiMeIQx, PhIP, Norharman, Harman, AαC, MeAαC, Trp-P-2). Samples cooked at 150°C had very low amounts of HAAs, and the levels of HAAs increased gradually when cooking temperature rose higher from 150 to 250°C. The inhibitory effect of hawthorn extract on total HAAs levels at concentration 0.5% and 1% were found 12-100%. This study shows that hawthorn extracts mitigate HAAs formation especially in high cooking temperature.

Key Words – antioxidants, cooking methods, maillard reaction

I. INTRODUCTION

Heterocyclic aromatic amines (HAAs) are compounds that are formed naturally during cooking of proteinaceous foods such as muscle meats including beef, pork, fish, and poultry (1). To the best of our knowledge, the effect of addition of hawthorn extract on the formation of HAAs in chicken breast meat has not been investigated in literature. Hence, the aim of the present study was to investigate the effect of hawthorn extract on the reduction of HAAs levels in pan fried and oven cooked chicken breast meat at different cooking temperature.

II. MATERIALS AND METHODS

Proximate composition, creatine/creatinine, reducing sugar of samples were analyzed for all treatments (0.5% and 1% hawthorn extract) in pan-fried and oven-cooked chicken breast meat. HCAs (IQx, IQ, MeIQx, MeIQ, 4,8-DiMeIQx, 7,8-DiMeIQx, Norharman, Harman, Trp-P-2, PhIP, AαC, MeAαC) analyzed from meat samples by HPLC.

III. RESULTS AND DISCUSSION

For each HAA type, HAAs levels and total HAAs levels were found at different levels both without hawthorn extract (control) and with hawthorn extracts at different concentrations. Total HAAs contents data are presented in Table 1. The mean total amount of HAAs in the control samples (without extract), pan cooked chicken meat at 150, 200 and 250°C temperature was detected as 5.66, 8.27, and 10.96 ng/g, oven cooked chicken breast meat at 150, 200 and 250°C temperature as 1.32, 2.79, 17.60 ng/g respectively. Varying levels of IQ (up to 4.47 ng/g), IQx (up to 0.69 ng/g), MeIQ (up to 0.82 ng/g), MeIQx (up to 1.01 ng/g), 7,8-DiMeIQx (up to 0.14 ng/g), 4,8-DiMeIQx (up to 0.10 ng/g), Norharman (up to 0.39 ng/g), Harman (up to 0.66 ng/g), Trp-P-2 (up to 4.38 ng/g), PhIP (up to 0.75 ng/g), AαC (up to 1.23 ng/g), MeAαC (up to 0.48 ng/g) were determined. Trp-P-2 was the most abundant HAA in the analyzed samples. The total amount of HAAs was found nd-17.60 ng/g. High levels of Trp-P-2 and Harman were attributed to the increase total amount of HAAs, especially when oven cooked at high temperatures. Among several factors known affecting HAAs formation, cooking temperature is the most important factor (2). In this study, higher concentrations of total HAAs have also seen when it was cooked at high temperatures ($p < 0.01$). It is known that lower cooking temperatures may reduce the exposure to HAAs (3,4). As well as cooking temperature, cooking time and cooking methods greatly influence HAAs formation, so controlling these factors could minimize HAAs levels in meats (2). It has found that the reduction of total HAA formation ranged from 12 to 100% by the addition of hawthorn extract.

Table 1 Levels of HAA of chicken breast meat samples with/without hawthorn extract cooked at different temperatures (ng/g)

Cooking Methods	Cooking Temperatures (°C)	Level (%)	Total HAAs	Inhibition (%)
Pan-cooking	150	Control	5.66	
		0.5	9.04	+59.72
		1	6.42	+13.43
	200	Control	8.27	
		0.5	6.87	-16.93
		1	5.01	-39.42
	250	Control	10.96	
		0.5	3.47	-68.33
		1	5.27	-51.92
Oven-cooking	150	Control	1.32	
		0.5	nd	-100.0
		1	0.03	-97.73
	200	Control	2.79	
		0.5	0.61	-78.14
		1	0.64	-77.06
	250	Control	17.60	
		0.5	15.35	-12.78
		1	14.24	-19.09

+: increase, -: decrease

IV. CONCLUSION

New strategies should be developed to reduce these mutagenic compounds. Adding antioxidant compounds prior to cooking may be effective for decreasing the levels of these carcinogens. The study has showed the reducing effect of hawthorn on the HAA formation and hawthorn extract may be helpful in the elimination of HAA formation.

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