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學號	486446086
研究生(中)	李坤煌
研究生(英)	Kuen-Huang Li
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其他題名	
指導教授(中)	陳炳輝
指導教授(英)	
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摘要(中)	雜環胺化合物(Heterocyclic amines,HAs)是由碳、氫、氮原子所組成，具有多環芳香族結構的化合物，其主要由食品中胺基酸、肌酸酐(creatinine)及糖類或直接由單一胺基酸或蛋白質經熱裂解而合成。由於大部份 HAs 具

	有致突變性或致癌性，且多發現於經油炸或燒烤等熱處理的高蛋白質食品中，如水產品及肉製品等，此類食品中的 HAs 含量高低已成為學界和消費者所關切的問題。本研究以自製魚鬆為模型，藉著在製造過程中對原料魚肉進行不同處理及添加不同成份，如味精、糖類、油脂與抗氧化劑等，以探討魚鬆製作過程中不同的處理方式與不同成份的添加對 HAs 生成之影響。 結果顯示，市售五種魚鬆所含的 HAs 種類以 Norharman、Harman、PhIP、A?C 及 MeA?C 為主。而自製之魚鬆所生成之主要 HAs 為 Norharman、Harman、A?C 及 MeA?C。而影響 carboline 型之 HAs 生成的前驅物主要為葡萄糖與 threonine、serine、leucine 及 phenylalanine 四種胺基酸，其中以葡萄糖影響較為顯著。 在不同加工方法方面，以水煮或蒸煮為前處理時，HAs 總生成量並無顯著差異，並且每一種 HAs 之生成量皆隨翻炒溫度升高而增加。在不同調味料添加量方面，以添加 19 %之砂糖時，HAs 總生成量最低，其中以 Norharman 生成量最低；隨著味精添加量增加，HAs 生成量亦增加，尤以 Norharman 增加最多。在抗氧化劑方面，添加高濃度 ascorbic acid 時，對魚鬆 A?C 及 MeA?C 的生成有顯著的抑制效果；添加低濃度?-tocopherol（0.1 克）時，對 HAs 有抑制效果，其中又以 Norharman 和 MeA?C 之抑制更為顯著；而低濃度 BHT 會促進 Norharman、Harman 及 MeA?C 生成，高濃度 BHT 則對 Norharman、Harman、A?C 及 MeA?C 皆有抑制效果。 在儲存溫度方面：以鋁箔袋包裝儲存時，HAs 生成量隨儲存溫度上升而增加；以塑膠袋儲存時，儲存溫度與 HAs 總生成量，則無顯著差異。在儲存時間方面：不論是以鋁箔或塑膠袋包裝時，HAs 總生成量隨儲存時間增加而降低。在添加不同油脂方面：HAs 總生成量以添加椰子油時最高，其次為添加豬油；而添加大豆油時，HAs 生成量遠低於添加豬油時之 HAs 生成量。
摘要(英)	Heterocyclic amines (HAs) are a group of compounds with unsaturated double bonds and ring structure that are composed of carbon, hydrogen and nitrogen. The major mechanism of HAs formation can be attributed by heating of four precursors, amino acids, creatine, creatinine and sugar, or by pyrolyzing of amino acids and proteins. Previous researches have shown that some HAs are mutagenic and carcinogenic. Frying or broiling of meat and other protein-rich foods, such as fish and beef may generate several HAs. The consumption of HAs in excess is harmful to human health. This study used shredded fried fish as a model to investigate various processing treatments and food additives, such as monosodium glutamate, sugars, oils and antioxidants, on HAs formation. Results showed that Norharman, Harman, PhIP, A?C and MeA?C were found in shredded fried fish of five commercial brands. In the lab-made shredded fried fish, four HAs, Norharman, Harman, A?C and MeA?C, were present. The total levels of HAs in shredded fried fish pretreated by boiling or steaming were not significant ($p>0.05$). The yield of each HAs increased with increasing heating temperature. High amount of HAs was found in shredded fried fish of 1.5 % monosodium glutamate. The HAs content increased with increasing amount of monosodium glutamate, however, high level of sugar (19 %) inhibited formation of both A?C and MeA?C. Likewise, high level of ascorbic acid inhibited formation of both A?C and MeA?C, while low level of ?-tocopherol (0.1 g) inhibited production of four HAs, Norharman, Harman, A?C and

	MeA?C. Also, low level of BHT (0.1 and 0.5g) accelerated formation of Norharman, Harman, A?C and MeA?C, but high level of BHT (1.0g) inhibited formation of Norharman and MeA?C. During storage, the HAs increased with increasing storage temperature when shredded fried fish was packed in aluminum foil , however, the difference was not significant (p>0.05) between storage temperature and HAs formation when shredded fried fish as packed in plastic bag. When packed with aluminum foil or plastic bags, the HAs decreased with increasing storage time. HAs was formed in largest amount in shredded fried fish of coconut oil, origin, followed by lard and soybean oil.
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