INVESTIGATION OF ACRYLAMIDE LEVELS IN SELECTED FRIED AND BAKED FOODS IN JORDAN

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ABSTRACT

Acrylamide is a potential health hazardous compound, occurring in baked and fried food as a result of excessive dry heating during preparation and/or processing of foods. This study aimed at investigating the acrylamide content in selected fried and baked foodstuffs commonly consumed in Jordan and comparing the effect of different processing factors on its level.

Seventeen food items representing four groups of food (breads, fine bakery products, Arabic sweets and fried foodstuffs) were chosen and purchased from the local markets after collecting data on their formulation and preparation or processing conditions. The selected foods are produced under different conditions (ingredients, method of preparing, pH, heating time and temperature). Furthermore, a controlled study was conducted on four types of foods (falafel, fried kobbeh, potato and karabeej Halab). Acrylamide content was extracted with 2-butanone and analyzed via GC/MS/EI using the
method of Biedermann et al., (2002). The extraction procedure of acrylamide from the samples had been modified and improved by the researcher to optimize recovery.

Acrylamide was found in 15 out of 17 of the tested food item samples at varying levels as a result of the differences in formulation and preparation or processing conditions. Acrylamide content of yeast fermented Arabic bread that is usually baked at high temperature and short time (35-45 sec. at 450-500 ºC for thin Lebanese type and 60-90 sec. at 300-350 ºC for thick kmaaj type), boiled potatoes and unheated dough of falafel, fried kobbeh and karabeej Halab were below the detectable level (180 µg/kg) of acrylamide. Whereas the Arabic bread leavened by yeast and sodium bicarbonate (mashroooh) or solely by sodium bicarbonate (shrak) and baked under comparable conditions of Arabic bread were found to contain acrylamide at levels of 1200 and 1800 µg/kg respectively. This demonstrates the effect of increasing pH, due to the addition of sodium bicarbonate as a leavening agent. In comparison to the rapidly baked Arabic bread, hamam bread that is a loaf type, baked at ~ 280 ºC for ~ 18 min and having a well developed brown crust showed an acrylamide average of 3300 µg / kg.

Fine (cracker type) bakery products, Arabic sweets and fried foods, their pH values ranging between 6.2 to 8 showed relatively high concentrations of acrylamide (2400 to 5200 µg/kg). Kirshaleh baladieh that is leavened by both bacterial flora and sodium bicarbonate was found to have the highest value (5200 µg/kg) among cracker types which contain 4300, 4700 and 4700 µg/kg for fermented kirshaleh, sweet kirshaleh and improved ka’ak respectively. Bormah crust which is thoroughly browned showed the highest level (4600 µg/kg) of acrylamide among the Arabic sweet samples of kunafah crust, awamah, haresah and karabeej Halab, that contained 2900, 4000, 4200 and 4200
μg/kg, respectively. Fried potato fingers (French fries), that represent simple starchy food contained high level of acrylamide (4100 μg/kg) compared with falafel (3500 μg/kg) and fried kobbeh (3600 μg/kg) that represent composed foods rich in protein.

Extending the time of frying of falafel, karabeej Halab and fried kobbeh caused a significant increase in the acrylamide content. The excessive use of frying oil caused a significant increase in the acrylamide content (~33%) in falafel compared with that fried in fresh oil.