REDUCTION OF HAZARD TOXIC COMPOUNDS NATURALLY OCCURRING OR FORMING DURING FOOD PROCESSING TREATMENTS

Submitted By

Doaa Mohamed Hassan Khorshed

B.Sc. of Agricultural Sciences, Faculty of Agriculture,Cairo University, 1996

A thesis submitted in Partial Fulfillment

Of

The Requirement for the Master Degree

In

Environmental Science

Department of Environmental Agricultural Sciences

Institute of Environmental Studies and Research

Ain Shams University

2015

APPROVAL SHEET

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This Thesis Towards a Master Degree in Environmental Science

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Acknowledgement

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First of all thanks are due to ALLAH Who had guided and helped me to complete this work.

I would like to express my great indebtedness and profound gratitude to **Prof. Dr. Usama Mohamed Radwan**, Prof. of food science and technology, department of agricultural science, Institute of environmental Studies and Research, for his great help, Valuable advice, highly supervision, guidance and support through this investigation.

I wish to extend my deepest appreciation and sincere gratitude to **Prof. Dr. Magdy Gomha El-Shemy,** Professor of Food science and Technology, Faculty of Agriculture, Ain Shams University, for the kind attention and greater help provided for the accomplishment of this work and for his efforts, supervising the research.

Thanks to **Dr. Hamdy Abd El-Naby El-Basel**, Associate professor of Analytical chemistry, department of food chemistry, Institute of nutrition, Quasr Al-Aini for his great help and advice .

Thanks will not be enough to my parents and my daughter for their continuous help and support.

Abstract

abstract

The main objective of this investigation was to study The effect of different pretreatments for reducing phytic acid content in Faba bean, dried and soaked Faba bean's hulls, germinated Faba bean's hulls, wheat and it's different extractions,selection methods for reducing Hydrogen Cyanide content in Apricot kernels, unripe tomato seeds and acrylamide levels in potato chips were studied. The biological assessment for the effect of various levels of acrylamide formed in fried potato chips on male albino rats including body weight gain, serum analysis and histopathological lesions of internal organs was also undertaken. Results indicated that, soaking of Faba bean for 24hr led to reduce phytic acid content by 25% and by 27% from soaked Faba been's hulls. While, germination for 96 hr of Faba bean reduced phytic acid content by 49%. But the reduction of phytic acid was 53% for germinated Faba beans's hulls . However. The most efficient treatment was noticed in cooking Faba bean for 90 min after soaking for 12 hr. in tap water which caused to reduce phytic acid by 68%. But roasting of faba bean at 200° C for 60 min had the lowest level (33%) for reducing phytic acid content from Faba bean .Meanwhile, the Fermentation of wheat flour with1% compressed yeast was the highest reduction of phytic acid.Morever, the fermentation of wheat flour with1% sodium bicarbonate had a little effect for reducing of phytic acid. our results indicated that, The moist heat treatment of Apricot kernels for 60 min achieved the highest reduction of Hydrogen cyanide content (70%). While, moist heat treatment caused to reduce of Hydrogen Cyanide for un ripe tomato seeds by 69% after 60 min. While, roasting of Apricot kernels at 200° C for 30, 60, 90 and 120 min reduced Hydrogen cyanide by 16% - 36% - 50% - 56% respectively. But roasting of un ripe tomato seeds at 200 °C for 30, 60, 90 and 120 min caused to reduce of hydrogen cyanide by 46%, 57%, 65% and 69%

respectively .Results also indicted that, frying of potato chips at 180 ° C had the highest content of acrylamide (2200 µg/Kg).on the other hand, the pretreatments of potato chips by soaking for 60 min in one of the following ways before frying at 180 °C. (2 and 4% citric acid), (0.5 and glycine), (0.5 and 1% lysine), (0.5 and 1% $cacl_2$), (0.5 and 1% NaCl) and fried potato chips in sun flower oil contained (0.5 and 1%) rosemary extract caused to reduce the acrylamide content with corresponding levels of (84, 94%), (75, 86%), (76, 85%), (81, 94%), (87, 88%) and (79, 89%) respectively, while, the control (without pretreatments) contained 2200 µg/ kg acrylamide, However, presoaking of potato chips with 4% citric acid and / or 1% $Cacl_2$ was more effective for reducing acrylamide than other used pretreatments. consequently, the effect of acrylamide in biological assessment through six weeks of feeding indicated that, rats group fed on basal diet contained 40% fried chips without pretreatments, rats group fed on basal diet and drank water contained 5 mg acrylamide and / or fed on diet contained 20 mg acrylamide and/or fed on basal diet contained 10mg acrylamide accompanied by alteration in kidney and liver functions. Where, GPT, Got and Alp in Liver were gradually decreased, Also the same findings were noticed in uric acid and creatinine of kidney by increasing the exposing dose of acrylamide for rats. Consequently, Results also showed that, the highest dose of acrylamide (20 mg) caused sever symptoms in rat's organs. Such as, necrosis of neurons and neurophagia of necrotic neurons of brain, kupffer cells activation, necrosis of sporadic hepatocytes and disorganization of hepatocytes of liver, atrophy of glomerular tuft and presence of renal tubules of kidney, focal necrosis of urothelium and submucosal infiltration with inflammatory cells of urinary bladder and multiple multinucleated giant cells in the lumen of seminiferous tubules. But there were no differences or little changes were observed for rats fed on potato chips

pretreated with citric acid and / or fried in sun flower oil contained 1% rosemary extract.

Keywords: Phytic acid,Hydrogen cyanide, acrylamide,soaking

Germination, roasting, fermentation, cooking, Faba bean, whole wheat, Apricot kernels, tomato seeds, fried potato chips,body weight, organs, GPT, GOT, ALP, Uric acid, Creatinine, testosterone, histopathology

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