DOI : 10.35124/bca.2019.19.2.2819

Biochem. Cell. Arch. Vol. 19, No. 2, pp. 2819-2822, 2019 | www.connectjournals.com/bca | *ISSN 0972-5075*

REDUCTION OF ACRYLAMIDE CONTENT OF BREAD BY SOME HERBS AND PLANTS

Makarim A. Mousa*, Nahla T. Khalid and Ezuldeen K. Hamood

Department of food science,College of Agriculture Engineering Sciences, University of Baghdad, Baghdad, Iraq
e-mail : makaremali37@yahoo.com

(Received 20 November 2018, Revised 27 February 2018, Accepted 10 March 2019)

ABSTRACT : The effect of addition of different plants like (spices, herbs) onacrylamide content in bread crust was studied, loaf bread with 3% of green tea, Thyme, anise, garlic and cinnamon powders were prepared, sensory evaluation of loaf bread was done ,chemical content of all types of bread were determined, acrylamide content of crust bread was determined by HPLC technique. The results showed that the plants powdersof (green tea, Thyme, anise and garlic)decreaseacrylamide content of crust bread,acrylamide content of crust bread were (742.0, 525.4, 706.8, 615.0) ppm for bread with 3% (green tea, Thyme, anise and garlic) contrardto wheat bread (control) (1758.0) ppm, Cinnamon powder led to increase acrylamide of crust wheat bread (3577.0 ppm). Thyme poweder led to increase protein content of bread, plants powder had different effect on quality of bread, the results showedimprovementon loaf bread specific volume, sensoryevolution showed that all types of bread were acceptance, bread with garlic powder had highest scores (97%) contraed to bread control treatment (86%).

Key words **:** Acrylamide, bread, herbs, plants.

INTRODUCTION

Acrylamide is colorless odorless crystalline soild, acrylamide was detected at 2002 by Swedish National food administration (SNFA) in foods processed at high temperature,The main pathway for the formation ofacrylamide in foods was Millard reaction between reducing sugars mainly (glucose, fructose) and free asparagin during high temperature processing (Becalski, 2003), Acrylamide can be found in manyfoods which heated at high temperature during production processing such as roasting tousting and frying such as cereal products, patato products, rousted coffee (Pedreschi *et al* 2006, Yuan *et al,* 2011).

Acrylamide classified as probably carcinogenic to human byInternational Agency for research on cancer (IARC1994), studies have shown that acrylamide (CH_2=CH-$CONH_2$) was toxic to gene andcase cancer (Olmez *et al,* 2008).

Some additive such as asparaginase, antioxdants mono and divalent cation (Na^+, Ca^{+2} ovmg) can reduce theacrylamide formation in foods,Some studiest explain that antioxidant such as phenolic compound, flavonoids, vitamins and phenolic extracts from different spices inhibit acrylamide formation (Kotsion *et al* 2010)

Different antioxidantslike green tea, bamboo leaves and rosemaryextractscould reduceacrylamide in different heated food (Zhung, 2007). Garlic powder was effected acrylamide formation in an aspargine/glucose model system, acrylamide was reduce with addition of garlic powder also a garlic powder of 15 g to 500gm wheat flour dough reduce acrylamide formation significutly at ($p<0.05$) in bread and had no effect on the sensory quality of the bread (Li *et al,* 2016).

Hedegaard *et al,* (2008) study the effect of antioxidants of bamboo leaves and green tea extract and showed that this extracts reduce acrylamide by 83 and 87% respectively

Markova (2012) used various spices (cloves, cinnamon, white pepper, anise, star anise, ginger vanilla, cardamom fennel coriander nutmeg in buckwheat ginger cake, resultsshowed that significant decrease ofacrylamide content was observed in sample of ginger cake with nutmeg 23%, also theacrylamide content decrease by 17% in gingercake with anise or clove but no changinacry lamidecontent ginger cake with staranise, correlation factor (0.6) was observed between antioxidantat capacity of spices extracts andacrylamide content in ginner cake.

Gunduz and Cencis (2014) study lvels of acrylamide

in different types of breads including white wheat bread, stone oven wheat, wheat bran bread, rye bread,whole grain bread and whole wheat bread, the mean acrylamide content in bread was 225 ppm and the highest mean level of acrylamide was detected in whole wheat bread. Morales *et al,* (2014) showed that a equeousextracts of The extract of green tea cinnamon and oregano reduce the acrylamide level by 62%, 39%, 17% infried potatoes.

Many possible methods have been identified to reduce acrylamide level in food such as avoiding excessive browning when frying, roasting or blacking, Jebur *et al,* (2016) using partially purified asparaginase for acrylamide mitigation in busicute products

MATERIALS AND METHODS

Wheat flour72% extraction, herbs(green tea, thyme, anise, cinnamon) and dry garlic were from local market. Sugar, food salt (NaCl), fat, yeast (*Saccharomyce. cerevisiae* from local market.

All herbs and plant milled by using powder grinder (Ciatronic). Straight dough formulation was applied according toKonnjdora and Karovicora, (2008)Formula was (100%wheat flour, 1% salt, 5% sugar, 3% fat, 1% yeast and 62% water,

Six treatmentswere preparing as fellow

Treat 1: bread (wheat flour only)

Treat 2 : Bread with 3 %green tea

Treat 3 : Bread with 3%thyme

Treat 4 : Bread with 3% garlic

Treat 5 : Bread with 3%anise

Treat 6 : Bread with 3%cinnimon

Loaf bread preparing

All the ingredients were mixed in mixer bowel after 5 min. All plants powder added by 3% of dough weight. all loaf pieces backed by using electric oven during 12 min. at 235 C, baking trails were performed in triplicate. Sensory evalution:all piece of bread were evaluated after cooling for 1 hour, sensory evaluation were accomplished as the form in (Omw GT1.89).

Extraction and calculatationof acrylamidecontentwas by using HPLC techinqe according to Zahra *et al,* (2018), as fellow:

$$\text{Con. of sample} = \frac{\text{con of standard} \times \text{area of sample} \times \text{dilution factor}}{\text{Area of standard wt. of sample gm}}$$

Mositure, fat and ash content of loaf bread were determined according to (19–44), (30–25), (01– 8) (AACC, 2000), Protein content determined as in AACC (2000) (46-11) and factor (5.7) was used, carbohydrates estamaited after the collection of protein, ash fat moisture and subtract them from 100 according to Pearson (1970) content was by difference carbohydrates estimated after the collection of protein, ash, fat, fibers and moisture and subtract them from 100% the difference in the proportion represents carbohydrates rate according to Pearson (1970).

Statistical analysis

The experiments were performed in completely randomizedesign .Results were examine using the low significant differences (L.S.D) using SAS program (SAS, 1987).

RESULTS AND DISCUSSION

Table 1 showed specific volume of loaf bread, additiion of all plants powder to flour increase specific volume of bread and improved flour quality and not made any degree of weakness, bread with garlic had highest specific volume value (3.9) and bread with green tea and thyme was the lowest one .

Al-Mamoori (2015) made three types of bread with addition of thyme, carob and sumac to flour and showed that this plants powder improved bread quality.

Sensory evaluation

Several properties of loaf bread taste and flavor, crumb and crust color, crust texture and porosity, spongy and irregular shape were determined, all types of loaf bread had quality score more than control treatment bread. It could observed that adding plants powder increase acceptability of bread, the highest score was 97% for (T4) and the lowest score was for (T2) and (T3) respectivelyall plants powder improve the sensory properties and acceptability of bread.

Table 3 showed that acrylamide content of control (T1) was 1785ppm,content treatment of crust bread with 3% green tea, thyme, garlicandanise (T2, T3, T4, T5) was decrease compare to control treatment (T1), all plant powder led to reduce the level of acrylamide of crust bread. Exceptcinnamon powder, addition of cinnamon led to increase acrylamide content of crust bread.

Crust bread with thyme had lowestacrylamide content

Table 1 : Specific volume ofbread.

Treatments	Specific Volume ml/gm
1	3.11
2	3.5
3	3.5
4	3.9
5	3.6
6	3.7

Table no. 2 : Sensory evaluations of bread.

Parameters of quality	Score	T1	T2	T3	T4	T5	T6
Shape	15	15	15	15	14	14	14
Crumb and crust color	15	12	13	13	14	13	14
Crumb texture and porosity	15	15	13	13	14	14	13
Taste and flavor	13	13	15	15	18	18	18
Sponginess	40	31	39	34	37	35	35
Total	100	86	90	90	97	95	94
L.S.D.	2.99						

Table 3 : Acryl amide content of crust bread.

Treatments	Acryl amide content (ppm)
1	1758.0
2	742.0
3	525.4
4	706.8
5	615.0
6	3577.0

Table 4 : Chemical content of bread.

Treat.	% Protein	% Moisture	% Fat	% Ash	% CHO
1	6.70	34.10	0.54	1.70	56.96
2	7.30	38.20	0.50	1.79	52.21
3	7.90	32.40	0.50	1.54	57.66
4	7.70	36.30	0.59	1.48	53.93
5	7.30	33.00	0.64	1.00	58.06
6	7.50	34.00	0.68	1.00	56.82
L.S.D.	0.20	2.20	0.10	0.90	2.00

525.4 ppm, the highest level ofacrylamide was found in crust bread with 3% cinnamon. Gunduz *et al,* (2017) refered that acryl amide of crackers, biscui, baby biscuit were (604-495-1535) respectively. Acrylamide content increased in buck wheat ginger cake with the addition of cinnamon up to 29% but not change in the acryl amide observed with star anise (markovaetyl *et al,* 2012). The acrylamide reducing activity of garlic was attributed to sulfur groups of alliin and allicin or their radical scavenging activity (Jan *et al,* 2013) marales *et al*, 2014 showed that the aqueous extracts of green tea ,cinnamon and organo reducedacry lamide level by (62–39 and 17)% in fried potatoes. Li J(2016) showedthe acrylamide content reached a maximum level (674.0 m mol) with 1.2 mmol of glucose and 1.2 mmol of asparaginesin model system after heating at 200 °C for 6 min and The acrylamide content was greatly reduced with the addition of garlic powder Compared to without garlic powder, Anti oxidants such as from different spices have been reported as inhibitingacrylamide formation (Hedegrd *et al*, 2008). Reactive carponyls heated with asparagines finely lead to yielding acrylamide, During the process, several antioxidants like specific flavonoid were found to be to trap maillard reaction intermediates by c6 or c8 position of the ring, flavonoids act to inhibit millard reactions because of their ability to block the carbonyl groups so led to reduce acrylamide formation (Jin *et al*, 2013).

Acrylamide content of Iraqi bakery products were (189.25 – 222.75 – 178.75 -188 -177.5 and 183.75) mg/kg for Iraqi bread respectively (Al-zobaidy *et al*, 2016).

Data in table 4 showed chemical content of bread. Protein content was significantly affected by addition of all plants powder, the highest protein content was observed in bread with 3% thyme. The table showed significant increase in fat content in bread with 3 % cinnamon (0.68)% and 3 % anise (0.64)% .The highest ash content defected in bread with 3% green tea powder and lowest one was in bread with 3% cinnamon and anise. Moisture content of (T5,T4) were increased compared to control treatment.

REFRENCESES

AACC (2008) Aprroved methods of the American Association of cereal chemistry. USA .

Al-mamoori S H (2015) Change of antioxidants during baking of bread. Thesis Mansoura University, Faculty of agriculture, Food industries dept.

Al zobaidy, H N, Shakir K A, Abulhussain S and Strasburg G M (2016) Occurrence of acrylamide in selected Iraqi bakery products and mitigation by partially purified L-Asparaginase. *J of Basic Eduction College,* **22**, **93,** 37-48

Becalski A, Lau B, Lewis D and Seaman S (2003) Acrylamide food in food occurrence,sources,andmodeling. *J Agric Food Chem,* **29, 51**(3), 802-8

Determination of acrylamide in brand and non brand potato chips by using high performance liquid chromatography. *Pak. J. Anal. Eenviron. Chem.* **19**(1), 91-95.

Gunduz C P and Cengiz M F (2014) Acrylamide contents of commonly consumed bread in turkey.international journal of food properties issn:1044-2912. Crisps and French fries. *Journal of Agricultural and Food Chemistry,* **55**, 523-528.

Gunduz C P B, Bilgin A K and Cengis M F (2017) Acrylamide content of some commercial crackers biscuit and baby biscuit. *Akademic Gida*. **15**(1), 1-7.

Hedegaard R V, Crunby K, Frandsen H, Thyzesen J and Askibsted Z H (2008) Acrylamide in bread effect of prooxidants and antioxidants. *European food research and tech.* **227**, 519-525.

IARC (1994). Acrylamide in some industrial chemicals IARC monographs on the evaluation of carcinog risk Chem Hum. **60**, (389-433).

Jebur H A, Fasil A K and Mousa M K (2016) Effect of using L-asparaginase in reducingacrylamide percentage in biscuit. *The Iraqi journal of Agriculture Science*. **97**(4), 1030-1038.

Jin C, Wu X, Zang Y (2013) Relationship between antioxaidants and acrylamide formation: *A review Food Reserch International* **51,** 611-620

Konnjdora Z and Karovicora J (2008) Influence of hydrocollide on quality of baked goods. ActaZci, Pol, Technol, Aliment, **792**, 43-49

Li J, Zuo J and Xu Z (2016) Effect of garlic powder onacrylamide formation in a low-moisture model system and bread baking. *J Sci Food Agric*. 96(3)

Markova L, Cisarova Z, Kukurova K, Zielinsk H, Starowicz M, Bednarikova A and Simko P (2012) Influence of various spices onacrylamide content in buck wheat ginger cakes. *Chemical papers* **66**(10), 949-954.

Morales C, Jimenez M, Garcia-Barradas O, Mendoza M and Beristian C (2014) Effect of natural extract on the formation ofacrylamide in fried potatoes. *Food Sci. and techn.* **58**(2), 587-593.

Olmez H, Tuncay F, Ozcan N and Demirel S (2008) Survey of acrylamide levels in foods from the Turkish market. *J. Food Comp Anal*. **21**, 564-568.

OmWLGT (organization manual for the work of the laboratories of the grain) (1984) quality control, Iraq trade ministry.

Pedreschi F, Kaack K, Granby K and Troncoso E (2007) Acrylamide reduction under different pre-treatments in French fries. *J Food Eng,* **79,** 1287-1294.

Rice JM (2005) Carcinogenicity ofacrylamide. *Mutation Research.* **580**, 3-20.

SAS (1987) Statistical analysis system ,SASinsitituateinc. carry, NC, 27512-8000, usa, sas proprietary software, release 6.03.

Yuan Y, Shu C, Zhou B,Qi X and Xiang J (2011) Impact of sclected additives on acrylamide formation in asparagines/sugurmaillard model system. *Food Res Intv.* **44**, 449-455.

Zahra N, Ainsyed QUL, Kalim I, Khurshid Z, Ahmad I and Saeed M K (2018).

Zhang Y, Chen J, Zhang X, Wu X, Zhang Y (2007) Addition of antioxidantof bamboo leaves (AOB) effectively reducesacry lamide formation in potato crisps and French fries. *JAgric Food Chem*, **24, 55**(2), 523-8.