Utilization of Wastes Resulted From Juice Production in the Fortification of Some Bakery Products for the Protection of Cardiovascular Diseases

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ABSTRACT

Fruits contain thousands of natural chemicals called phytochemicals, providing them with potential health benefits that help in protecting the body from diseases. The antioxidant activity of phenolic compounds is due to their ability to scavenge free radicals. The present study aimed to examine the effect of consumption of dried apple, orange and pomegranate wastes on blood lipid profiles of hypercholesterolemia rats. Nutritional value of apple, orange, pomegranate wastes powder was evaluated. This work was carried out on male white albino aged rats with weight of 197±20, randomly classified into six groups, the first group was fed on basal diet ''negative control". The other five groups were injected by 1% cholesterol to induce hypocholesterolemia. The second group was fed on basal diet as acute hypercholesterolemia rat's untreated ''positive control", the third was fed as ''positive control" with hypercholesterolemia drug, the fourth until sixth groups were fed as ''positive control" containing 5% apple, orange and pomegranate wastes for eight consecutive weeks. The Proximate chemical constituent and Antioxidant compositions (polyphones) were determined. Results revealed that all hypercholesterolemia groups administrated with fruits wastes of (5%) concentration had positive significance in profiles of blood lipid as compared with the positive control group at level 0.01. The highest acceptability score of bakery product are forfeited with fruit wastes, orange cake recorded a score of (7.67 ± 1.37) followed by orange cookies with a score of (7.44 ± 1.65) at (5%) concentration. Dietary intake like these raw food ingredients could help the healthy individuals to reduce CVD (cardiovascular disease) risk. The study recommended making the powder in the form of flavor which can be taken daily to prevent cholesterol disease on the long run.

Keywords: fruit wastes, dietary polyphenols, cardiovascular diseases, blood lipids, sensory evaluation

INTRODUCTION

Nowadays, cardiovascular diseases (CVD) remain the leading cause of mortality and a major cause of morbidity and disability in both genders worldwide (World Health Organization, 2008). The evidence that nutritional factors are central to the etiology of cardiovascular disorders is compelling (O'Toole et al., 2008). Researches indicate positive association between reduction in the incidence of CVD and consumption of plant-based foods such as fruit and vegetables, nuts, whole grains, plant-derived beverages (Dauchet et al., 2009). It is generally acknowledged that the increase intake of vegetables and fruits can decrease the chances of heart disease (Liu, 2003).

The role of fruits and their associated nutrients in the cardiovascular prevention could be stronger than that of vegetables. This beneficial effect was largely due to polyphenols, vitamins and carotenoids that are present in plant foods and known for their antioxidant properties (Scalbert et al., 2005). Relatively high concentrations of flavonoids may play a meaningful role in reducing cardiovascular disease (CVD) risks through an improvement in vascular function. The most common groups of phenolic compounds in our diet are phenolic acids and flavonoids (Manach et al., 2004).

Lipoproteins are substrates essential to the formation of atherosclerotic plaque as the first step begins with the infiltration and accumulation of low-density lipoproteins (LDLs) in the intima. This phase of lipid infiltration is followed by oxidative modifications of LDL. LDL, recognized as the major atherogenic lipoprotein that makes up of approximately 70% of total serum cholesterol. In contrast to this, levels of high-density lipoproteins (HDLs), which contain 20–30% of the total serum cholesterol, are considered as protective against atherosclerosis (Tsompanidi et al., 2010).

The agro-food industry generates a large quantity of waste or by-products every year (Dhillon et al., 2013). By-products of vegetables and fruit industry tend to show phenolic compounds (Balasundram et al., 2006).

Majority of bakery products are high in carbohydrate, fat and calorie, but low in fiber content (Mishra and Chandra, 2012). Because of the high consumption of bakery product, they can potentially be used as carriers of dietary fiber (Janharah et al., 2014)

Apple, orange and pomegranate waste are byproducts of juice and jam production that contains antioxidants (polyphenols, and pigments) (Hea et al., 2014, Mekni et al., 2014).

Due to the large amount residues of apple, orange and pomegranate with their valuable nutritional value and increasing demand for healthy and natural bakery product, it was chosen to be added to some bakery products. The aim of the present study was designed to:

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1-Evaluate the nutritional value of apple, orange, pomegranate waste .

2- Study the hyperlipidemic effects of some bakery products (fortified with apple, orange, and pomegranate wastes powder) in hyperlipidemic experimental rats.

3- Evaluate the sensory characters of some fortified bakery products with 5%, 10%, 20% of apple, orange, and pomegranate wastes powder.

MATERIALS AND METHODS

Three food industrial wastes were collected from the corresponding large production project for orange, apple and pomegranate juices from Egyptian juice factories in Borg El Arab (Faragalla Company), Egypt and were used as source samples. The bakery product ingredients including flour (72% extraction), egg, butter, sugar, baking powder, salt, fresh milk, vanilla, dried yeast, milk powder, shortening, Starch, corn oil and bread improver were purchased from the local market in Alexandria, Egypt. Casein, cellulose, salt, minerals, vitamins and Cholesterol (white crystalline powder) were obtained from El-Gomhoreya Pharm. Alexandria, Egypt.

Wastes were placed into cabinet dryer. Temperature was set at 60^{o} C. After seven to eight hours drying process was carried out using extrusion-expelling mechanical system. The air-dried samples (apple, orange and pomegranate wastes) were kept in dark glass bottle until use in the form of powder.

Moisture, crude protein, total lipids and ash content were determined according to (AOAC, 2007). Total dietary fiber (TDF) content was measured by the method according to Sun-Waterhouse et al., (2010). Carbohydrate values were derived empirically after subtracting the other components (AOAC, 1995 method). The proximate analysis as well as vitamins A and E of these food materials were determined according to AOAC (1990). Polyphenols of these food materials were determined according to kahkonen et al., (1999).

Experimental animals design: A 60 male Western strain albino rats of about 197±20 (6 groups, 10 animals each) according table (1) were individually housed in well-aerated cages at the Ophthalmology Research Institute, Giza, Egypt. All animals were maintained on a basal diet and named as the control group, the standard casein diet was prepared according to (Reeves et al., 1993), protein (13%), salt mixture (3.5%), cellulose (5%), fat (4%), choline (0.2%), vitamin mixture (1%) and the remainder was starch for ten days, then the diets groups were fed for eight weeks. Animals were kept in individual stainless steel metabolic cages at constant temperature (25± 1^{o} C) with a 12 hr light: dark cycle. Water and feeds were provided *ad libitum*. Food intake and food consumption were recorded daily and the body weight was recorded once a week. At the end of the experimental period, rats were decapitated; the blood was collected in tubes and centrifuged at 3000 rpm to obtain the serum, which was frozen at –20 ^{o} C. Rats were randomly divided into 6 groups (each of 10 rats). Serum cholesterol, triglycerides and High Density Lipoprotein (HDL-c) were determined according to methods described by Allain, et al., (1974), Wahlefeld (1974) and Albers et al., (1983) respectively. The concentration of Very Low Density Lipoprotein VLDL-c and low density lipoprotein cholesterol LDL-c were estimated according to the Fridewald's equation (Fridewald et al., 1972).

LDL-c = triglycerides/5, LDL-c = Total cholesterol - (HDL-c) - (VLDL-c).

The body weight gain (BWG %), Food efficiency ratio (FER), according to (Chapman, et al., 1959) using the following equations.

$$\text{Body weight gain percent (BWG \%)} = \frac{\text{Final body weight - Initial body weight}}{\text{Initial body weight}} \times 100$$

$$FER = \frac{\text{Body weight gain (g)}}{\text{Feed intake (g)}}$$

Cake, Cookies and Sandwich bread were prepared according to (Saba, 2005). The apple, orange, and pomegranate wastes powder and flour were mixed at three levels (5%, 10% and 20%) and other controls were prepared without any fruit powder.

Table 1. Dietary description of biological experiment

	Treatments name	Treatments Description
1	Negative control (G1)	Basel diet Reeves et al., (1993)
2	Positive control (Cholesterol) (G2)	G1 + 1% cholesterol. Ahmed et al., (2004).
3	Cholesterol treatment (G3)	G2 treated with hypercholesterolemia drug
4	Orange waste 5%.(G4)	G2 Treated with Orange waste 5%.
5	Apple waste 5%.(G5)	G2 treated with Apple waste 5%.
6	Pomegranate waste 5%.(G6)	G2 treated with Pomegranate waste 5%.

The sensory properties was evaluated by 60 volunteers at a big Supermarket in Alexandria checking the appearance, taste, texture, color, odor, and overall acceptability on a 9-point hedonic scale (from like extremely = 9 to dislike extremely = 1) as mentioned by (Watts et al., 1989, Munoz and King, 2007).The consumer test was performed in random selection. Questionnaires were used to collect consumer profile data. Also sensory attributes of bakery products were evaluated by 30 panelists of the members of the Food Science and Technology Department, Faculty of Agriculture and Faculty of Specialized Education, Alexandria University, Egypt. A questionnaire will be done to estimate the acceptance of consumers to the bakery products fortified with fruit wastes according to some social factors.

Data were analyzed according to (Field, 2009). Data obtained were made subjected to statistical analysis performed and recorded as mean and standard deviation. Kruskal-Wallis Test for K independent Samples. There is another alternative: the one-way independent ANOVA has a non-parametric counterpart. The results were statistically analyzed with SPSS 20.0.

RESULTS AND DISCUSSION

Growing evidence suggests that polyphenols could be serious candidates to explain the protective effects of plant-derived foods and beverages. Based on the current studies, a general consensus has been achieved to sustain the hypothesis that the specific intake of foods and beverages containing a relatively high concentration of flavonoids may play a meaningful role in reducing cardiovascular disease (CVD) risk through an improvement in vascular function and a modulation of inflammation (Vèronique Habauzit and Christine Morand, 2012).

Table (2) shows that the moisture content of pomegranate waste (PW) was higher (12.16%) compared to the other fruit wastes, whereas, the crude protein was considerably higher (8.63%) in orange waste (OW) compared to both apple waste (AW) and (PW) (3.78 and 5.19%, respectively). Also, it was found that PW was higher in fiber and ask contents (11.69 and 4.5%, respectively) compared to OW as well as AW. On the other hand, AW was considerably higher in carbohydrate content (71.27%) compared to both OW as well as PW (61.31 and 63.65%, respectively). Also, it is shown in table (2) that OW contains higher amounts of vit.A and E (161218.9 and 116.9 ppm) compared to both AW (86631.9 and 57.0 ppm) as well as PW (101904.9 and 90.1 ppm). Although PW showed the highest content of total polyphenols (9366458 ppm) compared to the two other fruit wastes OW and AW (6899324 and 2416118 ppm, respectively) on dry weight basic (DW). In another study, Nagarajaiah and Prakask (2011) reported that the total plenolics (TP) of banana peel was 850 mg / 100 g. Moreover, Hegazy and Ibrahim (2012) found that the (TP) of orange peel was (169.5 mg/ 100 g on DW. The results are in agreement with results were obtained by Nassar et al. (2008), Eaks and Sinclair, (1980).

Chemical composition of dried fruit wastes.

Table 2. Proximate chemical composition, vitamins and total polyphonls of dried orange, apple and Pomegranate wastes

component	Dried fruit wastes		
	Orange (OW)	Apple (AW)	Pomegranate (PW)
	Mean	Mean	Mean
Moisture	11.21± 0.8	9.02 ± 0.2	12.16 ± 0.5
Crude protein	8.63 ± 0.8	3.78 ± 0.6	5.19 ± 0.9
Fat	4.81 ± 0.4	5.42 ± 0.11	2.80 ± 0.6
Ash	4.24 ± 0.4	2.46 ± 0.3	4.51 ± 0.1
Fiber	9.80 ± 1.2	8.05 ± 0.9	11.69 ± 0.4
CHO**	61.31 ± 2.9	71.27 ± 2.4	63.65 ± 1.9
Vitamins Medicinal content			
Vitamin A ppm	161218.9	86631.6	101904.9
B –Carotene ppm	3.90	0.90	1 0.5
Vitamin E ppm	116.9	57.0	90.1
Total Polyphenols			
Total Polyphenols ppm	6899324	2416118	9366458

Values are means of three replicates ± SD on dry weight basis. ** By difference.

Table 3. Polyphenols fraction in ppm in some fruit wastes

Polyphenols fraction in Orange, Apple and, Pomegranate wastes			
Polyphenols fraction	**Orange**	**Apple**	**Pomegranate**
p.coumaric	342.9	185.4	111.9
Ferulic acid	0.0	46.1	24.7
Caffien	1057942	267897	643918
Caumarin	757947	93274	38217
Caffic acid	252224	144772	696566
P- hydroxy Benzoic acid	4427384	1824801	7970587
Cinnamic acid	211737	0.00	4557
Vanillic acid	58	29	141
Chlorogenic acid	144	21	283
Naringinin	188526	84980	8728
Syringic	72	31	44
Pyrogallol	2945	0.00	3239
Salycilic	0.00	80	43

Table 4. Initial body weight (IBW), final body weight (FBW), body weight gain (BWG), food consumption and food efficiency ratio (FER) according to experimental condition

Treatment	IBW		FBW		BWG		Food consumption gm/day		Food efficiency ratio (FER)	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
(G1)	197.15	16.33	239.35	17.47	21.57	1.89	19.43	13.66	2.29	2.40
(G2)	196.15	17.05	269.65	16.89	37.76	3.36	26.33	12.50	1.95	1.18
(G3)	196.65	15.87	254.75	16.57	31.29	5.53	21.73	13.11	2.34	1.87
(G4)	196.85	17.12	260.55	17.04	32.59	2.89	23.63	13.29	2.01	1.47
(G5)	195.37	16.53	258.15	17.32	32.36	2.79	23.43	12.45	2.05	1.50
(G6)	195.55	16.43	262.35	16.95	34.41	3.10	24.63	13.26	1.98	1.35
Kruskal Wallis Test Chi-Square	.949		12.819*		35.907**		2.719		.731	

**. Chi-Square Value is significant at the 0.01 level (2-tailed).
*. Chi-Square Value is significant at the 0.05 level (2-tailed).

Table 5. Effect of food treatments on blood lipoproteins

Treatment	Total cholesterol mg/dl		Triglycerides mg/dl		HDL mg/dl		VLDL mg/dl		LDL mg/dl	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Negative control (G1)	97.65	17.32	71.14	7.28	59.44	8.15	14.23	1.62	23.98	8.51
Positive control (Cholesterol) (G2)	198.17	16.70	148.74	8.12	48.02	7.22	29.75	1.53	120.34	12.81
Cholesterol treatment (G3)	130.61	17.39	98.24	8.03	58.84	8.19	19.65	1.44	52.12	8.28
Orange wastes 5 % (G4)	134.06	16.80	103.74	7.34	58.34	8.00	20.75	1.71	54.99	9.42
Apple wastes 5% (G5)	155.06	17.00	123.74	7.64	56.74	8.66	24.75	1.59	73.57	7.82
Pomegranate wastes 5 % (G6)	138.15	16.78	108.74	7.86	57.14	8.04	21.75	1.60	59.26	8.25
Kruskal Wallis Test Chi-Square	41.930**		51.257**		10.877		51.257**		49.327**	

**. Chi-Square Value is significant at the 0.01 level (2-tailed).
*. Chi-Square Value is significant at the 0.05 level (2-tailed).

Table (3) shows the polyphenol fractions for orange, apple and pomegranate wastes. coffien, caumarin, caffic acid, P-OH benzoic acid, cinnamic acid and naringinin were the most abundand phenolic acids amounting for or than 95% of the total polyphenols in the three fruit wastes. Also, table (3) shows that coffien content was higher in OW (1057942 ppm) compared to both AW (267897 ppm) and PW (643918 ppm), whereas, PW contains higher amount of P- hydroxy benzoic acid and caffic acid (7970587 and 696566 pp, respectively) compared to both OW (4427384 and 252224 ppm, respectively) as well as AW (1824801 and 144772 ppm

, respectively). Move over it is shown in table (3) that OW contains considerable amount or caumarin and naringinin (757947 and 188526 ppm, respectively) and higher than the two other wastes. The results are in agreement with results were obtained by Li et al. (2014) who report that the apple peel is reported to have a higher antioxidant capacity than the pulp. It is high antioxidant capacity (Plaza et al. 2014).

Table 4. Initial body weight (IBW), final body weight (FBW), body weight gain (BWG) and food consumption according to experimental condition.

It seems that all wastes that have slightly antagonistic effect against cholesterol tend to stimulate body weight gain. Results of food intake of rats feed on experimental diets are shown in Table 4. Currently, the differences among all test groups for their consumption of food could be attributed to the palatability of the nature of food itself.

These results are in conformity with the (Baumy, 2002) who reported an increase in food intake of rats fed on cholesterol. However, these results disagreed with that of (Cavallini et al., 2009) who reported that there were no significant changes in food intake between hypercholesterolemia rats and negative control. The effect of food treatments on blood lipoproteins showed that orange peel may be considered as the strongest antiatherogenic agent among all used peels. It has been stated that first, the poor bioavailability of phenolic compounds leads to relatively low plasma concentrations compared with that of other exogenous or endogenous antioxidants (Halliwell, 2008).This finding is consistent with (Amer, 2002) who found that there were increases in food intake of rats fed on apple peel (5%) and (7.5%) compared to negative control. On the other hand, Table 4 showed that to biologically evaluate these food chemical patterns, biological assays must include the changes in body weight of rats group through the experimental period. Data in Table 4 of albino rats at the beginning of the experimental period was 196.8 g and reached 267.0 g after 8 weeks of cholesterol challenge. These results are in agreement with those obtained by (Baumy, 2002) who reported that cholesterol fed rats increased in weight gain compared to the negative control group. (Sembries et al., 2004) stated that apple DF (Dietary fiber) in diets led to a lower weight gain in rats. Moreover, (Vidal et al., 2005) demonstrated that apple polyphenol extract decreased plasma lipid levels by the inhibition of both cholesterol ester synthesis and lipoprotein secretion. (Abdelbaky et al.., 2009) found that orange peel powder; its 1% methanol extract and its 5 % isolated pectin had a significant decrease in body weight gain ratio when compared with positive control (hypercholesterolemia rats). Meanwhile, these results disagreed with that of (Cavallini et al., 2009) who reported that there was a significant decrease in body weight gain in hypercholesterolemia rabbits compared to rabbits of negative control. It has been reported that the peel in particular possesses relatively higher antioxidant activity than seed and pulp and therefore might be a rich sources of natural antioxidants (Qu W et al., 2010)

In table 5, the effect of food treatments on blood lipoproteins showed that orange waste may be considered as the strongest antiatherogenic agent among all used wastes. Lipid profile includes measurements of cholesterol, triglycerides (TG), high, low density lipoprotein-cholesterol (HDL-C and LDL-C) and very low density lipoprotein-cholesterol (VLDL-C). Data listed in Table 5 showed the changes in plasma concentrations of lipid profile due to treatment with orange (G4), apple (G5) and pomegranate wastes 5% (G6) on cholesterol male rats (G2) .Treatment with these different wastes caused a significant decrease in plasma TG, cholesterol, LDL-C and VLDL-C, while HDL-C was increased compared to the control group (G1) and cholesterol group (G2), especially orange peel and waste treatment (G4) was significant when compared to medical treatment (G3). The change in plasma lipid profile of male rats treated with orange, apple and pomegranate wastes in the present study is in agreement with (Hung et al., 2004) who showed that 10-40% decrease in the risk of CVD (cardiovascular disease) was related to the increased intake of fruits due to its high content of antioxidants and fibers. The effect of fruits either when taken whole or processed was significant in lowering total plasma, LDL cholesterol and blood pressure (Dragsted et al., 2006) that lead to a decreased CVD risk factors . The preventive effects of apple consumption on CVD and other health conditions have been presented by others (Boyer and Liu, 2004).

Sensory evaluation

Sensory property for the evaluation and acceptability of the fortified bakery products was evaluated by consumer and panelists for appearance, taste, texture, color, odor, total acceptability. on a 9-point hedonic scale (for like extremely = 9 to dislike extremely =1).

The mean scores of different sensory parameters of apple, orange and pomegranate wastes powder substitution of bakery products (cake, cookies and sandwich bread). Products were served to consumers to evaluate how it appeals to them as shown in Table (6).

Table 6. Characteristics of the respondents

Characteristics	Cake / Frequency (%)				Cookies / Frequency (%)					Sandwich bread / Frequency (%)		
	D1 (N= 30)	AC (N= 30)	OC (N= 30)	PC (N= 30)	D2 (N= 30)	AK (N= 30)	OK (N= 30)	PK (N= 30)	D3 (N= 30)	AS (N= 30)	OS (N= 30)	PS (N= 30)
1- Sex												
Female	17 (57)	17 (57)	17 (57)	17 (57)	22 (73)	22 (73)	22 (73)	22 (73)	14 (47)	14 (47)	14 (47)	14 (47)
Male	13 (43)	13 (43)	13 (43)	13 (43)	8 (26)	8 (26)	8 (26)	8 (26)	16 (53)	16 (53)	16 (53)	16 (53)
2- Age												
20 – 30	7 (23)	7 (23)	7 (23)	7 (23)	10 (33)	10 (33)	10 (33)	10 (33)	14 (47)	14 (47)	14 (47)	14 (47)
31 – 40	12 (40)	12 (40)	12 (40)	12 (40)	9 (30)	9 (30)	9 (30)	9 (30)	6 (20)	6 (20)	6 (20)	6 (20)
41 – 50	6 (20)	6 (20)	6 (20)	6 (20)	8 (27)	8 (27)	8 (27)	8 (27)	4 (13)	4 (13)	4 (13)	4 (13)
51 and more	5 (17)	5 (17)	5 (17)	5 (17)	3 (10)	3 (10	3 (10	3 (10	6 (20)	6 (20)	6 (20)	6 (20)
3-Education												
Diploma or Secondary	2 (6)	2 (6)	2 (6)	2 (6)	6 (19)	6 (19)	6 (19)	6 (19)	8 (26)	8 (26)	8 (26)	8 (26)
Bachelors	18 (60)	18 (60)	18 (60)	18 (60)	14 (47)	14 (47)	14 (47)	14 (47)	12 (40)	12 (40)	12 (40)	12 (40)
Master	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)
p.h	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)	5 (17)
4- monthly income												
1000– or less	1 (4)	1 (4)	1 (4)	1 (4)	0 (0)	0 (0)	0 (0)	0 (0)	4 (13)	4 (13)	4 (13)	4 (13)
1001 – 2000	4 (13)	4 (13)	4 (13)	4 (13)	7 (23)	7 (23)	7 (23)	7 (23)	2 (7)	2 (7)	2 (7)	2 (7)
2001 – 4000	12 (40)	12 (40)	12 (40)	12 (40)	18 (60)	18 (60)	18 (60)	18 (60)	12 (40)	12 (40)	12 (40)	12 (40)
4001 - or over	13 (43)	13 (43)	13 (43)	13 (43)	5 (17)	5 (17)	5 (17)	5 (17)	12 (40)	12 (40)	12 (40)	12 (40)
5- Occupation												
Government employee	17 (57)	17 (57)	17 (57)	17 (57)	19 (63)	19 (63)	19 (63)	19 (63)	14 (47)	14 (47)	14 (47)	14 (47)
Private employee	13 (43)	13 (43)	13 (43)	13 (43)	11 (37)	11 (37)	11 (37)	11 (37)	16 (53)	16 (53)	16 (53)	16 (53)
6- Frequency of eating												
every days	10 (33)	10 (33)	10 (33)	10 (33)	13 (43)	13 (43)	13 (43)	13 (43)	21 (70)	21 (70)	21 (70)	21 (70)
2 -4 times / week	14 (47)	14 (47)	14 (47)	14 (47)	9 (30)	9 (30)	9 (30)	9 (30)	6 (20)	6 (20)	6 (20)	6 (20)
depend on occasion	6 (20)	6 (20)	6 (20)	6 (20)	8 (27)	8 (27)	8 (27)	8 (27)	3 (10)	3 (10)	3 (10)	3 (10)

Values in parenthesis are percentages ,(D1) Control sample of Cake, (AC) Cake with apple powder, (OC) Cake with orange Powder, (PC) Cake with pomegranate powder , (D2) Control sample of Cookies , (AK) Cookies with apple powder, (OK) Cookies with orange Powder ,(PK) Cookies with pomegranate powder , (D3) Control sample of Sandwich bread , (AS) Sandwich bread with apple powder, (OS) Sandwich bread with orange Powder ,(PS) Sandwich bread with pomegranate powder .

The consumer and panelists was divided into two groups. The results indicates the majority of the consumer and panelists where females which represents (57%, 73%, 47%) respectively, while (43%, 26% ,57%) of consumer and panelists were males resp. in (cake, cookies, sandwich bread) resp. Most of consumer and panelists (40%, 30%) resp. belongs to (31%, 40%) year category in the cake fortified with fruit waste while representing (33%, 47%) belongs to (20 -30) years category in the cookies and sandwich bread fortified with fruit wastes.

The level of education divided into four categories, starting from technical diploma or secondary till beyond higher education on table (6) Illustrates the level of education of the majority of consumer and panelists (60%, 47%, 40%) resp. were university educated in bakery products fortified with fruit wastes. The rest of consumer and panelists was in other different level of education. Very smaller ratio of consumer and panelists (2%) were recorded in sample of cake were technical diploma of secondary. It could be recognized from table (6) that the highest ratio of the total consumer and panelists (60%) income is from (2001-4000) in consumer and panelists of cookies, while it was found that (43%, 40%) in consumer and panelists of cake and sandwich bread resp. of (4001-or over). On the other hand, (40%, 60 %, 40%) resp. of total consumer and panelists has a total monthly income ranging (2001-4000).

Consumer and panelists work classified into two categories whether they are government employer, private employer, it can be detected from table (6) that the highest ratio of consumer and panelists are (57%, 63%) of government employer of cake and cookies, while the highest ratio of consumer and panelists are (53%) private employer of sandwich bread. Table (6) represents the distribution of the studied sample according to frequency of eating. It was found that (47%) of consumer and panelists eat from (2-4 times/week) of cake. However, the total of percentage (70%) of the total consumer and panelists eating every days of sandwich bread. also percentage (43%) of the total consumer and panelists eat every day from cookies. (Zandstra et al., 2001) found that there are different types of people. One of them who care about their health, these people were more likely to pick a healthy snack. The 2nd type of people are those who prefer sweaty food, also reports a higher consumption of sweet and high- fat snacks. People attitudes area mirror image to what they eat on an individual level, but it does not reveal the process that leads from personal attitudes and motives to actual choices.

Sensory attributes of cake:

Table (7) shows that, the highest acceptability score of (8.13) was found in orange cake in (5%) concentrate of orange powder followed by (10%) concentrate of orange powder with acceptability score of (7.00). Regarding taste, Table (7) clarifies that the highest acceptability score of (7.40) was in apple cake (5%) concentrate. Also acceptability score in orange cake was (6.97) in (5%) concentrate. As for the texture, it was found that the orange cake at (5%, 10%) concentrate scored acceptability score of (7.43, 7.17) respectively. Regarding color, it was found that acceptability score of orange cake at (5%) was (8.47), meanwhile, apple cake had an acceptance score of (7.27). As for the odor, it was found that orange cake at (5%, 10%) concentrate scored acceptability score of (8.37, 7.43) respectively. It was also found that the highest acceptance score belongs to orange cake at (5%) concentration in all cake concentrations with an acceptance score of (8.23) followed by apple cake at 10% with an acceptance score of (7.53). From the data it is recognized that the highest acceptability score was scored by orange cake at (5%) concentration followed by apple cake at (5%) concentration.

Sensory attributes of cookies:

Table (7) shows that, the highest acceptability score of (7.87) was found in orange cookies in (5%) concentrate of orange powder followed by (5%) concentrate of apple powder with acceptability score (7.13). Regarding taste, Table (7) clarifies that the highest acceptability score of (7.80) was in apple cookies (5%) concentrate, Also acceptability score in orange cookies was (7.57) in (5%) concentrate . As for the texture it was found that orange cookies at (5%, 10%) concentrate scored acceptability score of (8.27, 7.33). Regarding color, it was found that acceptability score of orange cookies at (5%) was (8.37). As for the odor, it was found that orange and apple cookies at (5%) concentrate scored acceptability score of (8.03, 7.43) respectively. Meanwhile, It was found that the highest acceptance score belongs to orange cookies at (5%) concentration in all cookies concentrations with an acceptance score of (8.13) followed by apple cookies at (5%) with an acceptance score of (7.90).From the data it is recognized that the highest acceptability score was scored by orange cookies at (5%) concentration followed by apple cookies at (5%) concentration.

Sensory attributes of sandwich bread:

Table (7) shows that, the highest acceptability score of (7.20) was found in orange sandwich bread in (5%) concentrate of orange powder followed by (5%) concentrate of apple powder with acceptability score

(7.03). Regarding taste, Table (7) clarifies that the highest acceptability score of (7.73) was in orange sandwich bread (5%) concentrate, Also acceptability score in apple sandwich bread was (7.17) in (5%) concentrate. As for the texture it was found that orange and apple sandwich bread at (5%) concentrate scored acceptability score of (6.80, 6.77) respectively. Regarding color, it was found that the highest acceptance score belongs to orange sandwich bread at (5%) concentration in all sandwich bread concentrations with an acceptance score of (7.13). As for odor, it was found that orange and apple sandwich bread at (5%) concentrate scored acceptability score of (7.90, 7.33) respectively. Meanwhile, it was found that the highest acceptance score belongs to orange sandwich bread at (5%) concentration in all sandwich bread concentrations with an acceptance score of (7.60). From the data it is recognized that the highest acceptability score was scored by orange sandwich bread at (5%) concentration. Previous results indicates that there is high acceptability for bakery products forfeited with fruit waste, their statement was in agreement with (Haque et al.,2015) who found that cookies produced with 6% orange pulp fiber had more acceptable sensory characteristics, with increasing the levels of orange pulp fiber,

Table (8) clarified that the highest acceptance score of (7.17 $\pm$ 1.68) was scored by orange cookies followed by orange cake with a score of (7.12 $\pm$ 1.68).

Also the highest taste evaluation score was in apple cookies sample with score of (7.29 $\pm$1.91) followed by orange bread with a score of (7.12 $\pm$ 1.71). Furthermore, orange cookies had achieved a high score in taste with a score of (7.10 $\pm$ 1.78). As for texture, orange cookies had the highest score of (7.18 $\pm$ 1.77), while orange cake scored a high score of (7.14 $\pm$ 1.66). As for color, orange cake had the highest score of (7.82 $\pm$ 1.53) followed by orange cookies with a score of (7.74 $\pm$ 1.71). On the other hand, orange cake had the highest score of (7.66 $\pm$ 1.38) as for odor, and followed by orange and apple cookies with scores of (7.27 $\pm$ 1.78) (7.24 $\pm$ 1.89) respectively. As for overall acceptability, orange cake had the highest acceptability score of (7.67 $\pm$ 1.37) followed by orange cookies with a score of (7.44 $\pm$ 1.65). Finally, data show that there is very high positive significance in all columns at level 0.01. However, (Kohajdová et al., 2014) reported that when using biscuits with 5 mass % of apple powder there was no significant difference in the overall acceptance against the ordinary biscuits. Furthermore, higher amounts (10 mass % and 15 mass %) of apple powder significantly reduced the overall acceptance of biscuits. These results are in agreement with (Mousavinejad et al., 2009) that proved that the phenolic compounds are the main factors affecting sensory characteristics of food, such as color and flavor. These results are also in agreement with (Garau et al., 2007) who observed markedly darker color of cookies on the addition of apple powder. (Akbarpour et al., 2010) also clarified these results when pomegranate fruit is consumed directly as fresh seeds and also it can be used for making juice, grenadine, jelly or as coloring and flavoring agents. In addition, this pomegranate species have been proven also to give therapeutic properties with an effective economical and ecological value. Bakery products are one of the best materials to be used as a vehicle to incorporate different nutritionally rich ingredients (Hussein et al., 2011).

Table (9) and showed the acceptance of consumers to buy products fortified with fruit wastes. It was found that the highest acceptance for cake in bakery products was the one fortified with orange wastes with acceptance score of (97%) at (5%) concentration. And the highest acceptance rate in buying products fortified with orange wastes was (83%) at concentration (5%). It was also found that the acceptance rate of cookies was for the products fortified with (93%) orange wastes at (5%) concentration and it was in highest rate of products fortified with orange wastes with a percentage of (93%) at (5%) concentration. It was found that the highest acceptance score of bread was the products which are fortified with orange wastes with a sore of (90%) at (5%) concentration and the highest demand for purchase

products fortified with orange was (83%) at (5%) concentration. Finally, the highest acceptance score and intent to buy was for the products fortified with orange with (5%) concentration. Previous results indicates that there is high acceptability for purchasing bakery products forfeited with fruit waste, their statement was in agreement with (Eskicioglu et al., 2015) who showed that the arise of negative concerns regarding the use of synthetic ingredients for preservation, natural alternatives such as plant extracts rich in phenolics are gaining popularity among consumers. It gives the opportunity to supplement food formulas with both dietary fiber and antioxidants which are an important parts of a healthy diet.

Table (10) shows that, it summarizes the correlation coefficients between some social variables with product acceptance and buying decision. It is worth to notice that there are positive significant relationship between product acceptance and frequency of eating ($p<0.05$) with 20% concentrate of orange cake. Meanwhile, correlation is negative between decision of buying and frequency of eating at level 0.05 with 10% concentrate of pomegranate cake.

Table 7. Sensory attributes of bakery products at different levels of wheat flour substituted with apple, orange, pomegranate powder

Bakery product	% Powder	Sensory Attributes					
		Appearance	Taste	Texture	Color	Odor	Total Acceptability
Cake with Apple Powder	Control (0) (D1)	7.03	7.13	6.57	7.27	6.63	7.17
	5% (AC)	6.97	7.40	7.03	7.20	7.27	7.53
	10% (AC)	5.13	6.27	6.83	6.97	7.03	6.97
	20% (AC)	4.97	5.33	4.20	5.97	6.57	5.17
	F Value	17.278**	13.156**	28.948**	5.630**	1.841	21.635**
Cake with Orange Powder	Control (0)(D1)	7.03	7.13	6.57	7.27	6.63	7.17
	5% (OC)	8.13	6.97	7.43	8.47	8.37	8.23
	10% (OC)	7.00	5.67	7.17	7.93	7.43	7.63
	20% (OC)	6.23	5.23	6.83	7.07	7.17	7.13
	F Value	6.865**	11.881**	1.597	5.424**	8.264**	4.077**
Cake with pomegranate powder	Control (0) (D1)	7.03	7.13	6.57	7.27	6.63	7.17
	5% (PC)	5.80	5.03	6.17	5.43	6.97	6.17
	10% (PC)	3.87	4.93	5.73	3.97	6.17	4.57
	20% (PC)	3.27	3.73	4.03	2.57	5.00	3.13
	F Value	27.732**	16.689**	10.902**	43.621**	7.515**	31.075**
Cookies with Apple Powder	Control (0) (D2)	7.23	7.30	7.23	6.80	7.17	7.27
	5% (AK)	7.13	7.80	7.10	6.87	7.43	7.90
	10% (AK)	6.73	7.13	6.53	6.03	7.33	7.27
	20% (AK)	5.23	6.93	4.67	5.77	6.97	6.07
	F Value	8.056**	1.420	13.249**	2.645	.441	5.831**
Cookies with Orange Powder	Control (0) (D2)	7.23	7.30	7.23	6.80	7.17	7.27
	5% (OK)	7.87	7.57	8.27	8.37	8.03	8.13
	10% (OK)	6.90	6.93	7.33	7.53	7.10	7.37
	20% (OK)	6.73	6.80	5.93	7.33	6.67	6.83
	F Value	3.146*	1.431	9.538**	4.978**	3.603*	4.001**
Cookies with pomegranate powder	Control (0) (D2)	7.23	7.30	7.23	6.80	7.17	7.27
	5% (PK)	4.97	5.60	5.50	5.13	6.23	5.00
	10% (PK)	3.23	4.07	3.07	2.90	5.40	3.97
	20% (PK)	2.53	3.47	2.27	2.00	4.70	3.03
	F Value	75.890**	29.861**	70.676**	74.340**+	14.783**	67.108**
Sandwich bread with apple powder	Control (0) (D3)	6.53	6.03	7.23	6.20	6.67	6.93
	5% (AS)	7.03	7.17	6.77	6.57	7.33	6.43
	10% (AS)	6.93	6.43	5.87	5.07	7.03	6.17
	20% (AS)	5.87	5.97	4.67	4.70	6.87	5.10
	F Value	3.109*	3.651*	17.585**	10.385**	.810	7.233**
Sandwich bread with orange powder	Control (0) (D3)	6.53	6.03	7.23	6.20	6.67	6.93
	5% (OS)	7.20	7.73	6.80	7.13	7.90	7.60
	10% (OS)	6.93	7.20	6.00	6.57	7.07	6.07
	20% (OS)	6.47	6.43	5.13	5.17	5.07	5.23
	F Value	1.303	6.545**	12.246**	7.319**	16.019**	17.558**
Sandwich bread with pomegranate powder	Control (0) (D3)	6.53	6.03	7.23	6.20	6.67	6.93
	5% (PS)	5.83	5.33	5.13	6.53	6.93	5.87
	10% (PS)	4.27	4.77	4.80	3.03	3.87	4.07
	20% (PS)	3.67	3.73	3.13	2.53	2.73	3.17
	F Value	33.995**	14.616**	43.455**	89.533**	96.212**	67.727**

**. F Value is significant at the 0.01 level (2-tailed).

*. F Value is significant at the 0.05 level (2-tailed).

(D1) Control sample of Cake, (AC) Cake with apple powder, (OC) Cake with orange Powder, (PC) Cake with pomegranate powder, (D2) Control sample of Cookies, (AK) Cookies with apple powder, (OK) Cookies with orange Powder, (PK) Cookies with pomegranate powder, (D3) Control sample of Sandwich bread, (AS) Sandwich bread with apple powder, (OS) Sandwich bread with orange Powder, (PS) Sandwich bread with pomegranate powder .

Table 8. Mean sensory scores of Bakery product samples with apple, orange and pomegranate wastes powder (Score 1-9)

Formulas no	Appearance		Taste		Texture		Color		Odor		Total Acceptability	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Control (D1)	7.03	1.13	7.13	1.11	6.57	1.28	7.27	0.91	6.63	1.00	7.17	1.12
(AC)	5.69	1.56	6.33	1.47	6.02	1.34	6.71	1.50	6.96	1.44	6.56	1.27
(OC)	7.12	1.68	5.96	1.52	7.14	1.66	7.82	1.53	7.66	1.38	7.67	1.37
(PC)	4.31	1.95	4.57	2.07	5.31	2.00	3.99	1.84	6.04	1.86	4.62	1.88
F Value	28.201**		19.484**		10.545**		55.712**		9.051**		36.452**	
Control (D2)	7.23	0.63	7.30	0.65	7.23	0.97	6.80	0.71	7.17	0.65	7.27	0.52
(AK)	6.37	2.00	7.29	1.91	6.10	1.94	6.22	2.09	7.24	1.89	7.08	1.96
(OK)	7.17	1.68	7.10	1.78	7.18	1.77	7.74	1.71	7.27	1.78	7.44	1.65
(PK)	3.58	1.47	4.38	1.92	3.61	1.55	3.34	1.49	5.44	1.69	4.00	1.30
F Value	55.057**		34.120**		48.077**		62.207**		14.487**		53.892**	
Control (D3)	6.53	1.28	6.03	1.25	7.23	0.90	6.20	1.35	6.67	1.18	6.93	0.74
(AS)	6.61	1.73	6.52	1.65	5.77	1.61	5.44	1.54	7.08	1.85	5.90	1.72
(OS)	6.87	1.73	7.12	1.71	5.98	1.58	6.29	1.74	6.68	1.75	6.30	1.46
(PS)	4.59	1.22	4.61	1.41	4.36	1.49	4.03	1.13	4.51	1.11	4.37	1.21
F Value	20.449**		21.462**		30.603**		21.485**		25.794**		30.053**	

**. F Value is significant at the 0.01 level (2-tailed).

*. F Value is significant at the 0.05 level (2-tailed).

(D1) Control sample of Cake, (AC) Cake with apple powder, (OC) Cake with orange Powder, (PC) Cake with pomegranate powder, (D2) Control sample of Cookies, (AK) Cookies with apple powder, (OK) Cookies with orange Powder, (PK) Cookies with pomegranate powder, (D3) Control sample of Sandwich bread, (AS) Sandwich bread with apple powder, (OS) Sandwich bread with orange Powder, (PS) Sandwich bread with pomegranate powder.

Also, there is negative significant relationship between decision of buying with total income / month when it is (10%, 20%) concentrate of apple cake and with occupation when it is (10%) concentrate of orange cake at level 0.05. The obtained results indicated that product acceptance was significantly negative correlated with frequency of eating ($p<0.05$) when it is (5%, 10%) concentrate of pomegranate cookies. It was significantly positive with age at level 0.05 when it is 5% concentrate of pomegranate cookies. Negative significant relationship existed between decisions of buying with frequency of eating ($p<0.05$) when it is (5%, 20%) concentrate and ($p<0.01$) when (10%) concentrate of pomegranate cookies. On other hand, product acceptance was significantly positive correlated with frequency of eating ($p<0.01$) when (5%, 10%, 20%) concentrate of apple sandwich bread and when (10%) concentrate of orange sandwich bread while ($p<0.05$) recorded when (20%) concentrate of orange sandwich bread. Finally, there is a positive significant relationship between product acceptances with gender when (5%) concentrate of apple sandwich bread and age when (10%) concentrate of apple sandwich bread at level 0.05. Previous results indicates that there is high acceptability for bakery products fortificated with fruit waste, their statement was in agreement with (Haque et al.,2015) who showed that different analysis of the formulations used for making cookies showed significant differences ($P\leq0.05$) including, appearance, flavor, texture, and overall acceptability. So it can be concluded that orange pulp fiber can be used as a food additives to obtain more nutritional and health benefits.

CONCLUSIONS

Apple, orange and pomegranate wastes are an excellent source of antioxidant compounds. Fortified diets with 5% dried apple, orange and pomegranate wastes were effective in reducing total cholesterol, triglycerides, LDL-C and VLDL-C, and decreased excreted cholesterol in rats when fed for eighth week and the level of HDL-C increased. There is an association between the polyphenols compounds found in apple, orange and pomegranate wastes and a wide variety of effects that may help prevent cardiovascular diseases. This supports the hypothesis that it is the phytochemicals like polyphenols found in fruit wastes that impart health benefits. There is the overall organoleptic acceptability form consumer and panelists to the bakery products forfeited of fruit wastes.

Products acceptance and buying decision of bakery product from consumer test:

Table 9. Products acceptance and buying decision of bakery product from consumer test

Products	Sample	Product acceptance (%)				Decision of Buying (%)					
		Acceptance (N=30)		Non acceptance (N=30)		Buy (N=30)		not ensure (N=30)		Not buy (N=30)	
Cake with apple Powder	Control (0) (D1)	28	(93)	2	(7)	20	(67)	1	(3)	9	30)
	5% (AC)	27	(90)	3	(10)	22	(73)	7	(23)	1	(3)
	10% (AC)	24	(80)	6	(20)	12	(40)	6	(20)	12	(40)
	20% (AC)	19	(63)	11	(37)	13	(43)	2	(7)	15	(50)
Cake with orange Powder	Control (0) (D1)	28	(93)	2	(7)	20	(67)	1	(3)	9	(30)
	5% (OC)	29	(97)	1	(3)	25	(83)	3	(10)	2	(7)
	10% (OC)	26	(87)	4	(13)	17	(57)	8	(27)	5	(17)
	20% (OC)	20	(67)	10	(33)	10	(33)	3	(10)	17	(57)
Cake with pomegranate powder	Control (0) (D1)	28	(93)	2	(7)	20	(67)	1	(3)	9	(30)
	5% (PC)	18	(60)	12	(40)	14	(47)	2	(6)	14	(47)
	10% (PC)	13	(43)	17	(57)	10	(33)	0	(0)	20	(67)
	20% (PC)	5	(17)	25	(83)	2	(7)	0	(0)	28	(93)
Cookies with apple Powder	Control (0) (D2)	30	(100)	0	(0)	22	(73)	5	(17)	3	(10)
	5% (AK)	26	(87)	4	(13)	26	(86)	2	(7)	2	(7)
	10% (AK)	21	(70)	9	(30)	19	(64)	7	(23)	4	(13)
	20% (AK)	17	(57)	13	(43)	17	(57)	6	(20)	7	(23)
Cookies with orange powder	Control (0) (D2)	30	(100)	0	(0)	22	(73)	5	(17)	3	(10)
	5% (OK)	28	(93)	2	(7)	28	(93)	2	(7)	0	(0)
	10% (OK)	24	(80)	6	(20)	22	(74)	4	(13)	4	(13)
	20% (OK)	19	(63)	11	(37)	16	(53)	6	(20)	8	(27)
Cookies with pomegranate powder	Control (0) (D2)	30	(100)	0	(0)	22	(73)	5	(17)	3	(10)
	5% (PK)	18	(60)	12	(40)	17	(57)	4	(13)	9	(30)
	10% (PK)	12	(40)	18	(60)	7	(23)	5	(17)	18	(60)
	20% (PK)	6	(20)	24	(80)	6	(20)	3	(10)	21	(70)

Table 9. Cont.

	Control (0)										
Sandwich bread with apple powder		27	(90)	3	(10)	20	(67)	7	(23)	3	(10)
	(D3)	24	(80)	6	(20)	18	(60)	6	(20)	6	(20)
	5% (AS)	22	(73)	8	(27)	15	(50)	8	(27)	7	(23)
	10% (AS)	18	(60)	12	(40)	10	(33)	5	(17)	15	(50)
	20% (AS)										
Sandwich bread with orange powder	Control (0) (D3)	27	(90)	3	(10)	20	(67)	7	(23)	3	(10)
	5% (OS)	27	(90)	3	(10)	25	(83)	4	(13)	1	(4)
	10% (OS)	24	(80)	6	(20)	17	(57)	7	(23)	6	(20)
	20% (OS)	20	(67)	10	(33)	11	(37)	5	(16)	14	(47)
Sandwich bread with pomegranate powder	Control (0) (D3)	27	(90)	3	(10)	20	(67)	7	(23)	3	(10)
	5% (PS)	10	(33)	20	(67)	11	(37)	2	(6)	17	(57)
	10% (PS)	3	(10)	27	(90)	1	(3)	2	(7)	27	(90)
	20% (PS)	30	(100)	0	(0)	1	(3)	0	(0)	29	(97)

Values in parenthesis are percentages,(D1) Control sample of Cake, (AC) Cake with apple powder, (OC) Cake with orange Powder, (PC) Cake with pomegranate powder, (D2) Control sample of Cookies , (AK) Cookies with apple powder, (OK) Cookies with orange Powder,(PK) Cookies with pomegranate powder, (D3) Control sample of Sandwich bread, (AS) Sandwich bread with apple powder, (OS) Sandwich bread with orange Powder, (PS) Sandwich bread with pomegranate powder .

Table 10. Correlation between some social variables and products acceptance and buying decision

Variables			Gender	Age	Education	Total Income /month	Occupation	Frequency of eating
Cake	Product acceptance	5% (AC)	.157	.114	.066	.181	.157	.250-
		10% (AC)	.067	.071-	.044	.057	.101-	.188
		20% (AC)	.172	.059-	.064	.087-	.107-	.329
		5% (OC)	.162-	.281	.097-	.279-	.212	.232-
		10% (OC)	.145-	.071	.154	.012	.053	.196
		20% (OC)	.095	.068	.097-	.234-	.238	.424*
		5% (PC)	.110	.074	.121-	.055	.027-	.068
		10% (PC)	.086	.028	.035-	.164-	.050-	.151-
		20% (PC)	.211	.016	.094-	.196-	.150-	.022
	Decision of Buying	5% (AC)	.086-	-.154-	.108	.194	.086-	.315-
		10% (AC)	.075	.117	.161-	.378-*	.150	.205-
		20% (AC)	.078	-.035-	.099-	.381-*	.061-	.133-
		5% (OC)	.192-	.045	.108-	.306-	.222-	.138-
		10% (OC)	.026-	-.016-	.074-	.135-	.462-*	.005
		20% (OC)	.220	-.206-	.007-	.070	.128-	.219
		5% (PC)	.070	-.134-	.068	.147-	-.209-	.233
		10% (PC)	.048	.103	.190	.004	-.238-	.371*
		20% (PC)	.036-	.065	.140	.284-	-.306-	.134
Cookies	Product acceptance	5% (AK)	.015-	.083-	.072	.039	.109	.061
		10% (AK)	.099	.211-	.040-	.043-	.257	.063-
		20% (AK)	.081	.081-	.012	.013-	.312	.096
		5% (OK)	.161-	.169-	.090	.035	.074	.041
		10% (OK)	.113-	.060	.118	.055	.138	.015
		20% (OK)	.167	.058	.094	.091	.005-	.257-
		5% (PK)	.031-	.374*	.046-	.090	.085	.395-*
		10% (PK)	.031	.308	.050	.135	.085-	.404-*
		20% (PK)	.075-	.327	.220-	.055-	.035	.191-
	Decision of Buying	5% (AK)	.236-	.248-	.246-	-.292-	.325	.060
		10% (AK)	.193	.176-	.002	.038	.318	.116
		20% (AK)	.244	.226-	.086	.009	.313	.225
		5% (OK)	.161-	.169-	.090	.035	.074	.041
		10% (OK)	.022-	.058	.099	.100	.124	.072-
		20% (OK)	.019	.093	.139	.178	.053	.161-
		5% (PK)	.074-	.301	.091-	.049	.157	.425-*
		10% (PK)	.015	.046	.054	.126	.073	.485-**
		20% (PK)	.097-	-.006-	.022-	.030	.074-	.383-*
Sandwich Bread	Product acceptance	5% (AS)	.367-*	.236-	.061	.186	.033-	.807**
		10% (AS)	.342-	.362-*	.114	.112	.191-	.778**
		20% (AS)	.191-	.260-	.107-	.228-	.055-	.527**
		5% (OS)	.089	.082	.195-	.358-	.089	.215-
		10% (OS)	.200-	.031-	.040-	.165-	.200-	.484**
		20% (OS)	.189-	.131-	.081-	.184-	.047-	.456*
		5% (PS)	.094-	.174-	.081	.289	.236-	.320
		10% (PS)	.134	.055	.074-	.096	.089-	.215
		20% (PS)	.	.	.	.	.	.

Table 10. Cont.

Decision of Buying	5% (AK)	.053	.114-	.064-	.088-	.000	.187
	10% (AK)	.113	.035	.072-	.106-	.017	.062
	20% (AK)	.042	.058	.072-	.170-	.021	.136
	5% (OK)	.042	.068-	.176	.112-	.304-	.157
	10% (OK)	.156	.065-	.041	.153-	.212-	.003-
	20% (OK)	.101	.227-	.070	.099	.181-	.043
	5% (PK)	.044	.049	.022	.247-	.154-	.281
	10% (PK)	.356	.036	.203	.270	.119	.007
	20% (PK)	.199	.274-	.248	.299	.174-	.120

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

(D1) Control sample of Cake, (AC) Cake with apple powder, (OC) Cake with orange Powder, (PC) Cake with pomegranate powder, (D2) Control sample of Cookies, (AK) Cookies with apple powder, (OK) Cookies with orange Powder, (PK) Cookies with pomegranate powder, (D3) Control sample of Sandwich bread, (AS) Sandwich bread with apple powder, (OS) Sandwich bread with orange Powder, (PS) Sandwich bread with pomegranate powder.

The study recommend that fruit powder could be used as flavoring agent that can be taken daily to prevent cardiovascular diseases on the long run, raising the level of awareness on the importance of phenols in food products for protection against atherosclerosis, encouraging food industries to support the study for producing natural products in the market, enhance the idea of using fruit powder among school children to prevent atherosclerotic diseases in the future ,the ministry of environment should embrace the idea of this study that helps in getting rid of fruits waste to maintain the environment.

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الملخص العربي

الإستفادة من متبقيات انتاج العصائر فى تدعيم بعض منتجات المخابز للوقاية من امراض القلب

نيفين الوردانى

تحتوى الفاكهة على الالاف من العناصر الكيميائية الطبيعية والتى تساعد على حماية الجسم من الأمراض، والتخلص من الجذور الحرة، كما أنها تحتوي على الفيتامينات والبوليفينول. وقد أجريت هذه الدراسة لدراسة تأثير استهلاك بعض بقايا الفاكهة المتبقية من مصانع انتاج العصائر ببرج العرب كالتفاح والبرتقال والرمان على دهون الدم في الجرذان المصابة بارتفاع كولسترول الدم. ولتقييم القيمة الغذائية للبقايا المجففة الناتجة من عصر التفاح، البرتقال، الرمان. وللتقييم الحسى لبعض منتجات المخابز المدعمة بنسبة ٥٪، ١٠٪، ٢٠٪ من البقايا المجففة للتفاح والبرتقال والرمان. فى هذا الدراسة تم استخدام ٦٠ ذكور الجرذان التجارب وزن ١٩٧±٢٠جم تم تقسيمها الى ستة مجموعات متساوية عشرة الجرذان لكل منها:(الضابطة، كولسترول ١%/ كلجم من الغذاء، كولسترول ١% / كلجم من الغذاء + الدواء، باقى المجموعات كولسترول ١%/ كلجم من الغذاء + تركيز ٥% من البقايا البودر للبرتقال، التفاح، الرمان على التوالى). وتم عمل تحاليل كيميائية لسيرم دم الجرذان لقياس الكولسترول والدهون الثلاثية وتحديد التركيب الكيميائي التقريبي والمواد الفينولية لبقايا الفاكهة التي تم اختيارها. وعمل استبيان وتقييم حسى لمنتجات المخابز المدعمة ببقايا الفاكهة لتحديد مدى قبول عينة عشوائية من المستهلكين والمحكمين لها وفقا لبعض العوامل الاجتماعية. اوضحت النتائج وجود فروق ذات دلالة احصائية عند مستوى معنوية ٠,٠١ بين مجموعات الجرذان المدعم تغذيتها ببقايا الفاكهة البودر وبين مستويات الدهون فى الدم عند التدعيم بتركيز(٥٪) بالمقارنة مع المجموعة الضابطة. كما ابرزت النتائج تقبل الاصناف المدعمة ببقايا الفاكهة البودر وسجلت كيك البرتقال اعلى تقبل (٧,٦٧± ١,٣٧) يليها كوكيز البرتقال بتقبل (٧,٤٤ ± ١,٦٥) عند تركيز ٥%.. لذا توصى الدراسة بالتوسع فى استخدام بقايا الفاكهة واضافتها للعديد من اغذية الاشخاص الاصحاء للوقاية من خطر امراض القلب الوعائية وكذلك أوصت الدراسة بانتاج المسحوق في شكل مواد نكهة يمكن أن تؤخذ يوميا للوقاية من مرض الكوليسترول على المدى الطويل، ونشر الوعي الغذائي حول أهمية الفينولات في المنتجات المستخدمة للحماية ضد تصلب الشرايين.

الكلمات المفتاحية: بقايا الفاكهة، البوليفينول، الوقاية من أمراض القلب والأوعية الدموية، نسبة الدهون في الدم، التقييم الحسي.