Journal of Home Economics

Volume 24, Number (3), 2014

Journal of Home Economics

http://homeEcon.menofia.edu.eg **ISSN 1110-2578**

Nutritional Evaluation Of Toast Bread Fortified With Mango Peels And Seed Kernels Powder

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Abstract: In the present study, the effect of mango peels powder (MPP) and mango seed kernels powder (MKP) at levels 5 and 10 % on chemical composition, minerals content, caloric value, natural phytochemicals content, sensory and physical properties of toast breads were evaluated. The results indicated that wheat flour was the highest content of moisture, protein and carbohydrates, while MPP was the highest in ash and crude fiber, MKP was the highest one in fats. MPP was the highest value of major minerals and natural phytochemicals. Fortification of toast bread with MKP lead to increase in moisture content. Ash content was increased in toast bread fortified with MPP (10%) and control samples ,while it recorded the lowest value in toast bread fortified with MKP (5%).Using MPP in preparing toast bread at levels 5and10% lead to increase in the content of crude fibers . The highest caloric values were observed for toast bread fortified with 10% MKP. Toast bread fortified with 10% MPP was rich in minerals content. Sensory evaluation resulted of the control samples was the best type of prepared toast bread in all organoleptic properties. For physical properties, control samples was the highest value of loaf volume,loaf height and specific volume, while toast bread fortified with 10% MPP had the lowest one in the last measurements. Toast bread fortified with 10% MKP recorded the highest value of loaf weight. Specific volume was the highest value in control samples.

Key words: Toast bread, chemical composition, natural phytochemicals, sensory and physical evaluation

Introduction

Mango (*Mangifera indica L.*) is one of the most important tropical fruit in the world. During processing of mango, by products such as peels and kernels are generated **.** There are several varieties

grown in Egypt the better known cultivars are alphons, pairi, zebda, mabroka, balady and succary **(El-Soukkary *et al*., 2000)** . Mango is regarded as a valuable source of phytochemical compounds **(Kim *et al*., 2007; Ashoush and Gadallah, 2011; Mudau *et al*., 2013)**.

Several studies have reported phenolic compounds in mango flesh and peels, including various flavonoids, xathones, phenolic acids and gallotannins (**Schieber *et al*., 2000; Berardini *et al*., 2005)** and variability of these compounds have been observed in different mango cultivars **(Souza *et al*., 2011; Taing *et al*., 2012).** Mango flesh, peel and kernel have been shown to contain high levels of antioxidants **(Ribeiro *et al*., 2008).** The antioxidant levels vary depending on a number of factors such as cultivar, growing location, climate, cultural practice, maturity and post-harvest practices such as processing, transportation and storage **(Melgarejo *et al*., 2000; Ozkan, 2002; Zarei *et al*., 2010).**

As peel is not currently utilized for any commercial purpose, it is discarded as a waste and becoming a source of pollution. Peel has been found to be a good source of phytochemicals, such as polyphenols, carotenoids, vitamin E, dietary fiber and vitamin C and it also exhibited good antioxidant properties **(Ajila *et al*., 2007).** The mango peels have been reported to a good source of dietary fiber containing high amount of extractable polyphenolics **(Larrauri *et al*., 1996).** According to **Ojokoh (2007),** mango peel fiber is a good source of dietary fiber and its chemical composition may be compared to citrus fiber. Mango peels also demonstrated higher values of anticancer properties because of polyphenolic extracts **(Noratto *et al*., 2010)** . Chemical in peels of certain mango cultivars have also been shown to prevent the formation of fat cells through disrupting adipogenesis **(Taing *et al*., 2012)** which is the key in development of obesity **(Min *et al*., 2013).**MPP can be used as a functional ingredient in developing healthy food products such as noodles, bread, biscuits, sponge cakes and other bakery products **(Aziz *et al*., 2012).**

A preliminary study of **(Maisuthisakul and Gordon,2009)** showed that the seed represents from 20% to 60% of the whole fruit weight, depending on the mango variety and the kernel inside the seed which represented from 45% to 75% of the whole seed.

Several studies have shown that MKP contain various phenolic compounds and can be good source of natural antioxidants **(Puravankara *et al*.,2000 ; Abdalla *et al*.,2007b).** MKP was shown to be a good source of phenolic compounds (**Soong and Barlow, 2004)** including microelements like selenium, copper and zinc **(Schiber *et al*.,2003). Soong and Barlow (2006)** indicated that MKP has potent antioxidant activity with relatively high phenolic contents. They referred

that MKP was also shown to be a good source of phytosterols as campesterol, bsitosterol, stigmasterol and also contain tocopherols. **Abdalla *et al.*, (2007a)** characterized the phenolic compounds in Egyptian MKP. The components included tannins, gallic acid, coumarin, ellagic acid, vanillin, mangiferin, ferulic acid, cinammic acid and unknown compounds.

Schiber *et al.*, (2003) and Nunez-Selles (2005) referred that the antioxidant effect of the MKP was due to its high content of polyphenols, sesquiterpenoids , phytosterols and microelements like selenium, copper and zinc. MKP are rich sources of gallic acid, ellagic acid, ferulic acid, cinnamic acids, tanins, vanillin, coumarin, and mangiferrin, all having potential to act as a source of natural antioxidants **(Abdalla *et al.*, 2007a**). MPP and MKP contains various classes of polyphenols, carotenoids and vitamins with different health-promoting properties, mainly antioxidant activity **(Manthey and Perkins-Veazie, 2009).** Phenolic compounds are associated with the health benefits deriving from consuming high levels of fruits (**Parr and Bolwell, 2000; Aberoumand, 2012).** Dried mango peel and kernel products can improve the nutritional, functional and sensory properties, and oxidative stability of oil/oil rich product **(Abdalla *et al.*, 2007b).**

Carotenoids are a family of pigmented compounds that are synthesized by plants and microorganisms but not animals. Carotenoids are notable for their wide distribution, structural diversity and of various functions **(Kimura and Rodriguez-Amaya, 2004).** They are especially abundant in yellow-orange fruits and vegetables and dark green, leafy vegetables **(Olson and Krinsky, 1995).** There is an increasing interest in the role of carotenoids as antioxidants **(Bohm *et al.*,2002).**

Flavonoids, the most common group of polyphenolic compounds that are found ubiquitously in plants. These are widely distributed in plant fulfilling many functions. Flavonoids and other plant phenolics are especially common in leaves, flowering tissues and woody parts such as stems and bark (**Kahkonen *et al.*,1999)**.

Bread is a food product that is universally accepted as a very convenient form of food that has desirability to all population rich and poor, rural and urban. It is still one of the most consumed and acceptable staple in all parts of the world **(Mannay and Shadaksharaswany,2005)**.

It is a good source of nutrients, such as macronutrients (carbohydrates, protein and fat) and micronutrients (minerals and vitamins that are all essential for human health. These values makes bread to be known as an essential food in human nutrition and this has lead all countries throughout the world to study the composition of the bread that consumed to improve its nutritive value. Bread has however

been transformed into different types with varying characteristics depending on the innovations put into the production. All these varying attributes of bread most times detract consumers about the nutritional and wholesome quality of the bread product. This is to say that there is a need to continuously improve the nutritional and organoleptic attributes of bread **(Potter and Hotchkiss, 2006).** This investigation was done to evaluate the chemical composition, mineral and natural phytochemicals content attributes of MPP, MKP and wheat flour as well as to evaluate the chemical composition, caloric value, mineral and natural phytochemicals content , sensory and physical properties of toast bread fortified with levels 5 and 10% of each MPP and MKP.

Materials and methods

Materials

Ripe mango seeds and peels as by–products were separated from zebda variety obtained from local market at Kafrelsheikh city, Egypt during the summer season of 2013. Commercial ingredients for baking were obtained from the same local markets.

Preparation of MPP and MKP

Mango peels were washed with tap water to remove any dirt particles .The peels were spread and sun dried. The dried peels were powdered using a hammer mill (Moulinex, France) and sieved through a 150 mm sieve. The mango seeds were washed, air dried and the kernels were removed manually from seeds. The kernels were chopped and sun dried (**Augustin and Ling, 1987).** The dried material was ground in a hammer mill (Moulinex, France) into a powdery form.

Preparation of toast Bread

Flour blends were baked using the straight–dough method according to **Chauhan *et al.*, (1992)**. Wheat flour was substituted by two levels of each MPP and MKP at levels 5 and 10%. The baking formula was 500 g of flour blend, 9 g of compressed baker's yeast, 5 g of NaCl, 13 g of cane sugar, 10 g of vegetable shortening and approximately 280 ml of water. All the ingredients were mixed in a Kenwood mixer (ModelA907D, England) for 3.5 min. The dough were fermented for 90 min at 28°C, then punched, proofed for 90 min at 30°C, 85% relative humidity and baked at 250°C for 30 min. Baked toast bread was ground, screened through a 0.25 mm sieve and used for chemical analyses.

Proximate chemical composition

MPP and MKP, wheat flour and prepared toast bread were analyzed for chemical composition . All analyses were carried out in triplicate .Moisture, crude protein, fat, ash and crude fiber content were

determined according to **A.O.A.C. (1995).** Carbohydrate contents were estimated by difference.

Mineral content

Mineral content including calcium, sodium, potassium , magnesium, iron, manganese, copper and zinc for MPP, MKP, wheat flour and prepared toast bread were estimated according to the methods described in **A.O.A.C. (1997)**. The samples were wet acid digested using a nitric acid and perchloric acid mixture (HNO3, HCLO4, 2:1 v/v). Calcium and magnesium were determined using double beam atomic absorption Shimadzu AA-6200. Sodium and potassium were determined by flame photometer 410.The amounts of iron, manganese copper and zinc in the digested sample were determined using Atomic Absorption 906 A.

Determination of natural phytochemicals

Determination of total carotenoids content

Total carotenoids content of MPP, MKP, wheat flour and prepared toast bread were determined as follow: The extraction was carried out as described by **Kimura and Rodriguez-Amaya (2004)**, with slight modifications. Samples were ground in a mortar and pestle, 4 g of the homogenized sample was transferred to a mortar and 0.3 g of $MgCo_3$ was added. The mixture was ground with 25 ml of cold acetone (refrigerated for about 2 hours). The extract was filtered using a Whatman filter paper (No.1)**.** A 20ml of petroleum ether were pipetted into a separating funnel with Teflon stopcock. A15 ml of the acetone extract were added and allowed to stand for 15 minutes. A150 ml of distilled water was added by flowing along the walls of the funnel. The mixture was allowed to separate into two phases, and the aqueous phase was discarded. The petroleum ether phase was washed 4 times with 100 ml of distilled water to remove residual acetone. The petroleum ether phase was collected in a 25 ml volumetric flask by passing the solution through a small funnel containing 7.5g of anhydrous sodium sulfate to remove residual water. The separating funnel was then washed with petroleum ether and the washing was collected into the volumetric flask by passing it through the funnel with sodium sulfate. The volumetric flask was then made up to volume with petroleum ether and the total carotenoids content were determined from the molar absorptivity β-carotene E1% = 2590 at λmax 450 nm **(Ball, 1988)** and derived from the standard plots.

Determination of total flavonoids content

Total flavonoids content of MPP, MKP, wheat flour and prepared toast bread were determined as follow: Accurately weighed powder of sample was ground with a pestle and mortar in the measured

volume of solvents (80: 20 ethanol ~ water). The extract was filtered through Whatman (No.1) filter paper. Each extract was prepared freshly for the analysis to prevent any degradation. The aluminum chloride method was used for the determination of the total flavonoid content of the sample extracts as described in **(Mervat *et al*., 2009).** Based on this method , aliquots of extract solutions were taken and made up the volume 3ml with methanol. Then 0.1ml AlCl3 (10%), 0.1ml Na-K tartarate and 2.8 ml distilled water were added sequentially. The test solution was vigorously shaken. Absorbance at 415 nm was recorded after 30 minutes of incubation. A standard calibration plot was generated at 415 nm using known concentrations of quercetin. The concentrations of flavonoid in the test samples were calculated from the calibration plot and expressed as mg quercetin equivalent /100g of sample.

Determination of total phenolics content

The extracts of MPP, MKP, wheat flour and prepared toast bread samples were obtained as described by **Bloor (2001).** Half gram from each of MPP, MKP, wheat flour and prepared toast bread samples was extracted with 20 ml of methanol: water (60:40 v/v). The mixture was centrifuged and the supernatant was adjusted to 25 ml. Aliquot of these extracts were used for the quantification of total phenolics content.Total phenolics content of the extracts were used for the quantification of total phenolics. The total phenolics content was determined colorimetrically, using the Folin-Ciocalteu method as described by **Singleton *et al*., (1999).** Aliquots of 1 ml of the extract were added to 1 ml of Folin-Ciocalteu reagent followed by addition of 1 ml of an aqueous 7.5% solution of sodium carbonate. The mixture was stirred and allowed to stand for 30 min. The absorbance at 765 nm was measured using a model UV/VIS-Spectrophotometer (Jasco, Japan, V630). A blank sample consisting of water and reagents was used as a reference. The results were expressed as milligrams of gallic acid equivalents per 100 g powder (mg GAE/100g powder).

Caloric value of prepared toast bread

Caloric value of prepared toast bread was calculated according to **Lawrence, (1965)** using the following equation:

Caloric value (K.cal/100 g) = (protein+ carbohydrate content x4) + (fat content x 9).

Estimation amounts of prepared toast bread (g) consumed to cover adults requirements of protein and caloric levels

The G.D.R of energy (g) were calculated using the equation reported by **FAO/WHO/UNU(1985)**.

$$\text{G.D.R (g)} = \frac{\text{Energy daily requirements of adult man (2900 k.cal./day)}}{\text{Energy value (k.cal/100g food)}}$$

Grams consumed of prepared toast bread to cover the daily requirements of protein for adult man (25-50 years) were calculated using the daily requirements for adult man (63g) as given by **N.R.C.F.N.(1989)**. The G.D.R of protein (g) was calculated using the equation given by **FAO/ WHO/ UNU (1985)**.

$$\text{G.D.R of protein (g)} = \frac{\text{Protein daily requirements of adult man (63g/day)}}{\text{Protein content (g/100g food)}}$$

Sensory evaluation

Loaves were cooled for 1-2 h at room temperature (25±3 º C) in a sealed plastic bag. Prepared toast bread was then cut into 2 x 3 x 5 cm slices using a bread knife. Sensory evaluation of prepared toast bread was evaluated by 20 trained panelists for appearance, taste, odor, inter color, external color, chewing, texture, volume and acceptance on a 9-point hedonic scale (from like extremely = 9 to dislike extremely = 1) according to **Watts *et al.,* (1989)**.

Physical properties

Physical properties of prepared toast bread were evaluated by measuring loaf volume loaf height, loaf weight and specific volume, 30 min. after removal from the oven.

The volume (cm^3) of prepared toast bread determined by rapeseed displacement method (**A.A.C.C., 2000)**, while height (cm) was measured using a measuring ruler and weight (g) were measured by using sensitive balance (WJ, china) .The specific volume of the loaf was calculated according to **(A.A.C.C.,2000)** using the following equation: Specific volume (cm^3) =loaf weight/ loaf volume. All objective measurements were done on triplicates and the main value was calculated.

Statistical analysis

Data of chemical composition, minerals, phytochemicals, sensory evaluation and physical properties were subjected to analysis of variance followed by Duncan's multiple range tests according to **Steel and Torrie (1980).**

Resuits And Discussion

Chemical composition of MPP, MKP and wheat flour

Chemical composition of MPP,MKP and wheat flour were showed in table (1). Results indicated that wheat flour was the highest content of moisture (13.08±0.01g/ 100g), protein (11.17±0.01g/100g) and carbohydrates (87.27±0.02g/100g).These results are in the same line of **Sanaz *et al.*,(2012)** who found that the chemical composition of wheat flour resulted in (10.12 and 10.32 g/ 100g) for moisture and protein, respectively. **Danster *et al* .,(2008)** studied the chemical

composition of wheat flour, they found that wheat flour contained 14 g/100g of moisture,10.2 g/100g of protein ,while fat recorded 0.8 , ash 0.6 ,crude fiber 2.3 and carbohydtares 72.1 as g/100g.

MPP was the highest in ash, recorded 4.42±0.01g/100g and crude fiber 9.86±0.01g/100g. In similar study, **Ashoush and Gadallah (2011)** reported that mango peels appeared 3.88±0.59 and 9.33±0.61g/100g for ash and crude fiber, respectively . Also**, Kakali *et al.*, (2014)** found that chemical analysis of MPP resulted in 5.9±0.56, 2.8±0.21, 1.4±0.13, 4.2±0.32, 9.9±0.59 and 75.7±0.51% for moisture ,protein ,fat , ash ,fiber and carbohydrates, respectively. **Reddy *et al.* (2011)** reported that MPP contained 10 % of moisture and 4% of protein . MPP fiber with high hydration capacities has potential in dietary fiber-rich foods preparation **(Koubala *et al.*, 2013).** MPP dietary fiber has been shown to be associated with natural antioxidant components and therefore its antioxidant capacity is greater than that of DL-α-tocopherol **(Larrauri *et al.*, 1997).**

MKP was the highest one in fat content recorded 7.88±0.01 g/ 100g,in addition it was contained 2.23±0.02 g/ 100g of ash and 3.21±0.02 g/ 100g of crude fiber ,also contained 5.13±0.01g/100g of protein, these results were in agreement with **Nizikou *et al*.,(2010)** who concluded that MKP contained high level of fat 13.00 g/100g, 6.36 g/100g of protein , 2.02 g/100g of crude fiber and 3.20g/100g of ash.

Ashoush and Gadallah (2011) reported that MKP contained 7.76±0.30, 8.15±0.06 and1.46±0.06 g/ 100g for protein ,fat and ash, respectively.

It was observed that there were significant differences at P<0.05 between MPP, MKP and wheat flour in the content of all chemical components.

Table (1): Chemical composition of MPP, MKP and wheat flour as (g/100g)

Chemical composition	MPP	MKP	Wheat Flour
Moisture	8.72±0.02 [b]	10.63±0.14 [c]	13.08±0.01 [a]
Crude protein	4.50±0.00 [c]	5.13±0.01 [b]	11.17±0.01 [a]
Crude fat	2.45±0.01 [b]	7.88±0.01 [a]	0.96±0.02 [c]
Ash	4.42±0.01 [a]	2.23±0.02 [b]	0.52±0.01 [c]
Crude fiber	9.86±0.01 [a]	3.21±0.02 [b]	0.08±0.01 [c]
Carbohydrates	78.77±0.02 [c]	81.55±0.05 [b]	87.27±0.02 [a]

*** Mean values in the same row which is not followed by the same letter indicate significant difference at P<0.05**

Dhingra and Kapoor (1985) found that MKP contained 5.34 ,7.82, 2.75 and 1.75 g/100g for protein ,fat ,ash and fiber, respectively. The results showed that there were significant differences between MPP, MKP and wheat flour in their content of moisture, protein ,fat, ash ,fiber and carbohydrates. **Kakali *et al.*, (2014)** found that chemical analysis of MKP resulted in 7.1±0.35, 7.2±0.30, 9.8 ±0.28 , 2.1±0.14, 0.5±0.1 and 73.1±0.75% for moisture ,protein ,fat ,ash ,fiber and carbohydrates ,respectively.

Minerals content of MPP, MKP and wheat flour

Table (2) showed the content of minerals of MPP, MKP and wheat flour ,the results of mineral assayed showed that MPP was rich in Ca (407.52 mg/100g) followed by MKP (110.12 mg/100g) ,these results was in the same line with **(Fowomola ,2010)** who concluded that MKP contained 111.30 mg/100g of Ca. MPP also, was the highest value of Mg, Fe, Mn,Cu and Zn as it recorded 38.86±0.02, 0.79 ±0.11,0.07±0.01, 0.16±0.01 and 0.09±0.01 mg/100g, respectively. MKP showed the highest value of Na, K (29.11±0.00 and 52.23±0.00 mg/100g) , respectively.

Wheat flour analysis appeared the lowest value of the majority of minerals as it recorded 6.69±0.02, 6.20 ±0.01, 9.21±0.01, 21.81±0.01 and 0.11±0.07 mg/100g for Ca , Na , K, Mg and Fe ,respectively. **Danster *et al.*,(2008)** found that mineral composition of wheat flour recorded 3.0, 5.0, 97.0, 14.0,1.3, 0.14 and 0.64 mg/100g for Ca ,Na, K, Mg ,Fe, Cu and Zn , respectively ,while Mn recorded 23.94 µg/100 g. **Peterson *et al.*,(1983)** found that mineral concentration in different varieties of winter wheat flour in different locations resulted in Ca (179-244),Mg (790-876) ,Fe (8.2-12.2),Cu (2.2-3.1),Mn (4.6-6.9) and Zn (5.8-8.7) as µg/ g.

Table (2): Minerals content of MPP, MKP and wheat flour as (mg/100g)

Samples / Minerals content	MPP	MKP	Wheat Flour
Ca	407.52±0.02 [a]	110.12±0.01 [b]	6.69±0.02 [c]
Na	26.43±0.017 [b]	29.11±0.00 [a]	6.20 ±0.01 [c]
K	42.10±0.01 [b]	52.23±0.00 [a]	9.21±0.01 [c]
Mg	38.86±0.02 [a]	38.41±0.01 [b]	21.81±0.01 [c]
Fe	0.79±0.11 [a]	0.17±0.01 [b]	0.11±0.07 [c]
Mn	0.07±0.01 [a]	0.054±0.00 [c]	0.06±0.07 [b]
Cu	0.16±0.01 [a]	0.10±0.01 [c]	0.03±0.00 [b]
Zn	0.09±0.01 [a]	0.05±0.01 [c]	0.06±0.07 [b]

***Mean values in the same row which is not followed by the same letter indicate significant difference at P<0.05 .**

Natural phytochemicals of MPP, MKP and wheat flour

Table (3) showed the natural phytochemicals included carotenoids , flavonoids and phenolics of MPP ,MKP and wheat flour as mg/100g.The results cleared that MPP was the highest value of total carotenoids (1123.56±0.11) ,followed by MKP (989.43±0.02) ,while wheat flour was the lowest one (803.05±0.01) mg /100g. Mango has been reported to contain high amounts of carotenoids **(Chen *et al.*, 2004).** Carotenoids content is high in peel with advance physiological ripening compared with the peel with partial ripening (**Ajila *et al*., 2007; Varakumar *et al.*, 2011).** The total carotenoids content in dried green and ripe mango peels have been reported to range from 9.69 to 16.06 mg/100 g **(Aziz *et al.*, 2012).**

Total flavonoids content was in the highest value for MPP (10.07 ±0.02 mg/100g), followed by MKP (8.14±0.05 mg/100g), while wheat flour was the lowest one (6.95±0.01 mg/100g).

The highest content of total phenolics (mg GAE/100g powder) was in MPP (10.34±0.01) ,followed by MKP (9.65±0.01),while wheat flour was the lowest one (8.73±0.03).**Ashoush and Gadallah (2011)** found that total phenolics in MPP and MKP was 19.06±0.03 and 23.90±0.33 mg GAE/ g,respectively. **Kakali *et al.*, (2014)** found that total phenolics in MPP and MKP was 24.3±0.42 and 27.9±0.38 mg GAE/g ,respectively. Polyphenol rich fractions of mango peel extract could be used as natural antioxidants and functional food or feed supplements (**Berardini *et al.*, 2005).**

It was noticed that there were significant differences between MPP, MKP,wheat flour in the content of total carotenoids , flavonoids and phenolics.

Table (3): Natural phytochemicals of MPP, MKP and wheat flour as (mg/100g)

Samples / phytochemicals	MPP	MKP	Wheat Flour
Carotenoids	1123.56±0.11[a]	989.43±0.02[b]	803.05±0.01[c]
Flavonoids	10.07±0.02[a]	8.14±0.05[b]	6.95±0.01[c]
Polyphenols	10.34±0.01[a]	9.65±0.01[b]	8.73±0.03[c]

***Mean values in the same row which is not followed by the same letter indicate significant difference at P<0.05.**

Chemical composition of toast bread fortified with MPP and MKP

Table (4) showed the chemical composition of toast bread fortified with MPP and MKP as (g/100 g).The results cleared that toast bread fortified with 5% MKP were the highest in moisture content as it recorded 26.18±0.01g/100g, it was observed that fortification of toast bread with MKP lead to increasing in moisture content ,it may be due to increasing

in moisture content of MKP (10.63±0.14 g/100 g) as shown in table (1).There were significant differences at $p<0.05$ in moisture content for all samples of prepared toast bread.

The content of crude protein of prepared toast bread was in the highest value in toast bread fortified with 5 % MKP (16.34±0.01 g/100 g), while it was in the lowest value in toast bread fortified with 5% MPP (15.21±0.01 g/100g).There were significant differences at $p<0.05$ in protein content for all samples of prepared toast bread.

The fat content of prepared toast bread cleared that there were no significant differences at $p<0.05$ for all samples of prepared toast bread. The highest content of fat in prepared toast bread was in toast bread fortified with 10% MKP (1.46±0.01 g/100 g),in general , toast bread fortified with MKP 5and10% were the highest samples of toast bread compared with toast bread fortified with MPP, it may be due to high content of fat in MKP (7.88±0.01 g/100g) comparing with MPP (2.45±0.01 g/100g).

Ash content was increased in toast bread fortified with MPP 10% and control samples as it reached 3.15±0.01, 2.59±0.03 g/100g in toast bread fortified with MPP 10% and control samples ,respectively, while it recorded the lowest value (2.14±0.01) in toast bread fortified with MKP 5% ,it may be due to the content of ash in plant sources used in preparing toast bread (table 1).

It was observed that using MPP in preparing toast bread at levels 5 and 10% lead to increase in the content of crude fiber comparing with control samples and toast bread fortified with MKP, as it was 1.78±0.00 and1.85±0.01 g/100g, respectively in toast bread fortified with (5 and 10 %) MPP, as it due to that MPP contained the highest value of crude fiber (9.86±0.01) g/100g. It was concluded that there were no significant differences between toast bread fortified with MKP (5 and 10%) at $p<0.05$ in crude fiber value.

For carbohydrates, it was noticed that the highest value of carbohydrate recorded for toast bread fortified with MKP 10% which was 80.09±0.03 g/100 g. There were no significant differences between toast bread fortified with MPP 5%, MKP (5 ,10%) and control samples. In similar study, **Lakshmi *et al.*,(2014)** studied the effect of using MKP on chemical composition of bread as it mixed with wheat flour ,soya flour ,sprouted mung flour and MKP as a percentage of (60:14:13:13),protein content was (18.54± 0.04) ,fat (5.,64±0.04) and crude fiber (1.9 ± 0.05) g/100g, respectively, while they studied the effect of using MKP on chemical composition of bread as it mixed with wheat flour ,soya flour ,sprouted mung flour and MKP as a percentage

of (70:10:10:10), protein content was (16.67± 0.6) ,fat (4.75±0.05) and crude fiber (2.10 ± 0.09) g/100 g, ,respectively.

Table (4): Chemical composition of toast bread fortified with MPP and MKP as (g/100 g)

Chemical composition	Toast bread control	Toast bread fortified with 5% MPP	Toast bread fortified with 10% MPP	Toast bread fortified with 5% MKP	Toast bread fortified with 10% MKP
Moisture	**21.41±0.00 ^{d}**	**21.14±0.00 ^{e}**	**23.92±0.00 ^{b}**	**26.18±0.01^{a}**	**23.44±0.00 ^{c}**
Crude protein	**15.91±0.01^{b}**	**15.21±0.01^{e}**	**15.25±0.00 ^{d}**	**16.34±0.01^{a}**	**15.26±0.01^{c}**
Crude fat	**1.16±0.00 ^{a}**	**1.21±0.01^{a}**	**1.26±0.34 ^{a}**	**1.44±0.01^{a}**	**1.46±0.01^{a}**
Ash	**2.59±0.03 ^{b}**	**2.41±0.00 ^{c}**	**3.15±0.01^{a}**	**2.14±0.01^{e}**	**2.25±0.01^{d}**
Crude fiber	**1.25±0.00 ^{c}**	**1.78±0.00 ^{b}**	**1.85±0.01^{a}**	**1.04±0.00 ^{e}**	**0.94±0.00 ^{e}**
Carbohydrates	**79.09±0.04 ^{a}**	**79.39±0.03 ^{a}**	**78.49±0.03 ^{b}**	**79.00±0.33 ^{a}**	**80.09±0.03 ^{a}**

***Mean values in the same row which is not followed by the same letter indicate significant difference at P<0.05**.

The proximate chemical composition of control samples were in the same line of **Mervat ,(2011)** who found that control toast bread contained 20.81, 16.02, 2.75, 1.78 and 1.61g/100g) for moisture, protein ,fat ,ash and fibers, respectively.

Caloric values of prepared toast bread

Data in Table (5) presented the caloric values of prepared toast bread. Carbohydrates represented the main source of calories in all samples followed by protein, while fat was the lowest level.

The highest caloric value, 394.54 k.cal./100 g was observed for toast bread fortified with 10%MKP, which had the highest level of carbohydrates caloric value ,320.36 k.cal./100g and fat caloric value, 13.14 k.cal/100g. The lowest caloric value,386.30 k.cal./100 g was observed for toast bread fortified with 10% MPP that may be due to low amount of carbohydrates caloric value, 313.96 k.cal/100g , protein caloric value, 61.00 k.cal./100 g and fat caloric value, 11.34 k.cal./100g.

Table (5): Caloric values of prepared toast bread (k.cal./100g)

Samples	Sources of calories			Total caloric values
	Protein	Fat	Carbohydrates	
	Caloric values			
Control	63.64	10.44	316.36	390.44
Toast bread fortified with 5% MPP	60.84	10.89	317.56	389.29
Toast bread fortified with 10% MPP	61.00	11.34	313.96	386.30
Toast bread fortified with 5% MKP	65.36	12.96	316.00	394.31
Toast bread fortified with 10% MKP	61.04	13.14	320.36	394.54

Estimation amounts of prepared toast bread (g) consumed to cover adults requirements of protein and caloric levels

As compared with **FAO/WHO (1985)** pattern, the results in table (6) show the estimated amounts of prepared toast bread samples to cover the daily adults requirements of protein levels in different samples. The daily adults requirements of protein could be covered when consumed 385.55- 414.20 g of prepared toast bread for adult man from 25-50 years. It was noticed that toast bread fortified with 5% MKP were the lowest consuming amount 385.55g compared with other samples. For energy, to cover daily requirements of energy adult need to consume 735.03-750.71 g of toast bread daily.

Table (6): Estimation amounts of prepared toast bread (g) consumed to cover adults requirements of protein and caloric levels

Prepared toast bread types	*G.D.R g of protein	*G.D.R g of calories
	** adult man (25-50 years) (63 g)	** adult man (25-50 years) (2900 k.cal.)
	grams of toast bread	
Control	395.97	742.75
Toast bread fortified with 5% MPP	414.20	744.94
Toast bread fortified with 10% MPP	413.11	750.71
Toast bread fortified with 5% MKP	385.55	735.46
Toast bread fortified with 10% MKP	412.84	735.03

***G.D.R grams consumed of prepared toast bread to cover the daily requirements for adult man ((25-50 years) of protein and calories.**

**** Recommended levels of protein and calories according to FAO/WHO (1985).**

Toast bread fortified with 10%MPP showed the highest amount to cover the daily requirements of energy (G.D.R 750.71g/ day), it due to that it recorded the lowest caloric value 386.30 k.cal./100g ,while toast bread fortified with 10% MKP showed the lowest value (G.D.R 735.03 g/ day), it due to that it recorded the highest caloric value 394.54 k.cal./100 g.

Minerals content prepared toast bread

Mineral content of prepared toast bread showed in table (7) . It was observed that toast bread fortified with 10% MPP was rich in minerals content ,as it was the highest value of Ca , Mg, Fe ,Mn, Cu and Zn ,it was recorded 1039.63±0.02, 243.04±0.01, 0.70±0.00, 0.29±0.00, 0.76±0.00 and 0.76±0.00 mg/100g,respectively. Control samples recorded the lowest value in Ca, Na, K, Mg, Cu and Zn as it recorded 396.15±0.01, 63.05±0.01, 59.95±0.01, 151.54±0.00, 0.13±0.00 and 0.18±0.00 mg/100g, respectively. In similar study, **Danster *et al* ., (2008)** studied the minerals content of unfortified white bread and found that ,it contained 12.00, 655.00,133.00,20.00,1.70,0.12 and 1.03 mg/100g for Ca , Na , K , Mg , Cu and Zn ,respectively, while Mn recorded 56.27 µg/100g.Generally ,it was noticed that fortification with MPP and MKP lead to increasing in the content of important minerals compared with control samples, it may be due to the high content of these minerals in used plant sources (table 2). There were significant differences between all prepared toast bread in Ca, Na, K, Mg, Cu and Zn. On the other hand, there were no significant differences between control samples and toast bread fortified with 5% MKP, also between toast bread fortified with 5% MPP and toast bread fortified with 10% MKP in the content of Fe. There were no significant differences between toast bread fortified with 5% MPP and toast bread fortified with 10% MKP in the content of Mn and it recorded the same value (0.28 mg/100g).

Table (7): Minerals content of prepared toast bread as (mg/100g)

Minerals	Toast bread control	Toast bread fortified with 5% MPP	Toast bread fortified with 10% MPP	Toast bread fortified with 5% MKP	Toast bread fortified with 10% MKP
Ca	396.15±0.01^{e}	799.27±0.02 ^{b}	1039.63±0.02 ^{a}	458.06±0.02 ^{d}	786.52±0.02 ^{c}
Na	63.05±0.01^{e}	155.36±0.02 ^{d}	164.32±0.02 ^{c}	295.27±0.01^{b}	394.06±0.01^{a}
K	59.95±0.01^{e}	68.17±0.01 ^{d}	78.46±0.01^{c}	193.31±0.01^{b}	269.31±0.00 ^{a}
Mg	151.54±0.00 ^{e}	233.33±0.00 ^{b}	243.04±0.01^{a}	169.31±0.01^{d}	172.41±0.01^{c}
Fe	0.42±0.00 ^{c}	0.55±0.00 ^{b}	0.70±0.00 ^{a}	0.42±0.001 ^{c}	0.54±0.00 ^{b}
Mn	0.19±0.00 ^{d}	0.28±0.00 ^{b}	0.29±0.00 ^{a}	0.24±0.00 ^{c}	0.28±0.00 ^{b}
Cu	0.13±0.00 ^{e}	0.57±0.00 ^{b}	0.76±0.00 ^{a}	0.33±0.17 ^{d}	0.46±0.00 ^{c}
Zn	0.18±0.00 ^{e}	0.54±0.00 ^{b}	0.76±0.00 ^{a}	0.39±0.00 ^{d}	0.47±0.00 ^{c}

***Mean values in the same row which is not followed by the same letter indicate significant difference at P<0.05 .**

Natural phytochemicals of prepared toast bread

Table (8) showed the content of prepared toast bread as (mg/100g) of natural phytochemicals included carotenoids , flavonoids and polyphenols ,it was observed that toast bread fortified with 10% MPP contained the highest level of total carotenoids , total flavonoids and total phenolics as it were 1123.05±0.02,13.82±0.02 and 9.01±0.02 ,respectively, followed by toast bread which fortified with MPP 5% , as it were 756.92±0.02, 10.38±0.01 and6.97±0.01 , respectively , it was observed that , toast bread fortified with MKP were lower than that fortified with MPP of these natural phytochemicals ,while control sample was the lowest one as it recorded 646.16±0.01, 7.31±0.02 and 6.66±0.01 for total carotenoids, total flavonoids and total phenolics, respectively. **Lakshmi *et al.*,(2014)** studied the effect of using MKP on chemical composition of bread as it mixed with wheat flour ,soya flour ,sprouted mung flour and MKP as a percentage of (60:14:13:13),respectively ,total phenolics content recorded 6.9 mg GAE/g, while they studied the effect of using MKP on chemical composition of bread as it mixed with wheat flour ,soya flour ,sprouted mung flour and MKP as a percentage of (70:10:10:10), respectively, total phenolics content recorded 10.21 mg GAE/g. **Ajila *et al.*, (2008)** found that total phenolics present in control cookies was 3.4 mg GAE/g, increased up to 18.6 and 6.3 (mg GAE/g) when incorporated with 50% of MPP and MKP respectively. Although during baking, there may be some loss of total phenolics content and there is an increase in phenolic content in cookies by the replacement of MPP and MKP at different levels with flours **(Ajila *et al.*, 2008).**

It could be concluded that fortification with MPP and MKP lead to enrich toast content of carotenoids , flavonoids and phenolics . There were significant differences between all samples in the content of these natural phytochemicals.

Table (8): Natural phytochemicals of prepared toast bread as (mg/100g)

Natural phytochemicals	Toast bread control	Toast bread fortified with 5% MPP	Toast bread fortified with 10% MPP	Toast bread fortified with 5% MKP	Toast bread fortified with 10% MKP
Carotenoids	646.16±0.01^{e}	756.92±0.02^{b}	1123.05±0.02 ^{a}	692.31±0.01^{d}	710.76±0.01^{c}
Flavonoids	7.31±0.02^{e}	10.38±0.01^{b}	13.82±0.02^{a}	8.29±0.02^{d}	8.46±0.01^{c}
Polyphenols	6.66±0.01^{c}	6.97±0.01^{b}	9.01±0.02^{a}	6.85±0.21^{b}	7.01±0.01^{b}

***Mean values in the same row which is not followed by the same letter indicate significant difference at P<0.05.**

Sensory evaluation of toast bread fortified with MPP and MKP

The organoleptic properties of prepared toast bread included appearance, taste, odor, inter color, external color, chewing, texture, volume and acceptance. Data in table (9) show the sensory scores of prepared toast bread evaluated by the panelists. It was noticed that control samples was the best type of prepared toast bread in all organoleptic properties. For appearance there were no significant differences between all fortified toast bread .Toast bread fortified with 10% MPP was the lowest value of appearance 5.66±1.95. For taste ,there were no significant differences between all fortified toast bread. Toast bread fortified with 10% MPP was the lowest one in taste value (5.38±2.03).Control samples was the highest value of odor (7.80±1.47), followed by toast bread fortified with 5% MPP (7.47±1.20) and there were no significant differences between control samples and toast bread fortified with 5% MPP ,while odor value was equal in toast bread fortified with 5% MKP and toast bread fortified with 10% MKP, as it was 6.33±1.42 and 6.33±1.8, respectively . Inter color cleared the maximum value in control samples and deceased for all fortified toast bread comparing with control samples, toast bread fortified with 10% MPP and toast bread fortified with 10% MKP were equal in the value of inter color (5.33), also there were no significant differences between them in inter color value .External color was in the highest value in control samples (8.23±0.83),while toast bread fortified with 10% MKP was the lowest one (5.42±1.83).The best sample in chewing characteristics was control samples 7.92±0.92, while the lowest one was

toast bread fortified with 5% MPP (6.76±1.67).There were no significant differences between all fortified toast bread samples in chewing. For, texture toast bread fortified with 5% MKP recorded the highest value, as it was 7.09±1.04, texture value was similar in toast bread fortified with 5 and 10% MPP, as it recorded 7.00,while toast bread fortified with 10% MKP recorded the lowest value,6.90±1.32 . There were no significant differences between all prepared toast bread in texture values. Control samples appeared the highest value of volume 7.42±1.20.There were no significant differences between all prepared toast bread in volume values. Control was the most acceptable sample as it recorded 7.92±1.28 ,followed by toast bread fortified with 5% MPP as it was 7.23±1.33 and 6.57±1.56 in toast bread fortified with 10% MKP .There were no significant differences between control samples and toast bread fortified with 5% MPP ,in the same time, there were no significant differences between all fortified toast bread samples for acceptance values.

Table (9): Sensory evaluation of toast bread fortified with MPP and MKP

Sensory evaluation	Toast bread control	Toast bread fortified with 5% MPP	Toast bread fortified with 10% MPP	Toast bread fortified with 5% MKP	Toast bread fortified with 10% MKP
Appearance	8.00±1.14 [a]	6.28±1.61 [b]	5.66±1.95 [b]	5.90±1.57 [b]	5.85±1.71 [b]
Taste	7.76±1.44 [a]	6.42±1.66 [b]	5.38±2.03 [b]	6.23±1.26 [b]	5.95±1.59 [b]
Odor	7.80±1.47 [a]	7.47±1.20 [a]	6.61±1.77 [b]	6.33±1.42 [b]	6.33±1.87 [b]
Inter color	8.14±1.06 [a]	6.04±1.56 [b]	5.33±1.74 [b]	5.66±1.55 [b]	5.33±1.87 [b]
External color	8.23±0.83 [a]	6.80±1.47 [b]	6.28±1.67 [bc]	5.71±1.70 [c]	5.42±1.83 [c]
Chewing	7.92±0.92 [a]	6.76±1.67 [b]	6.95±1.82 [b]	7.09±1.22 [b]	6.90±1.33 [b]
Texture	7.47±1.33 [a]	7.00±1.22 [a]	7.00±1.30 [a]	7.09±1.04 [a]	6.90±1.32 [a]
Volume	7.42±1.20 [a]	7.14±1.27 [a]	6.71±1.18 [a]	6.76±1.17 [a]	6.66±1.65 [a]
Acceptance	7.92±1.28 [a]	7.23±1.33 [ab]	6.47±1.56 [b]	6.52±1.47 [b]	6.57±1.56 [b]

***Mean values in the same row which is not followed by the same letter indicate significant difference at P<0.05 .**

Lakshmi *et al.*,(2014) studied the effect of using MKP in preparing bread as it mixed with wheat flour ,soya flour ,sprouted mung flour and MKP as a percentage of (60:14:13:13),respectively on sensory evaluation, they found that taste value was 6.7,texture 6.00,aroma

6.00,colour 6.50 and appearance recorded 6.5. They also, studied the effect of using MKP in preparing toast bread as it mixed with wheat flour ,soya flour ,sprouted mung flour and MKP as a percentage of (70:10:10:10), respectively ,they found that taste value was 7.00,texture 7.50,aroma 7.00,colour 7.00 and appearance recorded 7.6.

Physical properties of prepared toast bread

Data in table (10) show the physical properties of prepared toast bread .Control toast bread had the highest value of loaf volume 1034.20±0.10cm, while toast bread fortified with 10% MPP had the lowest value 906.27±0.15cm. There were no significant differences between toast bread fortified with 5 and 10 % MKP in loaf volume. It was noticed that control toast bread was the highest value of loaf height 7.55±0.19 cm, followed by toast bread fortified with 5% MPP (6.63±0.15cm). On the other hand , it could be observed that there were no significant differences between the height of toast bread fortified with 10% MPP, toast bread fortified with 5 and 10 % MKP for loaf height. In addition ,using MPP 10% lead to decrease height to the lowest value 5.34±0.12 cm.

Toast bread fortified with 10% MKP recorded the highest value of loaf weight (202.07±0.12g), while the lowest value was recorded in control samples 198.19±0.16. Loaf weight recorded the highest value in toast bread fortified with 10% MKP 202.07±0.12 , while control samples recorded the lowest value 198.19±0.16, there were no significant differences between control samples and toast bread fortified with MPP 5% in loaf weight. Specific volume was in the highest value in control samples 5.21±0.10 cm^3 ,followed by 4.64±0.15 cm^3 in toast bread fortified with 5% MPP, while the lowest value recorded for toast bread fortified with 10% MPP (4.50±0.15 cm^3).

Table (10): Physical properties of toast bread fortified with MPP and MKP

Physical properties / Toast bread	Loaf volume (cm^3)	Loaf height (cm)	Loaf weight (g)	Specific volume (cm^3)
Toast bread control	1034.20±0.10 [a]	7.55±0.19 [a]	198.19±0.16 [a]	5.21±0.10 [a]
Toast bread fortified with 5% MPP	922.27±0.15 [b]	6.63±0.15 [b]	198.45±0.02 [d]	4.64±0.15 [b]
Toast bread fortified with 10% MPP	906.27±0.15 [d]	5.34±0.12 [c]	201.21±0.18[b]	4.50±0.15 [d]
Toast bread fortified with 5% MKP	914.99±0.11[c]	5.62±0.03 [c]	199.01±0.14[c]	4.59±0.11[c]
Toast bread fortified with 10% MKP	913.21±0.20 [c]	5.48±0.07 [c]	202.07±0.12[a]	4.51±0.20 [d]

*** Mean values in the same column which is not followed by the same letter indicate significant difference at P<0.05.**

In similar study, **Lakshmi *et al.*,(2014)** studied the effect of using MKP in preparing bread as it mixed with wheat flour ,soya flour ,sprouted mung flour and MKP as a percentage of (60:14:13:13),respectively ,they found that loaf weight recorded 390± 5.0 g, loaf height 4.5±0.25 cm, loaf volume 780±3.0 and specific volume 1.00 ±0.4 cm^3 and they also, studied the effect of using MKP in preparing toast bread as it mixed with wheat flour ,soya flour ,sprouted mung flour and MKP as a percentage of (70:10:10:10),respectively ,they found that loaf weight recorded 392± 5.0 g, loaf height 5.5±0.20 cm, loaf volume 895±2.0 cm^3 and specific volume 2.00 ±0.4 cm^3.

Conclusion

MPP and MKP increased the nutritional value of prepared toast bread as using it in fortification of toast bread improved fat and minerals content , enrich toast bread content of carotenoids ,flavonoids and phenolics. Considering the large amounts available, MPP and MKP may be a promising source of carotenoids, flavonoids and polyphenols. The latter might be used as natural antioxidants or as bioactive ingredients of functional foods.

References

A.A.C.C.(2000). An approved Methods of American Association of Creal Chemists, Published by American Association of Cereal Chemists. In St.,Paul. Minnesota.

Abdalla, A. E., Darwish, S. M., Ayad, E. H. E.and El-Hamahmy, R. M. (2007a). Egyptian mango by-product 1: Compositional quality of mango seeds kernel. Food Chemistry,103:1134–1140.

Abdalla, A. E., Darwish, S. M., Ayad, E. H. E., and El-Hamahmy, R. M. (2007b). Egyptian mango by-product 2: Antioxidant and antimicrobial activities of extract and oil from mango seed kernel. Food Chemistry, 103, 1141– 1152.

Aberoumand, A. (2012). Screening of phytochemical compounds and toxic proteinaceous protease inhibitor in some lesser-known food based plants and their effects and potential applications in food. International Journal of Food Science Nutrition England, 3:16-20.

Ajila, C. M., Bhat, S. G., and Prasada Rao, U. J.(2007).Valuable components of raw and ripe peels from two Indian mango varieties .Food Chemistry,102: 1006–1011.

Ajila, C.M., Leelavathi, K. and Prasada ,Rao, U.J.S. (2008). Improvement of dietary fiber content and antioxidant properties in soft dough biscuit with the incorporation of mango peel powder. Journal of Cereal Science,48:319-326.

A.O.A.C.(1995).“Official Methods of Analysis”Association Official Analytical Chemists of the 16 Ed.International, Washington, D.C.

A.O.A.C. (1997). Official Methods of Analysis. 16th Ed., Association of Official Analytical Chemists. Arlington-Virginia.

Ashoush,I.S. and Gadallah,M.G.(2011). Utilization of mango peels and seed kernels powders as sources of phytochemicals in biscuit. World Journal of Dairy & Food Science, 6: 35-42.

Augustin, M.A. and Ling, E.T.(1987). Composition of mango seed Pertanika,10:53-59. kernel.

Aziz,N.A.,Wong,L. M., Bhat, R. and Cheng, L. H. (2012). Evaluation of processed green and ripe mango peel and pulp flours (*Mangifera indica var Chokanan*) in term of chemical composition, antioxidant compounds and functional properties. Journal of the Science of Food & Agriculture, 92, 557– 563.

Ball,G.F.(1988). Fat soluble vitamin assays in food analysis. London: Elsevier.

Berardini,N.,Knodler,M., Schieber,A. and Carle, R.(2005).Utilization of mango peels as a source of pectin and polyphenolics. Innov. Food Science Emerging Technolgy,6: 442-452.

Bloor,S.(2001). Overview of methods for analysis and identification of flavonoids. Methods in Enzymology,335: 3-14.

Bohm, V., Putpitasari-Nienaber, N.L., Ferruzzi, M.G. and Schwartz, S.J. (2002). Trolox equivalent antioxidant capacity of different geometrical isomers of α-carotene, β-carotene, lycopene and zeaxanthin. Journal of Agricultural & Food Chemistry, 50: 221–226.

Chauhan G.S., Zillman R.R. and Eskin N.A. (1992). Dough mixing and bread making properties of quinoa–wheat flour

blends.International Journal of Food Science Technology,27:701–705.

Chen, J.P., Tai, C.Y. and Chen, B.H. (2004). Improved liquid chromatographic method for determination of carotenoids in Taiwanese mango *(Mangifera indica L.).* Journal of Chromatogrphy A., 1054: 261-268.

Danster,N.,Wolmarans,P.,Buitendag,C.S. and Jager,A.(2008). Energy and nutrient composition of south african wheat, wheat flour and bread. Technical Report to the Winter Cereal Trust of South Africa.

Dhingra,S. and Kapoor, A.C.(1985). Nutritive value of mango seed kernel. Journal of the Science of Food & Agriculture 6: 752-756.

El-Soukkary,F.A.,EL-Sahn,M.A. and Mohamed,H.M.(2000). Physico- chemical and nutritional evaluation of mango seed kernel and its utilization for pan bread supplementation.Zagazig Journal of Agriculture & Research, 27: 1319-1342.

FAO/WHO(1985). Food Standards Program. Codex Alimentarius Commission, Geneva .Report of the 14th Session of the Codex Committee on Foods for Special Dietary Uses,Geneva.

FAO/WHO/UNU(1985). Energy and Protein Requirements Report of Joint FAO/WHO/UNU Expert Consulation World Health Organization ,Technical Report ,Series 724,WHO,Geneva.

Fowomola,M.A.(2010). Some nutrients and antinutrients contents of mango *(Magnifera indica L.*) seed. African Journal of Food Science,4(8):472 – 476.

Kahkonen ,M.P., Hopia ,A.I., Vuorela, J.H., Rauha ,J.P., Pihlaja ,K., Kujala, T.S. and Heinonen ,M. (1999). "Antioxidant activity of plant extracts containing phenolic compounds" Journal of Agriculture Food Chemistry, 47: 3954- 3962.

Kakali,B., Chaitali,C. and Sagarika,B. (2014). Fortification of Mango Peel and Kernel Powder in Cookies Formulation**.** Journal of Academia and Industrial Research (JAIR) 2(12):661- 664 .

Kim,Y.,Brecht,J.K. andTalcot,S.T. (2007). Antioxidant phytochemical and fruit quality changes in mango following hot water immersion and controlled atmosphere storage. Food Chemistry,105: 1327-1334.

Kimura, M. and Rodriguez-Amaya, D.B. (2004). Harvest plus handbook for carotenoids analysis, International food policy research Institute Washington, D.C., pp:2-54.

Koubala, B.B., Kansci, G., Garnier, C., Ralet, M.C. and Thibault, J.F. (2012). Mango (*Mangifera indica L.*) and Ambarella (*Spondias cytherea*) peel extracted pectins improve viscoelastic properties of derived jams. African Journal of Food, Agriculture, Nutrition and Development,12:6200-6212**.**

Lakshmi,M., Swarnali, D. and Usha, R. (2014). Mango (*Mangifera indica L.*) kernel flour as a potential ingredient in the development of composite flour bread. Indian Journal of Natural Products and Resources, 5: 75-82.

Larrauri ,J.A., Ruperez, P., Borroto ,B.and Saura,C, F, (1996). Mango peel as a new tropical fiber: preparation and characterization. Trends in Food Science Technology, 329:729-733.

Larrauri, J.A., Rupérez, P. and Saura-Calixto, F. (1997). Mango peel fibers with antioxidant activity. Z. Lebensm Unters Forsch A, 205: 39-42.

Lawrence,R.D.(1965). The diabetic life Journal & A . churchill , LTD . London.

Maisuthisakul, P. and Gordon, M.H. (2009). Antioxidant and tyrosinase inhibitory activity of mango seed kernel by product. Food Chemistry, 117: 332–341.

Mannay, S. and Shadaksharaswany, C. M. (2005). Foods: Facts and Principles. (2nd ed.). New Age International Ltd. Publishers. New Delhi, India.

Manthey, J. A. and Perkins-Veazie, P. (2009). Influences of harvest date and location on the levels of b-carotene, ascorbic acid, total phenols, the in vitro antioxidant capacity, and phenolic profiles of five commercial varieties of mango (*Mangifera indica L.*). Journal of Agricultural & Food Chemistry, 57: 10825–10830.

Melgarejo, P., Salazar, D. M., and Artes, F. (2000). Organic acids and sugars composition of harvested pomegranate fruits. European Food Research and Technology, 211(3), 185- 190**.**

Mervat, E.E. (2011). Evaluation of physico-chemical properties of toast breads fortified with pumpkin (*Cucurbita moschata*) flour**.** The

6th Arab and 3rd International Annual Scientific Conference , Specific Education ,Mansoura University, Egypt.

Mervat, M. M. , Hanan,E.F and Taie, A. A. (2009). Antioxidant activities , total anthrocynins, phenolics and flavonoids contents of some sweet potato genotypes under stress of different concentrations of sucrose and sorbitol.Australian Journal, Basic Applied Science, 3: 3609-3616.

Min ,S.Y., Yang, H., Seo ,S.G., Shin, S.H., Chung, M.Y., Kim, J., Lee ,S.J., Lee ,H.J. and Lee, K.W. (2013). Cocoa polyphenols suppress adipogenesis in vitro and obesity in vivo by targeting insulin receptor. International
Journal of Obesity, 37: 584-592.

Mudau ,F.N., Mabusela ,P.J.and Ngezimana, W. (2013). Proximate, chemical compositions and sulphur concentrations on quality of selected dried mango (*Mangifera indica L.*). African Journal of Biotechnology, 12: 2678-2684.

Noratto ,G.D., Bertoldi, M.C., Krenek, K.,Talcott,S.T., Stringheta, P.C., Mertens Talcott, S.U. (2010). Anticarcinogenic effects of polyphenolics from mango (*Mangifera indica L.*) varieties. Journal of Agriculture and Food Chemistry, 58: 4104-4112.

N.R.C.F.N. (1989). Recommended dietary allowances.National Research Council of Food and Nutrition.Board –National Academy of Science Review Washington, D.C.

Nunez-Selles (2005). Antioxidant therapy: myth or reality? Journal Brazilian Chemical Society, 16(4): 699-710**.**

Nzikou, J. M., Kimbonguila, A., Matos, L., Loumouamou, B., Pambou-Tobi, N. P., Ndangui, C. B., Abena, A. A., Silou, T.H., Scher, J. and Desobry, S. (2010). Extraction and characteristics of seed kernel oil from mango (*Mangifera indica L.*). Research Journal of Environmental & Earth Sciences, 2(1): 31-35.

Ojokoh, A.O .(2007). Effect of fermentation on the chemical composition of mango (*Mangifera indica L.*) peels. African Journal of Biotechnology, 6: 1979-1981.

Olson, J.A. and Krisky, N.I. (1995). The colorful, fascinating world of the carotenoids: Important physiological modulators, Federation

of American Societies for Experimental Biology Journal, 9: 1547-1550.

Ozkan, M. (2002). Degradation of anthocyanins in sour cherry and pomegranate juices by hydrogen peroxide in the presence of added ascorbic acid. Food Chemistry, 78(4), 499-504.

Parr, A.J. and Bolwell ,J.P. (2000). Phenols in the plant and in man. The potential for possible nutritional enhancement of the diet by modifying the phenol content or profile. Journal of Food Science Agriculture, 80: 985-1012.

Peterson, C.J.,Johnson,V.A. and Mattern,P.J.(1983). Evaluation of variation in mineral element concentration in wheat flour and bran of different cultivars. American Association of Creal Chemists.Inc.60 (6):450-455.

Potter, H. and Hotchkiss, I. (2006). Food Science (5th Edition). CBS Publishers and Distributors. New Delhi, India.

Puravankara, D., Bohgra, V. and Sharma, R. S. (2000). Effect of antioxidant principles isolated from mango (*Mangifera indica L*.) seed kernels on oxidative stability of buffalo ghee (butter-fat). Journal of the Science of Food & Agriculture, 80(4): 522-526.

Reddy, L.V., Reddy, O.V.S. and Wee, Y.J. (2011). Production of ethanol from mango (*Mangifera indica L.)* peel by *Saccharomyces cerevisiae* CFTRI101. African Journal of Biotechnology, 10: 4183-4189.

Ribeiro, S. M., Barbosa, L. C., Queiroz, J. H., Knodler, M. and Schieber, A. (2008). Phenolic compounds and antioxidant capacity of Brazilian mango (*Mangifera indica L*.) varieties. Food Chemistry, 110 (3):620-626.

Sanaz, Z., Sara, M., Hossein,A.C. and Ali, R.S. (2012) . Evaluation of sensory properties of toast breads containing banana powder. Indian Journal of Science & Technology 5 (8): 3163-3164.

Schieber, A., Ullrich ,W.and Carle ,R. (2000). Characterization of polyphenols in mango puree concentrates by HPLC with diode array and mass spectrometric detection. Innov. Food Science Emerging Technology, 1: 161-166.

Schiber, A., Berardini, N. and Carle, R. (2003). Identification of flavonol and xanthol glycosides from mango peels by HPLC. Journal of Agricultural and Food Chemistry, 51: 5006-5011.

Singleton,V.L., Orthofer, R.and Lamula-Ravento's, R.M.(1999). Analysis of total phenols and other oxidation substrates and antioxidants by means of Folin-Ciocalteu reagent . Methods in Enzymology, 299:152-178.

Soong, Y. and Barlow, P. J. (2004). Antioxidant activity and phenolic content of selected fruit seeds. Food Chemistry,88(3): 411-417.

Soong, Y. Y. and Barlow, P. J. (2006). Quantification of gallic acid and ellagic acid from longan (*Dimocarpus longan Lour*.) seed and mango (*Mangifera indica L*.) kernel and their effects on antioxidant activity. Food Chemistry,97(3): 524-530.

Souza, I.G., Valente ,S.E., Britto, F.B., de Souza ,V.A. and Lima, P.S. (2011). RAPD analysis of the genetic diversity of mango (*Mangifera indica L.)* germplasm in Brazil. Genetic Mol. Research, 10: 3080-3089.

Steel, R.G, and Torrie, J.H.(1980). Principles and Procedures of Statistics. 2nd Ed. (PP.120). McGraw-Hill, New York.

Taing, M.W., Pierson, J.T., Hoang,V.L., Shaw, P.N., Dietzgen,R.G., Gidley,M.J., Roberts,T.S. and Monteith ,G.R. (2012). Mango fruit peel and flesh extracts affect adipogenesis in 3T3-L1 cells. Food Function, 3: 828-836.

Varakumar, S., Naresh, K. and Reddy, O.V. (2011). Preparation of mango (*Mangifera indica L.)* wine using a new yeast mango peel immobilized biocatalyst system. Czech Journal of Food Science, 30: 557-566.

Watts, B.M., Ylimaki, L.E., Jeffery, L.E. and Elias, L.G. (1989). Basic Sensory Methods for Food Evaluation. IDRC, Canada.

Zarei, M., Azizi, M. and Bashiri-Sadr, Z. (2010). Studies on physico-chemical properties and bioactive compounds of six pomegranate cultivars grown in Iran. Journal of Food Technology, 8(3): 112–117.

Journal of Home Economics, Volume 24, Number (3), 2014

التقييم الغذائي لخبزالتوست المدعم بمسحوق قشور ونوى المانجو

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تم فى هذه الدراسة تقييم تأثير مسحوق قشور ونوى المانجو بنسب ٥ ,١٠ % على التركيب الكيميائى , محتوى المعادن ,محتوى السعرت الحرارية ،محتوى المواد الكيميائية النباتية ,الخصائص الحسية والطبيعية لخبزالتوست.ولقد أوضحت النتائج أن دقيق القمح كان أعلى محتوى فى الرطوبة والبروتين والكربوهيدرات ,بينما كانت قشور المانجو هى الأعلى فى المحتوى من الرماد والألياف الخام ,وكان نوى المانجو هو الأعلى فى المحتوى من الدهون. كان مسحوق قشور المانجو هو الأعلى فى غالبية المعادن وكذلك الكيماويات النباتية الطبيعية .ولقد لوحظ أن تدعيم خبزالتوست بمسحوق نوى المانجو أدى الى زيادة فى محتواه من الرطوبة .وقد زاد المحتوى من الرماد فى خبزالتوست المدعم بنسبة ١٠ % من مسحوق قشور المانجو وكذلك العينات الضابطة ,بينما قد سجل أقل قيمة فى خبزالتوست المدعم بمسحوق نوى المانجو بنسبة ٥ %.لوحظ أان استخدام مسحوق قشور المانجو فى اعداد خبزالتوست بنسب ٥ ,١٠% قد أدى الى زيادة المحتوى من الألياف الخام .ولقد لوحظت أعلى قيمة للسعرات الحرارية فى خبزالتوست المدعم بمسحوق نوى المانجو بنسبة ١٠% .وكان خبزالتوست المدعم بنسبة ١٠ % من مسحوق قشور المانجو هو الأغنى فى المحتوى من المعادن .وقد نتج عن التقييم الحسى أن العينات الضابطة كانت أفضل العينات فى جميع الخصائص العضوية الحسية,أما بالنسبة للخصائص الطبيعية,كانت العينات الضابطة أعلى قيمة فى حجم وارتفاع الرغيف والحجم النوعى ,بينما خبزالتوست المدعم بنسبة ١٠ % من مسحوق قشور المانجو كان الأقل فى المقاييس السابقة.وقد سجل خبز التوست المدعم بنسبة ١٠ % من مسحوق نوى المانجو أعلى قيمة فى وزن الرغيف . كانت أعلى قيمة للحجم النوعى فى العينات الضابطة.

الكلمات المفتاحية :خبزالتوست – التركيب الكيميائى - الكيماويات النباتية الطبيعية – التقييم الحسى والطبيعى