

ORIGINAL ARTICLES

Improvement the Nutritional Value of Especial Biscuits (Children School Meal) by Using Some Fruits and Vegetables.

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ABSTRACT

This study was carried out to produce high acceptable and nutritious especial sweet biscuits (children school meal) using some dried vegetables and fruits. Fresh fruits (kiwifruit and black mulberry) and vegetables (husk tomato and fennel) were analyzed for their gross chemical composition, amino acids profile, minerals and vitamins contents. Fruits and vegetables were dried and replaced instead of whole wheat flour at different ratios (10 and 15%) to produced the suggested especial biscuit. The effect of this replacement on the chemical composition, nutritive value and organoleptic properties of produced especial sweet biscuit were also investigated and compared with the commercial hard sweet biscuit (Marie). The obtained results showed that the dried fruits and vegetables powders were richness with the most determined protein, ether extract, ash and fiber, as well as they contained the most indispensable amino acids, also nutritious minerals, in addition it contained the most water and fat soluble vitamins at considerable high contents. The statistical analyses for sensory evaluation of biscuits formulas fortified with fruits and vegetables ascertained that they were get a high score acceptability when prepared with 15% of kiwifruit, black mulberry and husk tomato with 10% of fennel. Moreover, all produced special biscuit trials contained much higher contents of protein, ether extract, ash and fiber as compared with Marie biscuit. Furthermore, the suggested biscuits contained the majority indispensable amino acids at exceptionally high content, especially lysine, leucine, tryptophane and aromatic amino acids (phenylalanine & tyrosine), In addition, they are considered as a good source for many important elements such as Ca, Mg, P and Fe. Likewise, also they are a reasonable proportion of vitamins such as niacin, folate, B₁₂, vit. A, E and Das compared with Marie biscuit. The present results are recommended with that it should be directed toward the utilization of tested dried fruits and vegetables in production of new especial biscuit as good and available sources of such many nutrients which are to improve the nutritional quality of this product.

Key words: Fruits, Vegetables, Drying, Biscuit, Children school meal, Nutritional value, protein quality, vitamins

Introduction

Kiwifruit (*Actinidia deliciosa*) presents a high nutritional value, rich mainly in vitamin C, fibers, calcium, iron, phosphorus and antioxidant, which turn it into an excellent nutritional option, with an important association between quality attributes and flavor, with great acceptance in consuming markets, mainly among children (Carvalho and Lima, 2002). Abou-Tor *et al.* (2000) reported that moisture, crude protein, ether extract, ash, reducing sugars, non- reducing sugars, total sugar, crude fiber and acidity values of kiwi fruit were 82.33%, 10.5, 3.78, 4.86, 48.78, 6.90 55.68, 6.68, and 2.79% on dry weight basis; respectively.

Black mulberry (*Morus nigra*) contained relatively higher levels of ether extract, protein, and ash and slightly lower values of crude fiber and nitrogen free extract (Amin and Attia, 2003). In this concern, Mattuk (1998) showed that the moisture 79.59%, crude protein, ether extracts, ash, total sugar, reducing sugars, crude fiber and nitrogen free extract contents pf black mulberry fruits were 79.59, 1.94, 1.21, 1.08, 14.11, 13.92, 0.97 and 14.87%; respectively.

Husk tomato (*Physalis pubescens*) has significant anti-inflammatory such as cancer, malaria and asthma and antioxidant properties. Husk tomato is - An excellent high source of fiber, protein, vitamin C and good source of minerals (Wu *et al.*, 2007). In this rank, Brako (1993) reported that the moisture, crude protein, ether extract, ash, crude fibers, acidity, total sugars, reducing sugars and non-reducing sugars contents of Husk tomato fruit were 90.4-91.7%, 0.171-0. 70%, 0.60-0.76%, 0.60-0.69%, 0.60-1.70%, 0.84-1.89%, 5.97-6.21%, 3.16-3.28% and 2.81-2.96%, respectively.

Fennel (*Foeniculum vulgare Mill.*), belonging to the family Apiaceae, is a well-known aromatic plant species. Mature fruit and essential oil of fennel are used as flavoring agents in food products such as liqueurs,

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bread, pickles, pastries, and cheese. They are also used as a constituent of cosmetic and pharmaceutical products (Amine *et al.*, 2011).

Lillian *et al.*, (2010) found that the fennel shoots and leaves contained 73.88 and 76.36% moisture, 2.39 and 3.43% ash, 0.49 and 0.61% fat, 1.33 and 1.16% protein, 21.91 and 18.44% carbohydrates, 1.14 and 0.72% reducing sugars, 1.51 and 0.49% fructose, 4.71 and 0.76% glucose, 0.35 and 0.04% sucrose and 6.57 and 1.29% total sugars.

The dehydration or drying of foods is a complex phenomenon involving momentum, heat, and mass transfer processes. The reasons for drying are manifold but they ordinarily fall into one of the following categories: (1) to facilitate handling in further processing, (2) to permit satisfactory utilization of the final product, (3) to reduce shipping costs, (4) to increase the capacity of other equipment in the process and (5) to preserve a product during storage and shipment (Marshall and Friedman, 1950 and Sharma *et al.*, 2000).

The idea of integrating several foods in mixtures like biscuit would complement and mutually reinforce each other nutritionally, a balanced and efficient nutrient contents. In the same time, these mixtures should be palatable and acceptable from the consumer.

This study aimed to process some sorts of biscuit having a balanced nutritive value using natural ingredients dried fruits (kiwifruit and black mulberry) and vegetables (husk tomato and fennel) powders and some safe additives which could be consumed as primary school children meal.

Materials and Methods

Materials:

Kiwifruit (*Actinidia deliciosa*), Black mulberry (*Morus nigra*), Husk tomato (*Physalis pubescens*) and fennel plants (*Foeniculum vulgare*) were obtained from the Horticultural Research Institute, Agriculture Research Center, Giza, Egypt. All materials whole wheat flour, sugar, wheat germ, shortening (palm oil, having 30 IU of vitamin A and 30 IU of vitamin D /100g), grated coconut, fresh whole eggs, full cream milk powder, iodized table salt (Sodium chloride), active dry yeast powder and vanillin powder were purchased from local market. Defatted soybean flour was purchased from Soybean Plant of Food Technology Research Institute, Agriculture Research Center, Giza. Sodium bicarbonate and citric acid were purchased from El-Gamhouria Trading Chemicals and Drugs Company, Egypt. Dried carrot powder and chick pea powders were purchased from El-salam Company for Import and Export. Cinnamon and ginger were obtained from Harraz market, Cairo, Egypt.

Commercial biscuit (Marie) as a control was purchased from Bisco Miser Plant, Cairo, Egypt.

Packaging material (Polyethylene pouches) was provided from Nile Co., for Printing and Packing, 10th of Ramadan City, Egypt. Carton boxes were obtained from Egyptian Company for the Production of Cardboard Boxes (Fine back), Egypt.

Methods:

Preparation of fruits and vegetables powders:

Kiwifruit was peeled manually by using knife, and then sliced individually to slices with thickness about from 0.8 to 1 cm by using a conventional food slicing machine. Black mulberry was removed the shells and washed in tap water, and then cut by knife into halves. Meanwhile, the husk tomato was removed the external peel and washed, and then cut into halves by the same behavior method used in black mulberry, moreover the fennel plant (whole plant) was washed by the tap water, and then cut manually by using knife into a small parts. All fruits and vegetables prepared were placed in holed salvers, dried in an air oven provided with a motor fan, at 70 °C for 2 hr., and then dried at 55±C° (for approximately 16-18 hrs.) till its moisture content reached to ≤ 10 %. The dehydrated flakes of fruits and vegetables were ground by using a laboratory disc mill to pass through 20 mesh sieve (the same size of wheat flour to be blended).

Preparation of dried fruits and vegetables powders and wheat flour blends:

Whole flour used was replaced by 10 % individually of both dried fruits and vegetables powders, and 5% replacement of sugar when used the dried fruits and vegetables powders at 15% ratio. The produced flours and sugar blends are shown as indicated in Table (1).

Table 1: Blending ratio of both fruits and vegetables powders with whole wheat flour and sugar.

Flours and sugar blends											
Fruits powder, whole wheat flour and sugar blends						Vegetables powder, whole wheat flour and sugar blends					
Kiwifruit powder	Whole wheat flour	Sugar	Black mulberry powder	Whole wheat flour	Sugar	Husk tomato powder	Whole wheat flour	Sugar	Fennel powder	Whole wheat flour	Sugar
0	25	30	0	25	30	0	25	30	0	25	30
10	15	30	10	15	30	10	15	30	10	15	30
15	15	25	15	15	25	15	15	25	15	15	25

Processing of especial sweet biscuit:

The recipe for biscuit was altered by adding of both fruits and vegetables powder at ratio 10 and 15 %. The recipes of the biscuits are shown in Table (2).

Table 2: ingredient recipe of the processed special biscuit

Ingredients	Weight (g)	%
Whole wheat flour and sugar blend	550	55.0
Chick pea powder	20	2.0
Defatted soybean flour	40	4.0
Wheat germ flour	90	9.0
Dried carrot	10	1.0
Grated coconut	30	3.0
Shortening	60	6.0
Full cream milk powder	90	9.0
Fresh whole edible portions egg	50	5.0
Active dry yeast	20	2.0
Iodized table salt	5.0	0.5
Sodium bicarbonate	20	2.0
Citric acid	5.0	0.5
Vanillin	3.0	0.3
Cinnamon	3.0	0.3
Ginger	4.0	0.4

Especial sweet biscuit (meal for school children) was processed using manufacturing methods adapted by Dough and Bakery Department, Food Technology Research Institute, Agriculture Research Center, Giza Egypt.

The solid ingredients except fruits or vegetables and yeast were thoroughly mixed in a suitable pot. The fruits or vegetables were steeped for about one hour in a small amount of water for rehydration. The dry yeast was reactivated by about 10 g of sugar which had been taken from the weighed amount of sugar and dissolved in small amount of warmed water. After rehydration of dried fruits and vegetables and reactivation of yeast they were added with other liquid ingredients to the solid mixture in the pot and thoroughly kneaded until the produced dough became completely homogenous. The pot was covered and left for fermentation for about 30 min. Then, the dough was cut to form small round discs of about 3 mm. in diameter. Baking was carried out in a relatively hot oven (180-190°C) for 10-12 minutes. After cooling, every 10 baked biscuit discs were packaged in polyethylene pouch. Every 2 filled pouches were packaged in a carton box which was wrapped with a suitable polyethylene pouch.

Gross Chemical components, moisture, crude protein (Nx6.25), ether extract, ash, and crude fiber contents of fresh and dried fruits and vegetables powder, as well all biscuit tested samples were determined using the methods described of the AOAC (2005). The total carbohydrates was calculated by differences in all tested samples as followed: % carbohydrates = 100- the sum of (% crude protein + % fat + % ash + % crude fiber). Reducing and non-reducing sugars content was also determined according to the method of AOAC (2005) for all tested samples.

The amino acids composition of the investigated samples was determined using HPLC-Pico-Tag method according to the procedure of Cohen *et al.*, (1989).

Minerals (calcium, magnesium, iron, copper, and zinc) content was determined according to the method of AOAC (2005), using Atomic Absorption Spectrophotometer -Perkin Elmer, Model 5000, and Germany. Phosphorus was determined by spectrophotometer using molybdovanadate method according to AOAC (2005), while sodium and potassium contents were determined by Flame Photometer (CORNING 400, serial No. 4889.UK).

The total acidity (TA) was determined according to the method described by AOAC (2005). The TA value was analyzed in triplicate and expressed as citric acid equivalents.

The measurement of total phenolics (TPs) content was conducted according to the modified Folin–Ciocalteu colorimetric method (Rojas *et al.*, 2005). Each sample was measured at 760 nm using an UV/Vis spectrophotometer. Gallic acid was used as a standard, and results were expressed as gallic acid equivalents (GAE) per 100 g DM.

Vitamin A, vitamin E and vitamin D were determined by using high performance liquid chromatographic (HPLC) a 9012 multi solvent delivery system (Varian, Les Ulis, France), according to the methods described in the AOAC (2005).

Determination of vitamins B₁(Thiamin), B₂(riboflavin) contents of fresh and dried fruits and vegetables powder, as well all produced biscuit samples were determined by The standard fluorometric TRF method by using Fluorescence Spectrometer (Perkin-Elmer Corp., Norwalk, CT) according to the methods described in AOAC (2005). Meanwhile, Niacin, Folic acid, and cyanocobalamin (VB₁₂) contents were determined using High Performance Liquid Chromatography (HPLC) a 9012 multi solvent delivery system (Varian, Les Ulis, France), according to the method described in the AOAC (2005).

Sensory evaluation of prepared especial sweet biscuit:

A panel of ten members was asked to evaluate the quality of biscuits (made with dried fruits and vegetables powder) using a composite scoring test. The standard recipe which is processed from whole wheat flour (without dried fruits and vegetables powder) was used as the control. The tested biscuit samples were presented in a randomized order to the panelists to evaluate the appearance, color, taste, odor and crispness using a scale ranged from 9 as excellent to 1 as very poor. For statistical analysis, the original sensory panel data were transformed to a new scale as described by Baskar (1988).

Statistical analysis:

The results of organoleptic evaluation were statistically analyzed using computer statistical program according to the method of Snedecor and Cochran (1980).

Results and Discussion

1-The Nutritional Value of Fresh fruits and Vegetables Used in This Investigation:

a. Chemical composition of tested fresh fruits and vegetables used in this investigation:

The chemical composition of fresh fruits and vegetables used in this investigation are listed in Table (3), namely moisture, protein, lipid, ash, and carbohydrates (including reducing and non-reducing sugar, dietary fibers and other carbohydrates), also the total phenolic compounds as the health promoting phytochemicals, in addition the total acidity found in these investigated samples. It could be observed that the moisture content was ranged between 80.18 to 82.21% in all tested samples.

From the same Table, it could be also observed that the fruits and vegetables contained an adequate percentage of protein (on dry weight basis), especially in vegetables which was found to be as 13.23 and 16.07% of husk tomato and fennel; respectively, versus 10.16 and 9.98% of kiwifruit and black mulberry fruit; respectively. These results are in agreement with those obtained by Abou-Tor *et al.* (2000) and Zolfoghari *et al.* (2010).

As given in the previous data (Table 3), it could be observed that the ether extract and ash contents were found to be ranging from 3.78 to 6.51 and from 3.88 to 4.83% in kiwifruit and black mulberry; respectively, which were relatively near with than those found ranged between 5.81 to 6.54 and from 3.99 to 5.77% for the husk tomato and fennel; respectively. The present results for fat and ash contents of tested fruits (kiwifruit and mulberry) and vegetables (husk tomato and fennel) are relatively comparable with those obtained by Mattuk (1998); Amin and Attia (2003); Neva and Memnune (2008) and Gundogdu *et al.* (2011).

Regarding the reducing sugar content and total sugars, the black mulberry had higher values being which were found to be as 67.05 and 68.46 than those obtained from the kiwifruit (48.21 and 54.78%), husk tomato (11.09 and 37.97%) and fennel plant (39.82 and 41.20%); respectively.

From the former Table, it could be exhibited that the husk tomato had the higher content of phenolic compounds (mg/ 100g), which was represented about 90.91 (mg/ 100g), while the black mulberry had lower content of phenolic compounds (20.41 mg/ 100g). These results were agreed with those found by Abou-Gharbia and Abou-Tor (2001) and El-Sheikha *et al.* (2009).

Finally, as shown in Table (3), the total acidity (%) was 0.33% of mulberry fruit, which was lower than the corresponding values for kiwifruit (2.09%), husk tomato (1.23%) and fennel plant (1.89%), which are in

accordance with those reported by Abou-Gharbia and Abou-Tor (2001); Mahfouz and Sharaf-Eldin (2007), and Koudela and Petrikov (2008).

Table 3: Chemical composition of fresh fruits and vegetables used (on dry weight basis)

Component%	Fresh fruits and vegetables			
	Fruits		Vegetables	
	Kiwifruit	Mulberry	Husk tomato	Fennel
Moisture content %	82.21	80.18	81.25	80.50
Crude protein %	10.16	9.98	13.23	16.07
Ether extract %	3.78	6.51	5.81	6.54
Ash content %	4.83	3.88	3.99	5.77
Crude fiber %	6.69	5.09	6.03	9.85
Total carbohydrates %	74.54	74.54	70.94	61.77
Reducing sugars%	48.21	67.05	11.09	39.82
Non-reducing sugars%	6.57	1.41	26.88	1.38
Total sugars %	54.78	68.46	37.97	41.20
Phenolic substances (as gallic acid) mg/100g	50.80	20.41	90.91	38.38
Total acidity %	2.09	0.33	1.23	1.89

b. Amino acids composition of tested fresh fruits and vegetables (g/100g protein):

The nutritional protein quality of fresh fruits (kiwifruit and black mulberry) and vegetables (husk tomato and fennel plant) (g/100g protein) was evaluated according to their content of indispensable amino acids (IAAs), in comparison to the reference protein pattern of FAO/WHO (1973), as shown in Table (4).

Table 4: Amino acids composition of fresh fruits and vegetables (g/100g protein) on dry weight basis, compared with the reference protein pattern of FAO/WHO.

Amino acids	fresh fruits and vegetables				*FAO/WHO g/100g protein
	Fruits (g/100g protein)		Vegetables (g/100g protein)		
	Kiwifruit	Black mulberry	Husk tomato	Fennel	
⁺ I.A.As					
Lysine	4.83	6.18	2.49	6.29	5.5
Meth+ Cyst	1.39	2.01	1.32	8.47	3.5
Isoleucine	3.69	4.85	2.44	3.29	4.0
Leucine	5.89	8.96	3.79	6.38	7.0
Phen + Tyro	9.29	9.99	9.78	4.42	6.0
Therionine	4.83	5.30	3.99	4.31	4.0
Tryptophane	3.20	0.50	1.41	0.35	1.0
Valine	2.15	6.44	4.46	4.81	5.0
Total I.A.As	35.27	44.32	29.68	38.32	36.0
⁺⁺ D.A.As					
Histidine	2.16	4.01	1.56	2.28	
Aspartic	8.87	10.26	19.36	1.11	
Glutamic	8.55	10.94	23.00	6.19	
Serine	4.11	4.85	1.99	10.38	
Glycine	3.53	4.66	1.28	9.28	
Arginine	5.81	6.35	12.33	8.36	
Alanine	7.69	7.90	3.70	10.19	
Proline	4.77	5.63	6.58	8.19	
Total D.A.As	45.49	54.60	69.70	55.98	

*FAO/WHO (1973) ⁺I.A.As: indispensable amino acids ⁺⁺D.A.As: Dispensable amino acids

Meth+ Cyst: Methionine+Cystine(amino acids containing sulfur)

Phen + Tyro: Phenylalanine + Tyrosine(aromatic amino acids).

From the obtained data in Table (4), it could be observed that the black mulberry had the higher exceptionally contents of indispensable amino acids (IAAs); especially in lysine, isoleucine, leucine, aromatic amino acids (Phenylalanine & tyrosine), therionine and valine than the other tested samples. Thereby, the amino acid score for these IAAs was higher than those of the reference protein pattern. On the other hand, the fennel plant was contained a higher amounts of IAAs after the black mulberry, especially, in lysine, amino acids-containing sulfur (Methionine & cystine) and therionine than the reference protein pattern, also it was contained the adequate amounts of leucine and therionine, nearly to the amount of these amino acids reported in the reference protein pattern. Furthermore, the aromatic amino acids (Phenylalanine & tyrosine) and therionine were found in considerable amounts of kiwifruit sample, in addition the kiwifruit was also containing appropriate amounts of lysine, isoleucine and leucine as indispensable amino acids. Moreover, the husk tomato contained a higher amounts of the aromatic amino acids (Phenylalanine & tyrosine) when compared with the

reference protein pattern, and also it was contained the adequate amounts of threonine and valine, which nearly with the corresponding amino acids in the reference protein pattern.

As also given in Table (4), aspartic acid, glutamic acid and alanine were the predominant dispensable amino acids (DAAs), while the minor were arginine and proline found in both kiwifruit and black mulberry. Meanwhile, the major dispensable amino acids found in husk tomato were aspartic acid, glutamic acid and arginine, but proline was the minor DAAs. In addition, serine, alanine and glycine were the predominant, also, arginine proline and glutamic acid were the minor dispensable amino acids found in the fennel plant. The amino acids composition of kiwifruit, black mulberry, husk tomato and fennel was also investigated by Ciardiello *et al.* (2008); Sezai and Emine (2008); Oshchepkova *et al.* (2009) and Wang *et al.* (2009). Their results were relatively comparable with the present data.

In this concern, it is worth to mention that black mulberry is considered good source of indispensable amino acids (essential amino acids), as it contained higher values of the most IAAs (lysine, isoleucine, leucine, aromatic amino acids (Phenylalanine & tyrosine), threonine and valine) as compared with that reported in the reference protein pattern and with the other tested samples, while kiwifruit, husk tomato and fennel containing the higher amounts of some IAAs, but they were the adequate amounts of the other indispensable amino acids, nearly to that found in the reference protein pattern of FAO/WHO (1973)

C. Minerals content of tested fresh fruits and vegetables:

The nutritional quality of fruits and vegetables with regards their minerals (macro and micro-elements) content was evaluated and the obtained results were recorded in Table (5).

Table 5: Minerals content of fresh fruits and vegetables (mg/100 dry weight)

Varieties	fresh fruits and vegetables			
	fruits		vegetables	
Components (mg/100g)	Kiwifruit	Black mulberry	Husk tomato	Fennel
Sodium (Na)	140.00	86.73	165.23	145.33
Calcium (Ca)	569.19	278.46	384.16	882.05
Potassium (K)	1266.72	1039.15	1103.47	801.85
Magnesium (Mg)	252.33	151.65	136.32	208.51
Phosphorus (P)	200.00	333.65	106.61	827.89
Iron (Fe)	10.58	15.09	10.03	21.54
Copper (Cu)	0.18	1.36	2.44	0.18
Zinc (Zn)	0.11	2.12	0.99	0.50
Manganese (Mn)	0.07	0.106	0.01	0.47

As shown in the obtained results of Table (5), potassium was the major of macro-elements in fruits and vegetables samples, it was represented about 1266.72 and 1039.15 mg/ 100 g (dry matter) in kiwifruit and black mulberry; respectively, nearly of the corresponding indices of those found in husk tomato sample (1103.47 mg/ 100 g), but the fennel plant had the lower value (801.05) mg/100g dry matter of potassium content.

The same previous data (Table 5) also indicated that fruits and vegetables samples contained a higher amount (mg/100g dry matter) of macro-elements such as calcium, magnesium, and sodium. Fennel plant had the higher amount (882.05 mg/ 100 g), of calcium content, followed by kiwifruit (569.19 mg/ 100 g). On the other hand, kiwifruit had the higher amount of magnesium, which was represented about 252.33 (mg/ 100 g), followed by Fennel plant which found to be as 208.51 (mg/ 100 g), while the lowest amount of magnesium content was found in husk tomato (136.32 mg/ 100 g), followed by the black mulberry, it was accounted about 151.65 (mg/ 100 g). Furthermore, the black mulberry had the lowest value of sodium content (86.73 mg/ 100 g), meanwhile sodium content was found ranged between 140 to 165.23 65 (mg/ 100 g) in other tested samples. The above mentioned data are in accordance with those reported by Cantweel (2000); Amin and Attia (2003); Sezai and Emine (2008), and Ozcan *et al.* (2008).

Concerning the phosphorus content, which is considered one of the most important of minerals, was found in a considerable much higher amount of fennel plant than those found in other tested samples, which was found to be as 827.89 (mg/ 100 g). Moreover, the black mulberry contained the adequate amount of phosphorus, which represented about 333.65 (mg/ 100 g), followed by kiwifruit which was found to be as 200 (mg/ 100 g), while the lowest amount of phosphorus was found in husk tomato (106.61 mg/ 100 g). These results are in accordance with those found by Abou-Gharbia and Abou-Tor (2001); Ercisli and Orhan (2007); Ozcan *et al.* (2008) and Zolfoghari *et al.* (2010).

From the same data (Table 5), it could be noticed that the iron was the most predominant of micro-elements found in all tested samples, which is one of the most important minerals for the healthy promoting that are found in foods which contributing to the formation of red blood cells, fennel plant had the higher amount of iron content than those found in the other tested samples, which was found to be as 21.54 (mg/ 100 g), followed by black mulberry (15.09 mg/ 100 g). While the iron content was found ranged from 10.03 to 10.58 (mg/ 100 g) in

husk tomato and kiwifruit; respectively. On the other hand, the copper was found in a higher amount in husk tomato (2.44 mg/ 100 g), followed by black mulberry, it was found to be 1.36 (mg/ 100 g). In addition, black mulberry contained a considerable amount of zinc content (2.12 mg/ 100 g), which was a higher amount than that found in other tested samples. Meanwhile, Manganese content of fennel plant was found to be more in other tested samples. The present results are in agreement with those obtained by Cantweel (2000); Amin and Attia (2003); Sezai and Emine (2008), and Ozcan *et al.*, (2008).

From the above discussion, it could be showed that the tested fruits and vegetables, in general, characterized with its richness with the most tested macro and micro elements, generally, the kiwifruit contained a considerable amounts of K, Ca and Mg, also it was adequate amounts of P and Fe. On the other hand, the black mulberry was rich in Fe, P, Zn, Cu and K, in addition it was contained adequate amount of Mn. Furthermore, husk tomato characterized with it richness with K, Cu and Zn, while Na, Fe and Ca were found in an appropriate amounts. Finally, the fennel plant (herb) contained an exceptionally amounts of Ca, Fe and P, also it was contained an adequate amounts of Mg, Zn and Mn. Thereupon, all fruits and vegetables may be considered as a good sources of the macro and micro-elements, and therefore they should be utilized in food fortification.

d. Vitamins content of tested fresh fruits and vegetables:

Data of vitamins content of fresh fruits (kiwifruit & black mulberry) and vegetables (husk tomato & fennel) are presented in Table (6). The obtained results indicated that the most of water soluble vitamins of group B found in all tested samples were thiamin, riboflavin, niacin, folic acid and V.B₁₂.

As illustrated in Table (6), thiamin (Vit. B₁) was found in a higher amount in all tested sample than that reported in the reference RDA of vitamins, except in black mulberry which contained a lower amount (0.3mg/100g) to the corresponding value in the RDA of thiamin (1.0-1.2 mg/day), while it was presented 4.68, 6.44 and 4.0mg/100g in kiwifruit, husk tomato and fennel; respectively. On the other, the kiwifruit had a higher amount (3.08mg/100g) of riboflavin (B₂), followed by husk tomato (2.06mg/100g), while the black mulberry contained a lower amount (0.40mg/100g) of vitamin. From this result it could be noticed that kiwifruit, husk tomato and fennel had higher amount than those reported for the corresponding vitamin in RDA; especially in kiwifruit which was more 2 fold than the requirement of riboflavin (B₂). Regarding the niacin content, kiwifruit had the highest content (18.34 mg/100g) of vitamin than those found in other tested samples which was higher more ten times than that found in other samples, also the amount of this vitamin in kiwifruit had a much higher than RDA. The above mentioned data are in accordance with those obtained by Ercisli and Orhan (2007); Barros *et al.* (2009); El-Sheikha, *et al.* (2009) and Harder *et al.* (2009).

Folate and B₁₂ are necessary for normal RBC formation, tissue and cellular repair, and DNA synthesis. B₁₂ is also important for nerve health, while folate is necessary for cell division such as is seen in a fetus during pregnancy. A deficiency in either B₁₂ or folate can lead to macrocytic anemia (Quinlivan *et al.*, 2002). Folate and Vit. B₁₂ in tested fruits and vegetables are recorded in Table (6).

From the obtained data, it could be concluded that the husk tomato had the highest amount of folic acid (596.59µg/100g), followed by fennel (148.10µg/100g), the amount of this vitamin in husk tomato is a considerable more 2fold than that reported in RDA requirements, also, the fennel contained the adequate amount which within the limit of recommended vitamin in RDA. While the fennel, had highest amount of Vit. B₁₂ (1.44µg/100g), followed by husk tomato (1.33µg/100g), these amounts of Vit. B₁₂ found in both fennel and husk tomato had the higher than those recommended amounts of vitamin in RDA. Meanwhile, the lowest amounts of folic acid found in kiwifruit, which was presented 11.60 µg/100g, in addition, the lowest amounts of Vit. B₁₂ found in black mulberry, which was found to be as 0.56 (µg/100g). These results are in accordance with those obtained by Ercisli and Orhan (2007); Barros *et al.* (2009); El-Sheikha, *et al.* (2009) and Harder *et al.* (2009).

Table 6: Vitamins content of tested fresh fruits and vegetables .

Varieties	fresh fruits and vegetables				*RDA of vitamins for children (7-10 years)
	fruits		vegetables		
Vitamins	Kiwifruit	Black mulberry	Husk tomato	Fennel	
Water Soluble Vitamins					
Thiamin mg/100g	4.68	0.30	4.66	4.00	1.0-1.2 mg/day
Riboflavin mg/100g	3.08	0.40	2.06	1.44	1.2 mg/day
Niacin mg/100g	18.34	0.65	0.89	1.68	13-16 mg/day
Folic acid µg/100g	11.60	14.13	596.59	148.10	100-300 µg/day
V.B ₁₂ µg /100g	0.84	0.56	1.33	1.44	1.2-1.4 µg/day
Fat Soluble Vitamins					
V.A µg/100g	192.58	8.32	46.40	14.87	400 µg/day
V.E mg/100g	6.52	0.43	0.62	0.47	7 mg/day
V.D µg/100g	0.67	0.30	11.64	0.46	5 µg/day

*Recommended Dietary Allowance of vitamins reported by Food and Nutrition Board (1989)

Three of fat soluble vitamins were determined in all tested samples namely Vit. A, Vit. E and Vit. D. From the obtained data (Table 6), it could be observed that the kiwifruit had a much higher amount of Vit. A than those found in other tested samples, which was represented about 192.58 $\mu\text{g}/100\text{g}$, while the lowest amount found in black mulberry (8.32 $\mu\text{g}/100\text{g}$). Furthermore, Vit.E was found to be 6.25 mg/100g in kiwifruit, but it was found ranging between 0.43 and 0.62 mg/100g in the other tested samples. From this result, it could be observed that the fennel plant was contained the appropriate amount nearly to the corresponding value in RDA of vit. E. Moreover, the husk tomato had the higher amount of vit D than those found in the other tested samples, which represented 11.64 $\mu\text{g}/100\text{g}$ in husk tomato, while ranged from 0.30 to 0.67 $\mu\text{g}/100\text{g}$ in other tested samples. Also, the amount of this vitamin in the husk tomato had higher amount than that given in the reference RDA. The present data are in agreement with those obtained by Ercisli and Orhan (2007); Wu *et al.* (2007); Koudela and Petrikova (2008) and Tavarini *et al.* (2008).

e. Sensory evaluation of especial sweet biscuit produced by using different replacement levels of dried fruits and vegetables with whole wheat flour:

The organoleptic quality properties of especially sweet biscuit are greatly affected by the ingredients used in processing treatments. Therefore, the organoleptic quality properties (taste, color, odor, texture and appearance) of especially sweet biscuit containing different levels of tested dried fruits and vegetables powder were evaluated; the obtained data are presented in Table (7).

From the obtained data (Table 7), it could be exhibited that there was significant differences between the trials containing 10% of kiwifruit, black mulberry and husk tomato, and also the trial containing 15% of fennel for all tested organoleptic properties as compared to the control sample, whereas the total score of organoleptic qualities was 33.8, 34.0 and 33.9 for kiwifruit, black mulberry and husk tomato at replacement level at 15%, and also it was 36.9 for the trial with fennel at 15 % level as compared with the control sample (40.2).

In addition, from the statistical analysis of the above mentioned data that it should be noted no significant differences were noticed in all organoleptic properties at levels 15% of kiwifruit, black mulberry and husk tomato, and also in trial containing 10% of fennel when compared with the control sample. Whereas, these replacement of whole wheat flour by all dried fruits and vegetables at level 15%, except the trial containing 10 % of fennel resulted in an increase in the total score of organoleptic qualities, except the trial containing kiwifruit, which nearly with the total score of the control sample.

In general, it could be showed that the especial sweet biscuit trials containing the dried fruits and vegetables powder exhibited a good sensory properties and better acceptability when compared with the control sample, especially with the replacement level of 15 % of kiwifruit, black mulberry and husk tomato, as well as with the replacement level of 10%. Meanwhile, the other trials recorded lower scores as compared with the control sample. So, the best replacement levels from dried fruits and vegetables giving the best sensory quality and better acceptability into the produced special biscuits were applied to investigate the impact of these treatments on the nutritional value of produced special biscuit trials regards their chemical composition, nutritional protein quality and their contents from minerals and vitamins.

The especial sweet biscuit made by partially replacement of whole wheat flour and sugars of dried kiwifruit, black mulberry, husk tomato at 15% level and fennel with 10% level as substitute of could be improved their nutritional quality with regards with regards the indispensable amino acids, minerals and vitamins contents.

Finally from the previous discussion, it can be cleared that the all formulae used in this investigation by using whole wheat flour or partial replacement with either dried fruits or vegetables powder led to produce a product like biscuits can be used instead of a commercial hard sweet biscuit (such as Marie) for feeding, of school children, as it contains a high content of protein, that containing a considerable amounts of the indispensable amino acids, as well as of the minerals and vitamins necessary for the healthy promoting.

3.The Nutritional Value of Produced Especial Sweet Biscuit Trials Containing the Tested Dried Fruits and Vegetables , as Compared with Commercial Sweet Biscuit:

a.The chemical composition of produced especial sweet biscuit:

As shown in Table (8), there were considerable alterations in the protein, fat, ash and fiber contents observed in all tested samples, as compared with the commercial hard sweet biscuit (Marie).

Whereas, the protein, fat, ash and fiber contents of especial biscuit trials with whole wheat flour and dried fruits, and vegetables were found to be ranging between 14.52 to 15.34; 14.66 to 15.49; 2.63 to 3.20 and 1.46 to 2.18 %; respectively, as compared with Marie biscuit which contained 8.32, 8.85, 0.72 and 0.33% of the corresponding components respectively.

From the same data in Table (8), it could be also observed that the caloric value (Kcal.) in all tested biscuit samples (with whole wheat flour and dried fruits and vegetables powder) was the much higher values which ranged between 454.02 to 457.89 Kcal than those found in commercial hard sweet biscuit (441.32 Kcal). In the contrary, the total sugar and carbohydrates content were found in higher amounts in Marie biscuit which were presented 63.25 and 82.08% ; respectively, than those found in other tested samples which were ranging from 36.62 to 42.79 and from 64.16 to 66.73% ; respectively

From the former data, it could be observed that biscuit made with tested dried fruits and vegetables had the higher contents of protein, fat, ash and fiber contents, and total sugar than those found in biscuit made with whole wheat flour, meanwhile the caloric value in biscuit made with whole wheat flour was approximate nearly to that found in the other treatments.

Table 7: Means of the organoleptic evaluation of especial sweet biscuit produced by using different replacement levels of dried fruits and vegetables with whole wheat flour.

Properties	Biscuit produced								
	Whole wheat flour (Control)	dried fruits and vegetables powder replacement percent added to wheat flour							
		Dried fruits powder				Dried vegetables powder			
		Kiwifruit		Black mulberry		Husk tomato		Fennel	
	10%	15%	10%	15%	10%	15%	10%	15%	
Taste	8.7±0.67 ^{ab}	7.0±0.84 ^d	7.9±0.88 ^b	6.6±0.84 ^d	8.7±0.67 ^a	7.0±0.47 ^{de}	8.0±0.82 ^{bc}	9.1±0.5 ^{7a}	6.5±0.48 ^d
Color	8.1±0.71 ^{ab}	6.9±1.10 ^{de}	7.4±0.84 ^{bc}	6.7±0.82 ^{de}	8.0±0.82 ^{bc}	6.8±0.97 ^d	8.4±0.70 ^{ab}	9.0±0.4 ^{7a}	7.2±0.92 ^d
Odor	7.0±1.15 ^{bc}	6.3±1.06 ^d	8.2±0.42 ^{ab}	6.9±1.10 ^d	8.6±0.52 ^a	6.8±0.92 ^d	8.2±0.79 ^{ab}	8.9±0.7 ^{4a}	7.0 ^d ±0.7 ⁰
Texture	8.0±0.67 ^{bc}	6.8±1.03 ^d	7.9±0.74 ^b	6.9±0.82 ^d	8.0±0.67 ^b	6.6±0.52 ^{bc}	8.6±0.52 ^{ab}	9.1±0.5 ^{7a}	8.1±0.42 ^a
Appearance	8.4±0.52 ^{ab}	6.8±0.42 ^{bc}	8.2±0.42 ^{ab}	6.9±0.99 ^{bc}	8.5±0.53 ^a	6.7±0.52 ^d	8.5±0.53 ^{ab}	9.8±0.4 ^{2a}	7.1±0.74 ^{bc}
Total scores	40.2	33.8	39.6	34.0	41.8	33.9	41.7	45.9	36.9

L.S.D (at 5%): Least significant difference; the means in the same column having different superscripts are significantly varied.

Table 8: The chemical composition of especial sweet biscuit containing the tested dried fruits and vegetables, as compared with the commercial sweet biscuit:

Properties (%)	Commercial hard sweet biscuit (Marie)	Biscuit produced				
		Whole wheat flour	Replacement level with dried fruits and vegetables			
			Dried fruits powder		Dried vegetables powder	
		Kiwifruit 15%	Black mulberry 15%	Husk tomato 15%	Fennel 10%	
Moisture content %	3.55	3.43	4.18	3.89	3.98	3.21
Crude protein %	8.32	14.52	14.89	14.88	15.34	14.92
Ether extract %	8.85	14.66	15.10	15.49	15.39	15.16
Ash content %	0.72	2.63	3.20	3.00	3.07	3.04
Crude fiber %	0.33	1.46	2.14	1.89	2.04	2.18
*Total carbohydrates%	82.08	66.73	64.67	64.74	64.16	64.70
Reducing sugars%	2.35	5.50	11.70	14.10	6.50	9.40
Non-reducing sugars%	23.28	31.12	28.79	28.69	31.45	31.95
Total sugars %	63.25	36.62	40.49	42.79	37.95	41.35
Caloric value (Kcal.)	441.32	456.94	454.02	457.89	456.51	454.92

From the previous discussion, it could be concluded that all proposed formulas were much higher in protein, fat, ash and fiber contents, as well as the caloric value when compared to the components of the commercial biscuit (Marie). Moreover, when the whole wheat flour replaced partially by the dried fruits and vegetables powder, it has also led to a rise in the content of all components, in the produced biscuit trials.

b. The trititional protein quality of produced especial sweet biscuit:

The nutritisnal protein quality of biscuit trials produced by using different replacement levels of whole wheat flour with dried fruits and vegetables, as compared with the commercial sweet biscuit (Marie) was determined according to their content of indispensable amino acids (IAAs), also in comparison to the reference protein pattern of FAO/WHO(1973), as given in Table (9).

From the obtained results, (Table 9) it could be illustrated that there was on increasing pattern in the contents of the most indispensable amino acids such as lysine was noticed (which are usually deficient in the

most cereal products), leucine, aromatic amino acids (Phenylalanine & tyrosine) and tryptophane in produced biscuit trials containing dried fruits and vegetables more than the corresponding amino acids found in Marie biscuit, whereas the aromatic amino acids (Phenylalanine & tyrosine) were found in a much higher content, approximately two times or more, which ranged between 9.37 to 10.36 (mg/100g protein) in tested biscuits containing dried fruits and vegetables, than those found in either Marie biscuit (4.66 mg/100g protein), or the reference protein pattern. On the other hand; lysine, leucine, isoleucine and tryptophane were found ranging from 4.29 to 5.09, 6.67 to 7.04, 4.11 to 4.31 and from 1.57 to 2.11 in tested biscuits with dried fruits and vegetables, versus to 3.80, 6.5, 4.06 and 0.41(mg/100g protein) found in Marie biscuit; respectively.

As illustrated in Table (9), it could be also observed that all indispensable amino acids in produced biscuits with dried fruits and vegetables were found to be higher amounts when compared with the biscuit made by whole wheat flour, except leucine which was found in contrary a lower amount.

In addition, there was a slightly difference in amino acids-containing sulfur (Methionine & cystine), thionine and valine contents in tested biscuits containing dried fruits and vegetables, when compared with biscuit made by whole wheat flour and Marie biscuit.

From the above discussed data, it could be concluded that the addition of dried fruits and vegetables powder into the sweet biscuit formula could be improved the protein quality of such biscuit and may be take part in partial providing children and adults consuming biscuit with their daily requirements of the indispensable amino acids which are deficient in the most cereal products.

Table 9: Amino acids composition of produced especial sweet biscuit (g/100g protein) by using different replacement levels of dried fruits and vegetables with whole wheat flour, compared with the commercial sweet biscuit and the reference protein pattern of FAO/WHO.

Amino acids	Commercial hard sweet biscuit (Marie)	Produced Biscuit trials				*FAO/WHO g/100g protein	
		Whole wheat flour (Control)	Replacement level with dried fruits and vegetables		Dried vegetables powder		
			Dried fruits powder				
			Kiwifruit (15%)	Black mulberry (15%)	Husk tomato (15%)	Fennel (10%)	
[†] I.A.As							
Lysine	3.80	3.72	4.29	4.38	5.09	4.77	5.5
Meth+ Cyst	3.12	3.31	3.27	3.35	4.26	3.36	3.5
Isoleucine	4.06	4.60	4.23	4.19	4.31	4.11	4.0
Leucine	6.50	7.77	6.67	7.04	6.90	6.89	7.0
Phen + Tyro	4.66	8.02	9.37	9.57	10.36	9.41	6.0
Therionine	3.86	2.08	2.24	3.11	3.12	3.50	4.0
Tryptophane	0.41	1.57	1.65	1.79	2.11	1.61	1.0
Valine	4.29	4.18	4.28	4.67	4.46	4.82	5.0
Total I.A.As	30.70	35.25	36.00	38.10	40.61	38.47	36.0
^{**} D.A.As							
Histidine	4.47	2.29	4.64	2.41	3.14	3.27	
Aspartic	8.84	6.92	7.86	7.32	8.18	4.86	
Glutamic	25.20	30.13	27.67	30.18	26.41	28.24	
Serine	5.53	5.36	5.28	4.26	5.29	5.24	
Glycine	4.11	2.44	3.54	2.46	2.11	3.96	
Arginine	3.33	3.18	2.08	2.38	2.44	2.98	
Alanine	4.61	2.68	2.39	2.19	2.62	2.57	
Proline	11.0	10.11	9.29	8.89	8.16	9.86	
Total D.A.As	67.09	63.11	62.75	60.09	58.35	60.98	

*FAO/WHO (1973) [†]I.A.As: indispensable amino acids ^{**}D.A.As: Dispensable amino acids

Meth+ Cyst: Methionine + Cystine(amino acids containing sulfur)Phen + Tyro: Phenylalanine + Tyrosine(aromatic amino acids).

C. The Minerals content of produced especial sweet biscuit:

The Minerals content of produced especial sweet biscuit trials containing the tested dried fruits and vegetables, compared with the control trail and the commercial sweet biscuit, was determined and the obtained data was recorded as in Table (10)

From the obtained results (table 10), it could be noticed that there were a wide difference between all macro and micro-elements of suggested special biscuit trials made whether with whole wheat flour and/or with the dried fruits and vegetables, and the commercial hard sweet biscuit (Marie), especially Ca, P, Mg, Fe, K and Na. With regard the macro-elements such as Ca and P, which having the important role for the healthy promoting, found in the produced special biscuit trials at 2 fold or more of that found in the between 222 to 298 and from 298 to 516 mg/100g on dry weight basis; respectively, than those. Also, Na, K and Mg of biscuit made with dried fruits and vegetables were found to be considerable amounts which presented between 369- 428, 479- 582 and 149- 204 mg/100g, versus 203, 155 and 25 mg/100g for Marie biscuit; respectively.

The obtained data of Table (10) also evident that the Fe content, which is considered one of the most important of minerals (micro-elements), of biscuit made with dried fruits and vegetables was markedly (5.99 to 7.26 mg/100g) than that obtained in Marie biscuit (1.6mg/100g). On the other hand, the other micro-elements such as Cu, Zn and Mn in biscuit made with dried fruits and vegetables was found to be slightly more than that in Marie biscuit, except Mn content in biscuit made with black mulberry powder.

Table 10: Minerals content (mg/100g dry matter) of produced especial sweet biscuit by dried fruits and vegetables, as compared with the commercial sweet biscuit:

Elements (mg/100g)	Commercial hard sweet biscuit (Marie)	Biscuit produced				
		Whole wheat flour	Replacement level with dried fruits and vegetables			
			Dried fruits powder		Dried vegetables powder	
			Kiwifruit 15%	Black mulberry 15%	Husk tomato 15%	Fennel 10%
Sodium (Na)	203	309	369	342	428	379
Calcium (Ca)	95	222	235	201	225	298
Potassium (K)	155	383	582	462	479	483
Magnesium (Mg)	25	118	204	155	149	184
Phosphorus (P)	106	409	313	339	298	516
Iron (Fe)	1.60	5.15	6.18	6.35	5.99	7.26
Copper (Cu)	0.12	0.19	0.15	0.16	0.17	0.15
Zinc (Zn)	0.70	0.77	0.74	0.85	0.81	0.79
Manganese (Mn)	0.64	0.75	0.73	0.59	0.66	0.81

The same previous data (Table 10) also indicated that the biscuit made with dried fruits and vegetables contained higher amounts of macro and micro-elements, especially Na, K, Mg and Fe than that found in suggested biscuit made with whole wheat flour. In addition, Ca was also found in a higher content in biscuit made with dried fruits and vegetables more than in biscuit made by whole wheat flour.

As the present discussion, it could be concluded that there was a high exceptional rise in minerals content whether macro or micro elements, especially Ca, Mg, P and Fe, which are considered the most important minerals needed for the healthy promoting, in all tested biscuit trials with dried fruits (kiwifruit and black mulberry) and vegetables (husk tomato and fennel). The high contents of these minerals may be due to the presence of the most tested minerals in abundance in both dried fruits and vegetables. From the above mention, it could be concluded that the addition of dried fruits and vegetables to sweet biscuit could be improved the mineral quality of such biscuit and may be take part in partial providing children and adults consuming biscuit, and therefore it should be utilized in bakery products.

d. Vitamins content of produced especial sweet biscuit:

Data of vitamins content of especial sweet biscuit produced by using the replacement whole wheat flour of dried fruits and vegetables with, as compared with the commercial sweet biscuit (Marie) are presented in table (11).

Table 11: Vitamins content of produced especial sweet biscuit containing the tested dried fruits and vegetables with whole wheat flour, as compared with the commercial sweet biscuit:

Vitamins	Commercial hard sweet biscuit (Marie)	Biscuit produced				
		Whole wheat flour	Replacement level with dried fruits and vegetables			
			Dried fruits powder		Dried vegetables powder	
			Kiwifruit 15%	Black mulberry 15%	Husk tomato 15%	Fennel 10%
Water Soluble Vitamins						
Thiamin mg/100g	0.09	0.49	0.63	0.36	0.69	0.58
Riboflavin mg/100g	0.14	0.79	0.78	0.52	0.56	0.49
Niacin mg/100g	1.12	4.54	6.36	4.19	4.21	4.41
Folic acid µg/100g	49.31	96.19	95.81	98.21	139.29	121.12
V.B ₁₂ µg/100g	0.10	0.24	0.16	0.21	0.45	0.48
Fat Soluble vitamins						
Vit.A µg/100g	10.5	125.7	268.3	158.7	162.9	176.5
Vit.E mg/100g	0.33	0.71	1.76	1.45	1.61	1.54
Vit.D µg/100g	1.66	5.93	6.15	5.98	8.24	6.08

From the obtained results (Table 11), it could be concluded that the determined water soluble vitamins; thiamin, riboflavin, niacin, Vit.B₁₂ and folic acid were found in all tested biscuit trials. Thiamin (Vit.B₁), riboflavin (Vit.B₂) and niacin (Vit.B₃) were found in higher amounts of biscuit made with dried fruits and vegetables than those found in the commercial biscuit (Marie). In addition, the replacement of whole wheat

flour by dried fruits and vegetables powder in biscuit formula led to increase the amounts of their vitamins, especially in Vit.B₃. On the other hand, the Vit.B₁ was the highest amount in biscuit with husk tomato, while Vit.B₂ was found in a higher amount in biscuit with kiwifruit, moreover biscuit with black mulberry contained Vit.B₃ in a higher amount than that found in the other tested samples, which was represented about 6.36 mg/100g.

The obtained results (Table 11) showed that all tested biscuit trials made with dried fruits and vegetables, and also biscuit trial made with whole wheat flour had much superior amounts of folic acid and vit.B₁₂ than those obtained in Marie biscuit. In addition, the incorporation of dried vegetables in tested biscuit led to a considerable increase in folic acid and Vit.B₁₂ more than those found in biscuit made with whole wheat flour, whereas they were represented 139.29, 0.45 and 121.12, 0.48 µg/100g dry matter in biscuit made with husk tomato and fennel; respectively. The folic acid in biscuit made with the dried husk tomato and fennel was found in adequate amounts which are within the limit reported in the reference of RDA (100-300µg/100g).

From the obtained data in (Table 11) it could be also observed that the kiwifruit had a much higher amount (about 268.30 µg/100g) of Vit.A than those found in other tested biscuit. All tested biscuit made with dried fruits and vegetables were contained higher drastically amount of Vit.A, when compared with Marie biscuit, also they were more than the control biscuit batch made with the whole wheat flour. The same trend was also observed in Vit.E, which was found a higher amounts (ranging from between 1.45 and 1.76 mg/100g) in all tested biscuit made with dried fruits and vegetables, as compared to Marie biscuit (0.33 mg/100g). Regarding the Vit.D content, all tested biscuit batches made with the whole wheat flour with without addition of tested dried fruits and vegetables had higher amounts more 3 fold than those found in Marie biscuit (1.66 µg/100g), while the highest amount was found in biscuit batches made with husk tomato (8.24 µg/100g). All tested biscuit batches made with dried fruits and vegetables, especially in biscuit with husk tomato and with the whole wheat flour, were contained considerable amounts of Vit.D, which were higher than that given in the reference of RDA (5 µg/day).

From the above discussion, it could be concluded that the produced biscuit batches made with dried fruits and vegetables; in general, characterized with its richness with the most tested vitamins whether water or fat soluble vitamins when compared with the suggested biscuit made from whole wheat flour and As given in table (11), the 3 determind fat soluble vitamins; Vit,A, Vit.E and Vit.D were found in all tested biscuit batches. with the commercial hard sweet biscuit (Marie).

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