Journal of Home Economics

Volume 25, Number (4), 2015

http://homeEcon.menofia.edu.eg

Journal of Home Economics

ISSN 1110-2578

Nutritional Characterizations Of Sycamore *(Ficus Sycomorus*) Fruits

Emad M. El-Kholie, Tarek M. Abd- El-Rahman and Hager R. Matter

Nutrition and Food Science Department, Faculty of Home Economics, Menoufia University, Shebin El-Kom, Egypt

Abstract

The chemical composition, minerals content, physicochemical properties, microbiological aspects and antioxidant activity of sycamore fruit were evaluated. The results showed the fruits analysis included the levels of moisture, protein, fat, fiber, ash, carbohydrates and energy values. The highest mineral contents of sycamore fruits recorded for calcium, phosphorus and magnesium, with the mean values 385.50, 383.10 and 305.45 mg/100g, respectively. While, the lowest mineral contents of the fruits recorded for copper, sodium and potassium, with the mean values 1.30, 3.60 and 6.65 mg/100g, respectively. Sycamore fruit contained different amounts of anti-nutrition compounds such oxalate, tannin, saponin and phytate, with the mean values 2.80, 4.0, 1.6 and 1.85 mg/100g, respectively. Fruits contained different amounts of total phenols and total flavonoides, with the mean values 193.25 and 3.63 mg/100g, respectively. The highest phenolics compounds of dried sycamore fruit recorded for catechol and coumarin, while, the lowest which recorded for cinnamic and catechein. At the end of cold storage (6 months) the pH value, viscosity of sycamore jam recorded the lowest levels for titratable acidity, total sugar and reducing sugar. The value of total bacterial count and moulds & yeast of sycamore fruit jam increased a little during storage period. While, *E. coli*, *Staphylococcus aureus* and *Salmonella sp* did not detect.

Key words: (Sycamore fruits, antioxidants, jam quality, physical properties, and microbiological aspects.

Introduction

Sycamore *(Ficus sycomorus*, Linn) belongs to *Moraceae*, a family that is reputable for its medicinal values and consists of about 40 genera and over 1,400 species of trees, shrubs, vine and herbs, often with milky latex juices. They are usually found near streams in the savannah area, sycamore which is known as "Baure or Bore" in Hausa is a tree attaining height of 20 m with widely spreading branches and a massive crown. Sheep and cattle eat its foliage **(Zerega *et al.*, 2005)**.

Sycamore, locally known as (gemez), is believed to be one of such medicinal plants that need to be thoroughly evaluated in terms of its active and pharmacological constituents. It is a tropical and sub-tropical plant species. It is a tree attaining up to a height of 20 meters and sometimes reaching 6 meters in, growth with widely spreading branches and a massive crown. Sheep and cattle eat its young foliage **(Datziel, 1953)**.

Sycamore fruits have been suspected to possess antidiarrhoeal and anticonvulsant activities. The plant has also been reported to be a potent antimicrobial agent against *Salmonella typhi* **(Adashina *et al.*, 2010)**.

Sycamore fruits are are rich in antioxidants. It has been traditionally used for its medicinal benefits as metabolic, cardiovascular, respiratory, antispasmodic and anti-inflammatory remedy **(Duke *et al.*, 2002)**. Also, **Slavin (2006)**, has reported that Ficus species are an excellent source of minerals, vitamins and dietary fiber; they are fat and cholesterol-free and contain a high number of amino acids**.**

Furthermore, **Pande and Akoh (2010)**, added that ficus species contain polyphenolic compounds and flavonoid, which act as antioxidants and they mentioned that the predominant phenolic acids in fig and its leaves were gallic (1.5–6.4 mg/100 g FW) and ellagic (0.2– 33.8 mg/100 g FW), and the most abundant flavonoid was catechin.

On the other side, **USDA (2002)** concluded that figs produced a significant increase in plasma antioxidant capacity for 4 hours after consumption, and overcame the oxidative stress of consuming high fructose corn syrup in a carbonated soft drink. Also, **Zaku *et al.*, (2009)** reported that aqueous extract of the leaves, stem-bark and root-bark of *Ficus sycomorus* were screened for chemical constituents. They found that the extract

contained tannins, alkaloids, reducing compounds, saponins, flavonoid, steroid, terpenoids and anthracenoside. The aqueous root bark extracts induced 50% anesthesia at 30 mg/ml on rabbit compared with xylocaine. The extract was observed to show muscle relaxation in rats. It promotes muscle relaxation and increased aminobarbitone sleeping time in rats. Hence, *F. sycomorus* exhibits pharmacological activities. Furthermore, **Alphonsine *et al*., (2012)** reported that the highest content in total phenolics and tannins and the best antiradical activity were obtained with *Ficus sycomorus*. In addition, the latex of this plant showed an antibacterial activity on some very important pathogenic germs related to sickle cell disease.

The antibacterial activities of ethanolic extracts of *F. sycomorus,* L. and *F. platyphylla,* Del. in the treatment of ailments have been previously reported. The antibacterial activity of *F. sycomorus,* L. could be related to the presence of bioactive compounds, such as flavonoids, alkaloids, tannins, saponins and setroids **(Salem *et al*., 2013)**.

This work was conducted to study the chemical composition, minerals content, physicochemical properties, microbiological aspects and antioxidant activity of sycamore fruits.

2. Materials And Methods

Material:

The fresh fruit of sycamores *(Ficus sycomorus*) was obtained from local market, transferred to trlas and stored at -18^{o}C until used.

Chemicals:

Folin-Ciocalteu reagent and standard substances including gallic acid, sinapic acid, caffeic acid, chlorogenic acid, *p*-coumaric acid and dihydroxy benzoic acid were purchased from Sigma Chemical Company (St. Louis, MO). Vanillic acid, ferrulic acid, rutin and quercetin from Fluka St. Gallen, Switzerland. All reagents and standards were prepared using Milli-Q deionized water (Millipore, Bedford, USA). All other chemicals and reagents were of analytical reagent grade and purchased from Al-Ghomhoria Company for drug, chemicals medical instruments, Cairo, Egypt.

Methods:

Preparation of sycamore fruits

A part of the fresh fruits appropriated has been dried at 45^{o}C for approximately 6 hours in a hot air, then minced to powder by milling using a locally Milling machine (Molunix, Al-Araby), company, Egypt, and then kept in plastic sachets at room temperature (25^{o}C±2^{o}C).

Analytical methods

Moisture, protein (N x 6.25 Kjeldahl method), fat (hexane solvent, Soxhelet apparatus), fiber and ash were determined according to the method recommended by **A OAC (2010)**. Carbohydrate calculated by differences as follows:

% Carbohydrates = 100 - (% moisture + % protein + % fat + % ash + % fiber).

Energy value was estimated by the sum of multiplying protein and carbohydrates by 4.0 and fat by 9.0 according to **FAO (1982)**.

Determination of minerals content

The atomic absorption spectrophotometry as described by **Okwu&Ndu, (2006) and Odom *et al.*, (2013)** was used in the mineral analysis, magnesium and calcium was determined by complexometric titration described by **James, (1995) and Shimoyamada (1998)** whereas potassium was by flame photometry explained in **AOAC, (1990)**.

Anti–nutritional factors

The tannin content was determined using the vanillin-HCl reagent method of **Burns, (1971)**. The oxalate content of the samples was determined using the potassium permanganate titration method of **Dye (1956),** while the phytic acid content was determined using the method of **Mc Cance and Widdowson (1935)**.

Determination of physicochemical properties of sycamore jam:

Viscosity was determined as standard procedures described by **Ranganna (2002)** using a digital viscometer (model no. R 1:3M, Rheological Int.).

Determination of total soluble solids

The total soluble solids of the fresh and the processed sycamore jams was determined by using a refractometer (Carl Zeiss Jena – Germany) and they were expressed as percentage of TSS **Genna *et al.*, (2008)**.

Determination of titratable acidity (%)

Titratable acidity was determined by titrating samples with 0.1M NaOH and was expressed as percentage citric acid **(AOAC 2006)**.

Determination of pH:

pH of jam samples were measured using a pH meter model Orion 3 Star Series pH Benchtop (Thermo Electron Corp., Beverly, MA) **AOAC, (2005).**

Determination of sugars

Sugars (reducing and total sugars) were measured as per the standard method of Lane and Eynon according to the method described by **Pearson, (1976)**.

Determination of total phenolic content

Total phenolics in the selected extract samples were determined according to Mazza's method **(Mazza *et al.*, 1999)**, with some modifications as described by **Radovanović and Radovanović (2010)**. Briefly, 0.25 ml of the diluted sample was mixed with 0.25 mL of 0.1% HCl in 95% ethanol and 4.55 ml of 2% HCl, approximately 15 min before reading the absorbance at 280 nm with a UV/ VIS spectrophotometer (Agilent 8453 spectrophotometer). The absorbance at 280 nm, A , was used to estimate total phenolics (gallic acid was used as standard).

Total flavonoid content:

Total flavonoids in the fruit extract examined were determined by using a slight modification of the method given by **Meda *et al.*, (2005)**. A 0.5 ml of diluted extract solution was mixed with 0.5 ml of aluminium chloride (2%). After incubation at room temperature for 20 min, the absorbance of the reaction mixture was measured at 415 nm. A blank sample contained 0.5 ml of sample and 0.5 ml of distilled water. A 0.5 ml sample of aluminium chloride mixed with 0.5 ml of distilled water was used to zero the spectrophotometer. The data were calculated according to a

standard curve of quercetin (3–20 µg/ml), and they were expressed as quercetin equivalents (QE) per gram of extracts.

Identification of phenolic compounds

The polyphenol composition of the fruit was analysed by using high performance liquid chromatography (HPLC), previously filtered through a 0.45 µm-pore size membrane filter. The apparatus used for the separation and determination of individual polyphenols from the sycamore fruits was an Agilent Technologies 1200 chromatographic system, equipped with an Agilent photodiode array detector (DAD) 1200 with RFID tracking technology for flow cells, and a UV lamp, an automatic injector, and Chem. Station software. The column was calibrated at 30°C. The separation was performed on an Agilent-Eclipse XDB C-18 4.6 ×150 mm column. The HPLC method was used according to **Radovanović *et al*., (2010)**.

Microbiological examination

Preparation of sycamore samples for microbiological analysis:

Ten grams of each fruit sample were homogenized with 90 ml. of distilled water so as to give 0.1 dilutions. Then different dilutions ($1:10^{-1}$to $1:10^{-6}$) were prepared to be used for microorganisms tests.

Total aerobic bacterial count determined on nutrient agar media according to the method described by **Oxoide Manual (1979)**, *Staphylococcus aureus* determined on Paird parker agar base media **(ICMSF 1996)**, while molds and yeasts, enumerated in potato dextrose agar **(ICMSF, 1996)**, *E. coli* (Oxoid) enumerated on Endo agar media **(WHO, 1988)** and *Salmonella sp*. SS agar Oxoid modified according to **Bryan, (1991)**.

Statistical analysis

Statistical analysis were performed by using computer program statistical package for social science (SPSS), and compared with each other using the suitable test. Statistical analysis has been achieved using IMB-P-C computer by SPSS program **(SPSS, 1998)**.

Results And Discussion

Chemical composition of sycamore fruits

Data presented in Table (1) show the chemical composition of sycamore fruit. It is clear to notice that the sycamore fruit as wet weight

contains different amounts of moisture, protein, fat, fiber, ash, carbohydrates and energy values. The mean values were 97.50, 0.97, 0.36, 3.03, 1.91, 19.23 % and 84.04 k.cal/100g, respectively. These results are in agreement with **Nkafamiya *et al.*, (2010).**

Mineral contents of sycamore fruit

Data given in Table (2) show the mineral contents of sycamore fruits. The obtained data showed that the highest mineral contents of sycamore fruit recorded for calcium, phosphorus and magnesium. The mean values were 385.50, 383.10 and 305.45 mg/100g, respectively. On the other hand, the lowest mineral contents of sycamore fruit recorded for copper, sodium and potassium. The mean values were 1.30, 3.60 and 6.65 mg/100g, respectively. These results are in agreement with **Mutayobe *et al.*, (2014)**.

Anti-nutrition contents of sycamore fruit

Data given in Table (3) show the anti-nutrition contents of sycamore fruit. The obtained results indicated that a sycamore fruit contains different amounts of anti-nutrition compounds such as oxalat, tannin, saponin and phytate, the mean values were 2.80, 4.0, 1.6 and 1.85 mg/100g, respectively. These results are in agreement with **(Ladeji *et al.*, 2004)**, they reported that oxalate for example tends to render calcium unavailable by binding to the calcium ion to form complexes (calcium oxalate crystals). These oxalate crystals formed prevents the absorption and utilization of calcium. The calcium crystals may also precipitate around the renal tubules thereby causing renal stones. The oxalate and phytates composition of sycamore were 2.85 and 1.98, respectively. Phytates in food are known to bind with essential minerals such as calcium, iron, magnesium and zinc in the digestive tract, resulting in mineral deficiencies **(Bello *et al.*, 2008)**.

The tannin and saponin content were 4.03 and 1.75 %, respectively, tanns is plant polyphenols, which have ability to form complexes with metal ions and with macro-molecules such as protein and polysaccharides **(Dei *et al.*, 2011)**.

Total phenols and total flavonoids content of sycamore fruit

Total phenols and total flavonoides of sycamore fruit are shown in Table (4). It is clear to notice that the sycamore fruit contains different amounts of total phenols and total flavonoides. The mean values were

193.25 and 3.63 mg/100g, respectively. These results are in agreement with **Mahmoud *et al.*, (2013)**, they reported that the total phenols and total flavonoides of dried sycamore were 56±2.64 as mg/100g galic acid and 19.62 mg/100g as catchin respectively.

Phenolics compounds of sycamore fruit

Data presented in Table (5) show the identification of phenolics compounds of dried sycamore fruit by using HPLC technique. The obtained results showed that highest phenolics compounds of dried sycamore fruit recorded for catechol and coumarin, which recorded 9.41 and 8.14 mg/100g, respectively.

On the other hand, the lowest phenolic compounds of dried sycamore fruit recorded for cinnamic and catechein, the mean values were 0.62 and 1.26 mg/100g, respectively. While, pyrogallic and ferulic acid did not detect under these conditions. These results are in agreement with **Mahmoud *et al.*, (2013)**, who reported that the phenolics compounds in dried sycamore fruit using HPLC were catechol 9.396, catechein 1.2597 mg, chlorogenic acid 2.7871 mg, synergic acid 5.209 mg, coumarin 8.084 mg and cinnamic acid 0.621 mg, respectively.

Physicochemical properties contents of sycamore fruit during cold storage for 6 months:

The physicochemical properties of sycamore fruit during cold storage for 6 months are shown in Table (6). It is clear to notice that at zero time of cold storage period the pH value of sycamore fruit was 4.03. With progress of storage period up to 3 months, the pH value decreased, the value was 3.64, while, at the end of cold storage (6 months) the pH value recorded the highest reduction being, 3.01.

On the other hand, at zero time of cold storage period the value of total soluble solids (TSS) of sycamore fruit was 67.8 %. With advancement of storage period up to 3 months, the value of TSS slightly decreased. The value was 66.83%, while, at the end of cold storage (6 months) the TSS value recorded the highest reduction being, 63.80 %.

Regarding the titratable acidity, at zero time of cold storage period the value of titratable acidity of sycamore fruit was 0.45 %. With progress of storage period up to 3 months, the value of titratable acidity slightly

increased. The value was 0.51%, while, at the end of cold storage (6 months) the titratable acidity value recorded the highest increased being, o.57.

The viscosity value at zero time of cold storage period of sycamore fruit, the value was 26.25 mPa.s. With advancement of storage period up to 3 months, the value of viscosity slightly decreased, which was 25.85 mPa.s, while, at the end of cold storage (6 months) the viscosity value recorded the highest reduction being, 25.25 mPa.s.

For the total and reducing sugar, it could be noticed that, at zero time of cold storage period the values of total sugar and reducing sugar of sycamore fruit were 43.50 and 28.20 %, respectively. With progress of storage period up to 3 months, the values of total sugar and reducing sugar slightly increased, the values were 43.92 and 28. 95%, respectively, While, at the end of cold storage (6 months) the total sugar and reducing sugar values recorded the highest increases being, 45.73 and .30.13 %, respectively. These results are in agreement with **Beenu *et al.*, (2014)**, they reported that the processing of fig fruit pulp into jam and nectar resulted in a significant increase in physicochemical properties like TSS and TA but brought down a significant decrease in pH.

Microbiological aspects of sycamore jam during cold storage for 6 months:

Data given in Table (7) show the microbiological aspects of sycamore jam during cold storage for 6 months (cfu/g). It is worth to mention that the at zero time of cold storage period the count of total bacteria (TBC) of sycamore fruit jam was 3.5×10^1 cfu/g. With progress of storage period up to 3 months, the value of sycamore fruit jam slightly increased, the value was 9.0×10^1 cfu/g, while, at the end of cold storage (6 months) the sycamore fruit jam value recorded the highest increase being, 7.0×10^2 cfu/g. On the other hand, *E. coli*, *Staphylococcus aureus* and *Salmonella sp* did not detect in sycamore fruit jam in any time during cold storage period for 6 months.

Regarding the total count of mold and yeasts, it could be observed that at zero time of cold storage period no counts were recorded until 2 months. With advancement of storage period up to 3 months, the counts of

mold and yeasts of sycamore fruit jam detected being, 0.4 x 10^1 cfu/g. While, at the end of cold storage (6 months) the sycamore fruit jam value recorded the highest increase of mold and yeasts counts being, 3.4 x10^2 cfu/g. These results are in agreement with **Dilek (2003)**, they found that at the end of 3 months cold storage, the total mesophilic aerobic counts of disinfected figs increased. For the microbiological tests, the only mold count was obtained for one of the three plates of 3 months cold stored figs. However, the counts were still below 10^3 cfu. g^{-1}.

Table (1): Chemical composition of sycamore fruits

Component	% (W/W)	D/W
Moisture	74.50± 0.01	----
Protein	0.97 ± 0.01	3.80± 0.02
Fat	0.36 ± 0.02	1.41± 0.01
Fiber	3.03 ± 0.01	11.88± 0.04
Ash	1.91 ± 0.04	7.50± 0.02
Carbohydrates	19.23+0.02	75.41± 0.03
Energy value (K.cal/100g)	84.04± 0.03	329.53± 0.01

W/W = Wet weight D/W = Dry weight

Table (2): Mineral composition of sycamore fruits

Parameter	Sycamore (mg/100g)
Phosphorus	383.10^a ± 0.020
Magnesium	305.45^b ± 0.020
Calcium	385.50^a ± 0.011
Iron	10.80^c ± 0.041
Zinc	8.75^c ± 0.010
Copper	1.30^e ± 0.030
Sodium	3.60^e ± 0.004
Potassium	6.65^d ± 0.020

Mean under the same column bearing different superscript letters are different significantly (P< 0.05).

Table (4): Anti-nutrition of sycamore fruits

Component	Value (mg/100g)
Oxalate	$2.80^{b} \pm 0.015$
Tannin	$4.00^{a} \pm 0.003$
Saponin	$1.60^{c} \pm 0.020$
Phytate	$1.85^{c} \pm 0.004$

Each value is represented as mean ± standard deviation (n =3). Mean under the same column bearing different superscript letters are different significantly (P< 0.05).

Table (4): Total phenols and total flavonoids of sycamore fruits

Component	Value(mg/100g)
Total phenols	$193.25^{a} \pm 12.40$
Total Flavonoids	$17.68^{b} \pm 0.013$

Mean under the same column bearing different superscript letters are different significantly (P< 0.05).

Table (5): Phenolics compounds in dried sycamore by HPLC

phenolic compounds	Value (mg /100g)
Catechol	$9.41^{a} \pm 0.379$
Catechein	$1.26^{c} \pm 0.155$
Chlorogenic acid	$2.84^{c} \pm 0.19$
Synergic	$5.21^{b} \pm 0.2$
Coumarin	$8.14^{a} \pm 0.17$
Cinnamic	$0.62^{d} \pm 0.035$
Pyrogallic acid	ND
Ferulic acid	ND

ND = Not detection

Mean under the same column bearing different superscript letters are different significantly (P< 0.05).

Table (6): Physicochemical properties of sycamore fruit jam during cold storage for 6 months

Storage Period (month)	pH	T.S.S. %	Titratable acidity (%)	Viscosity (mPa.s)	Total sugar (%)	Reducing sugar (%)
0	4.03	67.80	0.45	26.25	43.50	28.20
1	4.00	67.60	0.47	26.11	43.75	28.43
2	3.84	67.00	0.49	26.01	43.80	28.60
3	3.64	66.83	0.51	25.85	43.92	28.95
4	3.30	66.31	0.52	25.72	44.10	29.30
5	3.23	65.40	0.55	25.30	45.30	29.70
6	3.01	63.80	0.57	25.25	45.73	30.13

Mpa.s = Millipascal-second

Table (7): Microbiological aspects of sycamore jam during cold storage for 6 months (cfu/g)

Storage Period (month)	Total Bacterial count	*E. coli*	*Staph. aureus*	*Salmonella sp*	Mold & Yeast
(0) time	3.5×10^1	ND	ND	ND	ND
1	4.4×10^1	ND	ND	ND	ND
2	6.2×10^1	ND	ND	ND	ND
3	9.0×10^1	ND	ND	ND	0.4×10^1
4	2.1×10^2	ND	ND	ND	0.9×10^1
5	4.2×10^2	ND	ND	ND	2.6×10^2
6	7.0×10^2	ND	ND	ND	3.4×10^2

ND= Not detected

References

Adashina, G.L.; Okeke, C.E.; Osugwu, N.O. and Ethinmidu, J.O. (2010): Preliminary in-vitro antibacterial activities of ethanolic extracts of *F. sycomotrus* and *F. platyphylla* Del. (Moraceae) Afr. J. Microbiol. Res., 4 (8): 598 - 601.

Alphonsine, R. T.; André, T.; Adama, H.; Marius, L.; Hassanata, M.; Odile, G. and Pierre, G. (2012): Antioxidative and antibacterial activities of phenolic compounds from *Ficus sur Forssk*. and *Ficus sycomorus* L. (Moraceae) : Potential for sickle cell disease treatment in Burkina Faso. Int. J. Biol. Chem. Sci., 6(1): 328-336.

A.O.A.C (1990): Official methods of Analysis. Ass. of Official Analytical chemists. Washington D.C., USA.

AOAC, (2005): Methods of Analysis of AOAC International. 18th edition, AOAC International. Gaithersburg, Maryland 20877-2417, USA.

AOAC (2006): Official Methods of Analysis. 18th Ed. Association of Official Analytical Chemists, Arlington, VA, 1103 p.

AOAC (2010): Official Methods of the Association of Official Analytical Chemists. 15thed. AOAC 2200 Wilson boulevard arling, Virginia, VA, U.S.A.

Beenu T.; Andallu, B. and Rajni, M. (2014): Influence of processing on physicochemical, nutrional and phytochemical composition of *Ficus carica,* L. (fig) products. Asian J. Dairy & Food Res., 33 (1): 37 – 43.

Bello, M.O.; Farade, O.S..; Adewusi, S.R.S. and Oluwone, N.O. (2008): Studies of some lesser known Nigerian fruits. In. Afri. J. Biotechnol., 1: 3972 - 3979.

Bryan FL (1991): Teaching HACCP techniques to food processors and regulatory officials. Dairy Food Environ. Sant., 11 (10): 562 – 568.

Burns, R. E. (1971): Methods for estimation of tannins in grains sorghum. J. Agronomy, 163:511-513.

Datziel, J.M. (1953): The Useful Plants of West Tropical Africa. Crown Agent for Over Sea Government and Administration, Mill Bank London, 199.

Dei, H.K. (2011): Poultry Science, Department of Animal Science, University for developmental studies, Tamale. Chana 90 (6): 1239-44.

Dilek, D. (2003): Control of Microbial and Enzymatic Changes in Intermediate Moisture Sun-Dried Figs by Mild Heating and Hydrogen Peroxide Disinfection. M SC Thesis, Department: Food Engineering, İzmir Institute of Technology, İzmir, Turkey.

Duke, J.A.; Bogenschutz-Godwin, M.J.; Du Celliar, J.; and Duke, P.K. (2002): Hand Book of Medicinal Herbs, second ed. CRC Press, Boca Raton, pp: 314-315.

Dye, W. B. (1956): Chemical studies on *Halogetots gloniieratius*. Weeds, 4: 55-60.

FAO (Food and Agriculture Organization) (1982): Food Composition Tables for the Near East, FAO, Food and Nutrition Paper, N. 26.

Genna, A.; Vecchi, P. De.; Bruno, M. and Maestrelli, A. (2008): Quality of 'Dottato' dried figs grown in the Cosenza region, Italy. A sensory and physico-chemical approach. Acta Hort. 798: 319-323.

ICMSF (1996): Microorganisms in Food. 5. Microbiological Specification of Pathogens. International Commission of Microbiological Specification for Foods Blockie. Academic and Professional, an Imprint of Chapman & Hall, New York.

James, C. S. (1995): Analytical Chemistry of Foods 1st ed. Chapman and Hall. N.Y, pp. 82-83.

Ladeji, O.; Akin. C.U. and Umaru, H.A. (2004): Level of phytochemicals factors in vegetable commonly eaten in Nigeria. Afri. J. Nutri. Sci., 7: 71-73.

Mahmoud, H.; Mahmoud, Azza Z.E.; Badawy, Qura I.H.; Yehya, A.; Abdel-Hady, Badawi, G.M. (2013): Hypocholesterolemic effect of antioxidant containing fruits in rats fed on high-cholesterol and fat diet**.** Journal of Applied Sciences Research, 9 (7): 4233-4244.

Mazza, G.; Fukumoto, L.; Delaquis, P.; Girard, B. and Ewert, B. (1999): Anthocyanins, phenolics, and color of Cabernet Franc, Merlot, and Pinot Noir wines from British Columbia J. Agric. Food Chem., 47: 4009-4017.

McCance, R. A. and Widdowson, E.M.(1935): Phytin in human nutrition.Biochem. J., 29 (12): 2694-2699.

Meda, A.;Lamien, C. E.;Romito, M.;Millogo, J. andNacoulma, O. G. (2005): Determination of the total phenolic, flavonoid and proline contents in Burkina Fasan honey, as well as their radical scavenging activity. Food Chemistry, (91): 571-577.

Mutayoba, S.K.; Diecenfeld, E.; Mercedes, V.A.; Frances, Y. and Knight, C.D. (2014): Determination of chemical composition and photochemical components of Tanzanian locally available poultry feed ingredients. In inter. J. Poultry Sci., 10 (5): 350 - 357.

Odom, T.C.;Udensi, E.A. and Iweh, M.O. (2013): Nutritional evaluation of Unripe *carica papaya*, Unripe *Musa paradisiaca* and *Mucuna cochichinensis* weaning food formulation. E.U.J. Bio / Med. Sci. Research, 1 (2): 6-15.

Okwu, D. E. and Ndu. C.U. (2006): Evolution of the phyto-nutrients, minerals and vitamin content of some varieties of yam (*Diocorea Spp*). Int. J. Med. Adv. Sci., 2(2): 199-20.

Oxoid Manual, (1979): The Oxoid Manual of Culture Media. Ingredients and other Laboratory Services, Fourth Ed., Oxoid Limited, Hampshire RG 24 OPW, UK.

Pande, G. and Akoh, C.C. (2010): Organic acids, antioxidant capacity, phenolic content and lipid characterisation of Georgia-grown underutilized fruit crops. Food Chemistry, 120: 1067-1075.

Pearson, D. (1976): The Chemical Analysis of Foods. 7th Edition,Churchill Livingstone, Edinburgh London and New York143-158.

Radovanović, B. and Radovanović, A. (2010): Free radical scavenging activity and anthocyanin profile of Cabernet Sauvignon wines from the Balkan Region. Molecules, 15: 4213-4226.

Radovanović, B.C.; Radovanović, A.N. and Souquet, J.M. (2010): Phenolic profile and free radical-scavenging activity of Cabernet Sauvignon wines of different geographical origins from the Balkan region. J. Sci. Food Agric.,90: 2455-2461.

Ranganna, S. (2002): Handbook of analysis and quality control for fruit and vegetable products. In: Ranganna, S. (Ed), Tata Mc-Graw Hill Publishing Co. Ltd, New Delhi, India.

Salem, M.Z.M.; Salem, A.Z.M.; Camacho, L.M. and Hayssam, M.A. (2013): Antimicrobial activities and phytochemical composition of extracts of *Ficus* species: An over view. Afr. J. Microbiol. Res., 7(33): 4207-4219.

Slavin, J.L. (2006): Figs: Past, Present, Future. Nutrition Tody, 41: 180-184.

Shimoyamada, M.;Ikedo, S.;Dotsubu, R.; and Watanaba, K. (1998): Effects of soyabeans saponins on chymotrptic hydrophyses.Chem.,(46): 4793-4797.

SPSS (1998): Statistical Package For Social Science, Computer Software, Ver. 10, SPSS Company, London, UK.

USDA, (Unit State Department of Agriculture) (2002): Agricultural Research Service, Release 15, Nutrient Data Laboratory Home Page, http://www.nal.usda.gov /finic/foodcomps.

WHO (1988): World Health Organization, Health Education in Food Safety. WHO / 88 (7): 32.

Zaku, S.G., Abdulrahma, F.A.; Onyeyili, P.A. and Thomas S.A. (2009): Phytochemical constituents and effects of aqueous root-bark extract of *Ficus sycamore*, L. (*moracae*) on muscular relaxation. African J. of Biotechnology, 8(21): 6004-6006.

Zerega, N.J.C,; Clement, W.L. and Datwley, S.L. (2005): Biography and divergence times in the mulberry family *Moraceae*. Molecular phytogenetics Eval., 37 (2): 402-416.

Journal of Home Economics, Volume 25, Number (4), 2015

الخصائص التغذوية لثمار الجميز

عماد محمد الخولى ـ طارق محمد عبد الرحمن ـ هاجر رضوان محمد على مطر
قسم التغذية وعلوم الأطعمة ـ كلية الأقتصاد المنزلى ـ جامعة المنوفية ـ مصر

ملخص البحث

تم فى هذه الدراسة تقييم التركيب الكيميائي ومحتوى المعادن والخصائص الطبيعية والكيميائية، والجوانب الميكروبيولوجية ونشاط مضادات الأكسدة لثمار فاكهة الجميز .وأظهرت النتائج أن ثمار الجميز تحتوي على كميات مختلفة من الرطوبة والبروتين والدهون والألياف والرماد والكربوهيدرات وقيم الطاقة .حيث سجلت الثمار محتوى عالى للأملاح المعدنية في مثل الكالسيوم والفوسفور والمغنيسيوم. وكان متوسط القيم ٣٨٥,٥٠، ٣٨٣,١٠ , ٣٠٥,٤٥ ملجم / ١٠٠جم على التوالي .في حين كانت أقل القيم مع النحاس والصوديوم والبوتاسيوم, والتى بلغت ١,٣٠، ٣,٦٠ و ٦,٦٥ ملجم / ١٠٠جم، على التوالي كما احتوى ثمار الجميز على كميات مختلفة من مضادات التغذية مثل الأكسالات، والتانينات، والصابونين والفيتات والتى بلغت ٢,٨٠، ٤,٠، ١,٦ و ١,٨٥ ملجم / ١٠٠جم على التوالي. كما احتوى ثمار الجميز على كميات مختلفة من الفينولات والفلافونيدات الكلية والتى بلغت ١٩٣.٢٥ و٣.٦٣ ملجم / ١٠٠جم، على التوالي .أعلى قيم للمركبات الفينولية لثمار الجميز التى تم التعرف عليها سجلت مع مركب الكاتيكول والكيومارين, في حين أن أقل قيم قد سجلت مع حمض االسيناميك والكاتشين. في نهاية التخزين البارد (٦ أشهر) لمربى الجميز وجد أن قيمة الأس الهيدروجيني واللزوجة سجلت أعلى انخفاض ، والعكس مع كل من الحموضة، السكريات الكلية والسكريات المختزلة .وكانت أعلى قيم للعد الكلى للبكتيريا والفطريات والخمائر فى مربى ثمارالجميز فى نهاية فترة التخزين.

الكلمات الافتتاحية: ثمار الجمييز ـ مضادات الأكسدة ـ جودة المربى ـ الخواص الطبيعية ـ الدلائل الميكروبية.