J. Agric. Sci. Mansoura Univ., 30 (5): 2571 - 2577, 2005

EVALUATION OF CHEMICAL CHARACTERISTICS AND PESTICIDE RESIDUES OF SOME IMPORTED FRUIT PRODUCTS

Hassannein, F. R. [1]; Somyaa M. Abd El-Moneam[1]; M. El-Zoghbi[2] and El. M. El-Saeidy[1]

1. Food Science Dept., Faculty of Agric., Zagazig Univ.

2. Home Economic Dept., Specific Education Fac., Suez Canal University

ABSTRACT

The study investigates the amount of heavy metals and pesticide residues in two widely imported fruit products to Egypt raisins and dried apricot sheets (Kamar El-deen sheets) as dried fruits, orange and grape juices as imported fruit juices. Some components were accepted according to the Egyptian Standard Specifications such as the average of moisture, dried fruits (raisins and Kamar El-deen sheets) (13.75 and 13.38%) respectively. Other products such as raisins, Kamar El-deen sheets and fruit juices showed a high lead content (0.18, 1.60 and 0.06 mg/100g) respectively. No pesticide residues were detected in Turkish raisins, Kamar El-deen from Esraa (E) factory in Syria and grape juice. Vitamin C in orange juice was much higher than that grape juice (3.26 times).

Keywords: Raisins, Carotenoids, Contamination, Organochlorine, Pesticide, Residue.

INTRODUCTION

Raisins are the second most important product of the grape vine. *Olmo*, (1960), and *Paolo et al.*, (1998), noticed that the quality of raisins depends on the size of the raisin berries, the uniformity and brilliance of the berry color, the condition of the berry surface, the texture of the skin and pulp in the berry, moisture content, chemical composition and presence of decay, mold, yeast and foreign matter. Based on the method of preparation and variety of grapes used for raisin making, they are called by various names.

Radi et al., (1997), cleared that β- carotene, γ- carotene and lycopene are the major carotenoids in apricot fruit. Interest in carotenoids has increased during the last years, because they are not only important natural pigments and precursors of vitamin A but also have been supposed to contribute to the prevention of cancer and cardiovascular diseases, to act as ulcer inhibitors and life extenders as reported by *Mayne*, (1996).

Omage and Zhang, (1998), indicated that orange juice is also characterized by a high content of ascorbic acid. Vitamin C is a natural antioxidant that may inhibit the development of major oxidative human conditions. According to *Tibble*, (1998) and *Slaterry et al.*, (2000), it has a high content of carotenoids (β- carotene, α- carotene and β- cryptoxanthin). In addition to vitamin C, orange juice contains flavonoid compounds that may produce their beneficial effects by scavenging free radicals as reported by *Rice Evans et al.*, (1996); *Benavente- Garcia et al.*, (1997). The antioxidant potential of citrus has been mainly related to phenolic and vitamin C content *Rapisarda et al.*, (1999) and *Gardner et al.*, (2000).

Glucose, fructose and the organic acids tartaric and malic are the main soluble matters in grape juices. Their content and relative concentration depend primarily on grape variety and degree of maturity *Kliewer,* (1967) and *Montogomery et al.*, (1992).

Egypt imports more than 50% of forementioned foodstuffs. In order to protect health, their will be a need to control the concentrations of heavy metals and pesticide residues in all imported foodstuffs. Unfortunately, the existence of such compounds resulted in dangerous effects, not only to plant but also animals and human health *Mikhail et al.*, (1979); *Andrews and Gray*, (1990) and *Chowedbury et al.*, (1990).

The present investigation aimed to evaluate the proximate composition and contamination level with heavy metals and pesticide residues of raisins and dried apricot sheets (Kamar El-deen sheets) as a two widely convenience dried fruits and orange juice, grape juice as a two widely convenience fruit juices of major and large quantities imported to Egypt.

MATERIALS AND METHODS

Source of samples :

Samples of two widely convenience dried fruits and fruit juices of major and large quantities imported to Egypt (raisins and dried apricot sheets-Kamar El-deen sheets) and (orange juice and grape juice) were collected randomly from Port-Said by the committee of General Organization for Import & Export Control. Samples of raisins were taken separately for three different countries (Iran, Turkey, and the United States of America). However, samples of Kamar El-deen were imported from three different factories in Syria namely Hwaa (H), Razky (R) and Esraa (E). Orange juice imported from France and grape juice imported from South Africa. These samples were kept in the deep freezer until analysis.

Analytical Methods :

Moisture content was determined using a thermostatically oven controlled, according to the method described by A.O.A.C (1995). Total soluble solids were determined using Abbe Refractometer (Lecia Mark II) according to the method reported by A.O.A.C. (1995). Titrable acidity was calculated as grams of mainly as anhydrous citric acid in the product per 100 gram fruit or per 100ml juice as recommended by A.O.A.C. (1995). pH value was measured using Corning pH meter 7020 as described by A.O.A.C. (1995). Vitamin C content was determined using 2, 6 dichlorophenol indophenol according to the method reported by A.O.A.C. (1995). Generally speaking, the results were expressed as mg/100gm (as mg ascorbic acid per 100 gram fruit or product or 100ml juice). Total carotenoids were estimated by using the method described by *Asker and Treptwo*, (1993).

Heavy metals (trace elements) were analyzed for lead, aluminum using plasma emission spectrometer (type Perkin- Elmor plasma 400) with argon

gas. The results were calculated as ppm. Sample (1.0 gm) were weighed and digested after complete ashing with 100ml HCl and filtered through Whatman filter paper No. 42.

Pesticide Residue Analysis :

Extraction and Clean up :

Residues of pesticides were extracted and clean up (partitioning and florisil clean up) according to A.O.A.C. (1995).

Gas Chromatographic Determination :

Hewlett Packard 5890 A Gas Chromatographic apparatus, equipped with electron capture detector (E.C.D) following conditions :

Column : Capillary column HP 101 (methyl silicon fluid) 25m. x 0.2mm x 0.2 Mm film thickness.

Initial temperature : 160^{o}C.

Hold on 1 min.

Rate = 3^{o}C / min.

Final temperature = 220^{o}C.

Hold on 220^{o}C = 20 minutes.

RESULTS AND DISCUSSION

Data summarized in Table (1) represent some chemical constituents concern the nutritional and safety quality of imported dried fruits namely raisins and dried apricot sheets (Kamar El-deen sheets) and compared them to both Egyptian Standard Specification and FAO/WHO Codex.

Table (1): Chemical composition of imported raisins and dried apricot sheets (Kamar El-deen sheets).

Chemical constituents	Raisins			Dried apricot sheets		
	Iran	Turkey	U.S.A.	R	H	E
Moisture (%)	17.17	11.34	12.21	13.40	14.87	11.88
Acidity	2.34	2.76	3.72	2.02	2.35	1.33
PH value	3.4	4.2	3.45	3.8	3.8	3.7
Carotenoids (mg/100g)	5.47	6.58	7.59	0.72	3.11	1.55
Pb (mg/100g)	0.08	0.20	0.27	0.92	3.7	0.18
Al (mg/100g)	0.95	0.32	-	4.15	0.51	8.3

Concerning the chemical constituents, it is obvious that Iranian raisins was the highest moisture content (17.17%), whereas Turkish one showed that lowest (only 11.34%). The general average of moisture content in raisins reached (13.75%), which agree completely with the Egyptian Standard Specifications (2003), which mentioned that the moisture content in such products should be not more than (18%). Also the general average of moisture content in Kamar El-deen sheets (13.38%), which agree completely with the Egyptian Standard Specifications (1985).

The acidity ranged from (2.34%) in Iranian of (3.72%) of American raisins. It affects not only the degree of quality but also the platability. The titrable acidity in raisins calculated as tartaric acid. The acidity in Kamar El-deen sheets ranged from (2.35%) to (1.33%). There were no considerable variation in the pH- values of raisins and Kamar El-deen samples. The American raisins was the highest in the carotenoids content, which ranged from (7.59 mg/100g) in American raisins to (5.47 mg/100g) in Iranian samples. Carotenoids content in Kamar El-deen sheets samples ranged from (3.11 mg/100g) in samples from the Hwaa (H) to (0.72 mg/100g) in samples from Razky (R).

Regarding the heavy metals content in the raisins samples, data in the same Table showed that two metals were determined lead and aluminum. The American raisins had the highest level of lead (0.27 mg/100g), followed by Turkish raisins (0.20mg/100g) while the lowest level of lead found in Iranian raisins (0.08mg/100g). The general average of lead content in Kamar El-deen sheets samples was (1.6mg/100g), while it is very high when compared to the allowed limit of lead in the Egyptian Standards Specifications (1993), which stated that the lead content in Kamar El-deen not be exceeded 0.2 p.p.m and in fruits as raisins not to be more than 0.3 p.p.m. Iranian raisins had the highest level of aluminum (0.95 mg/100g). The kamar El-deen sheets obtained from Esraa (E) showed the highest level of aluminum (2.3 mg/100g).

Data in Table (2) represent the residue amounts of some organochlorine pesticides detected in imported raisins from three different countries and imported dried apricot sheets (Kamar El-deen sheets) from different factories in Syria. It is interesting to notice that the Iranian and American raisins were contaminated with some pesticide residues, while raisins from Turkey showed no residues of any detected compounds. Kamar El-deen sheets from Razky (R) factory revealed the highest pesticidal contamination. In this respect, endrin and o,p-DDD were detected in this product with the mean level of 0.85 and 9.91 μg/g respectively.

Table (2): Residue levels of organochlorine pesticides detected in imported and raisins dried apricot sheets (Kamar El-deen sheets) (μg/g).

Detected compounds	Residue level in Raisins (μg/g)			Residue level in dried apricot sheets (μg/g)		
	Iran	Turkey	U.S.A.	R	H	E
Lindane	1.31	nd	nd	nd	nd	nd
Endrine	nd	nd	nd	0.85	1.10	nd
O,p-DDE	0.0007	nd	0.002	nd	nd	nd
Dieldreen	2.07	nd	nd	nd	nd	nd
o,p-DDD	nd	nd	3.89	9.91	nd	nd
p,p-DDD	nd	nd	10.53	nd	nd	nd
p,p-DDT	nd	nd	1.86	nd	nd	nd
Total	**3.38**	**-**	**16.28**	**10.76**	**1.10**	**-**

nd = not detected

Results presented in Table (3) show that the proximate composition of orange juice imported from France and grape juice imported from South Africa. Total soluble solids of orange juice comprises primarily soluble sugars, acids and other water soluble compounds. The data revealed that total soluble solids in orange juice (9.30%) and in grape juice (8.10%). Orange juice like other citrus juices is characterized by attractive acid taste. The titrable acidity measured in orange juice was 2.70% (calculated as citric acid) and the pH value was 3.9. The titrable acidity measured in grape juice was 1.40% (calculated as tartaric acid) and the pH value was 3.35. Vitamin C in orange juice was much higher than that from grape juice (3.26 times). Total carotenoids content in orange juice arrived to 12.39% and in grape juice to 1.17%. Lead content of orange juice was (0.07 mg/100g) and of grape juice (0.05 mg/100g). When compared with that mentioned by FAO/WHO Codex (1993) which the lead content not to be more than 2 p.p.m. Lead level in fruit juices not to be more than 0.3 p.p.m. by the Egyptian Standard Specifications (E.S.S.) (1993). Aluminum content in orange juice (0.09 mg/100g) and grape juice had not aluminum. Phenolic compounds of fruit juices play an important role in hazes and sediments in the extracted juices, taste characteristics such as bitterness and astringency and formation of yellow and brown pigments. Orange and grape juices were found to contain 52.45, 23.45 mg/100g respectively. The total phenolics content decreased during storage.

Table (3) : Chemical composition of imported orange and grape juices.

Chemical Constituent (%)	Orange juice	Grape juice
Total soluble solids (T.S.S.) %	9.30	8.10
Acidity (%)	2.70	1.40
pH value	3.90	3.35
Vitamin C (mg/100g)	24.00	7.36
Carotenoids (mg/100g)	12.39	1.17
Pb (mg/100g)	0.07	0.05
Al (mg/100g)	0.09	-
Total phenolics (mg/100g)	52.45	23.43

Table (4) revealed that the levels of pesticide residues in imported fruit juices (orange juice- grape juice). The residues of dieldreen and heptachlor-epoxide were detected in orange juice with the mean levels of (1.94 μg/g) and (0.00011 μg/g) respectively. Residues of dieldren (1.94 μg/g) was higher than maximum residues level (MRL) recommended by the (E.S.S.) (1992), and also higher than that mentioned by FAO/WHO Codex (1986). Grape juice showed no residues of pesticides.

Finally, the results indicate that much attention should be directed toward heavy metals and pesticide residues in the imported food. Also, it is of a prime importance to intalish maximum level (ML) for heavy metals and pesticides with no ML yet to avoid adverse effects.

Table (4) : Residue levels of organochlorine pesticides detected in imported orange juice and grape juice (μg/g).

Detected compounds	Residue level (μg/g)	
	Orange juice	Grape juice
Lindane	nd	Nd
Endrine	nd	Nd
Hept-epoxide	0.00011	Nd
o,p-DDE	nd	Nd
Dieldreen	1.94	Nd
o,p-DDD	nd	Nd
p,p-DDD	nd	Nd
p,p-DDT	nd	Nd
Total	1.94	-

nd = not detected

REFERENCES

Andrews,J.And Gray,L.(1990):The effect of lindane and linuron on calcium metabolism,bone morphometryand the kidney in rats.Toxicology,60-99.

AOAC (1995): Official Methods of Analysis of the Association of Official Analytical Chemists International. 16th ed., Published by The Association Official Analytical Chemists International, Arlington, Virginia, 22201.3301, U.S.A.

Asker, A. and H. Treptow (1993): Quality assurance in tropical fruit processing. Springer Verlag, Berlin, Heidelberg, New York.

Benavente- Garcia, O.; Castillo, J.; Marin, F.R.; Ortumo, A. and Del Rio, J.A. (1997): Uses and properties of citrus flavonoids. J. Agric. Food Chem., 45: 4505-15.

Chowedbury, A.R.; Gautam, A.K. and Bhatnagar, V.K. (1990): Lindane induced changes in morphology and lipids profile of testes in rats. J. Biomed. Biochem. Acta., 49: 1059-1065.

Egyptian Organization for Standardization and Quality Control: Egyptian Standard 1582-(1985), 2079-(1992), 2360-(1993) and 286-(2003).

FAO/WHO (1986): Codex Aliemantarious Commission, Acceptances to Codex Maximum Limits for Pesticide Residues. Vol. XIII, 31 August 1986, Ed. 2.

FAO/WHO Codex (1993): Joint FAO/WHO Food Standard Programms. Codex Alimentarius Comimission. Food Legislation: Basic Principles, 18, 19, 22 P. P.A.O. Rome, Italy.

Gardner, P.T.; White, T.A.C.; McPhait, D.B. and Duthie, G.G. (2000): The relative contributions of vitamin C, carotenoids and phenolics to the antioxidant potential of fruit juices. Food Chem., 68: 471-474.

Kliewer, W.M. (1967): Concentration of tartrates, malates, glucose and fructose in the fruits of the Fenus vitis. Am. J. Enol. Viticult, 18: 33-41.

Mayne, S.T. (1996): β-carotene, carotenoids and disease prevention in humans. FASEB J. 10: 690-701.

Mikhail, T.H.; Aggour, N.; Awadallah, R.; Boules, N.; El-Dessoukey, K.A. and

Karima, A.I. (1979): Acute toxicity of organophosphorous and organochlorine insecticides in laboratory animals. Zernahung Swiss, 18: 258.

Montogomery, M.W.; Reyes, F.G.; Cornwell, C. and Beavers, D.V. (1992): Sugars and acid analys and effect of heating on color stability of northwest concord grape juice. J. Food Sci., 47: 1983-86.

Olmo, H.P. (1960): Plant breeding programme aided by radiation treatment. J. Calif. Agar., 14(7): 4.

Omage, S.T. and Zhang, P. (1998): Photochemical interaction: β- carotene, tocopherol and ascorbic acid, in phytochemicals. A New Paradigm, ed. By Bidlack WR, Omaye ST, Meskin MS and Jahner D, Technmoic, Lancaster, Chapter 4.

Paolo, C.; Alberto, A.; Vincenzo, L.; Marinella, M.; Filippo, M.; Franco, C. and Mario, P. (1998): Pesticide residues in raisin processing. J. Agric. Food. Chem. 46, 2309-2311.

Radi, M.; Mahrour, M.; Jaouad, A.; Tacchini, M.; Aubert, s.; Hugues, M. and Amoit, M.J. (1997): Phenolic composition, browning susceptibility and carotenoid content of various apricot varieties of maturity. Hort science; 57: 958-962.

Rapisarda, P.; Tomoino, A.; La Cascio, R.; Bonina, F.; DePasqual, A. and Saija (1999): "Antioxidant effectiveness as influenced by phenolic content of fresh orange juice". J. Agric. Food Chem., 47: 4718-4723.

Rice-Evans, C.A.; Miller, N.J. and Paganga, G. (1996): Structure- antioxidant activity relationships of flavonoids and phenolic acids. Free Radic Biol Med., 20: 933-56.

Slaterry, M.L.; Benson, J.; Curtin, K.; Ma, K.N.; Shoeffer, D. and Potter, J.D. (2000): Carotenoids and colon cancer. Am. J. Clin. Nutr., 71: 575-582.

Tibble, D.L. (1998): Further evidence of the cardiovascular benefits of diets enriched in carotenoids. Am. J. Clin. Nutr.; 68: 521-522.

تقييم الصفات الكيميائية ومتبقيات المبيدات لبعض منتجات الفاكهة المستوردة

فوزى رمضان حسانين[١]، سومية محمد عبد المنعم[١]، محمد الزغبى[٢]والسيد محمود الصعيدى[١]

١ قسم علوم الأغذية- كلية الزراعة- جامعة الزقازيق

٢ قسم الاقتصاد المنزلى- كلية التربية النوعية ببورسعيد- جامعة قناة السويس

لقد استهدف هذا العمل تقييم عينات عشوائية ممثلة لنوعين من منتجات الفاكهة التى تستوردها مصر بكميات كبيرة تقييماً كيميائياً وكذا مستوى تلوثها بالعناصر الثقيلة ومتبقيات المبيدات الكلورينيه العضوية، حيث جُمعت عينات من منتجات الفاكهة المجففة متمثلة فى الزبيب ولفائف قمر الدين، وكذا إثنين من عصائر الفاكهة متمثلة فى عصير البرتقال وعصير العنب.

ولقد أوضحت النتائج المتحصل عليها أن متوسط المحتوى الرطوبى فى الفاكهة المجففة (زبيب- قمر الدين) (١٣,٧٥، ١٣,٣٨%) تتفق مع ما أوصت به المواصفات القياسية، وكان متوسط محتوى الزبيب وقمر الدين من الرصاص (١,٦٣، ١٦,٠ جزء فى المليون) عالياً عند مقارنته بالحدود المسموحة، ولم يحتو كل من الزبيب التركى وقمر الدين من مصنع إسراء فى سوريا على متبقيات مبيدات، وكان فيتامين جـ فى عصير البرتقال أعلى منه فى عصير العنب (٣,٢٦ مرة)، ولم يحتو عصير العنب على متبقيات مبيدات.