



## ESTIMATION OF SOME FOOD ADDITIVES AND HEAVY METALS IN SOME ORANGE JUICE.

Beadaa Abdalqader. Mahdii

Department of Biology, Collage of Science, University of Baghdad, Baghdad, Iraq, beadaa\_abdalqader.1978@yahoo.com

تاريخ قبول النشر: 2016/5/22

تاريخ استلام البحث: 2016/2/2

## ABSTRACT

The study included examination of three types of different origin and orange juice at the rate of recurring per sample, the results showed that the highest rates of acid (pH) in the A and juice were (4). And salts of calcium is 120 ppm in juice C and 86 ppm of magnesium in the juice B, for heavy metals the highest rate of lead .18 recorded ppm in juice B, 1.32 ppm of copper in juice A, 5 ppm of iron in the juice B, 1.3 ppm of zinc in the juice B, 0.05 ppm of aluminum in each of the sappy B and A, 0.02 ppm of cobalt in the juice B, 0.3 ppm of nickel in the juice B, 170.6 ppm sodium in C juice, but for the acids, organic that the highest rates were 3.2 part Millions of acid in the juice owner a, 260 ppm of the acid in the juice the ascorbic B, 240.5 ppm of the acid in the lemon juice A.

**Key words:** Orange juice, Food additives, Heavy metals, Organic acids.

## تقدير بعض المضافات الغذائية والمعادن الثقيلة في بعض انواع عصائر البرتقال

بيداء عبد القادر مهدي

علوم الحياة، كلية العلوم، جامعة بغداد، بغداد، العراق. beadaa\_abdalqader.1978@yahoo.com

## الخلاصة

اشتملت الدراسة فحص ثلاثة انواع من عصائر البرتقال مختلفة المنشأ وبمعدل متكرر للعينة الواحدة، اظهرت النتائج ان اعلى معدلات الحامضية (الاس الهيدروجيني) في عصير A وكانت (4). واملاح الكالسيوم هي 120 جزء بالمليون في عصير C و 86 جزء بالمليون للمغنيسيوم في عصير B، بالنسبة للمعادن الثقيلة فقد سجل اعلى معدل للرصاص 0.18 جزء بالمليون في عصير B، 1.32 جزء بالمليون للنحاس في عصير A، 5 جزء بالمليون للحديد في عصير B، 1.3 جزء بالمليون للزنك في عصير B، 0.05 جزء بالمليون للالمنيوم في كل من عصيري B و A، 0.02 جزء بالمليون للكوبلت في عصير B، 0.3 جزء بالمليون للنكل في عصير B، 170.6 جزء بالمليون للصوديوم في عصير C، اما بالنسبة للاحماض العضوية ان اعلى المعدلات كانت 3.2 جزء بالمليون لحمض المالك في عصير A، 260 جزء بالمليون لحمض الاسكوريك في عصير B، 240.5 جزء بالمليون لحمض الليمون في عصير A.

الكلمات المفتاحية: عصير برتقال، مضافات غذائية، معادن ثقيلة، الحوامض العضوية.

## INTRODUCTION

Fruits contain many qualities for one's health; they initialize an abundance of vitamins, minerals, anti- oxidants and fibers, which are all essential for the human diet (Jasmine, 2012). Count on me the design holistic of fruit juice extracting machine, this machine has the ability to slice and extract juice from fruits and vegetable (Gbasouzor, 2014). With industrial development and increasing agricultural area to keep up with population growth in the world combined with the progress in the food and beverage industry technology has led to the increasing environmental pollution sources and then contaminate food. This led to an increase in awareness among professionals and the general and persistent harm. The researchers were interested in studying and analyzing food contaminants and determine the quantity and a damage resulting there from (Zakrewski, 1991) has established a government and private



bodies that monitor the safety of drinks and food pollutants and enact laws that regulate it (FAO/ WHO, 1984). Is a heavy metal pollution one of the images resulting environmental pollution from human activity industrial or agricultural, and in recent years, scientists interested in studying the heavy elements in terms of their presence in the environment and biological effects and its relation to human health is the drinks and food one of the main sources of human exposure to these elements so focused on several studies introduction appropriate methods to determine the extent of contamination of these drinks with these elements and its suitability for human use (Dahiya *et al.*, 2005) and determine the minimum or critical concentration allowed by these pollutants without that happening damage (Ashwort, 2004). as has been attributed allowed heavy metals in drinking water situation which in turn is within the juices and other food manufacturing (Alsrwy, 2008; WHO, 2011). According to VMD techniques is very efficient for the concentrated juice presents nutritional and sensorial quality very similar to concentration of Fruit Juices by vacuum membrane distillation (Shukla, *et al.*, 2013). Consolidated markets, brand competition, and orange juice, increased brand competition, particularly between private labels and leading national brands, did, however, appear to lower average market prices (James *et al.*, 2002). Then isolated the pricing behavior of brand marketers, and retailers by observing the retail prices for specific orange juice products, contain leading national brands and private label brands (Dooley, 2001). The property is exploited for ability of a membrane to control the permeation rate of a chemical species through the membrane, so it can be used in concentration of fruit juices (Reza, 2010). Preparation of adsorption gel for metal ions from orange wastes by simple chemical modification was investigated. Two types of adsorption gels, Ca<sup>2+</sup>-form and H<sup>+</sup>-form gels, were prepared by orange juice residues with calcium hydroxide and acid treatment, respectively (Rabindraet *al.*, 2005; Sharma, 2011). Additionally, many consumers mistakenly thought that some orange-flavored beverages contained orange juice. The isolation of orange essence and refined orange oil motivated these detailed juice categories, because manufacturers could produce a beverage that tasted like orange juice without containing much natural juice (Hamilton, 2011; Common 2011). Orange drink only needed to contain 6 percent orange juice and could also modify to specified optional ingredients (TOII, 2011).

### THE AIM OF RESEARCH

This study amid to estimation of some food additives and heavy metals in some commercial orange juice that available in local market in Baghdad.

### METHOD AND MATERIAL

Samples were collected from Baghdad city and analyzed three models of common juices and the most popular among the people (Tazech and Dandanah and Nazik) and for the period of January 2016 (Table, 1).

**Table (1):** Type of Orange Juice, Original and Capacity.

Type	Original	Capacity	symbol
Metal cans Dandanah	Saudi Arabia(KSA)	355ml	A
Metal cans Tazech	Iraq-Kirkuk	250ml	B
Cardboard cans Nazek	Amman	200ml	C



1. Flame atomic absorption spectrometer device Atomic absorption / Flam Emission PYEUNICAM kind of Shimadzu.
2. Heat oven from a company (Gallen Kamp).
3. Hydrochloric acid.
4. Water lead acetate.

#### THE METHOD OF WORK

1. Dried samples so that the stability of the weight on the degree of 105 m.
2. Preserved after grinding in bags of polyethylene with the definition of each sample cards.
3. Conjunctivitis (1) g of the sample on a score of 550 m
4. Solution ash in hydrochloric / 2N / acid
5. Complete the volume to 50 ml using N hydrochloric acid, 0.1. Thus, the samples are ready for measurement by flame atomic spectrometer device.
6. Prepare a standard solution: Weigh (1.8303 g) of the acetate and water lead  $\text{CH}_3\text{COO} \cdot 2\text{Pb} \cdot 3\text{H}_2\text{O}$ ) accurately and processed BDH company using a sensitive balance Metter Model PE3600 and melted weight water-free distilled from ions and he finished the solution to one liter where he became the element concentration in the solution a standard equivalent to (g / l).

#### pH DETERMINATION AND FOOD ADDITIVES

The pH was determined with a digital pH meter and titratable acidity was estimated with the visual acid-base method (Salma, 2015).

#### MINIRALS and SALTS

Calcium and Magnesium (Ryann, 2008; Ronald, 1991) were determined by titration process. The element magnesium (Mg) is a silvery-white and lightweight metal. It is protected by a thin oxide layer, which is very difficult to remove but at the same time removes the need to store it in an oxygen-free environment (see alkali metals). Magnesium reacts with water but much more slowly than its neigh pouring earth alkaline metal calcium. Magnesium is a highly flammable metal, and once ignited it burns with characteristic bright white flame. Calcium is the most abundant inorganic element in the human body and is an essential key for many physiological processes.  $\text{Ca}^{+2}$  has numerous intra and extracellular physiological roles, for example, a universal role as messenger and mediator for cardiac, skeletal and smooth muscle contractions. Calcium ions are a critical factor in several life-defining biochemical processes as well as in the endocrine, neural and renal aspects of blood pressure homeostasis. Calcium chloride ( $\text{CaCl}_2$ ) is used in ice removal and dust control on dirt roads, as a conditioner for concrete and as an additive in canned tomatoes.

#### METALS

Sodium contents was determined by flame photometric method mentioned by Ward and Johnston (Jahan, *et al.*, 2011). Copper, Iron, Manganese, Zinc, Lead and Chromium were determined by Flame Atomic Absorption Spectrometric method (Kirk *et al.*, 1991; charley *et al.*, 2005) Al is a soft, durable and lightweight metal, which makes it attractive to many applications. Nowadays, AL is mainly used for the construction of cars and aircrafts and can be found in packaging and construction materials (Katja, 2015).

#### STATISTICAL ANALYSIS

It was obtained SD by using program Microsoft Excel .

#### RESULT AND DISCUSSION

The (Table, 2) levels of elements of the article and compounds in samples of orange juice different origins and it is clear that the rate of the value of the pH of the juice to lower values, a matching (Specification, 1989), As for the rate of juice values C was within the upper



limits of the Iraqi standard while not match pH rate of the results of the value A Iraqi standard as recorded concentrations of pH 0.4 has a value which is not allowed.

Came the current study, matching what was found (**Jan et al.,2012**) where he also recorded high values of pH in the juices As for the values of calcium salts  $\text{CaCl}_2$  and magnesium  $\text{MgCl}$  highest equations were recorded for the  $\text{CaCl}_2$  in the juice C and reached 120ppm, while the juice A 115ppm juice B 106.5ppm and all these values was within the permissible where the border by the (**Iraqi Specification, 1989**) while the rates in the values of  $\text{MgCl}$  B 8.6ppm juice and juice A 7.6ppm and juice C 8.0 ppm and all these rates are not mentioned among the (**Iraqi specification 1989**) Company is the values are not allowed within the installation juices (النسر واخرون , 2012)

As for heavy metals was Pb, Cu, Fe, Zn, Al, Co, Ni, Na study were the results of the current study showed that the Pb component record the highest rates him the juice B and valued at 0.18 ppm and all other samples are within the permissible limits results according to the specification, either with respect to Cu highest rates were recorded in the juice A amounted to 1.32ppm also was part of the specification as standard values reached 5ppm according to (Table, 2).

And record Fe highest in the juice B component valued at 5ppm It is also within the range of (**Iraqi specification, 1989**) while the highest rates of Zn in the juice B amounted to 1.3ppm, and coincided with them all kinds of juices (A, C) in the non-compliance of the Iraqi Specification amounting to 0.2ppm, either for Al's has recorded the highest rates in each of the sappy (A, B) and amounted to 0.05ppm either C has reached 0.006ppm was not well within the allowed specification, as it amounted to zero within the specification limits product, Values Co have been recorded, Ni highest in juice B and amounted to 0.30 ppm for Ni, 0.02ppm of Co, while the rest of the kinds of juices lowest recorded this value but all kind of juices were also not within the boundaries of the Iraqi specification and amounting to zero within a good product limits.

While the rates of Na highest recorded values in sappy (B, C) and stood at 170.5 ppm for B and 170.6 ppm for C and all of these values within the limits of the specification Walt valued at 300ppm and with respect for the study of heavy elements, this study approval came to his record (السبيعي واخرون, 2014) in the study of the pineapple juice from her high values, Considered to increase the heavy metal values in juices are harmful to human health by (**EPA, 2001;Ysarf , 2000; Ketal, 2011; Haware et al.,2014**).

It also indicates the( Table ,2) to the equations of acid values which were measured acid of malic acid was the pace high and all kinds of juices and are not allowed within a good product specification and valued at 3.2ppm in juice A. While the acid of Ascorbic acid highest rates recorded in juice B and reached 260ppm did not record any value to other juices, but its value has remained juice B within the limits of the specification was not the Ascorbic Acid values of approval of what he brought (**Jain et al., 2005**), Which reported high values for Vitamin C value of 478.56 ppm and study (**Jan et al., 2012**) and thus is not in conformity with the limits permitted by the Iraqi specification, while Citric Acid record rates high in sappy A,



C, reaching 240.5ppm for A, 227.5 ppm B for a non-matching (Iraqi Specification, 1989) as worth zero specification to the specifications of a good product.

**Table(2):** The Range and the mean, Standard Deviation in different orange juice and standard specification.

Parameters	B (ppm)	A (ppm)	C (ppm)	Standard specification (ppm)
pH	3.4-3.6 3.5 ± 0.28	3.9-4 4.0 ± 0.39	3.6-3.9 3.8 ± 0.27	2.7-3.8
CaCl <sub>2</sub>	100-113 106.5 ± 9.31	112-118 115 ± 12.62	119-121 120 ± 12.81	300
MgCL	8.1-9 8.6 ± 0.56	7.4-7.8 7.6 ± 0.95	7.9-8.1 8.0 ± 1.48	—
Pb	0.15-0.2 0.18 ± 0.04	0.09-0.1 0.01 ± 0.003	0.01-0.06 0.04 ± 0.008	0.3
Cu	0.3-0.81 1.06 ± 0.07	0.95-1.7 1.32 ± 0.04	0.9-1.1 1.0 ± 0.02	5
Fe	4.8-5.1 5.0 ± 0.63	2.2-3.4 2.7 ± 0.08	1.2-3.2 2.2 ± 0.06	15
Zn	1.2-1.3 1.3 ± 0.06	0.6-0.8 0.7 ± 0.02	0.07-0.08 0.8 ± 0.27	0.2
Al	0.03-0.07 0.05 ± 0.02	0.04-0.06 0.05 ± 0.02	0.01-0.002 0.006 ± 0.002	—
Co	0.01-0.02 0.02 ± 0.008	0.009-.01 0.01 ± 0.008	0.001-0.003 0.002 ± 0.0009	—
Ni	0.29-0.31 0.30 ± 0.05	0.03-0.09 0.06 ± 0.02	0.0-0.02-0.003 0.003 ± 0.0007	—
Na	170.2-170.76 170.5 ± 14.38	158.7-160.3 159.5 ± 11.69	170.2-170.9 170.6 ± 13.57	300
Malic acid	2.3-2.5 2.4 ± 0.35	2.9-3.4 3.2 ± 0.68	2.6-3.4 3.0 ± 0.44	From best production
Ascorbic acid	250-270 260 ± 24.91	-	-	300
Citric acid	-	220-261 240.5 ± 19.65	210-245 227.5 ± 21.73	From the best production

## References

- السبيعي فهد بن ناصر. العيد محمد بن عبد الرحمن والهمشري هاني عبد المنعم. (2014). دراسة مدى تلوث بعض الاغذية المعلبة بعناصر المعادن الثقيلة والنترات والنترينات. كلية العلوم الزراعية والاعذية قسم الكيمياء والنبات فيصل.
- نيفين عبد الغني وهبة ناهد محمد. (2012). مكسبات الطعم والالوان الصناعية التي تضاف الى الاغذية مجلة اسبوط للدراسات البيئية, 1(36):91-98.
- Alsrwy, A. (2008). Water pollutant: source, the influence, and therapy control. *publishers of scientific books for publication and distribution Cairo*.pp1-623.



- Awsi, J. E. M. (2012). Development and Quality Evolution of pineapple juice blend with carrot and orange juice.. *J. of scientific Research Publications*. V. 2(8). 2250-3153.
- Ashworth, D. J., Alloway, B. J. (2004). Environmental Pollution., 127.137-144.
- Charley, W., Jerome, O., Jugdeep, K., Toyin A., Kola, A., and Russell, F. (2005). Lead Contamination in Cocoa and Cocoa Products: Isotopic Evidence of Global Contamination. *J. Environ Health Perspect.* 113(10): 1344–1348. <http://dx.doi.org/10.1289/ehp.8009>.
- Common or Usual Names for Non standardized Foods. (2011). Diluted Fruit or Vegetable Juice Beverages: 49 Fed. Reg. 11,621–26. Report.
- Dahiya, A., Karpe, R., Hegde, A. G. and Shsrma, R. M. (2005). Lead, Cadmium and nickel in chocolate and candies from suburban areas Mumbai, India. *J. Food. Compos. Anal.* 1(8):517-522.
- Dooley, R. (2001). An Analysis of Competitive Behavior in the Orange Juice Industry: Regional Retail Response to a Freeze” M.S. thesis, Purdue University .11(22):832. [http://dx.doi.org/10.1002/1520-6297\(200124\)17](http://dx.doi.org/10.1002/1520-6297(200124)17).
- FAO/WHO. (1984). Joint FAO/ WHO food standers program, codes Aliment Arius commission contamination. CAC/ Vol. XV(11). FAO, Roma.
- Gbasouzor, A. I. (2014). Member IAENG, Okonkwo Chika Anthony .Improved Mechanized Fruit Juice Extracting Technology for Sustainable Economic Development in Nigeria. *Journal of Proceedings of the World Congress on Engineering and Computer Science*. Vol. II(1): 22-24.
- Hamilton, A. (2011). Common or Usual Names for No standardized Foods: Diluted Fruit or Vegetable Juice Beverages, 49 Fed. Reg. 86.
- Harith, Y. (2011). Estimation of Lead in Some of Foods and Drinks Common Popular in Basrah City- Iraq- 2010, *Journal of Dialaa for science agriculture*. 3(1): 106- 101.
- Haware, D. J., Havanur, P. (2014). Determination of Specific Heavy Metals in Fruit Juices Using Atomic Absorption Spectroscopy (AAS); *J. of Chemistry and Environment*: Vol. 4( 3): 163-168.
- Jahan, S., Gosh, T., Begum, M., and Saha, B. K. (2011). Nutritional profile of some tropical fruits in Bangladesh: specially anti-oxidant vitamins and minerals. *Bangladesh Journal of Medical Science*, 10(2): 95-103. <http://dx.doi.org/10.3329/bjms.v10i2.7804>.
- Jain S. K., Khurdiya D.S. (2005). Vitamin C enrichment of fruit juice baced ready-to- sereve beverages through blending of Indian gooseberry (Emblica of ficinalis Gaertn juice. *Plant Foods Hum. Nutr.J. article published*. Vol: 59(2):63-66. <http://dx.doi.org/10.1007/s11130-004-0019-0>.
- James, B., Patrick C., Ryan, D., and James, E. (2002). Consolidated Markets, Brand Competition, and Orange Juice Prices: *agriculture information bulletin*. No.747-06.
- Jasmine, Y. S. (2012). Comparison of Sugar Content in Bottled 100% Fruit Juice versus Extracted Juice of Fresh Fruit; *journal of Food and Nutrition Sciences*. Vol 3(11) :509-1513. <http://dx.doi.org/10.4236/fns.2012.311196>.



- Ketal, J., Bentum, J.K., Essumang, D.K., Koranteng, J.E. (2011). Analysis of heavy metals in citrus juice from the Abura- Asebu –Kwamankese District, Ghana. *J. Chem. Pharm. Res.*, 3(2):397-402.
- Kirk, K., Arthur, W., Vern, C. (1991). Occurrence of arsenic in seafoods from fast foods analyzed by X-ray fluorescence. *Journal of Food Composition and Analysis*. Vol 4(4): 285 – 292. [http://dx.doi.org/10.1016/0889-1575\(91\)90014-w](http://dx.doi.org/10.1016/0889-1575(91)90014-w).
- Katja, A. Strohfltd. (2015). *Essentials of Inorganic Chemistry*. <http://dx.doi.org/10.1002/9781118695425>.
- Rajwar, B.S., Pandey, K.(2014). Determination of Ca and Mg in clinker ,cement and fly ash based cement by EDTA without using masking reagents. *International J. of Advanced R. in Engineering and Applied Sciences*.Vol 3(4):7-16.
- Reza, M., Zeinab, N., Maryam, R. and Abolghasem, J. (2010). Determination and Comparison of Total Polyphenol and Vitamin C. Contents of Natural Fresh and Commercial Fruit Juices. *Pakistan Journal of Nutrition*. 9 (10): 968-972. <http://dx.doi.org/10.3923/pjn.2010.968.972>.
- Ryann, J. (2008). Determination of Mg<sup>+</sup> with EDTA. CHEM222 Lab Manual. Truman State University.5(29).2242.
- Salma, I. J., Sajib, M. A. M., Motalab, M., Mumtaz, B., Jahan, S., Hoque, M. M., Saha, B. K.(2015) Comparative Evaluation of Macro and Micro-Nutrient Element and Heavy Metal Contents of Commercial Fruit Juices Available in Bangladesh. *American Journal of Food and Nutrition.*; 3(2):56-63. <http://dx.doi.org :10.12691/ajfn-3-2-4>.
- Sharma, P. (2011). A text book of Production Engineering 11th Edition S. *Chand and Company Ltd, New Delhi*.
- Shukla, S. K., Mishra, A.and Jain, J.( 2013). Concentration of Fruit Juices by Vacuum Membrane Distillation: A Review; *International Journal of Chemistry and Chemical Engineering*. Vol3(4): 49-54.
- Standard Specification No. (1258) second update. (1989). The Ministry of Planing and Development Cooperation. CentralOranization for Standerization and Quality Control- Iraq.
- The optional ingredients included (2011). "*Coloring, ascorbic acid, butter salts, emulsifying and stabilizing substances, and weighting oils*".
- USEPA.(2001). USEPA IN tegrated Risk in formation system(IRIS).
- WHO (World Health Organization). (2011). "*Guidelines for drinking-water quality*". 4<sup>th</sup> edition.
- Ysart, G.(2000). Food Additives and contaminants, *J.Aricle puhlised*:17(9):775-786. <http://dx.doi.org/10.1080/026520300415327>.
- Zakreweski, S.F. (1991). *Principle of environmental toxicology. Asc professional reference book*, Washington, DC, 1.