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Evaluation of ascorbic acid levels and other biochemical parameters levels in Local and Imported Lemon Juices.

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ABSTRACT

Lemon fruit is an important type of *Rutaceae* family, it has many health benefits due to its important contents. Ascorbic acid (Vitamin C) is a water-soluble vitamin which has reductive properties, so it is used on a large scale as antioxidant in food and drinks. The goal of this search is to determine the concentrations of vitamin C and protein and minerals (Iron, Magnesium, Potassium , and Calcium) in local and imported lemon juices. Local and imported (from Turkey) lemon were chosen in this study, Ascorbic acid concentration was measured via redox titration method; involve titration with an oxidant solution: dichlorophenol indophenol. Furthermore protein concentration was measured spectrophotometry depending on Biuret method and the minerals by Atomic Absorption Spectrophotometer. The results indicated that local lemon juice is a rich source of vitamin C (24.02 ± 1.07 mg/100ml juice) in comparison to the imported lemon. However the local lemon juice gave a lowest concentration of protein (0.37 ± 0.21 mg/100ml juice). Minerals concentrations were somewhat close when compared between the three studied groups while the pH value was slightly higher in local lemon . Our results indicates that local lemon juice is a highest source of the important antioxidant vitamin (vitamin C) with acceptable acidity.

1. Introduction

Lemon; scientific name “Citrus limon”; is an important plant of the *Rutaceae* family. It grown mainly in Mediterranean regions including Iraq , Spain , Morocco, Greece, Cyprus , Italy, Turkey (Klimek *et al*, 2020). It's juice has more medicinal uses due to its composition ,it contains vitamins , such as vitamin C ,B1,2,5, and6 as well as minerals like iron, potassium, magnesium, phosphorus, calcium, manganese, and copper (Rafid *et al*, 2018,&Dixon *et al*, 2006). Furthermore lemon has bioactive compounds, such as polyphenols and flavonoids as well protein with a little fat , and some carbohydrates, therefore it has many medicinal properties such as strengthens the immune system , antioxidant, antibacterial,, antifungal and antiviral activities in addition of it role in reducing obesity (Ekawatil *et al*, 2019,& Lamine *et al*, 2019) . L-ascorbic ($C_6H_8O_6$; -oxo-L-threo-hexono-1,4-lactone-2,3-enediol) and dehydroascorbic acid are the major dietary forms of vitamin C. Lemon juice contain high level of this essential water-soluble vitamin, it has antioxidant properties that make it very important for human body that get it from food which need about 100 mg/day especially because the body can't produce this vitamin (Klimek *et al*, 2020,&Haji mahmed *et al*, 2012). Element in their simple inorganic form known as minerals, nutritionally, they familiar as inorganic nutrients or mineral elements. Minerals are essential for human body , they help retain and maintain water, regulating , building living cells that necessary for life's all living cells which makes up the body, maintain and keep water necessary for life's processes in the body was assisted by this important vitamin (Czech *et al*, 2020, & Chuku *et al*, 2014). Because this fruit is widely grown in Iraq and used widely in Iraqi kitchen , this work is aimed at comparing the concentration of vitamin C , some minerals (magnesium, Iron, potassium, and calcium) and protein of local and imported lemon juices as well as evaluating the pH values .

2. Materials and Methods

Three types of lemon were used in this study: Iraqi lemon ,Turkey lemon(non-grafted) , Turkey Lemon (Meyer, grafted), Figure 1. Fresh lemon of the three types were peeled and cut into two transversely and then squeezed by a manual juice squeezer, sufficient juice was obtained for each kind.

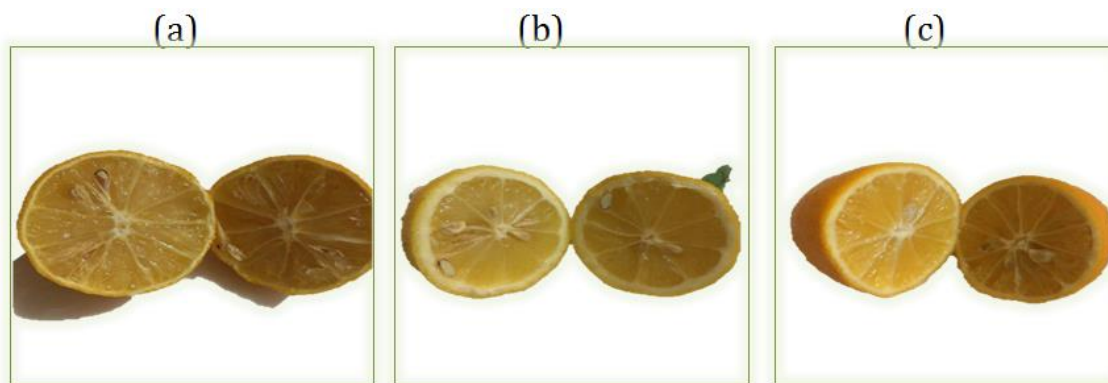


Figure (1): The used plants: (a)Iraqi lemon. (b)Turkey lemon. (c) Turkey Lemon (Meyer).

For the three different types of lemon juices :pH of the samples were determined using glass electrode pH meter , and the concentration of ascorbic acid was determined by a titration method (Plummer ,2004) The titration volumes recorded then the concentration of tests calculated by the following equation :-

$$\text{Vitamin C of Test (mg/100ml)} = \frac{V_{\text{test}} - V_{\text{B}}}{V_{\text{st}} - V_{\text{B}}} * 0.02 \text{ (mg/1ml)} * 100 * \text{dilution factor}$$

(Standard Concentration.)

Whereas V_{test} = Volume of the test, (ml). $V_{\text{st.}}$ = Volume of the standard(ml). , and V_{B} = Volume of the blank(ml.)

Minerals were analyzed by AAS (Atomic Absorption Spectrophotometer) , finally Protein concentration of the three different types of lemon juices was determined using Biuret method (Janairo *et al*, 2011).

Statistical analysis (mean \pm standard deviation)was carried out by using the following equations:

$$SD = \sqrt{\frac{\sum(A-\bar{A})^2}{n-1}} \quad , \quad \bar{A}(\text{Mean}) = \frac{\sum A}{n}$$

n = Number of Measurements = **3**, A = the measurement.

3. Results

The results of the present study showed convergent pH values with highest value for the local lemon, Table (1), while about the concentration of ascorbic acid local lemon juice gave high concentration (24.02 \pm 1.07mg/100ml) in comparison to the imported lemon; Turkey lemon has (15.78 \pm 1.11mg/100ml) of vitamin C and the Turkey Lemon Meyer juice gave a lowest concentration of this vitamin (9.98 \pm 1.88mg/100ml). Meanwhile local lemon juice gave a lowest concentration of protein (0.37 \pm 0.21 mg/100ml), while the Turkey Lemon Meyer gave highest concentration of protein(1.89 \pm 0.11 mg/100ml) and the Turkey juice give (0.68 \pm 0.15mg/100ml), Table (1).

Table (1) :- Mean \pm SD of pH, Vitamin C, and Potassium in the three studied samples.

Samples	pH value	Vit. C Concentration (mg/100ml)	Protein concentration (mg/100ml)
Iraqi lemon	2.44 \pm 0.07	24.02 \pm 1.07	0.37 \pm 0.21
Turkey lemon	2.37 \pm 0.09	15.78 \pm 1.11	0.68 \pm 0.15
Turkey Lemon Meyer	2.08 \pm 0.11	9.98 \pm 1.88	1.89 \pm 0.11

According to Table (2), mineral concentrations were approximately in the same range.

Table (2): Mean± SD of Iron, Magnesium, Potassium , and Calcium in the three studied samples.

Samples	Iron (µg/ml)	Magnesium (µg/ml)	Potassium (µg/ml)	Calcium (µg/ml)
Iraqi lemon	1.40± 0.13	0.20± 0.07	190.66± 20.45	2.99± 0.42
Turkey lemon	1.37± 0.09	0.19± 0.04	188.91±19.65	3.24±0.55
Turkey Lemon Meyer	1.42± 0.14	0.21 ±0.08	189..53±23.76	3.11±0.19

4. Discussion

Lemon exhibits maximal stability between pH 4 and 6 It has been used in order to its great ability lipid solubility in antioxidant preparations (Saubertich , 1985). It is easily absorbed by the Body Most of it (80–90%) will be absorbed when the intake is up to 100 mg/day. Levels of pH of fruits and vegetables give an indication of it's acidity which relate with their effect on stomach and so on digestion of food (Sehgal *et al*,2015) . Ascorbic acid being a water soluble compound is easily absorbed by active transport in the intestine (Oikch *et al*,2016) . but it is not stored in the body. Many Methods for ascorbic acid determination in lemon juice were used such as ; direct titration methods , chromatographic method, Electrochemical and Spectrophotometric . Meanwhile several of these methods are costly, some require special training agent, time-consuming, or they are incomplete selectivity or sensitivity (Balogan *et al*,2019) . The effectiveness of reducing agent (vitamin C) due to the two alcoholic groups and the endiol group with acidic character. It can be quantitatively and reversibly oxidized by different oxidizing agent in aqueous solutions such as iodine ion and 2,6-Dichlorophenolindphenol, in this research titration method was used because it is accurate and precise method for vit. C determination in comparison with other methods (Huanget *al*,2019) (Bugan *et al*,2011) . The total vitamin C (ascorbic acid + dehydroascorbic acid) were determined in various fruits and vegetables by using a simple UV- spectrophotometric method for the determination of at Koya area in Kurdistan Region is described, the content of vit. C was(0.841 to 17.416 mg/10g) in vegetables and (1.868 to 51.74 mg/10g) in fruits. (Mohammed *et al*, 2009) .

The differences in ascorbic acid concentration , Table (1), may be due to the fact that it was estimated in different methods { principle , precision, repeatability, accuracy }, as well as the differences of samples i.e. the samples were from several types of soils countries , and in the natural components of the soils and additive soil materials such as fertilizers , and the most commonly are Nitrogen fertilizers ; fertilizer 6-6-6-2, that used in planting Turkey Lemon Meyer , Turkey lemon samples. That mainly due to increase the source (amount) of nitrogen ;then increase the growth and anabolism of protein and increase conversion of glucose to Amino acids (that basic material for the

composition of protein) , That Lead to decrease formation of ascorbic acid (the glucose it is precursor) in order to decrease amount of glucose (Klimek *et al*, 2020).

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