iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** X **Month of publication:** October 2017

DOI: http://doi.org/10.22214/ijraset.2017.10047

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue X, October 2017- Available at www.ijraset.com

Comparative Analysis of Nutritional and Anti Nutritional Components of Selected Citrus Fruit species

Ayona Jayadev[1] and Athira U [2]
[1.2] *Department of Environmental Sciences, All Saints' College, Thiruvananthapuram, Kerala, India*

Abstract: *Analysis of* ***nutritional and Anti-nutritional content of six varieties of citrus fruit species: Sweet orange (Citrus sinensis), Lemon (Citrus limonum), Mosambi (Citrus limetta), Pomelo (Citrus maxima), Bitter orange (Citrus aurantium) and mini orange (Citrus microcarpa) were done in this study. The results of the analysis revealed the presence of nutrients and anti nutrients comprising vitamins, proteins and tannin. The Total vitamin content was higher in lemon (Citrus limonum) with range of 1.231±0.110mg when compared with other citrus fruits. Vitamin C is a powerful antioxidant and protects the body from damaging free radicals. The highest (%) amount of protein was recorded in lemon (Citrus limonum) containing 0.021±0.014mg followed by Bitter orange with 0.019±0.013, indicating that the fruits of lemon are very good for consumption with respect to protein content. The Tannin content was found to be highest in sweet orange (Citrus sinensis) and bitter orange (Citrus aurantium) with the range of 0.0366±0.02mg.***

Keywords: Citrus fruits, Sweet orange (Citrus sinensis), Lemon (Citrus limonum), Mosambi (Citrus limetta), Pomelo (Citrus maxima), Bitter orange (Citrus aurantium) and mini orange (Citrus microcarpa); nutrient components (protein, vitamin), antioxidants (tannin)

I. INTRODUCTION

Fruits are important part of our daily diet. They are naturally good and contain vitamins and minerals that can help to keep us healthy. They can also help protect against some diseases. Eating fruits provide health benefits. People who eat more fruits as part of an overall healthy diet are likely to have a reduced risk of some chronic diseases. Fruits provide nutrients vital for health and maintenance of our body. Fruits are the usually sweet, fleshy, edible part of a plant. Fruits are usually eaten raw, although some varieties can be cooked. They come in a wide variety of colours, shapes and flavours. Citrus fruits are important sources of minerals, fibre and which provide essential nutrients to the human body. But it is known that some fruits have so-called anti nutritional factors. Bioactive compounds comprising phenol, tannin etc. also act as antioxidants.

Citrus is a genus of flowering trees and shrubs in the family, Rutaceae. Plants in the genus produce citrus fruits, including important crops like oranges, lemons, grapefruit, pomelo and limes. It is well established that citrus and citrus products are a rich source of vitamins, minerals and dietary fibre that are essential for normal growth and development and overall nutritional well-being. However, it is now beginning to be appreciated that these and other biologically active, non-nutrient compounds found in citrus and other plants (phytochemicals) can also help to reduce the risk of many chronic diseases. Citrus is considered as a good source of vitamin C. However, like most other whole foods, citrus fruits also contain an impressive list of other essential nutrients, In addition, citrus contains no fat or sodium and, being a plant food, no cholesterol. Since the average energy value of fresh citrus is found to be low, this is liked by consumers who are concerned about obesity.

Citrus fruits are a particularly good source of vitamin C, as an antioxidant. Citrus can help to prevent cell damage. Regular consumption of citrus fruits can be an important part of a diet aimed at reducing the risk of chronic diseases. Only 10 mg of vitamin C per day are required to prevent vitamin C deficiency and the devastating disease scurvy generally seen with very high levels of supplementation, may be dangerous, especially for those at risk of iron overload.

Bioactive compounds in citrus fruit that having antioxidant properties. Antioxidants are substances that known to delay or inhibit oxidation [1]. Plant component in citrus fruits has antioxidant components that are able to reduce oxidative stress [2]. Phenolic compounds are widespread constituents of plant foods and partially responsible for the overall organoleptic properties [3]. Fruits are also important sources of kinds of phytochemicals. Bioactive compounds in fruit that have antioxidant properties are carotenoids, polyphenols, anthocyanins and vitamins [4], [5]. Phytochemicals, which are naturally occurring compounds found in plants have a wide range of physiological effects and may help to protect against various chronic diseases, including cancer and

heart disease. The wide variety and number of known phytochemicals continue to grow, as does understanding of their role and importance in the diet [6].

Citrus fruits are well known to be rich in certain nutrients comprising vitamins, proteins, carbohydrate etc and phyto nutrients especially phenol, tannin etc that protect against human diseases such as cancer and cardiovascular diseases. They also help in lowering blood pressure levels and substantially reduce the risk of stroke. Vitamin C (ascorbic acid) helps in the formation of collagen, a primary component of much of the connective tissue in the body.

II. MATERIALS AND METHODS

A Sample collection

The experimental citrus fruits comprises of sweet orange (C. sinensis), Lemon (C. limonum), mosambi (C. limetta), pomelo (C. maxima), wild orange (C. aurantium) and mini orange (C. microcarpa). These citrus fruits were purchased from a local market and were evaluated for the nutrient and anti nutrient contents.

B Taxonomical information of selected citrus fruit species

1) Citrus sinensis

a) *Kingdom:* Plantae
b) *Order:* sapindales
c) *Family:* Rutacea
d) Genus: Citrus
e) *Species:* C. sinensis

2) Cirus limonum

a) *Kingdom:* Plantae
b) *Order:* Sapindales
c) *Family*: Rutaceae
d) *Genus:* Citrus
e) *Species:* C. limon

3) Citrus limetta

a) *Kingdom:* Plantae
b) *Order:* Sapindales
c) *Family*: Rutaceae
d) *Genus:* Citrus
e) *Species:* C. limetta

4) Ctrus maxima

a) *Kingdom:* Plantae
b) *Order:* Sapindales
c) *Family:* Rutaceae
d) *Genus:* Citrus
e) *Species:* C. maxima

5) Citrus aurantium

a) *Kingdom:* Plantae
b) *Order:* Sapindales
c) *Family:* Rutaceae
d) *Genus*: Citrus
e) *Species:* C.aurantium

6) Citrus microcarpa

a) *Kingdom:* Plantae
b) *Order:* Sapindales

c) *Family*: Rutaceae
d) *Genus:* Citrus
e) *Species:* C. microcarpa

C Sample preparation

Six different species of citrus fruits were peeled out and for reducing the surface area the endocarps and mesocarps were cut into smaller pieces with a sharp clean knife. The juices from six citrus fruit samples were pressed out from the fruit, preserved and stored in airtight bottles in a refrigerator until analysis.

D Determination Nutrients and anti nutrients

1) Determination of protein: Two grams of sample was weighed and mixed thoroughly in phosphate buffer. The sample solution was filtered out by using cheese cloth. Then the filtrate was centrifuged at 5000rpm for 10 minutes. The supernatant was collected and made it to known volume by using buffer. 1ml of the above solution was taken and into the solution 1ml of 10% TCA was added. Then the solution was shaken thoroughly. It was kept in freezer for 15 minutes and centrifuged at 10,000 rpm for 10 minutes. The upper layer was decanted; from this the pellet was carefully taken. It was dissolved into known volume of 0.1 N NaOH. 0.1 ml of aliquot was taken from it. The solution was made up to 1ml by using 0.1 N NaOH. 5ml of reagent C was added into it. And it was kept for 30 minutes. The OD was read at 670nm [7].

2) Determination of vitamin C (Ascorbic acid): Two gram of the citrus fruit sample were weighed into a extraction tube and 100 mL of EDTA extracting solution were mixed and the mixture shaken for 30min.This was transferred into a centrifuge tube and centrifuged at 3000rpm for about 20 minutes. It was transferred into a 100mL volumetric flask and made up to 100mL mark, with the extracting solution .20mL of the extract was pipette into a volumetric flask and 1% starch indicator, was added and titrated with 20% CuSO4 solution to get a dark end point [8].

3) Determination of Tannin: One gram of each citrus fruit was extracted in 50% of methanol. The solution was mixed occasionally by swirling. The solution is then centrifuged after 20-28hrs and the supernatant was carefully collected. From the collected supernatant 1ml of it was pipette out. 5ml of vanillin hydrochloride reagent was added quickly into it. After 20 minutes the OD was read in spectrophotometer at 500 nm. Vanillin hydrochloride reagent alone was prepared as the blank.

III. RESULT AND DISCUSSION

This study was undertaken to evaluate the percentage of nutrient and anti nutrient constituents present in different citrus fruits selected based on the availability of species. The nutrient contents of the selected citrus fruits are shown in TABLE 1. Citrus is an excellent source of vitamin C .The total vitamin content was higher in lemon with range of 1.231±0.110g GAE/g. Most Vitamin C (ascorbic acid) is a water-soluble. Citrus contains large amounts of vitamin C. Vitamin C helps produce collagen, which provides structure and elasticity for skin and tendons.

TABLE 1
(NUTRIENT COMPOSITION (PROTEIN AND VITAMIN) IN CITRUS FRUITS EXPRESSED AS MG

Citrus fruit species	Protein(Mg)	Vitamin C (mg)
Citrus sinensis	0.018 ±0.013	0.062 ±0.386
Citrus limonum	0.021±0.014	1.231±0.110
Citrus limetta	0.016±0.012	0.626±0.079
Citrus aurantium	0.019±0.013	0.446 ±0.067
Citrus maxima	0.015±0.012	0.716 ±0.084
Citrus microptera	0.012±0.010	0.324 ±0.057

The results also indicated the highest (%) amount recorded in lemon (Citrus limonum) containing 0.021±0.014mg protein, followed by Bitter orange (Citrus aurantium) with 0.019±0.013mg protein, indicating that the fruits are very good for consumption with respect to protein content. Citrus lemon contains the highest amount (180.67mg/100ml) of total soluble protein as per reports [8] lowest amount of protein in Citrus microptera with range 0.012±0.010mg.

As a result of the availability of phytonutrients in these citrus fruits, there are so many health benefits on their consumption. The sequential order of antioxidant activities of citrus samples were studied from highest to lowest [9] and was found that the order is such that orange, lemon, grapefruit and mandarin juices and from the grapefruit, lemon, mandarin and orange peels. There

was no correlation between antioxidant activity and the levels of total phenolic compounds and flavonoids in the citrus samples [9] found 66% and 81% antioxidant activity in orange and Jaffa orange juices, respectively.

The Tannin content of the selected citrus fruits is shown in TABLE 2.The Tannin content was found to be highest in Citrus sinensis and Citrus aurantium with the range of 0.0366±0.02g GAE/g when compared with other citrus fruits. Tannin content was more in C. aurantifolia and C. sinensis having (0.04 mg 100g-1) while C. reticulata and Citrus limonum have 0.02 mg 100g-1 and 0.01mg/100g of tannin respectively. The presence of tannin could be responsible for the bitter principle and sour taste of some citrus species.Tannin s have astringent properties, hasten and healing of wounds, and inflamed mucous membranes [10] This is supported the use of lemon juice in herbal medicine for the treatment of varicose ,ulcers,hemorroids, frostbite and burns by the natives [10].

TABLE 2
TANNIN CONTENTS IN DIFFERENT CITRUS FRUIT SPECIES (MG)

Citrus fruit species	Tannin(Mg)
Citrus sinensis	0.0366±0.02
Citrus limonum	0.016±0.014
Citrus maxima	0.026±0.017
Citrus aurantium	0.036±0.02
Citrus limetta	0.016±0.014
Citrus microptera	0.013±0.01

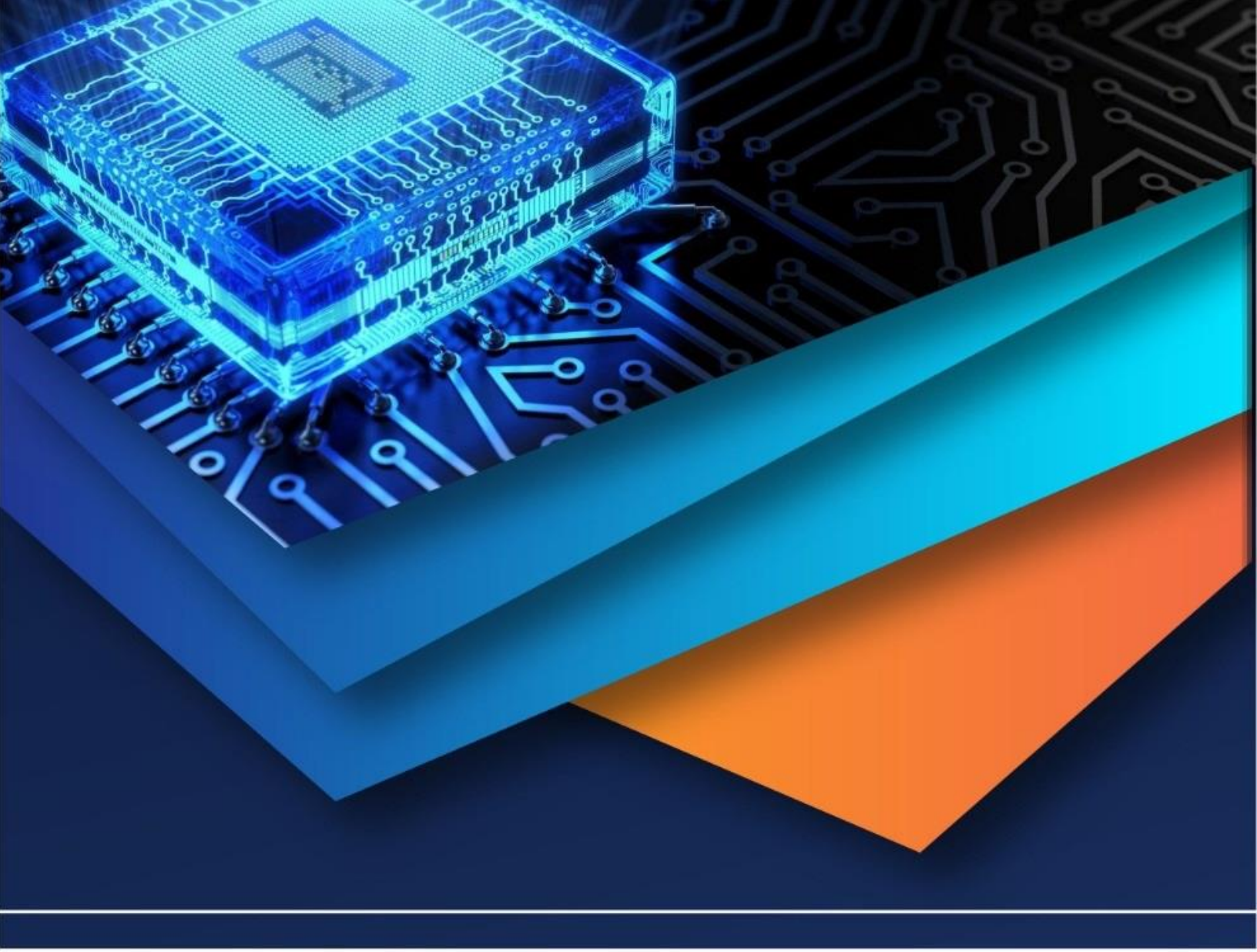
The nutritional and phytochemical contents of citrus vary widely depending upon growing conditions, the variety of fruit, maturity, storage conditions, and on processing. Another barrier is a dearth of knowledge about the nutrient content, bioavailability, and potential health benefits of citrus varieties grown in tropical areas. Currently most research and development has been done using common citrus fruits grown in temperate climates, such as oranges, lemons, and mandarins. Encouraging research on lesser known citrus varieties, and developing citrus varieties capable of expanding into new environs might increase consumption in low income countries that currently lack sufficient domestic citrus production and extend the potential health benefits of citrus to these populations. Finally, promoting the nutritional and health benefits of citrus may correspondingly encourage consumption.

IV. CONCLUSION

Citrus fruits contain a large variety of nutrient and anti-nutrient components are considered as potential sources of functional components. The obtained results reveal that citrus fruits are of good quality and a valuable source of health promoting constituents (Nutrient and anti nutritional). Presented results suggest that, protein, vitamins (nutrients) and Tannin (anti nutrient) are compounds that could be responsible for the biological and antioxidant activity respectively. They also provide natural refreshment to the skin. The amount of citrus needed to provide health benefits is quite variable but appears to be within reasonably consumable amounts. One to three glasses of orange juice a day appears improvement in health. Thus the current research supports the fact that various species of citrus family have so much of health benefits and immunoprotective properties.

REFERENCES

[1] Halliwell, B.(1995). Antioxidant characterization: Methodology and mechanism. Biochemical Pharmacology 49: 1341–1348.
[2] Agudo, A., Cabrera, L., Amiano, P., Ardanaz, E., Barricarte, A., Berenguer, T. and Gonzalez, C. A,(2007)Fruit and vegetable intakes, dietary antioxidant nutrients, and total mortality in Spanish adults: Findings from the Spanish cohort of the European Prospective Investigation into Cancer and Nutrition (EPIC-Spain). American Journal of Clinical Nutrition 85: 1634– 1642.
[3] Shahidi F., Naczak M. (2004)Phenolics in Food and Nutraceuticals. CRC Press LLC.
[4] Dillard, C. J. and German, J. B. (2000) .Phytochemicals: nutraceuticals and human health. Journal of the Science of Food and Agriculture 80: 1744–1756.)
[5] Ness, A. R. and Powles, J. W. (1997) Fruit and vegetables, and cardiovascular disease: a review. International Journal of Epidemiology 26: 1–13.
[6] Steinmetz, K. A., & Potter, J. D. (1991). Vegetables, fruit, and cancer. I. Epidemiology. Cancer Causes and Control, 2(5), 325-357.
[7] Lowry O.H Rosebrugh N.J Farr A.L and Randall R.J 1995.Protein measurement with the folin phenol reagent .J.Bioo.chem.193:275-285
[8] Bavakat,M Z S.K. Shehab,N.Darwich and E.I Zahermy,(1973).Determination of ascorbic acid from plants. Analyst Biochemistry,53:225-245)
[9] Rakesh Kumar ,Saurabh vijay and Nawaz khan ,2013 Comparitive nutritional analysis and antioxidant activity of fruit juices of some citrus spp. 1(1): 44-53
[10] Garden P.T, White T.A.C., Mc phail,D.B and G.g. Duthei (2000).The relative contributions of vitamin C, Carotenoids and Phenolics to the Antioxidant potential of fruit juices.Food chem.68,471-474
[11] Okwu,De and ME Okwu,(2004).chemical compositions of spondias mombin linn plant parts.J Sustain Agric.Environ.6:140-147



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY