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NUTRITIONAL QUALITY OF DIFFERENT NUTS AS REVEALED BY ITS BIOCHEMICAL ANALYSIS

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ABSTRACT

In nature, various types of plant are available. These nuts are important for living things. The nuts containing organic and inorganic matter are present organic matter contains lipid, carbohydrates, vitamin C, protein, fats etc. Similar to plant foods, nuts provide a range of nutrients, including large quantities of healthy monounsaturated and polyunsaturated fats and moderate amounts of protein. The inorganic matter contains inorganic elements such as sodium, potassium, calcium, etc. These elements are major nutrients. Micronutrients such as magnesium, zinc, manganese, copper, iron etc. are essential nutrients for living organisms. Nuts are also a good source of dietary fiber and provide a wide range of essential nutrients, including several B group vitamins (including folate), vitamin E, minerals such as calcium, iron, zinc, potassium and magnesium, antioxidant minerals (selenium, manganese and copper), plus other photochemical such as antioxidant compounds (flavonoids and resveratrol) and plant sterols. These elements are analyzed by various analytical techniques such as UV visible spectrophotometer, flame photometry and atomic absorptions spectrophotometers. Nuts are important part of human diet. They are commercially important and nutritionally indispensable food commodity. Man has kept these commodities in his diet to provide variety, taste, interest, aesthetic appeal and to meet certain nutritional requirements. Nuts are edible products of the perennial higher plants with high water content, sweet, sour. Also, because of their exotic flavor and taste, considerable attention is paid in different parts of the world.

KEYWORDS: *Nuts Nutritional Quality, Organic & Inorganic Matter in Nuts, Biochemical and Biophysical, Antimicrobial Property*

Abbreviations*: AAS-Atomic Absorption Spectroscopy, DNSA- Dinitro Salicyclic acid*

INTRODUCTION

Nuts are healthy plant food because they are high in healthy fats, protein and fiber, yet they're often the source of confusion for those wanting to manage their weight. In nature, various types of plant are available these Nuts are important for living things, the nuts containing organic and inorganic matter are present. Organic matter contains lipid, carbohydrates, vitamin C, protein, fats[12]etc. The inorganic matter contains inorganic elements such as sodium, potassium, calcium, etc. these elements are major nutrients. Micronutrients such as Magnesium Zinc, manganese, Copper, Iron etc. are essential nutrients for living organisms. Similar to other plant foods, nuts provide a range of nutrients, including large quantities of healthy monounsaturated and polyunsaturated fats (49–74% total fat), and moderate amounts of protein (9–20 %) (except chestnuts

which are low fat).Nuts are also a good source of dietary fiber and provide a wide range of essential nutrients, including several B group vitamins (including folate), vitamin E, minerals such as calcium, iron, zinc, potassium and magnesium, antioxidant minerals (selenium, manganese and copper), plus other photochemical such as antioxidant compounds (flavonoids and resveratrol) and plant sterols[6]. Nuts are important part of human diet. Nuts are edible products of the perennial higher plants with high water content, hard texture, sweet and sour. Also, because of their exotic flavor and taste, considerable attention is paid in different parts of the world. The Nuts are consumed by man, mainly because of their organoleptic and chemical property. They play a vital role in human nutrition, by supplying the necessary growth factors essential for maintaining normal health [7]. Nuts along with vegetables are termed as 'Protective foods'. They contain rich sources of vitamins (A, B complex and C) and minerals (calcium, iron and phosphorus) in diets to keep human health in good state. Fruits are easily digestible and contain ample amounts of different organic acids and digestive enzymes. They contain rich sources of roughage value in food, help in bowel movement, prevents constipation. Its natural fiber and an energy giving materials contain high calorific value. Almost all plants have some medicinal value in one way or the other. Physicians recommend fruits for the treatment of many ailments like scurvy, night blindness, asthma, fever, anemia, ulcers[18]

Anacardiumoccidentale: (cashew)

The cashew tree is large and evergreen, growing to 33–39 feet tall, with a short, often irregularly shaped trunk. The leaves are spirally arranged, leathery textured, elliptic to obviate, 4–22 cm long and 2–15 cm broad, with smooth margins. The flowers are produced in a panicle up to 26 cm long; each flower is small, pale green at first, then turning reddish, with five slender, acute petals 7–15 mm long. The true fruit of the cashew tree is a kidney or boxing-glove shaped drupe that grows at the end of the cashew apple. In a 100 gram serving, raw cashews provide 553 calories, 67 % of the Daily Value in total fats, 36 % of protein, 13 % of dietary fiber and 11 % carbohydrates [4]. Cashews are rich sources of dietary minerals, including particularly copper, manganese, phosphorus and magnesium (79–110 %) and of thiamin, vitamin B6 and vitamin K (32–37 %). Iron, potassium, zinc and selenium are also present in significant content (14–61 %) [2]. Cashews were first brought to India by the Portuguese, who planted them along the coasts of Goa to prevent erosion. Delicately sweet yet crunchy and delicious cashew nut is packed with energy, antioxidants, minerals and vitamins that are essential for robust health.

Prunusdulcis: (Almond)

The almond is a deciduous tree, growing 4–10 m in height, with a trunk of up to 30 cm (12 in) in diameter. The young twigs are green at first, becoming purplish where exposed to sunlight, then grey out in their second year. Almond grows best in Mediterranean climates with warm, dry summers and mild, wet winters. Almonds begin bearing an economic crop in the third year.[3]

Pistaciavera

Although pistachio trees are long living, with a large tap root, and can grow to 20–30 feet, seedlings can be grown in containers for the first three to five years and then transplanted into the garden. The bush grows up to 10 m (33 ft) tall. In a 100 gram serving, pistachios provide 562 calories and are a rich source of protein, dietary fiber, several dietary minerals and the B vitamins, thiamin and vitamin B6. Pistachios are a good source of calcium, vitamin B5 and vitamin E. The fat profile of raw pistachios consists of saturated fats, monounsaturated fats and polyunsaturated fats. Saturated fatty acids include palmitic acid (10% of total) and stearic acid (2 %). Oleic acid is the most common monounsaturated fatty acid (51% of total fat) and polyunsaturated fatty acid (18 % of total) [9]

Arachishypogaea: (Peanut)

Peanut is an annual herbaceous plant growing 30 to 50 cm tall. As a legume, it belongs to the botanical family Fabaceae. Like most other legumes, peanuts harbor symbiotic nitrogen-fixing bacteria in their root nodules. The leaves are opposite and pinnate with four leaflets (two opposite pairs; no terminal leaflet); each leaflet is 1 to 7 cm long and 1 to 3 cm across. The specific name, hypogaea means "under the earth", because peanut pods develop underground, a feature known as geocarpy. The flowers are 1.0 to 1.5 cm across, and yellowish orange with reddish veining. Peanuts grow best in light, sandy loam soil with a pH of 5.9–7. Their Capacity to fix nitrogen and improve the Soil Fertility. Peanuts can be eaten raw, used in recipes, or made into oils, textile materials, and peanut butter, as well as many other uses. Very unusual among crop plants, peanut pods develop under the ground.[12]

MATERIALS AND METHODS

Glass wares

All glass wares used in the study were of Borosil made. Prior to use, the glass wares were rinsed with chromic acid. Then washed with tap water and further rinsed with double distilled water, which was used from hat progeny model 5 SD/E Distillation Assembly.

Petri-plates, conical flask, measuring cylinder, beaker, slides, cover slips etc were also utilized,

Chemicals

NaCl (sodium chloride), KCl (Pottasium chloride), $CaCl2.2H_2O$ (Calcium Chloride Dihydrate), $CuSo_4.5H_2O$ (Copper (II) sulfate pentahydrate), $FeSo_4.7H_2O$ (Ferrous sulfate heptahydrate), chloroform, Distilled water, Oxalic acid 4 %,- Dye Solution: (weigh 42 mg sodium bicarbonate into a small volume of distilled water. Dissolve 52 mg 2,6dichloro phenol indophenol into it and make up to 200 ml distilled water). Stock standard solution: (Dissolve 100 mg ascorbic acid in 100 ml of 4 % oxalic acid solution in a standard flask (1 mg / ml).),Working standard: Dilute 10 ml of the stock solution to 100 ml with 4% oxalic acid. The concentration of working standard is 100 ug / ml), Dinitrosalicylic Acid Reagent Solution: Mix 100 ml of 5 % (w / v) 3, 5 dinitrosalicylic acid in 2 M NaOH with 250 ml of 60 % (w / v) sodium potassium tartrate and make the total volume up to 500 ml with distilled water., Standard glucose solution. Solution A: Prepare 100ml 2 % Sodium carbonate Solution in distilled water)., Solution B (prepare 100ml 0.5 % Copper sulphate in 1 % Sodium potassium tart rate). Reagent C (Protein reagent: mix 50ml of solution A with 1ml of solution B.s)

REQUIREMENTS

Crucible with lid, Oven, Balance weight, Desiccators, Autoclave, laminar air flow cabinet, incubator, compound stereo binocular microscope, electronic top balance, dissecting microscope.

Method of Sample Collection

Sample Collection

Four nuts fresh were purchased from local market in Loni market city. Before the extraction procedure, all the samples were thoroughly cleaned using deionizer water to remove any adhering contaminants, if present.

METHODS

Analysis of Physical Parameter:

The Standard Methods of the Association of Official Analytical Chemists, AOAC methods, 939.13 and 966.18 were used for the determination of ascorbic acid in the Nuts juice. [14] Analysis of Flame Emission Spectroscopy and Atomic Absorption Spectrophotometry [5]. According to standard protocol, we can estimate different physical parameter such as Sodium, Potassium, Copper, Iron and calcium content are estimated. [20, 21]

Biophysical Parameter Analysis

Moisture Content

The moisture content is determined by standard protocol and it will be discussed in the result section. Difference in weight determines the moisture content [12, 18, and 14].

Ash Content

According to the method, 100g of each sample was weighed in a silica crucible. The crucible was heated in a muffle furnace for about 3-5 hrs at 600 C. It was cooled in desiccators and weighed to completion of ashing. To ensure completion of ashing, it was heated again in the furnace for ½ an hour more, cooled and weighed. This was repeated consequently till the weight become constant weight of ash. [17] The ash content was calculated by the following formula:

Ash % = weight of ashed sample /weight of sample taken × 100[13]

Ash content was analyzed by AOAC method Ref. 942.05.[12]

Biochemical Parameter Estimation

Estimation of Carbohydrate

The carbohydrate are estimated by DNSA method using standard protocol. The concentrations of reducing sugars and non-reducing sugars were determined by the dinitrosalicylic acid method [15]. We can estimate sugar content and it is discussed in detail in result section [18]

Estimation of Protein

Macro method was used for the estimation of crude protein content [12,10]. Grind 2g of sample fresh fruit and dry powder in a pestle and mortar with 10ml of distilled water and centrifuge 4000rpm for 10mins. Then 1ml of supernatant was made up to 100ml with distilled water. The amount of protein was estimated by the method of Lowry *et al* using BSA as the standard. [15, 16]

Estimation of Lipid

The lipid confirmatory test are determined by lipid spot test that is determined by physical test in which we take dry paper do not wet them it give spot of fruit extract from conclude C.T. of lipid and detailed discuss in result and conclusion Taken a 1gm powdered sample and add to it 4 ml chloroform. Dissolve all samples properly. Then spot the mixture in whatsmann filter paper no. 41 by using dropper. Identified the lipids present in the sample.[18]

Estimation of Ascorbic Acid

The Ascorbic acid estimation method that is by volumetric analysis the ascorbic acid content in these fruits and vegetables were determined by volumetric method. [2, 3, 4, 7, 18]

Secondary Metabolite

Preliminary qualitative phytochemical analysis of all the extracts was carried out by using standard conventional protocols [1, 9, 16, and 18]

RESULTS & DISCUSSIONS

Analysis of Physical Parameter

The analysis of different minerals concentrations in methanolic extracts of fruit from loni, Maharashtra was determined using atomic absorption spectroscopy (AAS) and results obtained were tabulated in Table 1, showing analysis of components like Sodium (Na), Pottasium (K), Calcium (Ca), Copper (Cu), Iron (Fe). In all observation of analysis and Figure we get following result

Sodium (Na)

The nuts sample are analyzed by flame photometry and concluded that the Anacardiumoccidentale and Arachishypogaea having maximum concentration of sodium i.e. 6.5 mg / 100gm and on the other hand side minimum concentration of sodium is Prunusdulcisi.e 5 mg / 100 gm.

Pottasium (K)

The nuts sample is analyzed by flame photometry and conclude that the Prunusdulc is having maximum concentration of potassium i.e. 20 mg / 100 gm and on the other hand side minimum concentration of potassium is Anacardiumoccidentale i.e. 13 mg / 100 gm.

Calcium (Ca)

The fruits sample is analyzed by flame photometry and concludes that the Anacardiumoccidentale having maximum concentration of Calcium i.e13 mg / 100gm and on the other hand side minimum concentration of Calcium is Prunusdulcisi.e3 mg / 100 gm.

Copper (Cu)

The fruits sample are analyzed by flame photometry and conclude that the Pistaciavera having maximum concentration of copper i.e. 6.6 mg / 100 gm and on the other hand side minimum concentration of copper is Anacardiumoccidentale and Prunusdulcis i.e. 5.8 mg / 100gm.

Iron (Fe)

The fruits sample are analyzed by flame photometry and conclude that the Prunusdulcis having maximum concentration of iron i.e 4.6 mg / 100 gm and on the other hand side minimum concentration of iron is Anacardiumoccidentale, Pistaciavera and Arachishypogaea i.e 4.4 mg / 100 gm.

Table 1:Analysis of Flame Emission Spectroscopy and Atomic Absorption Spectrophotometry

S.No.	Sample Name	Flame Emission Spectroscopy (Mg / 100 Gm)			Atomic Absorption Spectrophotometry (Mg / 100 Gm)	
		Na	K	Ca	Cu	Fe
1	Anacardiumoccidentale	6.5	13	13	6	4.4
2	Prunusdulcis	5	20	3.5	6	4.6
3	Pistaciavera	6	16	11.5	6.6	4.4
4	Arachishypogaea	6.5	19	7	6.2	4.4

Moisture Content

The moisture content is determined by standard method. Difference in weight determines the moisture content [12, 21]. In following Table 2, we can see different types of nuts moisture content. The out of four nuts Analysis in following Figure 8. In Anacardiumoccidentale high amount of moisture content is about 6 % and other hand side lowest amount of moisture content in Pistaciavera is about0.7 %.

Table 2: Analysis of Moisture Content Four Nuts

S.No	Sample Name	Wt. of Empty Crucible+Lid (M1)	Wt. Crucible + Sample Before Drying (M2)	Wt. Crucible + Sample After Drying (M3)	Moisture Content
1	Anacardiumoccidentale	33.661	34.661	34.601	6
2	Prunusdulcis	37.732	38.732	38.687	4.5
3	Pistaciavera	35.063	36.063	36.056	0.7
4	Arachishypogaea	49.034	50.034	49.983	5.1

Ash Content

Ash content is determined by standard method [12, 13] In Table no.3, analysis of different nuts Ash Content In the Ash content graphical Analysis Shown in the Figure 9 In Anacardiumoccidentale high amount of Ash content 60.4 % and other hand side minimum ash content present in Pistaciavera is above 0.8 %

Table 3: Analysis of Ash Content of Nuts

S. No.	Sample Name	Initial Wt of Sample	Final Wt. of Sample	% of Ash Content
1)	Anacardiumoccidentale	1	0.604	60.4
2)	Prunusdulcis	1	0.157	15.7
3)	Pistaciavera	1	0.081	0.8
4)	Arachishypogaea	1	0.166	16.6

Bio-Chemical Parameter

Estimation of carbohydrates (DNSA Method)

The carbohydrates determine by DNSA method and result found that the higher concentration of reducing sugar present in fruit Arachishypogaeais about 0.047 gm while minimum sugarAnacardiumoccidentalein0.017 gm in the Table 4 there different nuts reducing sugar content are given that are estimated by standard protocol on the basis of Table 4 we draw graphical analysis of Carbohydrate estimation in Figure 10

Table 4: Analysis of Carbohydrate Estimation of Different Nuts

S.No	Sample Name	Sugar
1	Anacardiumoccidentale	0.017
2	Prunusdulcis	0.019
3	Pistaciavera	0.034
4	Arachishypogaea	0.047

Estimation of Protein (Folin's Lowry Method)

The protein is determined by Folin's Lowry Method. In Table 5 there protein analysis of different nuts on that basis we can conclude that the higher concentration of protein present in Pistaciavera is about 0.046 gm while lowest in the Anacardiumoccidentale and Prunusdulcis 0.028 gm all of protein analysis are explain Figure 11 of different fruit

Table 5: Estimation of Protein of Different Nuts

S.No	Sample Name	Protien
1	Anacardiumoccidentale	0.028
2	Prunusdulcis	0.028
3	Pistaciavera	0.046
4	Arachishypogaea	0.030

Lipid Analysis

The lipid analysis are carried out of by standard method lipids spot test in which following are lipid spot photo Figure in fruit lipid are present in following Table 5 enlisted in which fruit lipid are present

Table 6: Lipid Spot Test Analysis

S.No.	Sample Name	Observation
1	Anacardiumoccidentale	Present
2	Prunusdulcis	Present
3	Pistaciavera	Present
4	Arachishypogaea	Present

Estimation of Ascorbic Acid

The ascorbic acid estimation are carried out by standard protocol with the help of that ascorbic acid analysis are done. in the Table 6 there ascorbic acid analysis are carried out of four nuts in which highest ascorbic acidare present in Pistaciavera is about 45.6 (mg / 100 gm), while lowest ascorbic acid in the Arachishypogaea a 34.2 (mg / 100 gm), compared other nutssample with help of table 6 we can draw graphical analysis of ascorbic acid in Figure 12

Qualitative analysis of Secondary Metabolite

In Table 7 Analysis Phytochemical and Secondary Metabolite are given:

- In Cashew present Tarpenoids,Tannins,Saponins,Glycosides,Flavonoids comp.
- Almond sample present a Tannins, Steriods,Flavonoids,Phenolic comp.
- Pista sample present Tarpenoids,Flavonoids,Phenolic comp.
- Peanutsaponins,Alkaloids,flavonoids,phenolic comp are present.

Table 7: Analysis of Ascorbic Acid of Different Nuts

S.No	Sample Name	Burette Reading	Ascorbic Acid
1	Anacardiumoccidentale	0.7	39.9
2	Prunusdulcis	0.7	39.9
3	Pistaciavera	0.8	45.6
4	Arachishypogaea	0.6	34.2

Table 8: Analysis of Secondary Metabolite in Different Nuts

S.No	Secondary Metabolite	Cashew	Almond	Pista	Peanut
1	Steriods	-	+	-	-
2	Tarpenoids	++	-	+	-
3	Tannins	+	+	-	-
4	Saponins	+	-	-	-
5	Alkaloids	-	-	-	_
6	Phlobatanin	-	-	-	-
7	Quinone	-	-	-	-
8	Glycosides	+	-	-	-
9	Flavonoids	+	-	+	++
10	phenolic compound	-	+	+	+++

FIGURES

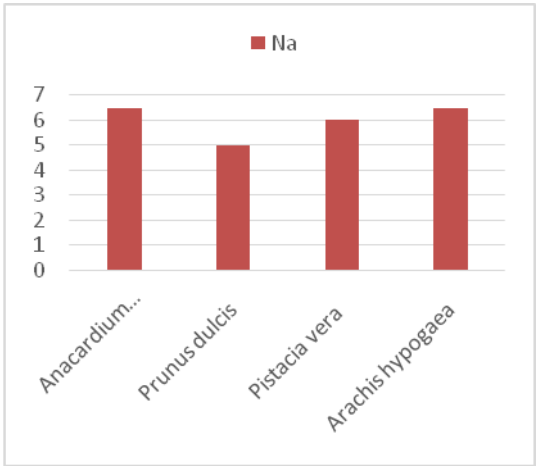


Figure 1: Analysis of Nuts for Sodium.

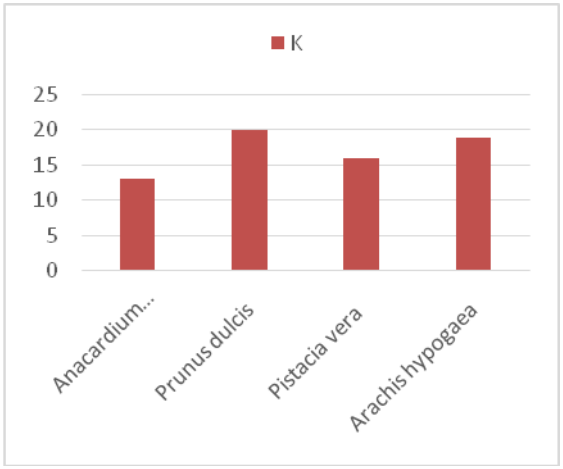
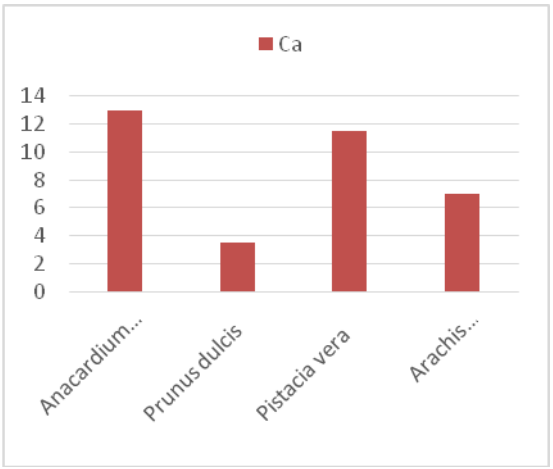


Figure 2: Analysis of Nuts for Pottassium.



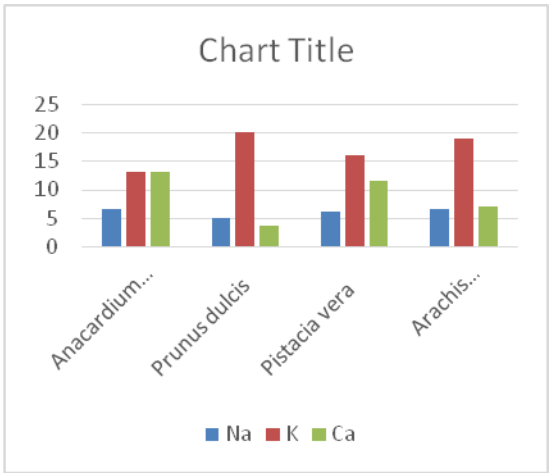


Figure 3: Analysis of Nuts for Calcium.

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Figure 4: Comparatively Analysis of Nuts for Sodium(Na),Pottasium(K), Calcium(Ca).

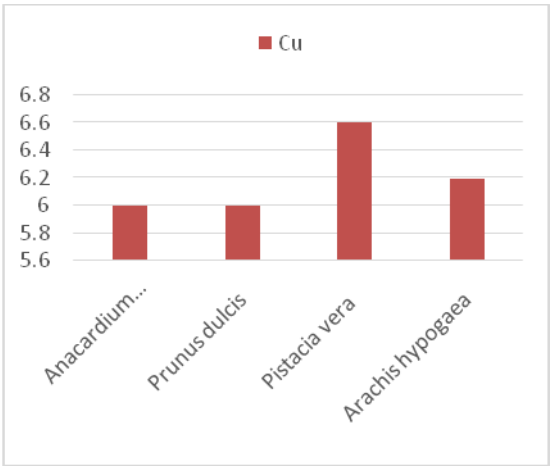


Figure 5: Analysis of Nuts for Copper.

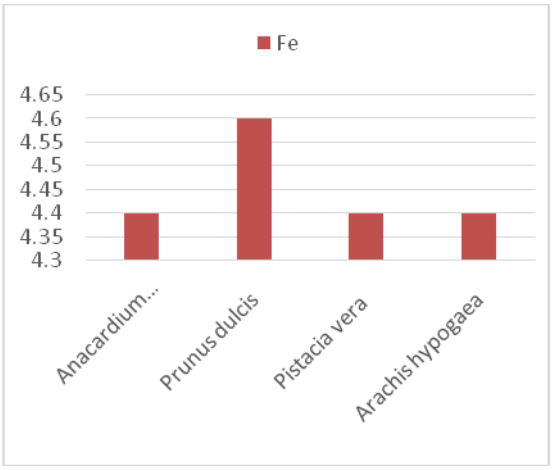
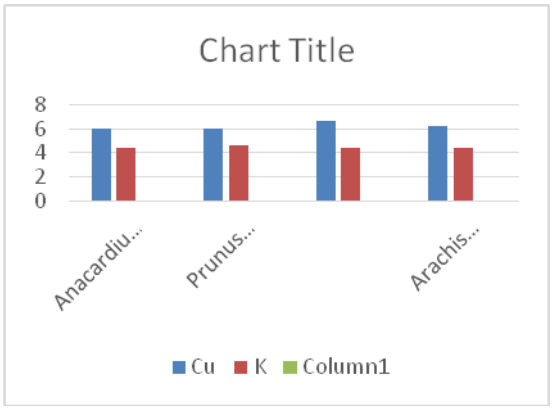


Figure 6: Analysis of Nuts for Iron.



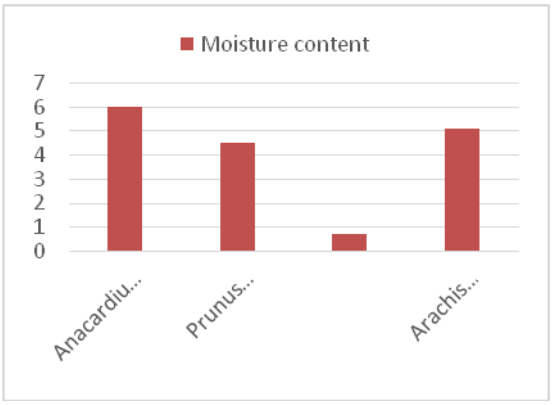


Figure 7: Comparatively Analysis of Nuts for Copper (Cu),Iron (Fe).

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Figure 8:Analysis of Nuts for Moisture Content.

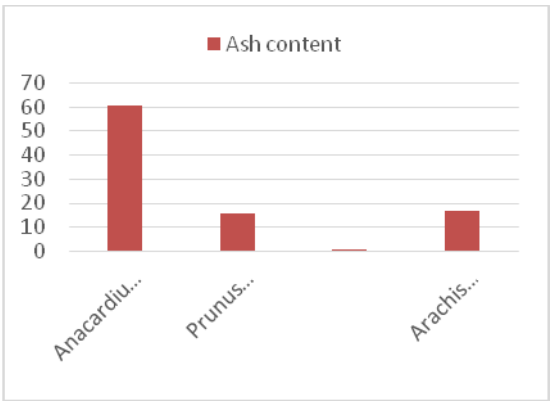

Figure 9: Analysis of Nuts for Ash Content.

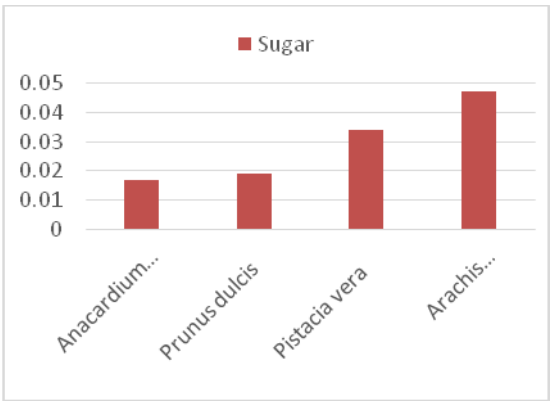

Figure 10: Analysis of Nuts for Carbohydrate.

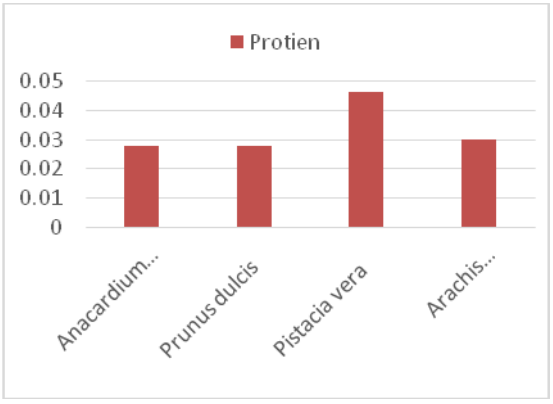

Figure 11:Analysis of Nuts for Protein.

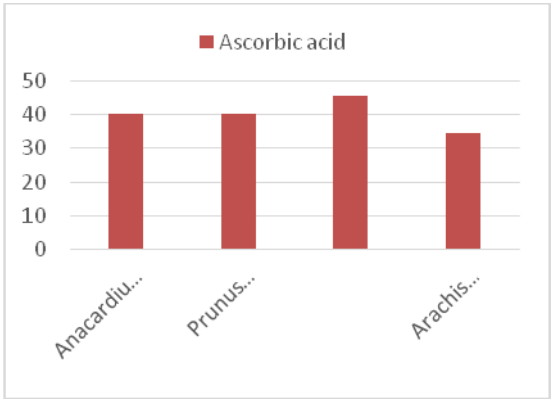

Figure 12:Analysis of Nuts for Ascorbic Acid.

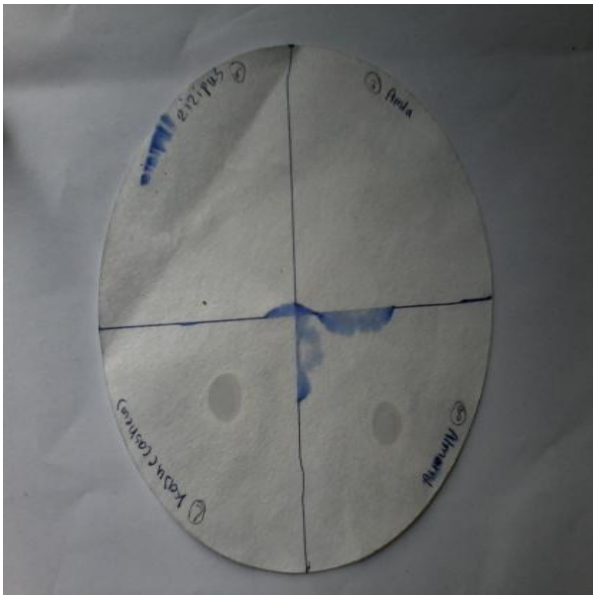

Figure 13:Cashew,Almond Lipid Spot.

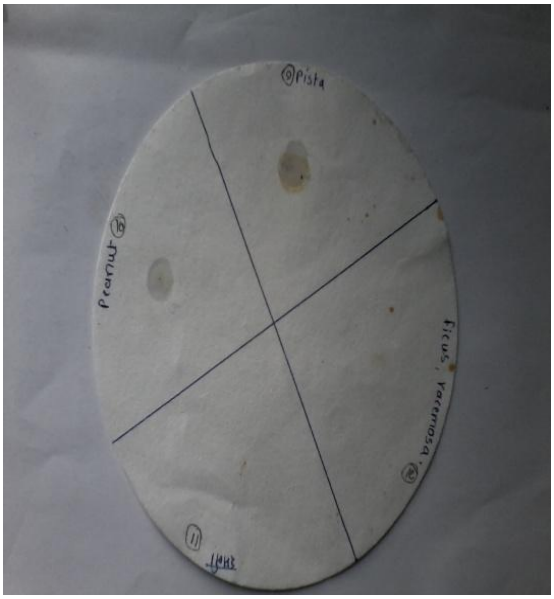

Figure 14:Pista,Peanut Lipid Spot.

CONCLUSIONS

The composition and nutritional quality of fruit is dependent on environmental and variety of fruits. Overall analysis of different edible four nuts suggest that The nuts sample are analyzed by flame photometry and conclude that the Anacardiumoccidentale, Arachishypogaea having higher concentration of major nutrient like sodium, the Prunusdulcis having higher concentration of major nutrient like potassium, Anacardiumoccidentale having higher concentration of major nutrient like Calcium.. The analysis by AAS we conclude that Pistaciavera has higher concentration of Copper and the Prunusdulcis having higher concentration of Ferrous. In Cashew nut (Anacardiumoccidentale) high amount of moisture content. In cashew (Anacardiumoccidentale) nut high amount of Ash content. The highest carbohydrate (sugar) content in the Arachishypogaea.while highest protein is concluded is in Pistaciavera. Ascorbic acid analysis is we can conclude that in which Pistaciavera. The lipid analysis we can conclude that In cashew, almond, pista, peanut Lipid are present. Qualitative analysis of secondary analysis indicates that all nuts content secondary metabolite. All analysis concludes that fruit different minerals and Nutritive biochemical content which are beneficial to health and nuts edible.

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