PHENOLOIC SUBSTANCES AS BENEFICIARY FRUIT PHYTONUTRIENTS

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Abstract: The phenolic concentration diversity is assessed among the nine selected species of indigenous and exotic fruits. A comparative estimation and analysis of phenolic content in three portions namely inner, middle and outer portions of fruits were carried out. Among the species investigated, *Morinda citrifolia* showed highest phenolic content while *Syzygium jambos* expressed lowest total phenolic content. The present work indicates that these fruits are significant sources of different phenolic components and could be considered as good source of natural antioxidants. Consumption of such fruits rich in total phenolic contents contributes to much better nutritional requirements of the daily diet for better health of human body. Thus the studies in the selected indigenous and exotic fruits, will explore wider opportunities for utilizing the fruits in medicinal, pharmaceutical, clinical and also for commercial purposes.

IndexTerms – Phenolic substances, phytonutrients

I. INTRODUCTION

Fruits are nature's marvelous gift to the humankind, indeed, they are life enhancing medicines packed with vitamins, minerals, antioxidants and many phytonutrients. They are an absolute feast to our sight, not just because of their color and flavor but of their unique nutrient profile that helps the human body be fit, rejuvenate and free of diseases (Rudrappa, 2009).

Botanical definition of fruit is that, it is a seed bearing part of a flowering plant or tree that can be eaten as food. From culinary view point a fruits is, any sweet tasting plant product with seeds. Fruits can be eaten raw, frozen, stewed, cooked or dried. All fruits may be classified into three major group, simple, aggregate or multiple .Fruit is an important component of a healthy diet and if consumed daily in sufficient amount could help to prevent major diseases such as CVDs and certain cancers. The inclusions of fruits in daily diet also helps to protect body from minor ailments likes wrinkling of skin, hair fall and memory loss. Thus fruits provide nutrients vital for health and maintenance of our body.

Fruits have been recognized as a good source of vitamins, minerals, flavonoids, antioxidants, phytochemicals and countless micro and macro nutrients. Most fruits are low in fat, sodium and calories. None have cholesterol. Fruits are sources of many essential nutrients that are under consumed, including potassium, magnesium, dietary fiber, vitamin c and folate (folic acid). These nutrients are vital for health and maintenance of our body. All the fruits contain carbohydrates mainly in the form of sugar, dextrix and acids. Fruits give more energy than sugar or sweets as they contain natural glucose and fructose.

Researches show that fruits play critical role to promoting good health in a growing body. Adding fruits to our diet is a sure fire way to become healthier. A daily intake of fruit can benefit our body in many ways. When we eat fruits energy supply increases in our body, this is one of the prime benefits of fruits that we can utilize in our busy schedules. Fruits are having health benefiting properties because of their richness in vitamins, minerals, micro nutrients, pigments and antioxidants. People who eat more fruits as part of an overall healthy diet generally have a reduced risk of chronic diseases. Eating a diet rich in fruit may reduce risk for heart diseases including heart attack, stroke, and other cardiovascular diseases and type 2 diabetes (Lampe 1999, Arts and Hollmann 2005). Fruits help to maintain optimum health due to the presence of health promoting phytochemicals in fruits. Fruits play important role in preventing vitamin C and vitamin A deficiencies. A diet rich in some fruits as part of an overall healthy diet may protect against certain types of cancers including mouth, stomach and colon bowel cancers.

Fruits rich in potassium may lower blood pressure and may also reduce the risk of developing kidney stones and help to decrease bone loss. Dietary fiber from fruits as part of an overall healthy diet helps to reduce blood cholesterol levels and may lower risk of heart disease by reducing hyperlipidemia, hypertension, diabetes mellitus and obesity. Fiber containing fruits provide a feeling of fullness with fewer calories. Fibrous fruits aid the digestion process in the body. The fruit skins are rich in dietary fiber, which is a major contributing factor in proper digestion and the excretion process of your body, while simultaneously keeping you safe from problems like gastritis and constipation.

Vitamin C present in fruit is important for growth and repair of all body tissues, helps to heal cuts and wounds and keeps teeth and gums healthy. It also enhances the metabolic process in the body. Folate (folic acid) helps the body to form red blood cells. Women of child bearing age who may become pregnant should consume adequate folate from foods. This reduces the risk of neural tube defects, spina bifida and anencephaly during fetal development. Fruits are great source of antioxidants (Scalbert et al., 2005) eating them regularly will stop free radicals attaching and mutating our cells. Antioxidants help to prevent premature ageing and the onset of disease.

In fruits, carbohydrates present mainly in the form of sugar, dextrix and acids. These types of carbohydrates get digested by the body very easily and are absorbed quickly. This makes fruits extremely good for sick and invalids as a quick source of energy. The salts present in fruits have organic acids which, when transformed in the body produce alkaline carbohydrates. This leads to alkalization of the fluids and in turn promotion of intestinal elimination. In other words regular consumption of fruits help the body stays free of toxic wastes. Most of the fruits are rich in magnesium and sodium. These nutrients act as diuretic and dieresis, increasing the frequency of passing urine. This high frequency results in lower urine density, which ultimately speeds up the process of elimination of nitrogenous waste and chlorides from the body.

Fruits keep our skin supple, hydrated and nourish it with essential vitamins, minerals and antioxidants. Fruits even ensure healthy hair growth. Vitamin A brings luster to hair and also softens its texture. If you have fruit on an empty stomach, it will prevent hair loss and premature greying. Recent research suggests that greater consumption of fruits may lower the risk of multi morbidity. Fruits provide the necessary nutrition supplements to our body and also improve the body condition. Fruits provide perfect supplement for hormonal imbalance. Fruits contain water that maintains necessary moisture in the body. Fruits contain a substance called fructose which is a better supplement than sugar. All the fruits improve the sodium level content in the body. Fruits regulate the body weight by adding necessary supplements and reducing the unnecessary fat.

An indigenous fruits are one of that is native to a specific country or region. North America is home to many indigenous fruit trees, although many of the common fruits in the grocery store come from trees that originated in other parts of the world. Benefits of growing native fruit trees ranges from reduced water consumption and less maintenance, to a reduced reliance on chemical fertilizers and pesticides. Indigenous fruit trees have adapted and evolved to thrive in the soil and climate conditions of the region.

Exotic fruits are that which are not native and that are cultivated outside, available at their place of origin. Some exotic fruits are tropical. They are important dietary components, and contain various bioactive constituents. Many of these constituents have been proven to be useful to manage and treat various chronic diseases such as diabetes, obesity, cancer and cardiovascular diseases. The whole extract and purified bioactive compounds in exotic fruits have various targets to ameliorate the health ailments (Devalaraja et al, 2011).

Indigenous fruits are branded as a' poor man's food and their nutritional benefits are dismissed as 'old wives tales '. Fruits are a vital source of fiber and vitamin c and can act as a 'safety net 'when other fruits are scarce because the trees are well adapted to harsh condition. The nutritional benefit of specific fruits are not often widely known fast food and foreign eating habits have changed traditional diets and eroded the usage of traditional cooking preparation and ingredient. In some places indigenous fruits are still used to compliment a normal diet. The fruits are used as a supplement in traditional recipes but knowledge about their nutritional benefits could be more encouraged.

The fruits usually contain sugars nutrients. According to nutrients they makes dense and nutrients dilutes. Nutrient dense fruits are considered to be variable in protein relatively high in lipids and low in water and carbohydrates. Nutrient dilute fruits are considered to be low in fiber and protein high in water and fewer carbohydrates. Fruit pulp varies in both sugar composition and concentration. Fruit pulp consists of three main sugars: disaccharide sucrose, hexose monosaccharide glucose and fructose. Indigenous fruits are high in both antioxidants and phenolic compounds. Phenolic compounds are secondary metabolites widely found in fruits mostly represented by flavonoids and phenolic acids. Indigenous fruits, for example papaya are rich in beta carotene. It act as powerful antioxidants with an abundance of vitamin C, E, D and A that all aid in the oxidation of LDL cholesterol. This prevents Atherosclerosis and heart attacks.

Indigenous fruits are having potential for commercial development. It provides so much phytochemical substances. Phytochemicals are being detected in these fruits are mainly phenolic compounds, carotenoids and other terpenoids. Most of these phytochemicals are potent antioxidants and have corresponds to the free radical scavenging activities and other biological activities of the fruits. Indigenous fruits are beneficial for humans. These fruits are often valued by local communities for their medicinal properties. They contribute to the vitamin and mineral supply of local communities, eg: Baobab. In addition to this, it provides micronutrients contribute much to energy supply due to their sugar content. Indigenous fruits are commonly consumed for their nutrients and some fruits are used as medicine. Medicinal properties of fruits are closely related to their available phytochemical as well as antioxidants. Many of these fruits have been traditionally used as folk medicine. These fruit contain phytochemical antioxidants that can prevent, treat and cure various types of disease. Many phytochemicals such as carotenoids tannic acids, triterpenes and some flavonoids are free radical scavengers that can contribute to the suppression of oxidative stress and anti-inflammatory effects in human body. Obesity can be controlled by the use of indigenous fruit for eg: Averrhoa. Through the continuous usage of fruit juice can be useful for treating the high level cholesterol.

In addition to these some other indigenous fruits possess antimicrobial effect and several protective effects against chronic diseases. This fruit has been used in folk medicine for easing whooping cough. They also possess anti-inflammatory properties, where the methanolic extract of this fruits are used. The fruit of *Cynometra cauliflora* possessing proliferative activity inhibits cytotoxic effect to human promyelocytic leukemia. They are assisted in the ayurvedic formulations also. Some of the indigenous varieties used as anticancer agents. The *Syzygium* fruit has been traditionally used as astringent and for brain and liver as well as digestive problems. Fruit extract of *S. cumini* is also a potential antioxidant agent. Thus these indigenous fruits are important for their medicinal values.

Indigenous fruits are among the best nutritional food materials in the world. Such fruits available in Tanzani include Tamarinds, *Syzygium jambos* sps and many others. Despite their role in ensuring rural live hood and enhancement of house hold income. Indigenous fruit trees are at the risk of vanishing due to anthropogenic factors that culminate into deforestation. Indigenous fruits constitute an important part of human diet in many countries particularly in rural areas and during droughts. The expanded utilization of indigenous fruit depends on the nutritional composition. It mainly composed of macronutrient and mineral. Vitamin C is major constituent being analyzed. These fruits shows higher primarily antioxidant potential. It will fulfill some sort of nutrient requirement particularly in the rural area. The minor indigenous fruit contained higher amounts of vitamins and minerals than major national imported fruits. Indigenous fruits show higher antioxidant activity and total phenolic compounds. They also exhibits anti fatigue properties being studied through triglyceride mobilization during exercise and protecting corpuscular membrane, by prevention of lipid oxidation via modifying several enzyme activities (Weihua Ni et al., 2013).

The phenolic compounds in fruits are secondary plant metabolites and are mainly associated with the nutritional as well, as the sensorial properties of fruits. These compounds not only affect the aroma of the fruit, but also found to have profound effects on human health due to their antioxidant, anti-inflammatory and antimicrobial effects (Cevik et al, 2010).

Phenolic compounds are regarded as a group of phytochemicals that may promote human health (Boyer and Liu, 2004). Studies have shown that polyphenolic compounds have the ability to reduce cellular damage and therefore may be beneficial in promoting human health and protecting against numerous diseases linked to oxidative events such as cardiovascular and respiratory disorders cancers and diabetes (Hollman, 1999).

Phenol only has limited use in pharmaceuticals today because of its toxicity. Phenol occurs in normal metabolism and is harmless in small quantities according to present knowledge, but it is definitely toxic in high concentrations. It can be absorbed through the skin, by inhalation and by swallowing. The typical main absorption route is the skin, through which phenol is resorbed relatively quickly, simultaneously causing caustic burns on the area of skin affected. Besides the corrosive effect, phenol can also cause sensitization of the skin in some cases. Resorptive poisoning by larger quantities of phenol (which is possible even over small affected areas of skin) rapidly leads to paralysis of the central nervous system with collapse and a severe drop in body temperature. If the skin is wetted with phenol or phenolic solutions, decontamination of the skin must therefore be carried out immediately. After removal of contaminated clothing, polyglycols are particularly suitable for washing the skin. On skin contamination, local anaesthesia sets in after an initial painful irritation of the area of skin affected. Hereby the danger exists that possible resorptive poisoning is under estimated, if phenol penetrates deep into the tissue, this can lead to phenol gangrene through damage to blood vessels. The effect of phenol on the central nervous system—sudden collapse and loss of consciousness—is the same for humans and animals. In animals, a state of cramp precedes these symptoms because of the effect phenol has on the motor activity controlled by the central nervous system. Caustic burns on the cornea heal with scarred defects. Possible results of inhalation of phenol vapour or mist are dyspnea, coughing, cyanosis and lung edema. Swallowing phenol can lead to caustic burns on the mouth and esophagus and stomach pains. Severe, though not fatal, phenol poisoning can damage inner organs, namely kidneys, liver, spleen, lungs and heart. In addition, neuropsychiatric disturbances have been described after survival of acute phenol poisoning. Most of the phenol absorbed by the body is excreted in urine as phenol and/or its metabolites. Only smaller quantities are excreted with faeces or exhaled.

The phenolics may a good source of antioxidant (Hossain et al, 2011). Antioxidant activity and total phenolic content of an isolated *Morinda citrifolia* L. methanolic extract from Poly-ethersulphone (PES) membrane separator was investigated .The extract of *Morinda citrifolia* L. fruit was separated into permeate and retentate by PES .The effect of temperature in the range of 30 -70 degree celcious and pressure in the range of 0.5-1.5 bar on the antioxidant activity and total phenolic content was studied. Result shows that the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity exhibited a gradual increase in permeates collection from separation. The total phenolic content was also found to allow the same trend. The optimum magnitude of DPPH radical scavenging activity and total phenolic content were found to be 55-60% and 43:18 mg/10 gm of sample respectively (Krishnaiah et al, 2015).

A study on phytochemical constituents of *Averrhoa bilimbi*. Fruits indicates the presence of secondary metabolites especially flavonoids, coumarins, saponins and phenols. Methanol extract was more diverse followed by chloroform and petroleum ether extracts. The LC-MS analysis and the integrated library search results in the presence of 20 phytochemicals (Merin Abraham , 2016).

Study on phenolic profile of Cashew apple juice (*Anacardium occidentale*) from Yamoussoukro and Korhogo (Cote d Ivoire), evaluate the phenolic profile of the two varieties of cashew cultivated in Cote d Ivoire. Cashew apple harvested from areas of Yamoussoukro and Korhogo were transported to the laboratory, crushed and the juice collected was analysed. The total phenolic, flavonoids and anthocyanins were assayed by UV spectrometry, while concentration of individual phenolic was done by HPLC. The comparison of yellow and red apples juices in total phenolic was determined in galic acid equivalents using Folin-Ciocalteu assay. The level of total phenolic, flavonoids, anthocyanins, galic acid and cafeic acid in the juice showed significant variation according to the colour of the cashew apple. Similarly the ecological zone has influence on the concentrations of total phenolics and flavonoids (Marc et al, 2012).

The *Syzygium cumini* fruit was studied to find out the nutritional properties of Jamun pulp powder even after drying under different drying conditions. Total phenol, anthocyanins and flavonoids present in each dried samples vary with respect to temperature. These results will be a source for the further study in antioxidants and pharmaceutical formulations. In the result among all the dryers ,the maximum amount of total phenolic content measured by Folin- Ciocalteau method was 13.99 mg GA equivalents/g, total flavonoids content as measured by aluminium chloride method was 104.8 mg quercetin equivalent and anthocyanins content 7.56 mg/g. The lowest was found in cross flow dryer with phenol content 7.6 mg GA equivalents/g, flavonoids 34.05 mg GA and anthocyanin 1.43 mg/g. The antioxidant property was high in freeze dried powder (Reginold et al, 2016).

Study on *Pouteria campechiana* was done to evaluate the total phenolics and antioxidant capacities of the seeds, pulp, and peel of the fruit, using three extraction solvents water 70% methanol and 70% ethanol. Among them 70% ethanol exhibited the best solvent for yielding highest total phenolic content, total flavonoids and antioxidant activities. The results shows that 70% ethanol extract from the peel shows highest phenolic content and pulp has the high flavonoids content. And both peel and pulp having high antioxidant activities (Kong et al, 2013).

Phytochemical and proximate analysis of Papaya leaves carried out to investigate the presence of phytochemical composition and proximate constituents. Phytochemical analysis revealed the presence of bioactive compound saponins and tannin. Results showed that the plant leaves contained Dry matter 89.60%, crude protein 13.1, crude fat 3.5%, crude fibre 1.955, total ash 18.3% (Ritha Nath et al, 2016).

Study on antioxidant capacity of phenolic phytochemicals from various cultivars of plums were performed using aqueous methanol with ultrasound assistance and extracts were analysed for total phenolics, flavonoids and antioxidant caoacity. The total phenolic capacity expressed as Vitamin C Equivalent Antioxidant capacity(VCEAC). Results show that there was a good correlation between total phenolics, flavonoids content and VCEAC(Dae-ok kim et al, 2004). The present study aims at the comparative estimation and analysis of phenolic content in in three portions of selected indigenous and exotic fruit species

II. MATERIALS AND METHODS

2.1 Materials used

The fresh healthy indigenous fruits with an average measure of nine varieties were collected from the localities of Ernakulam district .The collected fruits were thoroughly washed with running water and remained in open air for several hours for further processing. At least five pieces of each fruits from the outer, middle, inner and total portions were taken, while the peels were carefully removed with a sharp knife and cut into small pieces. Weighed out one gram of each fruit sample using electronic weighing balance.

The nine different species selected for the present study are enlisted below.

1. Averrhoa bilimbi L. (Oxalidaceae)
2. Syzygium jambos (L.) Alston (Rosaceae)
3. Syzygium cumini (L.) Skeels (Myrtaceae)
4. Anacardium occidentale L .(Anacardiaceae)
5. Ananas comosus (L.) Merr. (Bromeliaceae)
6. Morinda citrifolia L. (Rubiaceae)

7. Carica papaya L. (Caricaceae)
8. Syzygium jambos (L.) Alston(Myrtaceae)
9. Pouteria campechiana (Kunth) Baehni (Sapotacaceae)

2.2 Extraction procedure

The extraction procedure was carried out based on a method in literature (Kosar et al, 2007). About one gram of samples were weighed out and homogenized in 10ml 50% ethanol. The extract collected to a centrifuge tube and centrifuge at 5000rpm for 5 minutes .The supernatant was collected and preserved at 37^0C until further use. All analysis were carried out repeatedly at least three times.

2.3 Determination of total phenol content

Total phenolic content was assayed by Folin-Ciocalteu method (Velioglu et al, 1998).In this method 10ml of distilled water was added into 1ml of the samples in a test tube, followed by adding 1ml of Folin-Ciocaltue reagent and the content was mixed thoroughly. A blank was prepared using 1ml of distilled water without addition of sample. After 3 minutes of incubation, 2ml of 20% Sodium carbonate solution was added to the mixture of the sample .The test tube contents were mixed by vortex mixer before keeping it in incubation for 1 minute in boiling water bath set at 37^0C. The absorbance of blue coloration formed was measured at 650 nm against the blank standard .Total phenolic s were calculated in respect of standard graph obtained by drawing optical density versus concentration of the sample (Manisuthisakul et al,2005). Results are expressed in mg/g fresh weight of plant material.

III. RESULTS AND DISCUSSIONS

The total phenolic content investigation of three different portions of selected exotic and indigenous fruits was carried out using standard protocol available. The absorbance of samples studied obtained from spectrometric analysis are shown in Table 1.Table 2 shows the concentration of the species obtained from standard graph. The graphical representation shows the phenolic concentration among the study species and three different portions of fruits being studied.

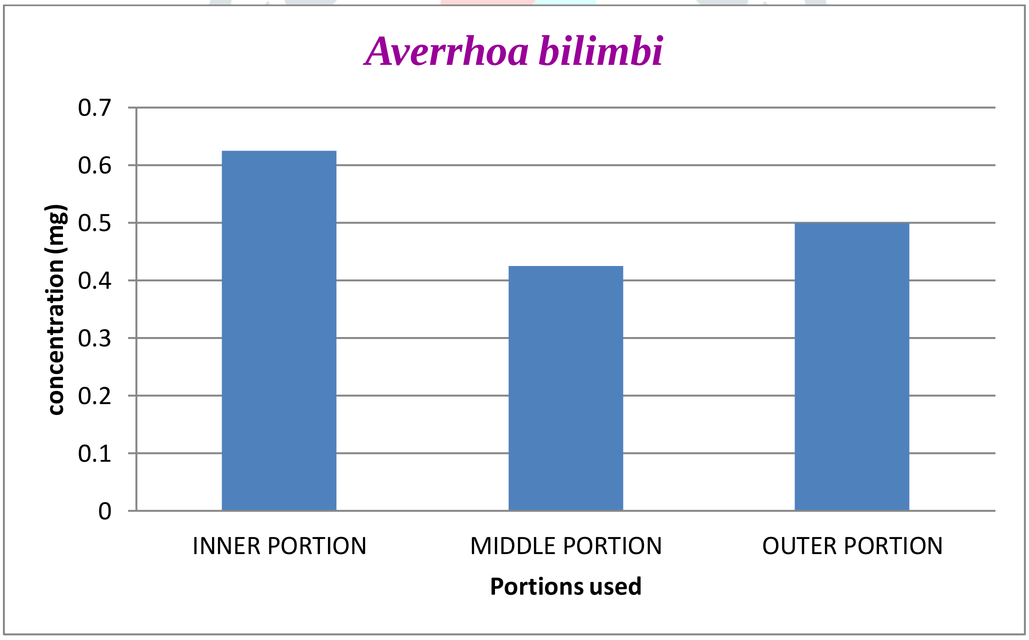
The total phenolic contents of selected indigenous and exotic fruits were in the range of 0.40-4.40 mg/g .The highest phenolic content was in *Morinda citrifolia* fruit(4.40mg/g),followed by *Syzygium cumini* (4.175mg/g),*Syzygium jambos* sps (4.0 mg/g) fruit, in *Anacardium occidentale*(3.925mg/g), *Carica papaya* (2.05mg/g), *Ananas comosus* (1.225mg/g)*Pouteria campechiana* (1.0mg/g), *Averrhoa bilimbi* (0.525mg/g) and *Syzygium jambos* (0.40 mg/g).The lowest phenolic concentration were recorded in the fruit *Syzygium jambos* . By analyzing the three different portions of the selected exotic and indigenous fruits, can be make various observations. In *Averrhoa bilimbi* the innermost portion of fruit shows high phenolic content than outer and middle portions, whereas middle shows lowest. In case of *Syzygium jambos* outer and middle portions shows higher and lower phenolic contents respectively. In case of *Syzygium cumini* middle portion rich in phenolic content compared to the outer and inner, outer shows lowest content of phenol. Other species such as *Anacardium occidentale*, *Ananas comosus*, and *Morinda citrifolia*, they have outer portion with relatively highest peak of total phenolic components. Variations in the phenolic content of these fruits in the middle and inner portions .Inner portion of *Anacardium occidentale*, middle portions of *Ananas comosus* and *Morinda citrifolia* are characterized by the lowest phenolic concentration. Middle edible portion of *Carica papaya* is rich in phenolic constituents, whereas outer is lowest in phenolic concentration. *Syzygium jambos* is having phenol rich outer portion and lowest concentration in the middle portion. Rich in phenolic concentration in the edible inner portion, middle and outer portions shows the relatively similar concentration of total phenolics.

TABLE 1. Absorbance of samples obtained from spectrometric analysis at 650nm

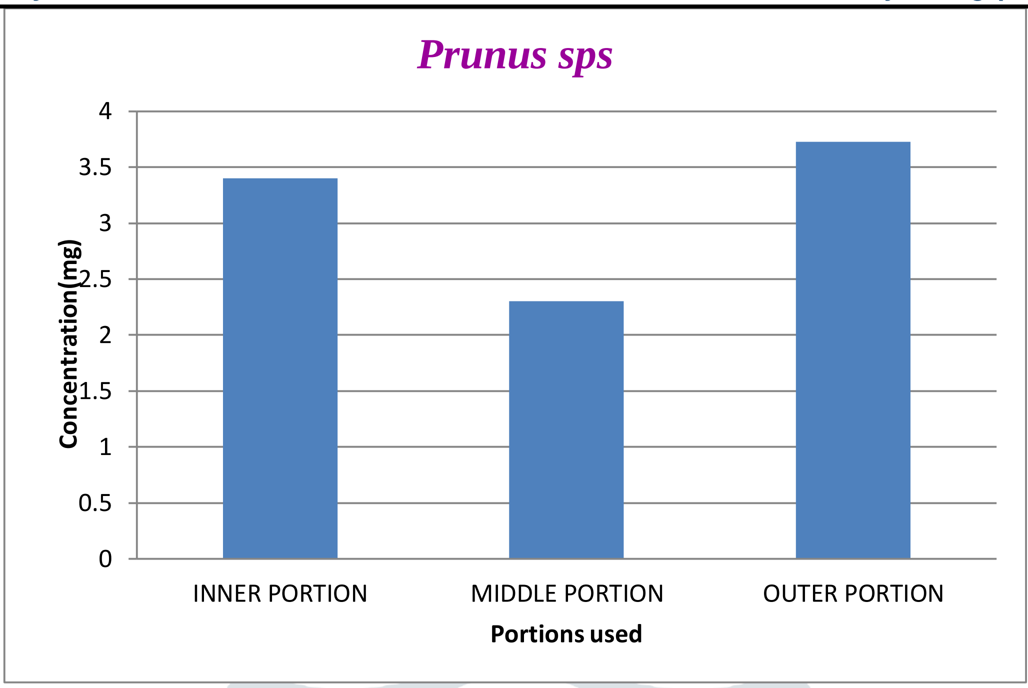
No	Name of fruits	Inner portion (nm)	Middle portion (nm)	Outer portion (nm)	Total (nm)
1	*Averrhoa bilimbi*	0.258	0.178	0.205	0.211
2	*Syzygium jambos* sps	1.367	0.922	1.515	1.603
3	*Syzygium cumini*	1.711	1.958	1.486	1.672
4	*Anacardium occidentale*	0.965	1.666	1.672	1.579
5	*Ananas comosus*	0.331	0.320	0.352	0.494
6	*Morinda citrifolia*	1.744	1.658	1.947	1.778
7	*Carica papaya*	0.605	0560	0.645	0.823
8	*Syzygium jambos*	0.511	0.205	0.352	0.172
9	*Pouteria campechiana*	0.493	0.458	0.443	0.416

TABLE: 2 , Shows the concentration of fruit samples obtained from standard graph

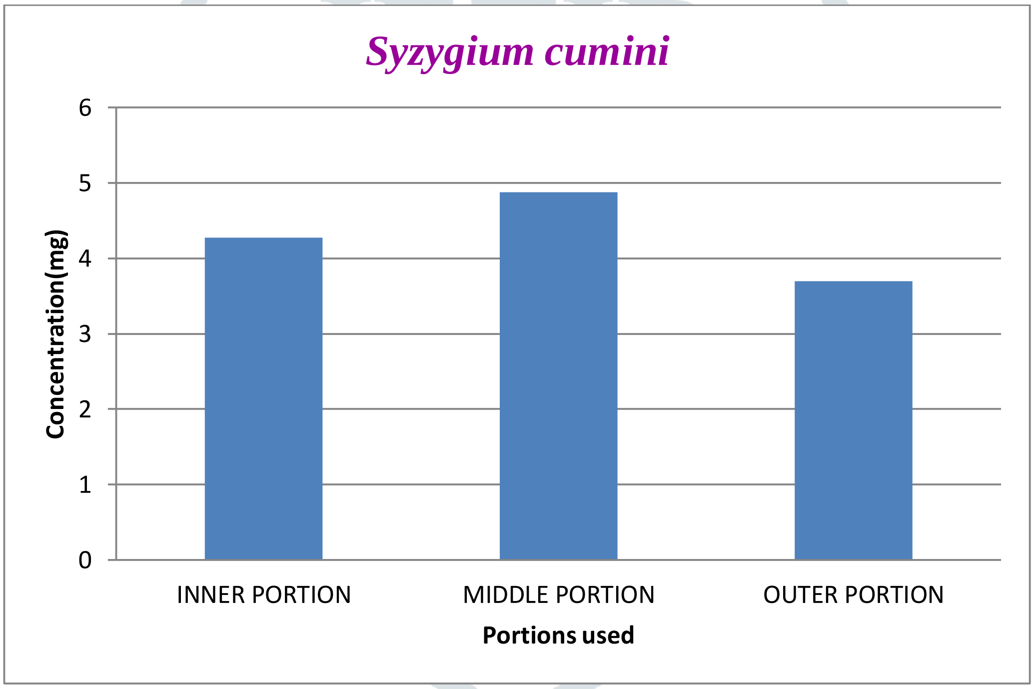
No	Name of fruits	Inner portion (nm)	Middle portions(nm)	Outer Portions (nm)	Total(nm)
1	*Averrhoa bilimbi*	0.625	0.425	0.5	0.525
2	*Syzygium jambos* sps	3.4	2.3	3.725	4.0
3	*Syzygium cumini*	4.275	4.875	3.70	4.175
4	*Anacardium occidentale*	2.4	4.15	4.175	3.925
5	*Ananas comosus*	0.825	0.8	0.875	1.225
6	*Morinda citrifolia*	4.325	4.125	4.85	4.40
7	*Carica papaya*	1.5	1.4	1.6	2.05
8	*Syzygium jambos*	1.25	0.5	0.85	0.4
9	*Pouteria campechiana*	1.2	1.1	1.1	1



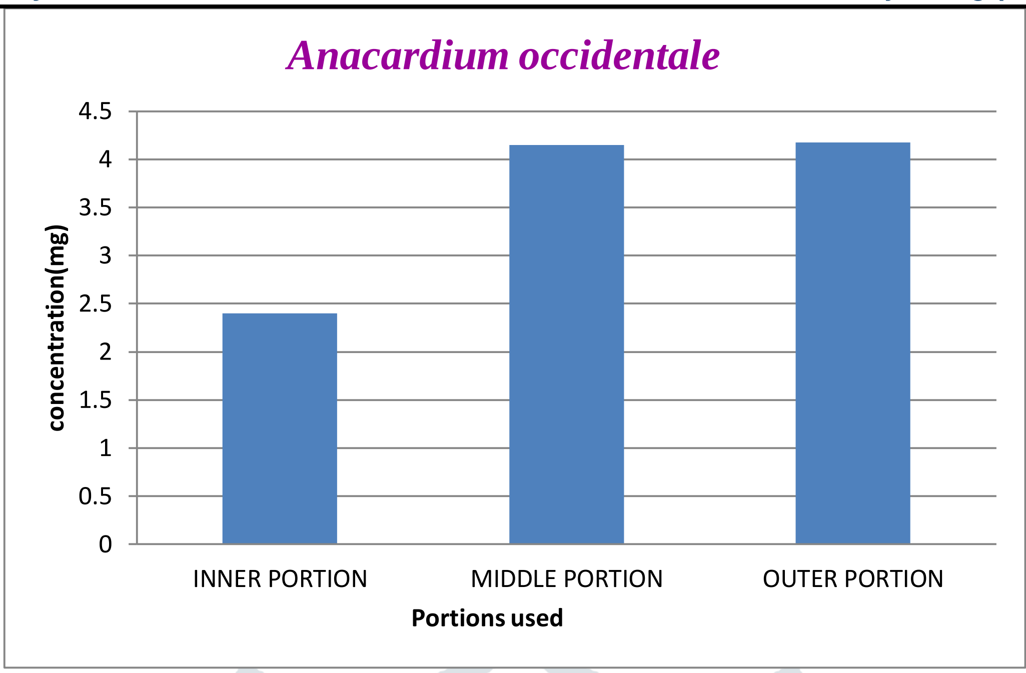
Graph 1. Highest phenolic content in the inner portion.



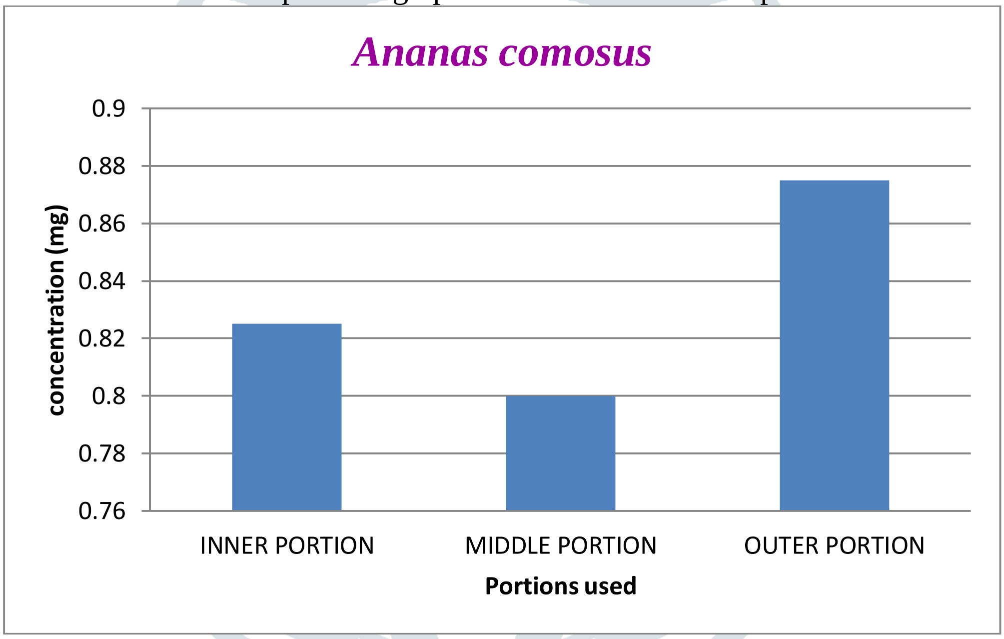
Graph 2. Highest phenolic content in outer portion.



Graph : High phenolic content in middle portion



Graph 4. High phenolic content in outer portion.



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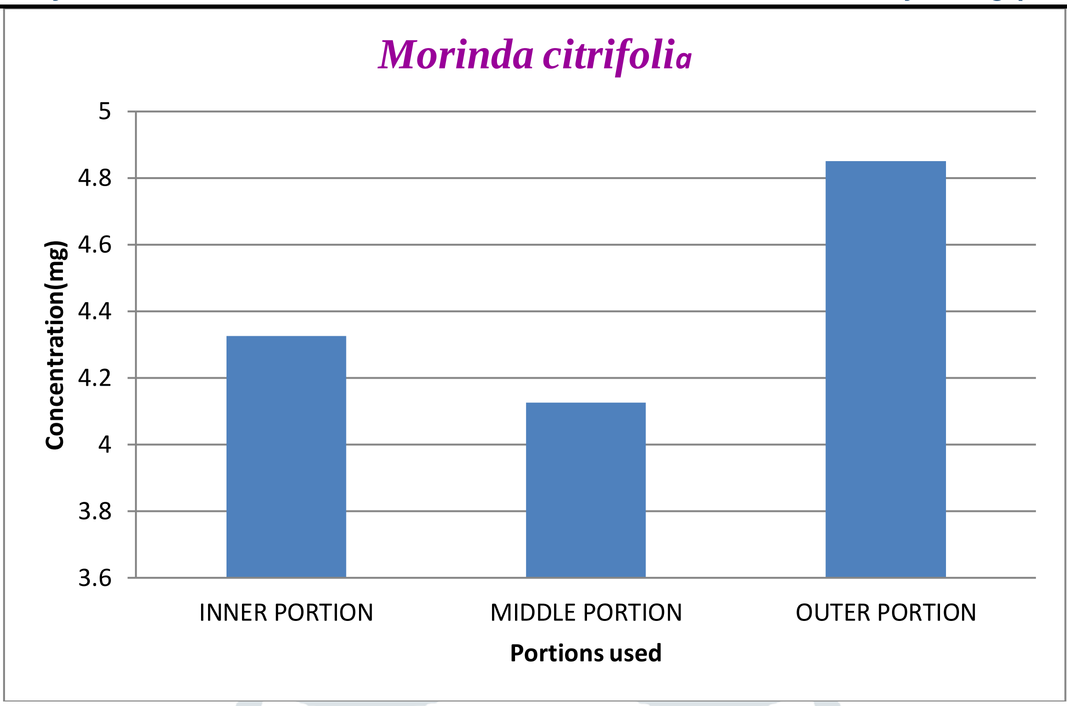
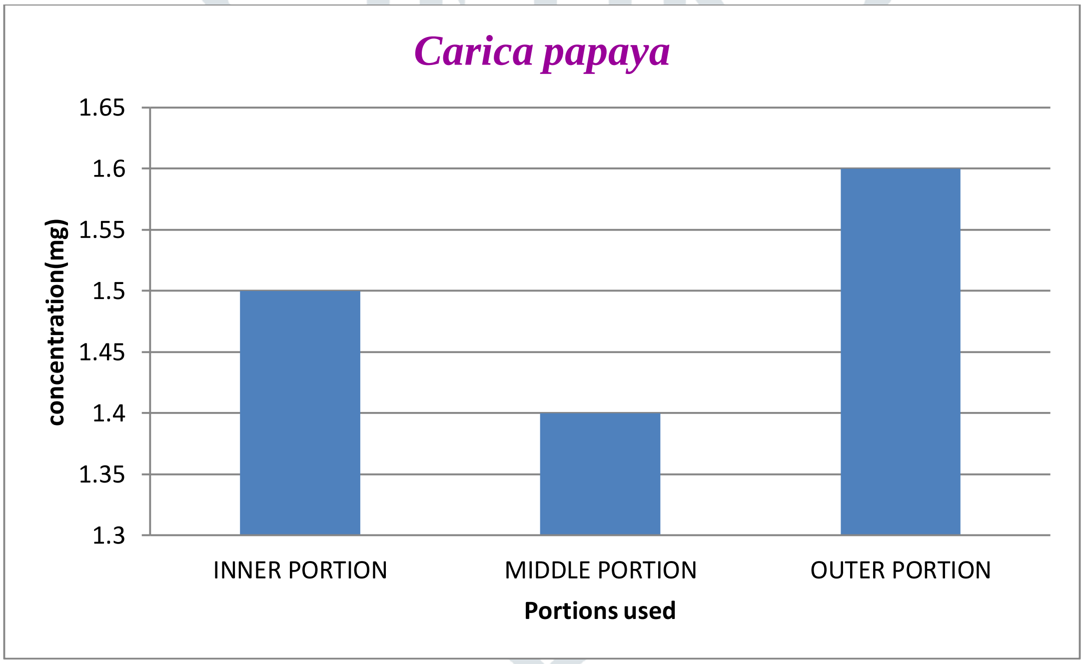
Graph 5: High phenolic content in the outer portion.



Graph 6. High phenolic content in outer portion



Graph 7. High phenolic content in outer portion

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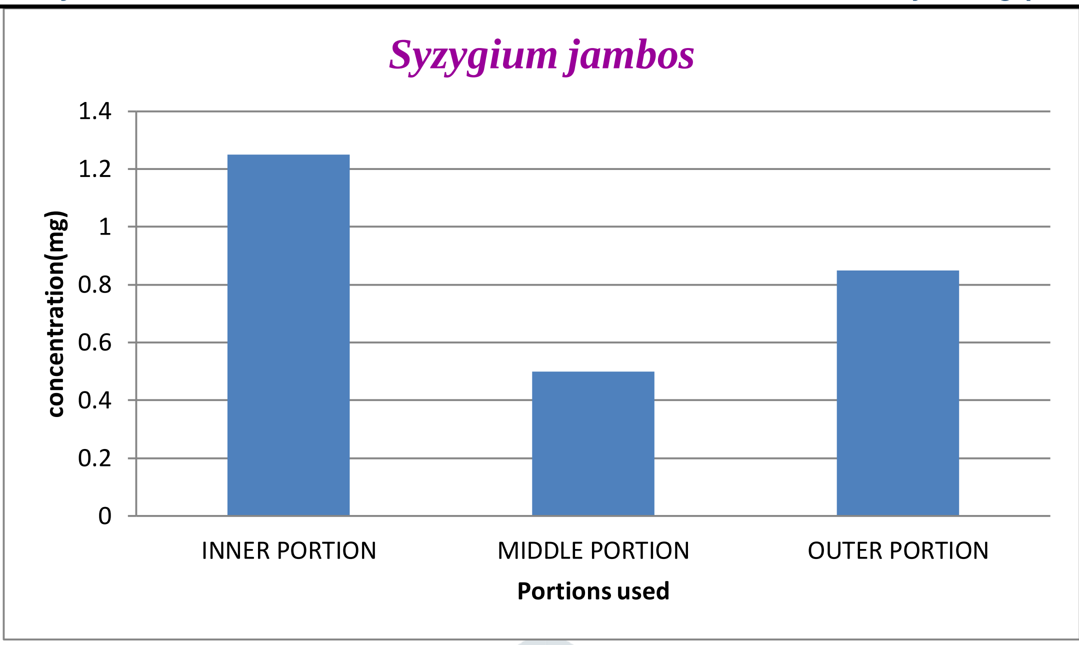
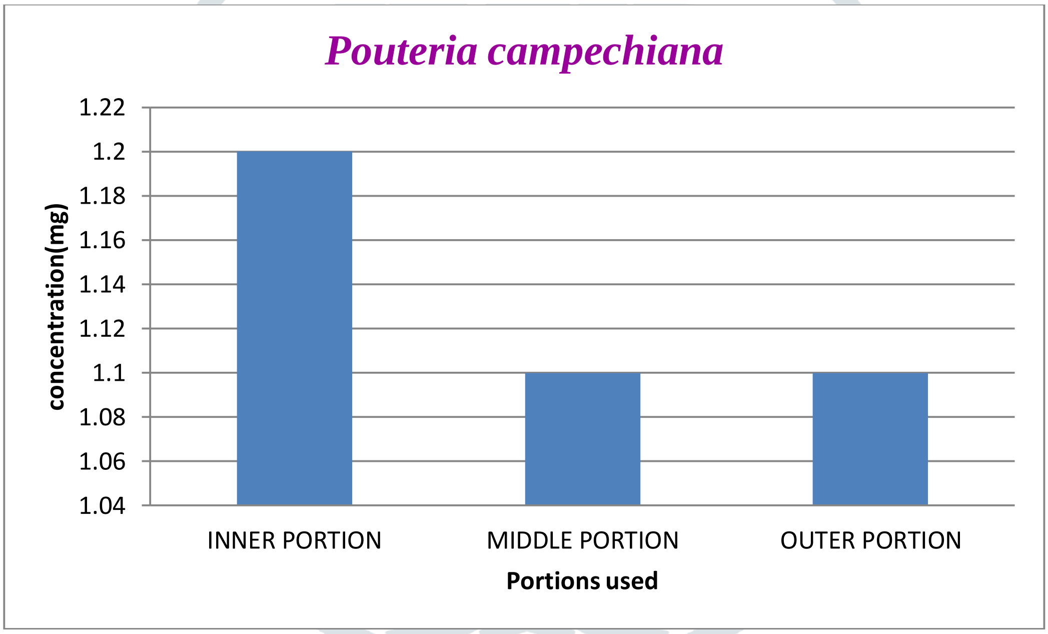
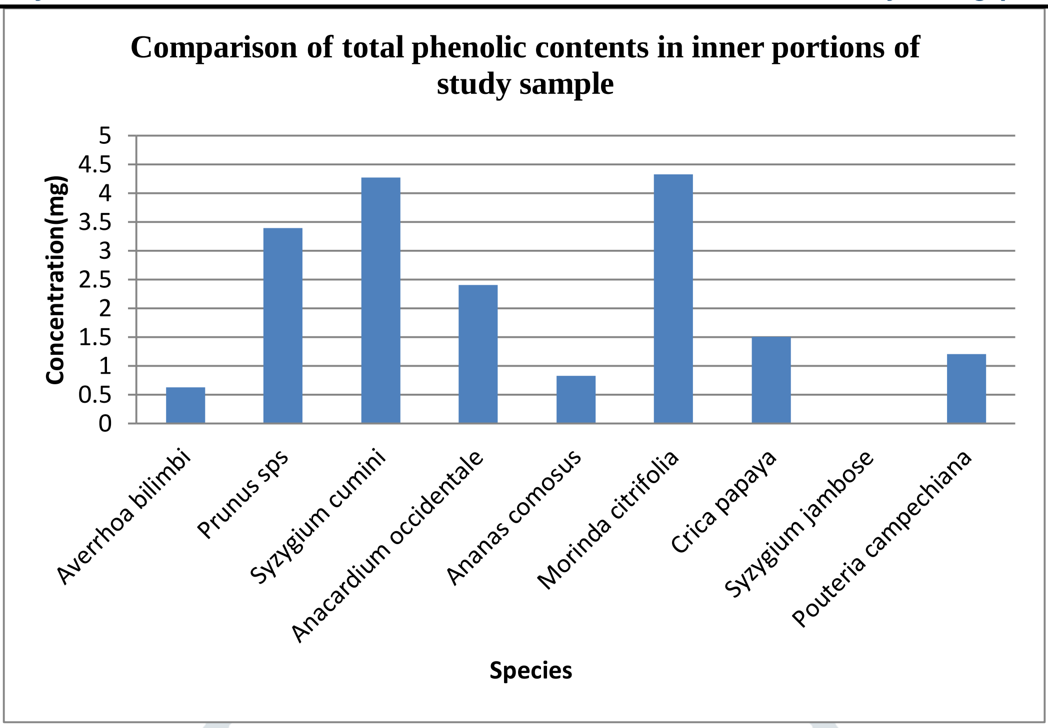


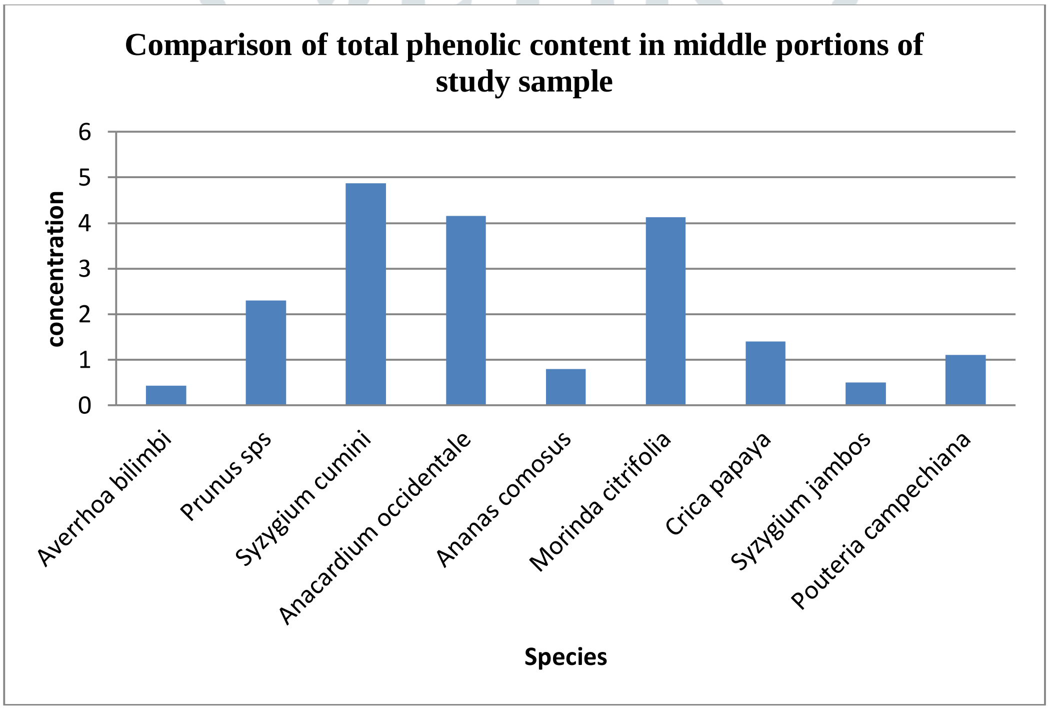
Graph 8: High phenolic content in inner portion.



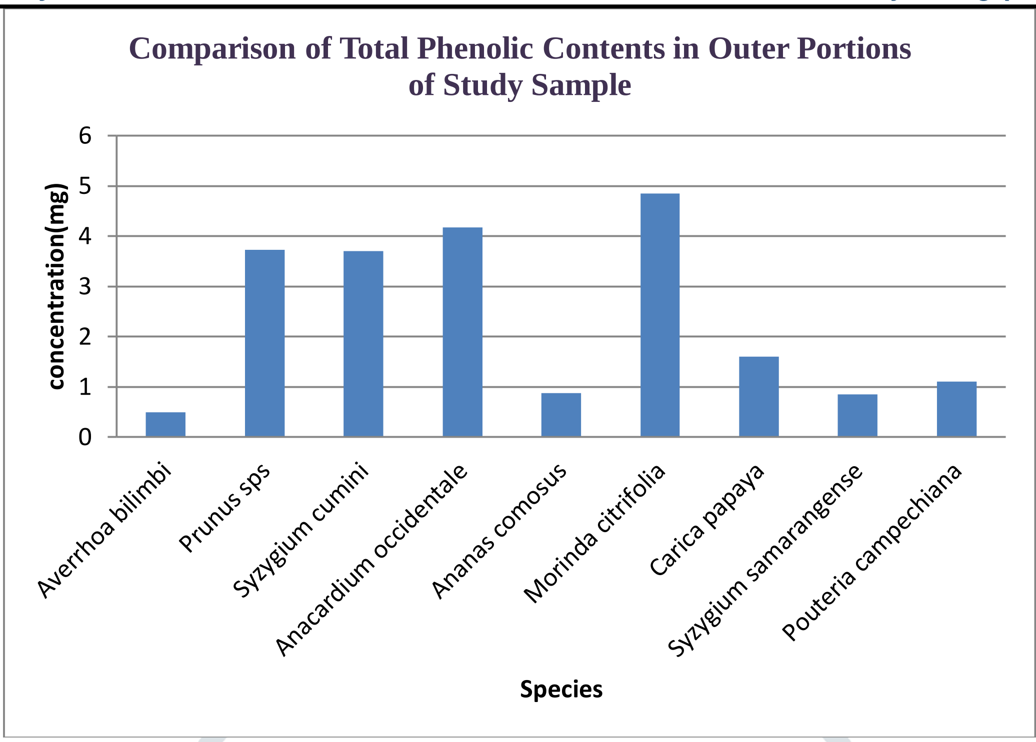
Graph 9. High phenolic content in inner portion.



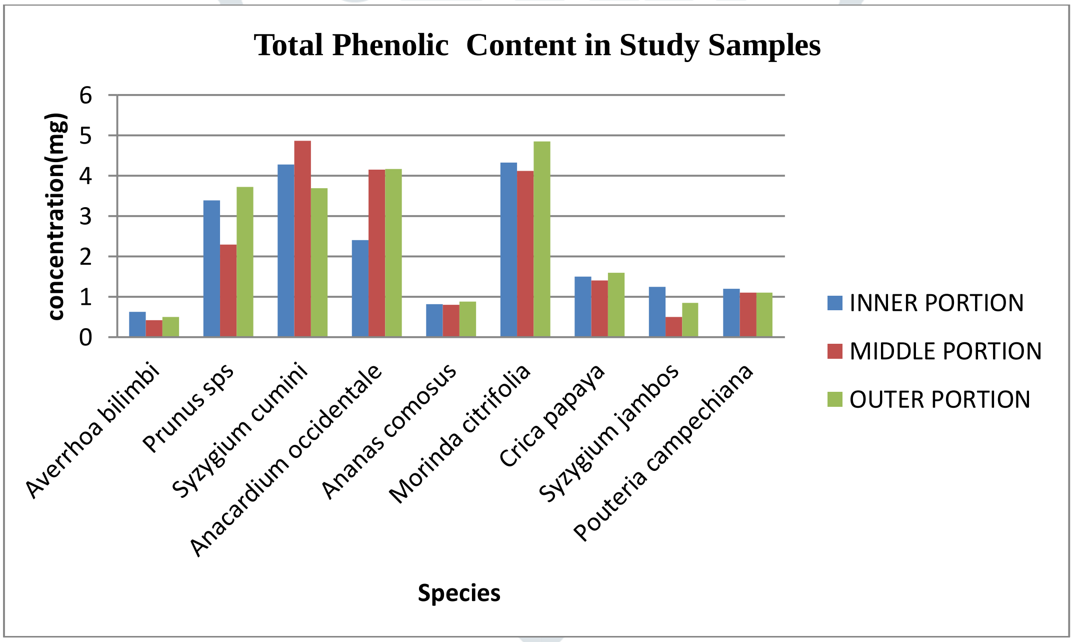
Graph 10. Comparison of total phenolic contents in inner portions of study sample.



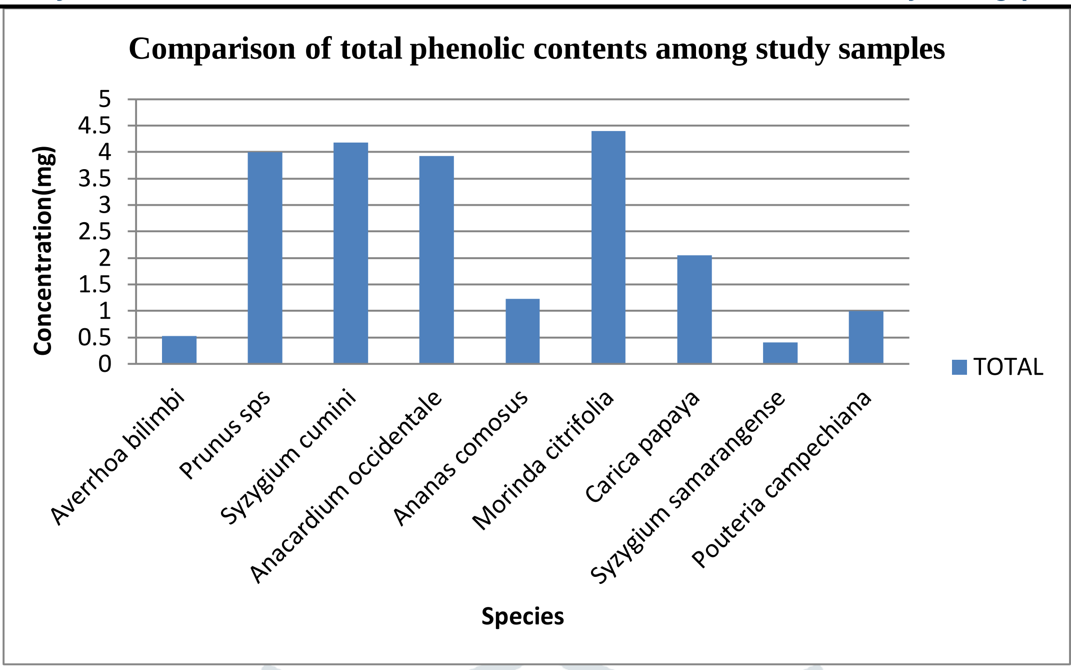
Graph 11. **Comparison of total phenolic content in middle portions of study sample**



Graph 12. **Comparison of Total Phenolic Contents in Outer Portions of Study Sample**



Graph 13. **Total Phenolic Content in Study Samples**



Graph 14. **Comparison of total phenolic contents among study samples**

The present study has well demonstrated the phenolic concentration diversity among the nine selected species of indigenous and exotic fruits. The presence of phenolics was well established in the present study, which is also at par with available reports from different studies (Mainsuthisakul et al, 2005).The occurrence of highest phenolic content was reported from *Morinda citrifolia* fruit, the Indian Mulberry in earlier studies (Ramamoorthy et al, 2015). Similarly antioxidant and flavonoid content were also studied (Krishnaiah et al, 2015). The presence of flavonoids, saponins, coumarins and phenol were reported *Averrhoa bilimbi*, (Abraham et al, 2015). This is in support to the present where *Averrhoa bilimbi* shows highest phenolic content in the inner region of the fruit.

The presence of phenolic compounds have been reported from the sweet cherry (*Syzygium jambos*) petioles, and they possess antioxidant activity. They are significant source of different phenolic compounds and could be considered as a good source of natural antioxidants (Prvulovic et al, 2011). The present study indicates that fruits of *Syzygium jambos* and *Syzygium cumini* fruit have shown the presence of phenolic contents, a related work on *Syzygium cumini* fruit pulp shows the potential occurrence of natural antioxidants, phenols, flavonoids and anthocyanins and it is in support to the fact that fruit of *Syzygium cumini* are having phenolic content in considerable amount. Another species of *Syzygium* viz *S.jambos* shows relatively lower phenolic concentration. Total phenolic and flavonoid content of *Syzygium jambos* leaf extracts were studied, using spectrometric method and DPPH radical scavenging activity shows that the total phenolic content of ethanoic and chloroform leaf extracts were predicted as 42.72+-0.07 and 31.06++-1.4 GAE /g of extract respectively. The occurrence of phenol in the genus *Syzygium* was studied by Dhanabalan et al, (2014). The present study reveals that the presence of phenolic content in *Syzygium jambos* will open frontiers for further studies. *Carica papaya* fruit being examined shows highest phenolic content in the outer region, that's being removed hardly .Work on phytochemical and proximate analysis of papaya reveals the occurrence of phenolic content in *Carica papaya* leaves. It ensures the phenolic occurrence in papaya (Nath et al, 2016). *Pouteria campechiana* is having phenolic content in whole fruit especially in seed, pulp and peel. Among them fruit pulp is reported to be rich in phenolic concentration, flavonoid and antioxidant activity (Kong et al, 2013). *Anacardium occidentale* shows phenolic concentration, earlier works on phenolic profile of two varieties of cashew apple supports this result (Marc et al,2012). From the fruit of *Ananas comosus* phenolic compounds were extracted using solvents such as methanol, acetone and Folin-Ciocalteu method. Valid information on the phenolic distribution in pineapple was provided by Rasheed et al (2012).

IV. CONCLUSIONS

The investigation shows large variability between three portions of different fruits species in measured total phenolic content. The finding of this study indicates that each type of fruit has different total phenolic content, contributed by different phytochemical components. *Morinda citrifolia* showed highest phenolic content amongst all fruits under study. High levels of phenols lead to high antioxidant activity. *Morinda citrifolia* contains phytochemicals that own antibacterial, antiviral, antifungal, antitumor and immune e has great relevance both to human health and commercial purpose. *Syzygium jambos* expresses lowest total phenolic content among the species studied. Apart from this non –phenolic substances may also be responsible for antioxidant activity in the species.

Thus the phenolic compounds or polyphenols constitute one of the most abundant and widely distributed group of substances in plants. Besides their nutraceutical properties, polyphenols are indicative of the quality of fruits. All these fruits may have sufficient non-lethal concentration of phenolic content, that provide enormous beneficial properties to human health .The increase of fruit polyphenol content can be of research interest in order to improve human health. Therefore the sufficient amount of phenol in fruits provides protection against various ailments, such as they act as cancer chemo preventives antioxidants and also helps to promote healthy aging by minimizing DNA damage. However exposure to higher concentration of phenol may exhibit roles in health issues such as genotoxicity, thyroid toxicity, respiratory disorders, pneumonia and necrosis.

Thus the phenolic compounds appear to influence the quality of fruits, contributing to their organoleptic and sensorial quality in addition to improving fruit nutritional value. The health effects of phenols depend on the amount of consumption and on their bioavailability needs more controlled and clinical studies.

Hence it can be concluded that phenolic content in fruits accounts for the quality and nutritional value of fruits. Consumption of such indigenous and exotic fruits rich in total phenolic contents contributes to much better nutritional requirements as well as good health of human body. Thus these fruits are significant sources of different phenolic components and could be considered as good source of natural antioxidants. Thereby they can be included as good components of our daily diet for better human health. Thus the studies in the selected indigenous and exotic fruits, will explore wider opportunities for utilizing the fruits in medicinal, pharmaceutical, clinical and also for commercial purposes.

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