iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** XI **Month of publication:** November 2017

DOI: http://doi.org/10.22214/ijraset.2017.11010

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 XI, November 2017- Available at www.ijraset.com

Nutritional Factors in Three Varieties of Annona Species

Shilpa Sasidharan[1], Ayona Jayadev[2]
[1,2]*Department of Environmental Sciences, All Saints' College, Thiruvananthapuram, Kerala, India,*

Abstract*: Annona reticulata, Annona squamosa and Annona muricata, the three plants which come under family Annonaceae, is reported to have anti nutritional properties such as Carbohydrate, Fat, Protein, Vitamin A and Vitamin C. This study is done to analyze the nutritional content in the fruits of these three varieties. Analyses were carried out in the laboratory of Department of Environmental Sciences of the institution and the following results were observed. The total carbohydrate in one gram of Annona muricata is 0.168, Annona reticulata is 0.186 mg/g and Annona squamosa is 0.253 mg/g ,The total fat in Annona muricata is 0.003mg/g , Annona reticulata is 0.043 mg/g and Annona squamosa is 0.033 mg/g , The total protein in Annona muricata is 0.029 mg/g , Annona reticulata is 0.016 mg/g and Annona squamosa is 0.017 mg/g , The total vitamin A in Annona muricata is 0.127 mg/g , Annona reticulata is 0.005 mg/g and Annona squamosa is 0.034mg/g, The total vitamin C in Annona muricata is 0.206 mg/g , Annona reticulata is 0.373 mg/g and Annona squamosa is 0.378 gm/g.*

Keywords*: Annona reticulata, Annona squamosa, Annona muricata, Nutritional, Carbohydrate, Fat, Protein, Vitamin A, Vitamin C*

I. INTRODUCTION

Fibers found in Fruits have been shown to reduce intestinal passage rates by forming a bulk, leading to a more gradual nutrient absorption, [1] hence preventing constipation. They can be fermented in the colon, increasing the concentration of short chain fatty acids having anti-carcinogenic properties, [2] and maintaining gut health. An increased consumption of carotenoid-rich fruits maintains the cholesterol level in blood since they reduce oxidative damage and cause an increase in LDL oxidation resistance, [3]. Fruits have also been suggested to prevent osteoporosis in adults mainly for their rich sources of calcium and other vitamins which are vital in bone health, [4].The high fiber content of fruits may play a role in calcium absorption and reduce the 'acid load' of the diet, [5] enhancing bone formation and suppressing bone resorption which consequently result in greater bone strength, [6]. Moreover, phyto ingredients in fruits such as isoflavones have shown to be protective against lens damage which occurs due to hyperglycemia and certain flavonoids such as quercetin can prevent oxidative stress in the pathogenesis of glaucoma, [7]. Also, a high intake of Fruits was inversely associated with the risk of respiratory symptoms, [8]. Higher total fruit intake is also associated with lower risk of cognitive decline hence proved beneficial for mental health, [9],[10]. phytochemicals in fruits have been found to act as anti-obesity agents because they may play a role in suppressing growth of adipose tissue, [11]. Adiposity is closely related to biomarkers of oxidative stress and inflammation and a diet rich in fruit can modify these adiposity related metabolic biomarkers in overweight women, [12].

II. MATERIALS AND METHODS

A. Study Material

Three species of fruits of the family Annoneacea were selected for the study: Annona reticulata, Annona squamosa and Annona muricata.



Plate 1: *Annona73quamosal73*Plate 2: *Annona73quamosal*Plate 3: *Annona muricata*

1) Taxonomical information of selected plants

a) Annonamuricata

Kingdom : Plantae
Order : Magnoliales
Family : Annonaceae
Genus : Annona
Species : Muricata
Vernacular names:
English: Sour soup, prickly custard apple

b) Annonareticulata

Kingdom : plantae
Order : Magnoliales
Family : Annonaceae
Genus : Annona
Species : reticulate
Vernacular names:
English : Custard apple, wild sweet sop

c) Annonasquamosa

Kingdom : Plantae
Order : Magnoliales
Family : Annonaceae
Genus : Annona
Species : Squamosa
Vernacular names
English: Custard apple, sugar- apple, sweetsop

B. Collection and Preparation of Sample

The fresh samples of three varieties of Annona fruits were collected from local market of Attingal, Trivandrum district (Kerala state). Well matured slightly yellow to green coloured fruits were selected which were free from blemishes and mechanical injuries. Fruits were washed under running tap water, hand-peeled, cored, and deseeded and the pulp was macerated. One gram of the fruit pulp was used for analyses.

III. ANALYSIS OF NUTRITIONAL FACTORS

A. Estimation of total carbohydrate

One gm of sample added into the boiling tube. Then added 10mL distilled water into it. Grind and filter it out. Centrifuge at 10,000rpm for 10 minutes. Collected the supernatant and make it to a known volume using distilled water. 0.1 mL of sample makes up to 1mL by distilled water. Then added 4mL anthrone reagent and kept in boiling water bath for 10 minutes. Taken OD at 620nm.

B. Ascorbic acid analysis

Sample (2gm) is grinded in 4% oxalic acid and filtered. Centrifuge at 10,000 rpm for 10 minutes. Supernatant was collected and make up to 25mL with distilled water. Pipette out 5mL of solution into a conical flask then added 10mL of 4% oxalic acid and titrate against the dye. The end point appeared to be pink color which persists for a few minutes. The amount of the dye consumed is equivalent to the amount of ascorbic acid.

C. Estimation of Protein

2gm of sample is grinded in phosphate buffer. Then it is filtered out by cheese cloth. Centrifuge the filtrate at 5000rpm for 10 minutes. Take the supernatant and make it to known volume by using buffer. 1mL of solution is taken and added 1mL of 10% Trichloroacetic acid. Shake thoroughly .Kept in freezer for 15 minutes .Centrifuge at 10,000 rpm for 10 minutes. Remove the upper

layer. Dissolve the pellet in known volume of 0.1 N NaOH. Take 0.1 mL of aliquot. Make up to 1mL by using 0.1 N NaOH .Add 5mL of reagent C .Keep it for 30 minutes .Take the OD at 670nm.

D. Estimation of beta carotene

To 2gm of sample, 20mL 60% KOH is added. Keep it for 3hours in darkness. Transfer the mixture to separating funnel .Wash it with petroleum ether 6 times .Collect ether layer after each washing. Pool the ether layer and wash with water. Make up the ether layer to known volume. Read the absorbance at 429 nm.

E. Estimation of fat

Sample (2gm) is taken in wide mouthed boiling tube. Then added 20 mL alcohol: diethyl ether mixture in the ratio 3:1 and stir well. Kept in thermostatic water bath for 2 hours for 55º C. Centrifuge at 3000 rpm for 10 min and pour the supernatant to a weighed petri dish. Add another lot of alcohol: diethyl ether mixture and extract for 2 hours. Centrifuged the contents and decanted to the same petri plate. Then added 20 mL of chloroform: methanol in the ratio 1:1 to the residue. Extracted the contents at 50ºC for one hour. Centrifuged and decanted to the same petri plate and dry the petri dish in an oven at 60 º C. Take the weight of the dish.

IV. RESULTS AND DISCUSSION

The results of Carbohydrate, protein, vitamin A, vitamin C, fat of the three varieties of Annona fruits which was analyzed are presented here. The quantitative result of Carbohydrate, protein, vitamin A, vitamin C, and fat is shown in Table.1.

Sl No.	Nutritional components	Annona muricata	Annona reticulata	Annona squamosa
1	Carbohydrates	0.168	0.186	0.253
2	protein	0.029	0.016	0.017
3	Vitamin A	0.127	0.005	0.034
4	Vitamin C	0.206	0.373	0.378
5	fat	0.003	0.043	0.033

Table No: 1 Nutritional component of *Annona* fruit

IV. NUTRITIONAL COMPOSITION

A. Total Carbohydrate

The total carbohydrate content in Annona muricata is 0.168 mg/g, in Annona reticulata is 0.186 mg/g and Annona squamosa is 0.253mg/g. As per the results obtained, Annona squamosa has the highest carbohydrate content and Annona muricata, the least. As per the earlier observations, in Annonamuricata inhibition decreases carbohydrate hydrolysis and glucose absorption, and inhibits carbohydrates metabolism into glucose,[13]. Additionally, glycemic index (GI) and glycemic load (GL) have been reported for Annona muricata fruit. GI indicates the upshot of the content and type of carbohydrates of a food on blood glucose content, while GL estimates how much the food will raise blood glucose level after eating it. GI and GL are considered low for Annona muricata, which agrees with its hypoglycemic potential,[14]. Carbohydrate is the highest macronutrient present into soursop fruit. Its value is higher than those from locust bean pulp (6.28%), [15].

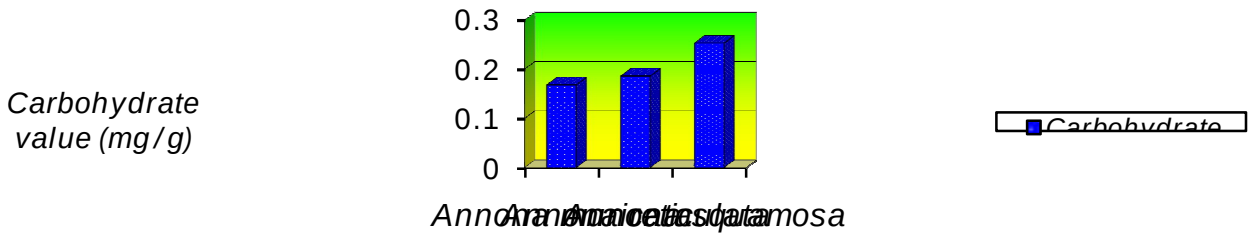


Figure 1: Carbohydrate

B. Fat

The Fat content in Annona muricata is 0.003 mg/g, in Annona reticulata is 0.043 mg/g and Annona squamosa is 0.033 mg/g. Annona reticulata have highest fat content. According to the earlier researchers, the seed extracts have shown the most active insecticidal activity, [16], [17], [18], probably due to its content of chemical compounds such as alkaloids, fatty acids and acetogenins. Fatty acids are toxic to insects in different manners: by inhalation of volatile compounds, by contact with film at the surface of water, and by penetration due to the amphibolic property of some compounds, [19]. New technologies, such as nano science, are exploring the growth of environmentally friendly, valuable, economical and easy to apply mosquito control products. For this purpose, green silver nanoparticles synthesized using aqueous crude extract of Annona muricata show larvae toxicity of Aedesaegypti, [20]. The expenditure of these fruits will also help to improve symptoms of magnesium and zinc deficiency. Several studies on nutrition in developing countries have shown that adequate nutrient intake (daily calories, daily protein, daily fat, minerals and vitamins) is an essential ingredient for improved well-being, economic growth and development, since a healthy body enhances the capacity to learn which in turn determines productivity and economic growth, [21], [22].

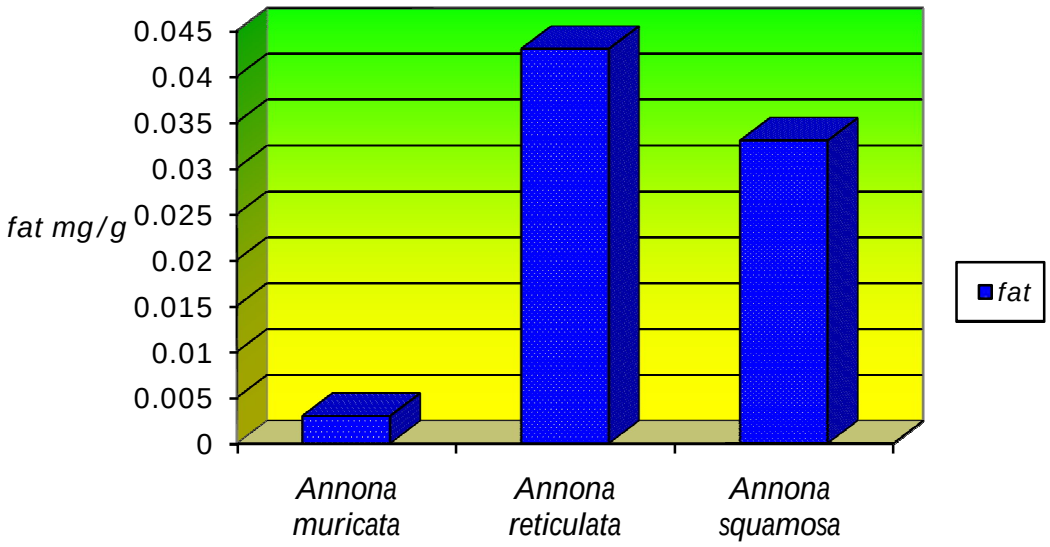


Figure 2 : Fat

C. Protein

The Protein content in Annonamuricata is 0.029 mg/g, in Annonareticulata is 0.016 mg/g and Annonasquamosa is 0.017 mg/g. Annona reticulata have highest protein content. In earlier research, [23], suggested that Annona muricata extracts induce apoptosis by Reactive Oxygen Species (ROS), and down regulates Bcl- 2 proteins. Bax protein Bcl-2 are anti-apoptotic proteins that suppress the function of apoptosis, while Bax are proteins that mediate the leakage of pro-apoptotic factors, including cytochrome c, Ca^{2+} and the mitochondrial protein Smac/DIABLO into the cytosol through dimerization and translocation to the outer mitochondrial membrane; a property that was also observed for acetogenins, [24],Annonamuricata extracts isolated Annomuricin E down regulates Bcl-2 proteins and up regulates Bax protein. This finding confirms that Annonacin E-induced apoptosis was through the mitochondrial mediated pathway, [25], [26], suggested that selective cytotoxicity of Annonamuricata is due to the enhanced ATP demand of cancer cells with respect to normal cells. Antiulcer potential of Annona muricata is probably through its antioxidant compounds that increase the mucosal nonprotein sulfhydryl group content, [27]. Soursop fruit are good source carbohydrates, proteins, and crude fibers. Protein content of soursop pulp is similar to those reported for important cereals which contain, in general, 7.8 to 22.8 g / 100 g , [28],[29].

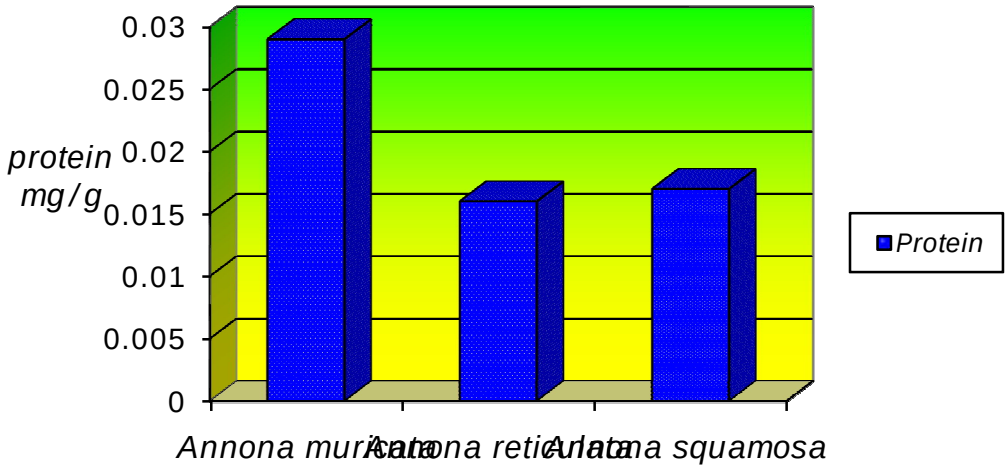


Figure 3 : Protein

D. Vitamin A

The Vitamin A content in Annona muricata is 0.127 mg/g, in Annona reticulata is 0.005mg/g and Annona squamosa is 0.034mg/g. Annona muricata have the highest vitamin A content. According to [30], Vitamins and carotenoids have been found in leaves, seeds and fruit pulp. The fruit makes an excellent drink or ice cream after straining. Its white edible pulp contents 80% water, 1% protein, 18% carbohydrate and fair amounts of vitamin [31]. Edible wild indigenous plants become an substitute source of food with high potential of vitamins, minerals and others interesting elements particularly during seasonal food shortage, [32]. β-carotene improves absorption of iron possibly by forming a complex with iron, keeping it soluble in intestinal lumen and preventing the inhibitory effect of phytates and polyphenols on iron absorption. β-carotene is precursor of vitamin A, which is important in strengthening and boosting the immune system to fight infection. Vitamin A is necessary for good eye health. It improves iron status possibly by reducing levels of infection, improving production and proliferation of red blood cells in bone marrow, increasing the absorption of iron from food in the intestine and mobilization from body store.

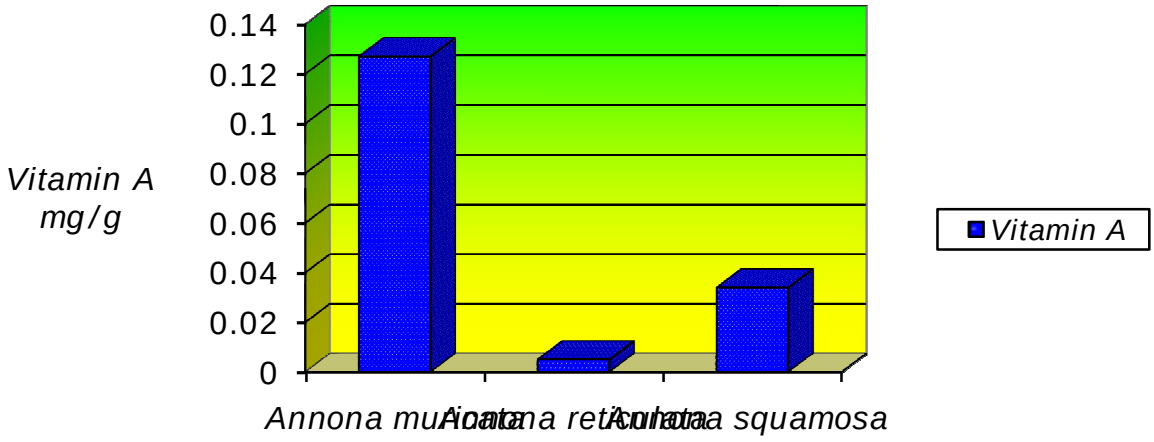


Figure 4 : Vitamin A

E. Vitamin C

The Vitamin C content in Annona muricata is 0.206 mg/g, in Annona reticulata is 0.373 mg/g and Annona squamosa is 0.378mg/g. Annona squamosa have the highest vitamin C content. According to [33] Vitamin C is antioxidants which are known to protect the cells by reacting with oxidizing factors and neutralizing their effects. They help protect the body from cell damage caused by free radicals and peroxides. The enhancing effect of ascorbate has been attributed to its reducing and chelating properties during the digest ion of food. The presence of ascorbate in foods overcomes the negative effects of all major inhibitors of iron absorption, including phytate and polyphenols to increase iron absorption two to three folds. Ascorbate also enhances iron absorption by reducing the iron III ions to ferrous (Fe2+) state, a form in which iron is absorbed.

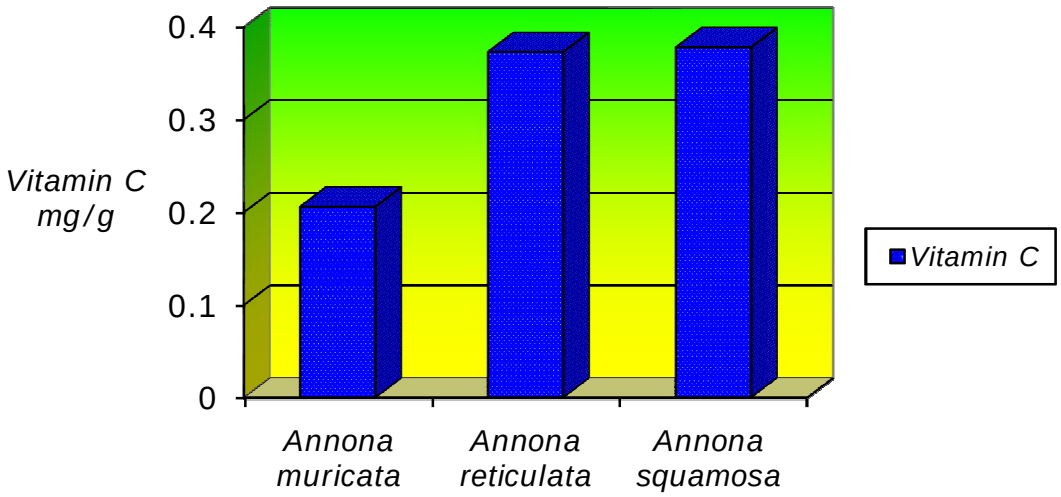


Figure 5 : vitamin C

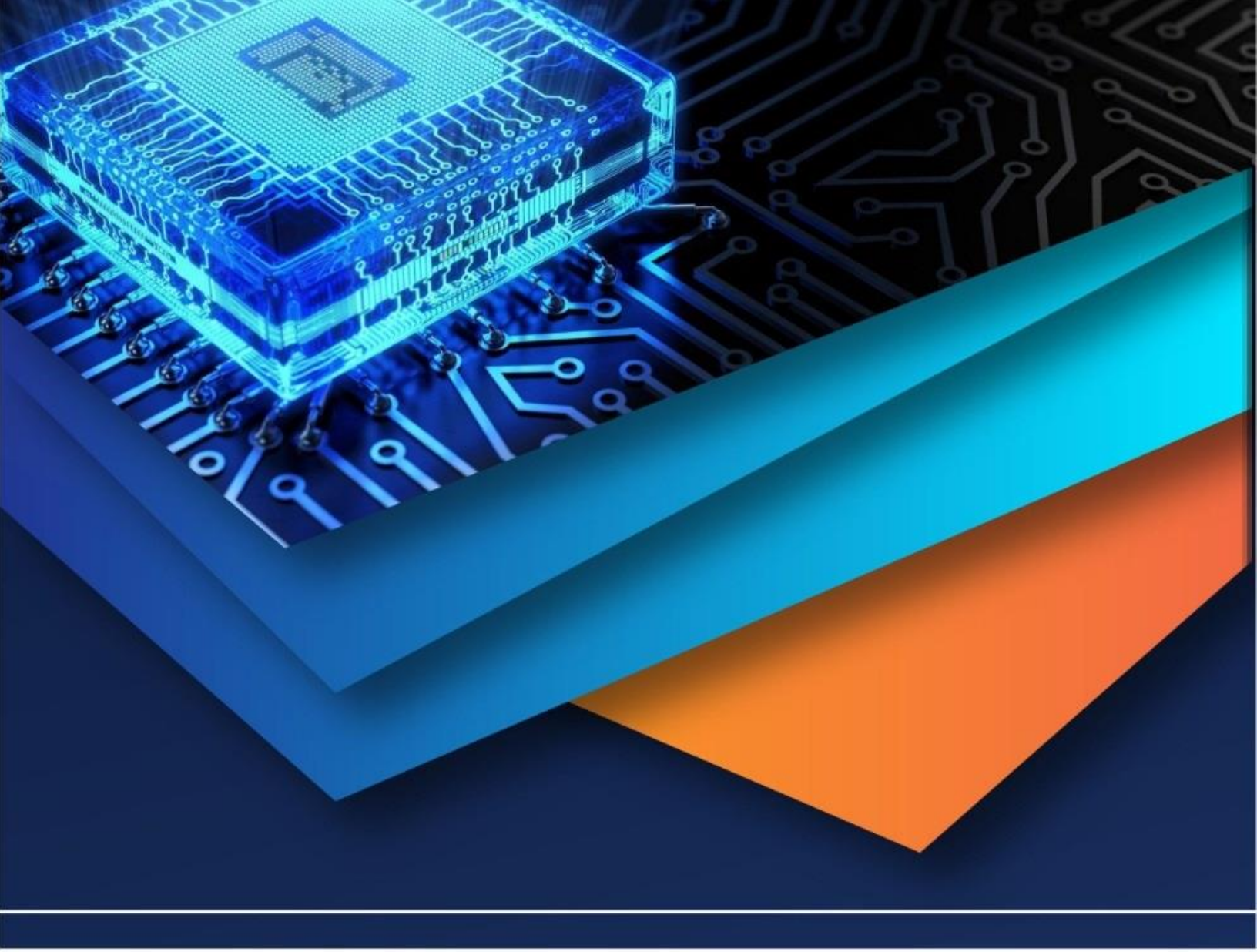
VI. CONCLUSION

The Mother Nature has provided us with an enormous count of flora and fauna. Annona reticulata is the best example of it. This study shows that Annona reticulata, is an important medicinal plant with diverse pharmacological spectrum. Some chemical constituent are isolated from the Annona reticulata showed anti-cancer, properties for bladder cancer and various cancer cell lines also. It's found to be a chemo preventive agent in cancer therapy. Further assessment is needed to be carried out on Annona reticulata in order to explore concealed areas and their practical clinical application, which can be used for the welfare of the mankind**.** Annona muricata is a coveted tropical tree, and a wealth of phytochemical investigations has been conducted for this fruit plant. In addition to being an important source for the food industry and an indigenous medicinal plant, Annona muricata is proven to possess a wide spectrum of biological activities. Among all former studies on Annona, the most promising activities are found to be its anticancer, ant parasitic and insecticidal activity. Because the greater part of the prior studies were focused on the biological activities of the plant extract, further investigations on the biochemical and physiological functions of active compounds and the detailed mechanisms underlying these activities are completely pivotal for the development of pharmaceutical and agricultural products. Custard apple or the sugar apple is the fruit of Annona squamosa, which is one of the most widely grown species of Annona. The fruit pulp has shown frequent medicinal properties which include antioxidant, anti-diabetic, anti-infective and anti dyslipidemic properties. Still the pulp of the fruit is not very easy for intake. There are a variety of recipes to overcome the hitch and increase intake.

REFERENCES

[1] J.Anderson, Perryman.S, Young.L, and Prior.S, "Dietary Fibre Fact." Colorado State University: Fort Collins, CO, USA Sheet No. 9.333, 2010
[2] J.M. Lattimer and Haub M.D, "Effects of Dietary Fibre and Its Components on Metabolic Health.Nutrients" vol:2: pp:1266–1289, 2010
[3] Southon S, "Increased fruit and vegetable consumption within the EU: potential health benefits", Food Res Int, vol: 33(3–4): pp: 211– 217, 2000

[4] H M, Heo J, Park Y "Calcium from plant sources is beneficial to lowering the risk of osteoporosis in postmenopausal Korean women " Nutr Res, vol: 31:pp: 27–32, 2011
[5] New S "Fruit and vegetable consumption and skeletal health: is there a positive link? Nutrition Foundation Nutr Bull,vol:26:pp: 121–125, 2001.
[6] Shen C L, Bergen V V, Chyu M C, "Fruits and dietary phytochemicals in bone protection ", Nutr Res, vol: 32:pp: 897– 910, 2012.
[7] Miyamoto N, Izumi H, Tawara A, Kohno K "Quercetin and Glaucoma. In: Handbook of Nutrition, Diet and the Eye." Eds, Preedy VR, vol:1, pp:97– 103, 2014.
[8] Celik F and Topcu F "Nutritional risk factors for the development of chronic obstructive pulmonary disease (COPD) in male smokers." Am J ClinNutr, vol: 25(6):pp: 955– 961,2006
[9] Mc MartinS E, Jacka F N, Colman I.,"The association between fruit and vegetable consumption and mental health disorders: Evidence from five waves of a national survey of Canadians.",2013
[10] Payne M E, Steck S E, George R R, Steffens D C, "Fruit, Vegetable, and Antioxidant In-takes Are Lower in Older Adults with Depression " J AcadNutrDiet,vol: 112:pp: 2022–2027,2012
[11] Slavin J L, Lloyd B "Health Benefits of fruits and vegetables" AdvNutr, vol: 3(4),pp: 506–516,2012.
[12] Yeon J Y, Kim H S, Sung M K "Diets rich in fruits and vegetables suppress blood biomarkers of metabolic stress in overweight women" Am J Prev Med, 54: S109–S115, 2012
[13] Hardoko, Halim Y, Wijoyo S, "In vitro antidiabetic activity of ''Green Tea" soursop leaves brew through a-glucosidase inhibition." Int. J. Pharm. Tech. Res.vol: 8 (1), pp:30–37, 2015
[14] Passos T U, Alves H, Sampaio DC, Olganeˆ M, Sabry D, Luisa M, Lima D O, "Glycemic index and glycemic load of tropical fruits and the potential risk for chronic diseases " Food SciTechnolIntvol: 35 (1),pp: 66–73, 2015
[15] Dahouenon-Ahoussi E, Adjou E.S, Lozes E, Yehouenou L.L, Hounye R, Famy N, Soumanou M.M, Sohounhloue D C K, "Nutritional and microbiological characterization of pulp powder of locust bean (Parkiabiglobosabenth) used as a supplement in infant feeding in northern Benin," African Journal of Food Sciences vol:6(9),pp: 232-238, 2012
[16] Bobadilla M, Zavala F, Sisniegas M, Zavaleta G, Mostacero J, Taramona L, "Evaluacio´nlarvicida de suspensionesacuosas de Annonamuricata Linnaeus sobreAedesaegypti Linnaeus (DipteraCulicidae)." Rev. Peru. Biol. Vol:12, pp:145–152, 2005.\Morales C A, Gonza´lez R, Arago´n R, "Evaluacio´n de la actividadlarvicida de extractospolares y no polares de acetogeninas de Annonamuricatasobrelarvas de Aedesaegypti y Anopheles albimanus (Dipeta: Culicidae) " Rev ColombEntomolVol: 30, pp:187–192, 2004aegypti (primerosensayos) MemInst Invest CiencSalud, vol: 27 (2),pp: 26–31, 2009
[17] Raveloson L H, Andrianiaina H, Nantenaina F, Rasoahantaveloniaina B, Herve´ P, Mavingui P, "Efficacy of seed extracts of Annona squamosa and Annonamuricata (Annonaceae) for the control of Aedesalbopictus and Culexquinquefasciatus (Culicidae) ", Asian Pac J Trop Biomed vol: 4 (10),pp: 798–806, 2014
[18] Santhosh S B, Ragavendran C, Natarajan D, "Biology Spectral and HRTEM analyses of Annona muricata leaf extract mediated silver nanoparticles and its larvicidal efficacy against three mosquito vectors Anopheles stephensi, Culexquinquefasciatus " J PhotochemPhotobiol, vol:153,pp: 184–190, 2015
[19] Flores R " Health and Nutrition: Emerging and Reemerging Issues in Developing Countries. In Pinstrup-Andersen, and Pandya-Loveh,R. (eds) The Unfinished Agenda: Perspectives on Overcoming Hunger Poverty and Environmental Degradation. Washington D.C.: International Food Policy Research Institute.", 2001
[20] Diao X, Hazell P, Resnick D, Thurlow J, "The Role of Agriculture in Development: Implications for Sub-Saharan Africa." International Food Policy Research Institute Research Paper (153). Washington D.C: International Food Policy Research Institute, 2007
[21] Pieme C, Kumar S, Dongmo M, Moukette B, Boyoum F, Ngogang J, Saxena A, "Antiproliferative activity and induction of apoptosis by Annonamuricata (Annonaceae) extract on human cancer cells " BMC Complement Altern Med Vol:14 (1),pp: 514–516, 2014
[22] Asare G, Afriyie, D, Ngala R, Abutiate H, Doku D, Mahmood S, Rahman H, "Antiproliferative activity of aqueous leaf extract of Annona muricata L. on the prostate, BPH-1 cells, and some target genes." Integr. Cancer. Ther. Vol:14 (1), pp:65–74, 2014
[23] Moghadamtousi S Z , Rouhollahi E , Karimian H , Fadaeinasab M , Firoozinia M , Ameen Abdulla M , Abdul Kadir H, "The chemopotential effect of Annona muricata leaves against azoxymethane-induced colonic aberrant crypt foci in rats and the apoptotic effect of acetogeninannomuricin E in HT-29 aells: a bioassay-guided approach.", 201
[24] McLaughling J L "Paw paw and cancer: Annonaceousacetogenins from discovery to commercial products." J. Nat. Prod.vol: 71, pp:1311–1321, 2008
[25] Roslida A H, Chan P F, Zuraini A, Mohd K H, "Antinociceptive and anti-ulcerogenic activities of the ethanolic extract of Annona muricata leaf, Brazilian", J Pharmacogn Vol:1, pp:1–12, 2012.
[26] Bullock D G, Raymer P L, Savage S "Variation of protein and fat concentration among commercial corn hybrids in the Southeastern USA." Journal of Production Agriculture vol:2, pp: 157-161,1989
[27] Ranhotra G S, Gelroth J A, Glaser B K, Stallknecht G F, " Nutritional profile of three spelt wheat cultivars grown at five different locations "Cereal Chemistry vol: 73, pp: 533-535,1996.
[28] Correa-Gordillo J, Ortiz J, Sa´nchez-Mejı´a M, Pacho´n H, "Actividadantioxidante en guana´bana (Annona muricata L.)" unarevisio´nbibliogra´fica. Bol. Latinoam. Caribe Plant. Med. Aromat.vol: 11,pp: 111–126, 2012.
[29] Rice R P, Rice L W, Tindal H D, "Fruit and vegetable production in warm climate", Macmillan Education Ltd, p 383, 1991
[30] Umaru H A, Adamu R, Dahiru D, Nadro M S, " Levels of anti nutritional factors in some wild edible fruits of Northern Nigeria", African Journal of Biotechnology vol: 6 (16),pp: 1935-1938, 200
[31] Vijayameena C, Sabhashini G, Loganayagi M, Ramesh B, "Phytochemical screening and assessment of antibacterial activity for the bioactive compounds in Annonamuricata" Int J CurrMicrobiolApplScivol: 2, pp: 1–8,2013.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY