P: ISSN NO.: 2321-290X RNI : UPBIL/2013/55327 VOL-4* ISSUE-11* July- 2017
E: ISSN NO.: 2349-980X **Shrinkhla Ek Shodhparak Vaicharik Patrika**

Functional Components (Phytochemical) and their Medicinal Importance: An Overview

Akansha Agarwal
Research Scholar,
Deptt.of Home Science,
Lucknow University,
Lucknow

Ruchira Rathore
Associate Professor,
Deptt.of Home Science,
Mahila Mahavidyalaya Degree College, Lucknow

Abstract

For many years health professionals have urged to increase our daily consumption of fresh fruits and vegetables. Eating a diet high in fruits, vegetables, grains legumes has long term health benefits because many plant based foods and herbs contain powerful functional components called Phytochemical Substances. These substances can improve the quality of health and can protect us against many diet related diseases. The term Phytochemical are naturally occurring substance found in plants gives fruits, vegetables and herbs their colour. These substances have been found to be beneficial for human health as well as they have antioxidant activity, anti-inflammatory activity and the ability to enhance our body's natural detoxification system. There are many Phytochemical some of the best known are carotenoids, Flavonoids and sulfur compounds. Carotenoids are groups of Yellow, orange, red and green plant pigment with powerful antioxidant activity, papaya, carrot, apricot and green leafy vegetables.

Such as broccoli or spinach are high in carotenoids offer many health benefits such as reducing the risk of certain cancer and heart disease and also help with enhancing immune system and protecting body from eye skin liver and lung damage. Flavonoids are large group of water soluble antioxidant and some of which have blue and purple colour pigment. These flavonoids have anticancer properties and help to keep blood vessels healthy. Out of all the phytochemicals in fruits and vegetables it's the flavonoids that we eat in the largest quantity in our diet isoflavones can be found in soybeans legume, apple, carrot, garlic, cherries potentially reducing the risk of certain type of cancer.

Different coloured fruits and vegetables also have different kind of phytochemical, so it is important to have a variety of colours in the diet. This can reap the health benefits.

Keywords: Functional components, Phytochemicals, Carotenoids, Antioxidant, Flavonoids

Introduction

Functional components present in foods are non-nutritive biomolecules which modulate metabolic processes of the body and promote well being. Functional components showing many health benefits and protective effect against many diseases at various stages of disease control. Decades of research has shown that relationship between functional components present in foods health and disease prevention /treatment. Functional components present in foods include Phytochemicals .Steinmetz and Potter (1991) identified more than a dozen classes of these biologically active plant chemicals now known as Photochemical (ADA ;1995).

Phytochemicals is naturally occurring and biologically active compounds in plants (''Phyto'' means Plant) are largely responsible for protective health benefits. Phytochemical are found in fruits , vegetables, whole grains, herbs, spices and are also responsible for colour , flavor and odour of plant foods. It is classified according to their chemical structures and functional properties.

Objective of the Study

1. To describe plant based functional components (Phytochemicals) present in the foods.
2. To describe medicinal power of functional foods.

Aim of the Study

This paper therefore review Phytochemicals present in foods with focus on their medicinal properties and sources.

Phytochemicals their Sources and Medicinal Properties

There are over 900 phytochemicals found in foods (Srividya A.R.et al 2010). Phytochemicals can be classified into major categories such as Carotenoids (Micronutrient Information Center 2016) and Polyphenols which include Phenolic Acids Flavonoids and Lignans (Heneman.et.al; 2008) Carotenoids, Anthocyanin Isoflavones, Phtoestrogen etc.

Some of the most beneficial Phytochemicals their sources and medicinal properties are overviewed below.

Phytochemical(s)	Plant Source	Possible Benefits
Carotenoids (such as beta-carotene, lycopene, lutein, zeaxanthin)	Red, orange and green fruits and vegetables including broccoli, carrots, cooked tomatoes, leafy greens, sweet potatoes, winter squash, apricots, cantaloupe, oranges and watermelon	May inhibit cancer cell growth, work as antioxidants and improve immune response
Flavonoids (such as anthocyanins and quercetin)	Apples, citrus fruits, onions, soybeans and soy products (tofu, soy milk, edamame, etc.), coffee and tea	May inhibit inflammation and tumor growth; may aid immunity and boost production of detoxifying enzymes in the body
Indoles and Glucosinolates (sulforaphane)	Cruciferous vegetables (broccoli, cabbage, collard greens, kale, cauliflower and Brussels sprouts)	May induce detoxification of carcinogens, limit production of cancer-related hormones, block carcinogens and prevent tumor growth
Inositol (phytic acid)	Bran from corn, oats, rice, rye and wheat, nuts, soybeans and soy products (tofu, soy milk, edamame, etc.)	May retard cell growth and work as antioxidant
Isoflavones (daidzein and genistein)	Soybeans and soy products (tofu, soy milk, edamame, etc.)	May inhibit tumor growth, limit production of cancer-related hormones and generally work as antioxidant
Isothiocyanates	Cruciferous vegetables (broccoli, cabbage, collard greens, kale, cauliflower and Brussels sprouts)	May induce detoxification of carcinogens, block tumor growth and work as antioxidants
Polyphenols (such as ellagic acid and resveratrol)	Green tea, grapes, wine, berries, citrus fruits, apples, whole grains and peanuts	May prevent cancer formation, prevent inflammation and work as antioxidants
Terpenes (such as perillyl alcohol, limonene, carnosol)	Cherries, citrus fruit peel, rosemary	May protect cells from becoming cancerous, slow cancer cell growth, strengthen immune function, limit production of cancer-related hormones, fight viruses, work as antioxidants

Carotenoids

Carotenoids are a class of more than 750 naturally occuring pigments synthesized by plants algal and (Wang .X.D; 2014) Photosynthetic bacteria. Carotenoids are strong antioxidant (Paiva, S.A. 1999) can help reduce the oxidative damage caused by radicals. Epidemiological studies have shown a link between dietary intakes of carotenoids and reduce risk of certain cancer, cardiovascular disease and many other diseases. Of the various classes of pigment in nature the carotenoids are in among the most widespread and important ones, especially due to varied function.

This richly colored molecule is the source of yellow, orange and red colour of many plants. Fruits and vegetables provide most of 40 to 50 carotenoids found in the human diet like α carotene β carotene β - cryptoxanthin , Lutein, zeaxanthin and lycopene are the most common dietary carotenoids (Wang.s.d; 2004)

β Carotene gives carrot, pumpkin, their rich orange pigmentation. It is also offer number of health benefits.

Lycopene gives tomatoes, pink grapefruit watermelon and guava their red colour (Clinton.S.K.et.al; 1998) and support maintenance of prostate health. Lutein And Zeaxanthin gives dark colour to the foods, Green vegetables like spinach and kala are particular rich source of lutein but poor source of zeaxanthin (Hendler.ss.et al; 2000). Good source of dietary zeaxanthin include yellow corn orange pepper, melon and mango support maintenance of eye health.

Protective effects of carotenoids against serious disorder such as cancer (Donaldson 2004 and Kantoff 2006) heart disease (lonn et al; 1999 and Sesso; 2003) and degenerative eye disease (Mozaffarieh.M.I.et al 2003).

Polyphenols

Polyphenols is a generic term for the several thousand plant based molecules that have antioxidant properties (Elliott M. et.al. 2000) Polyphenols are devided into four primary groups (a) Phenolic acid (b) lignans (c) stilbenes and (d) flavonoids (Cloudine M. et al. 2004) found in green tea, citrus fruits, apples, whole grain and may prevent cancer formation, inflammation and work as antioxidant. Current evidence strongly supports a contribution of polyphenols to the prevention of the cardiovascular disease and osteoporosis, neurodegenerative disease and diabetes mellitus.

Flavonoids are a sub group of Polyphenols and a large family of Phytochemicals themselves there are over individuals flavonoids including anthocyanine, flavonals, flavonanones, flavones and isoflavones (Tsao.R; 2010) quercetin of these flavonals are the most common in the human diet (delange.B; 2015) these are found in apples apricots, beans, broccoli, cherry, tomatoes, pears, onion, red grapes; Sweet cherries.

The potential health benefits to human health of flavonoids include antiviral (kanerva, A; 2007) antitoxic, antifungal (Friedman.N, et.al; 2007) antibacterial (Moller.M; et al 2006), antiallergic (Kawai m, et al; 2007) anti-inflammatory (Nowakowska. Z; et al 2007) and antioxidant activities (shahidi F, et al 2004).

Flavonoids also exert a positive effect on the prevention and/or treatment of many different type of cancer (gates, M.A. et al; 2007) Lungs (Theodoratou, E; et al; 2007) Breast (fink. B.N.et al; 2007) among other.

It is also play a protective role of flavonoids regarding heart disease (osakabe N, et al 2004) diabetes (Li T; et al 2007) and neurodegenerative disease (Hisronata M; 2007)

Anthocynins are plant pigments. They are responsible for the rich red, blue and purple colour found in fruits and vegetables high concentration of anthocyanins are found in fruits and vegetables. High concentration of anthocynins are found in blue berries in the form of the water soluble pigment (Shadi F; et al 2004) cherries, strawberries, blackberries, grapes red cabbage, red apple.

It is also a strong antioxidant that can help protect the liver improve eye sight reduce blood pressure and even reduce the risk of many serious diseases (konczak, et al 2004).

Phytoestrogen

It is a plant compounds similarly to estrogenic which have role in the metabolism of carbohydrates, Proteins, lipids and minerals in the body (Gardiner. T. et al;2001), Phytoestrogen are devided into three main categories as isoflavones genistein , daidzein, glycitein,lignane (enterolactone) and coumstans Phytoestrogen have beneficial effects on the skeleton and the cardiovascular system (Gardiner.T. et al; 2001) reduce the incidence of osteoporosis (Roudsari A,H. et al; 2005) . Some Phytoestrogen have antibacterial (Adlercreutz. H. etal ; 1997) antiviral activity (konigneim. B.S. et al; 2005).

Isoflavones are polyphenolic compounds for this reason they are classified as phytoestrogen plant derived compounds as phytoestrogen isoflavones are plant compound that mimic the effect of estrogen in the human body. Saybean are an especially rich source of isoflavones sometime reffered as soy isoflavones (Darke .V;2009) In soyabean isoflavones are present as glycosides. They have been also known for their antioxidant, antinflamotory health benefits (Garcia.L.A. et.al; and Crozier.A.et al; 2009). In a study on isoflavones indicate that isoflavones are beneficial for patients with cardiovascular diease, cancer, osteoporosis (Conklinc.m. et al 2007) and Barnes S. 1998)

Lignan are another type of polyphenols, lignans present in a wide variety of plant foods including seeds (Flax, pumpkin, sunflower) whole grain (rye, oats, wheat) beans., fruits particularly barriers and vegetables (Drake .V; 2010)

Lignans plays a protective role against certain type of cancer (Adlercreutz.H; 2007) heart disease (Vanharantam.et.al; 2003) osteoporosis (Kim.Mk. et al; 2002).

Isothiocynates

It is a group of phytochemicals containing Sulphur that occur naturally as glycosinolates conjugates in cruciferous vegetables such as broccoli , cauliflower cabbage and other (Foney; 2001) studies have shown that isothiocynates and their metabolic help to lower the risk of developing different type of cancer, namely lungs, breast, liver, stomach, colon, small intestine (Hecht ;2004 and Conway. et al; 2002)

Conclusion

Reserch have been proved a relationship between functional component (Phytochemicals) of foods health and well being. Protecting our health has never been easier.All we have to do is take advantage of these powerful healths promoting phytochemicals. We can do this by having a rich plant based diet full of brightly coloured fruits and vegetables.Functional components(Pshytochemicals) present in foods will play an important role in health maintenance in the future as result of their medicinal properties.

References

1. *ADA (1995) Position of the American Dietetic Association: Phytochemicals and functional foods J.AM. Diet Assoc. 95:493 – 496.*
2. *Adlercreutz, H. etal (1997) Phyto estrogens and western Disease Ann. Med., 29: 95 – 120 .*
3. *Adlercreutz H; (2007) Lignans and human health: crit Rev clin Lab sci. 44(5 – 6) 483 – 525*
4. *Barnes S. (1998) Evolution of the health benefits of soy isoflavones. Proc. Soc. Exp. Biol. Med. 217:386-392. Doi: 10.3181 / 00379-727 – 217 – 44249. (PubMed).*
5. *Canaway. C.C; Yang. Ym; chung. FL; Isothiocynates as cancer Chemopreventive Agents; Their Biological Activities and metabolism in Rodents and humans. Curr. Drug. Metab, 3 (3) , 233 – 255 .*
6. *"Carotenoids" , Micronutrient information centre, linus Pauling Institute, Oregon state university, corvallies, Oregon. 2016. Retrived 12 feb 2017.*
7. *Cladine. M; Augstin .S; Charistine. M; Christion.R; and Liliana .J; (2004) Polyphenols: Food sources and bioavailability. Am J. Clin Nutr 79(5) 727 -747*
8. *Cliritonsk(1998) lycopen: chemistry, biology and implication for human health and disease nutr Rev. 56 (2) : 35 – 51 (PubMed)*
9. *Cogolludo. A; Frazzionao, G; Briones, AM;cobeno, L; Moreno, L; Lodi, F; salaices, M; Tamargo, J; Perez – Vizcaino, F. (2007) The Dietory Flavonoids Quercetin activates BKca Currents in coronary arteries via Production of H202. Role in vasodilation. Cardivoasc. Res; 73 (2) 434 – 431.*

10. *Conklin C.M.; Bechberger J.F; MacFade D; Guthrie N; Kurowska E.M. Naus CC; (2007) .Genistein and quercetin increase connexin 43 and suppress growth of breast cancer cells. Carcinogenesis 28: 93 – 100 .doi 10. 093/ carcin/ bgl106. [PubMed]*
11. *Crozier A, Jaganath I.B.; Clifford (2009) M.N. Dietary phenolics: Chemstry, bioavailability and effects on health. Nat. Prod. Rep. 26 : 1001 – 1043 . doi 10 . 1039/ b 802662a (PubMed)*
12. *Darke, Victoria, Ph.D. "SoyIsoflavones," Oregon state university.Linus pauling institute.Oregon State University 2009, web 18 oct 2016.*
13. *Deleange, Barbera (2015) Ph.D. "Flavonoids" Oregon state university: Linus Paulenginsititute, Oregon state university, accessed 18 oct 2016.*
14. *Donaloson, MS. (2004) Nutrition and cancer; A Review of the Evidence for and Anti – cancer Diet. Nutr. J . 3; 19.*
15. *Elliott Middleton Jr; chithankandaswami and Theoharis c. Theonarides (2000). The Effect of plant Flavonoids on Mammalion cells. Implications for inflammation, Heart disease and cancer Pharmacological Reviews 52(4) 673 – 751*
16. *Fatey, Jw; Zalcmann, AT. Talaley P.(2001) The chemical diversity and Distribution of clucasionalate and Isothiocyantaes. Among Plant Phytochemistry, 56(1) . 5-51*
17. *Fink , BN; steck, SE; wolff, M; Briton, JA; kabat, GC; Schroeder,JC; Teitelbaum, SL; Neugut, AI; Gammon, MD. (2007) Dietary Flavonoid Intake and Breast cancer risk Among women on Long Island. Am. I. Epidemiol; 165(5) 514-523.*
18. *Friedmen, M. (2007) Overview of antibacterial, antitoxin, Antiviral and antifungal activities of Tea flavonoids and Teas. Mol. Nutr Food Res; 51(1) 116 – 134*
19. *Garcia – Lafuente A; Guilla mon E; Villares A. Rostagno M.A. ; Martinez . J (2009) Flavonoids as antinflamatory agents: Implications in cancer and cardiovascular diseases. Inflamm Res 58:537-552 doi : 10.1007/500011 – 009 - 0037 – 3 (Pubmed)*
20. *Gardiner. T; Ramberg. j.; (2001) Plant Estrogens: Importance in Health and Disease. Glycoscience & Nutrition , 2(8), 2 -12.*
21. *Gates, M.A.; Tworoger , S.S; Hecht, J.L; De Vivo, I; Rosner B; Hankinson SE; (2007) A Prospective study of Dietory flavonoids intake and incidence of Epithelial Ovarian cancer, Int. J. cancer, 121 (10),2225-2232*
22. *Hecht, S.S. (2004) chemoprevention by Isothiocynates. In Kelloff, Gj, Hawk, Et, Sigman, CC. Eds. Promising cancer chemopreventive agents, Volume 1. Cancer chemopreventive agents. New Jersey: Humana press.*
23. *Hendler SS, Rovik DM, eds. PDR for Nutritational supplements 2nd ed. Thomson Reuters; 2008.*
24. *Heneman, Karrie, Zidenberg – cherr, sheri (2008) Publication 8313 Phytochemicals "(PDF) University of California co-operative extension.*
25. *Hiroata, M; Hasegawa, K; TsutsumiYasuhara, S; onnashi, Y; ookoshi, T; ono k; yamada; M, Naiki, H. (2007). The Anit – amyloidogenic effect is exerted against Alzneimer's Beta amyloid Fibrils in vitro by Prefrential and Reversible Binding of Flavonoids to the Amyloid Fibril Structure, Bichemistry, 46 (7) 1888 – 1899.*
26. *Kanerva , A; Raki, M; Ranki, T; Sarkioja, M; Koponen, J; Desmond, RA; Helin; A; Stenman, UH; Hockerstedt, K; Ristimaki, A; Hemminki, A, (2007) Chloorpromazine and Apigenin Reduce. Adenovirus Replication and decrease relication associated toxicity. J, Gene. Med; 9(1), 3 – 9.*
27. *Kawai, M; Hirano, T; Higa, S; Arimitsu, J; Maruta, M; kuwahara Y; onkawara, T; Hagihara, K; Yamadori, T; Shima, Y; ogata, A; Kawase, I; Tanaka, T; (2007). Flavonoids and related compounds as Anti – Allergic substances. Allergol. Int; 56 (2) 113 – 123*
28. *Kim Mk; chung BC; Yu vy; Nam Jh; Lee Hc; Huh. KB; Lim SK; (2002) Relationship of urinary photoestrogen excretion to BMD in postmenopousal woman clin Endocrinal (oxf) 56(3): 321 – 328.*
29. *Konczak Izabela and weizhang (2004) Anthocyanis more than Nature's colours. 5(1) Accessed 19 oct 2016.s*
30. *Konigheim, Bs; Goleniowski, ME; contigiani, MS. (2005). Cytotoxicity and antiviral activity of a Ligrnan extracted from Larrea divaricata Drug Design Reviews – online , 2(1) 81 - 83*
31. *Laparra. J.M. sanz Y. (2010). Interactions of gut microbiota with functional food componants and nutraceutionalsPharmacol. Res. 61:219 – 225(Pubmed).*
32. *LI, T; Liu, J; Zhang, X; Ji G; (2007) Antidiabetic Activity of Lipophilic (-) – epigallocatechin -3 gallate Derivative under its role of Alpha – glucosidase inhibition. Biomed. Pharmacother; 61 (1) 91 – 96*
33. *Lonn, EM; Yusuf , S. (1999) Clinical Eveidence . Emerging Approaches in Preventing Cardiocascular Disease. West. J. Med., 171 (4) 247 – 252.*
34. *Maller, M; Suschke , U; Nolkemper, S; schneele, J; Distl, M; Sporer, F, Reichleing, J, wink, M. (2006) Antiacterial, Antiviral, Antiproliferative and Apoptosis inducing Properties of Brackenridgea Zangullbarica (ochnnaceae.) J. Pharm. Phormacol; 58 (8),1131-1138*
35. *Malyneux, Rj; Lee, ST; Gardner, DR; Panter, KE; James, LF;(2007). "Phytochemicals: the good, the bad and the ugly?" Phytochemicals 68 (22 – 24) : 2973 –2985 – PMID 17950388*
36. *Mozaffarien, M; sacu, wedrich A; (2003) . The role of carotenoids, Lutein and Zeaxanthin, in Protecting against age – related mocular Degeneration. A Review based on controversial Evidence, Nutr. J., 2: 20.*
37. *Murano Ps, Phytochemicals and Phytonutrients in understandinal food science & technology Bemontwadsworth; 2003. 51 – 56*
38. *Nowakowska, Z; (2007) A review of Anti – infective and Antiinflammatory chalcones. Eur. J. Med. Chem; 42 (2), 125 – 137.*

39. *Paiva, S.A. and RM> Russell. "(1999) Beta carotence and other carotenoids as antioxidants Journal of the American college Of Nutrition, 8 (5) 426 – 33 Accessed on 19 oct 2016.*
40. *Roudsar , AH; Tahbaz , F; Hossein Nezhad , A; Arjmandi , B ; Larijani , B ; Kimiagar, S.M. (2005) . Assessment of soy Phytoestrogens effects on bone Turnover indicators in Menapausal women with osteopenia in Iran; A Before and after clinical trial. Nutr. J; 4: 30.*
41. *sakabe, N; Yamagishi, M; Natusme, M; Yasuda, A; osawa, T. (2004) Ingestion of Proanthocyanidins Derived from cocaoInnibits diabetes – induced cataract formation in rats, Exp. Biol. Med. (Maywood), 299 (1) 33 – 39 .*
42. *Shahidi, F; Naczk. M; (2004) Phenolics in food and Nutraceuticals. Florida CRC Press LLC*
43. *ShobamotoT, kanazawa k, shahidi, F(2008) funct food Health, ACS symposium. P, 993. ISBN 978 – 0 – 8412 – 6982 – 8*
44. *Snahindi, F; Naczk M; (2004) Phenolics in Food and Nutraceuticals Florida; CRC Press LLe.*
45. *Srividya AR, Nagasamy V, Vishnuvartan VJ (2010) Nutraceutical as medicine : a review Pharmanest, 1: (2) : 132 – 145:*
46. *Steinmetz, K.A. and Potter, J.D.(1991) vegetables, fruit and cancer II Mechanism cancer causes control 2:427 – 442*
47. *Swanson JE 92003). Bioactive food components. Encycl food cult, gale cengage. http://www.enotes.com/bioactivefood-component. S-refrence/ bioactive-food components accessed 18 november 2012.*
48. *Theodoratou, E; Kyle, J; cetnarskyj, R; Farrington, SM; Tenesa, A, Barnetson, R; Porteous , M; Dunlop , M; Campbell, H. (2007) Dietary Flavonoids and the risk of colorectal cancer.Cancerepidemiol. Biomarkers Prev; 16(4) 684 – 693.*
49. *Tsao, Ronng (2010) chemistry and Biochemistry of Dietary Polyphenols 2:12 Accessed on 19 oct 2016.*
50. *Vanharanta M; voutilainen S; Rissanen. TH; Adlercreutz H; salonen JT; (2003) Risk of cardiovascular disease related and all cause death according to serum concentration of enterolactone: Kuopio Ischaemic Heart disease risk factor study arch Intern Med. 163 (9) 1099 – 104 .*
51. *Wang XD (2014) carotenoids. In: Ross CA, caballero B, cousins Rj, Tucker KL, Ziegler Tr, eds. Modern Nutrition in Health and Disease 11th ed: Lippincott williame & wilkins 427:439.*
52. *Wildman REC (2001) Handb Nutraceuticals Funct Foods (1st ed.) CRC series. ISBN – o – 8493 – 8734 – 5*