

STRATEGIC DESIGN OF DELIVERY SYSTEMS FOR NUTRACEUTICALS AND HEALTH BENEFITS-A REVIEW

Gayatri, D¹, Nandyala Yamuna², Satya Tulasi, V³ & Monika Krishna Janga⁴

¹Assistant Professor, Department of Food Technology, Rajiv Gandhi Degree College, Rajahmundry – 533 103

^{2,3,4}Students, Department of Food Technology, Rajiv Gandhi Degree College, Rajahmundry – 533103

Received: 26 Jul 2021

Accepted: 06 Aug 2021

Published: 10 Aug 2021

ABSTRACT

Nutraceuticals are natural active ingredients that can be present in functional or separate food. Nutraceuticals is a combination of two words: nutrition and pharmaceutical. It means that could be used as a food supplements and functional ingredients in food processing to decrease the risk of diseases. In this paper, importance of active ingredients, operation mechanism of nutraceutical, sources and health benefits are reviewed.

KEYWORDS: *Nutrition and Pharmaceutical*

INTRODUCTION

The name nutraceutical was minted from nutrition and pharmaceutical in 1989 by Stephen Defelice, founder and chairman of foundation for innovation in medicine, an American organization.

The definition of nutraceuticals and its products are depending upon the natural sources. These are classified according to their sources, medicinal properties and chemical composition. These nutraceuticals are categorized into four types that include 1. Functional foods, 2. dietary supplements, 3. Medicinal foods, and 4. Pharmaceuticals.

Nutraceuticals is a spacious umbrella name and it is used to depict any product derived from food sources with extra health benefits in addition to the basic nutritional composition ascertained in foods. This type of products can be considered non-specific natural biological therapies used to elevate general well-being, control symptoms, and preventable processes.

The consumer awareness about food and health has led to an increase in the necessitate for food containing biologically active components, especially antioxidants, which could help the human body conflict the oxidative stress. The many sources of antioxidants have been exposed, which is a priority not only for food, but also for the pharmaceutical industry. It has been shown that not only raw materials, but also waste from fruit and vegetable processing industry contains valuable molecules, such as: proteins, essential amino acids, antioxidants, dietary fibers, natural pigments, or aromatic compounds, that could be isolated, purified and modernized in food products and other chemicals with added value. It is the basis of immense potential of not only plant and biotechnology raw materials, but also food waste from different food processing industries such as sugar cane processing in sugar industry, fruit alcoholic beverages, confectionary and bakery processing units, dairy processing, fruit pulp processing industry, spices processing industry can also employ as a source of antioxidants.

Functional foods are foods that have a specific function and positive effect on health. These functional foods can be employed to reduce the risk health hazards in a pandemic situation by using natural sources which are available in home.

The important examples for functional foods are oatmeal can be used to reduce the total cholesterols and LDL cholesterols and thereby reducing the risk of cardiovascular diseases. Rice bran oil can be used to lower the cholesterol levels because it contains functional ingredient such as an antioxidant and phyto-chemical that is oryzanol present naturally in rice bran oil.

Phytosterols naturally present in fruits and vegetables, their waste generated from food processing industries can be utilized to isolate and purify the stanols. These plant stanols are functional ingredients can be used to lower the blood cholesterol levels in humans. An orange juice can be used to boost the bone formation with fortification with calcium. An orange juice fortified with calcium can be used as a functional food. Pumpkin juice and ash gourd juice can be used as a healthy medicinal food because of their active components and showing many health benefits. Plant stanols can be isolated from different natural plant sources such as fruit sources, grains, cereals, pulses and vegetable oils. These type of foods can be used as dietary supplements. Almost all type of spices can be used as medicinal foods, because of their medicinal properties.

The Food and Drug Administration regulates the claims that manufacturers can make about functional foods' nutrient content and effects on disease, health or body function.

OPERATION MECHANISM

Nutraceuticals are biologically active ingredients that can be present in functional or medicinal food and have a documented, and at the same time, good effect on human health through their involvement in metabolic processes (Audery et al. 2004). Espin et al. (2007) consider nutraceuticals to contain pharmaceutical conceptualisations containing food phytochemicals as active substances.

These nutraceuticals include nutrients and biologically active phytochemicals, supplements, functional foods, plant stanols and sterols, different spices and herbal products (Blecha and Wawer 2011). Biologically active phytochemicals include phenolic compounds, polyphenols, anthocyanins, flavanones, isoflavones, ellagitannins, ellagic acid, resveratrol, proanthocyanidins, procyanidins, flavan-3-ols (Sakthinathan and Nandhini, 2017).

Nutraceuticals is created from the combination of two words: nutrition and pharmaceutical. It means substances that can be considered as a food or a part of it, can help maintain the health and as well as reduce the risk of and prevent from refinement diseases (Audery et al. 2004, Krochmal-Marczak et al. 2018). According to Wildman (Audery et. al. 2004), nutraceutical is an ingredient that is a common element for both foods for special nutritional purposes, functional food and dietary supplements. The term includes any biologically active substance that can strengthen, weaken or modify the physiological and metabolic functions of the body, and thus have beneficial effect on the body. The generally used and most recognized raw materials for the manufacture of nutraceuticals include plant extracts, including herbs, fruits, eggs, colostrum, spice products, etc. (Blecha and Wawer 2011, Trziszka and Cichocka 2018).

The substances that can be comprised in nutraceuticals are: vitamins, minerals, polyphenols, e.g. vitamin E; flavonoids, e.g. flavonoids contained in the fruits of black cranberry, chokeberry; polyphenols, e.g. contained in a peel of

navy grapes; or polyunsaturated fatty acids, e.g. omega-3 fatty acids contained in marine fish or chia plants. The basic mechanisms of action of these substances are their antioxidant activity (scavenging free oxygen radicals). This leads to the protection of cellular structures against retrogression processes resulting from environmental pollution, aging processes and other processes adverse to health (Sharifi-Rad et al., 2019).

Nutraceuticals are products isolated from food sources that are proposed to provide extra health benefits, in addition to the basic nutritional value found in foods. Nutraceutical are a food or part of food that furnishes health benefits including the intervention and treatment of a disease. Generally the nutraceuticals ameliorate the health status of individuals by modulating the body functions. Different types of those nutraceuticals are available in general viz., proteins, vitamins, minerals, and other pure food compounds like., dietary supplement, herbals, nutrients, medical foods, functional foods. Nutraceuticals have attracted considerable interest due to their potential nutritional, safety and therapeutic effects (Bagchi and Nair, 2016).

HEALTH BENEFITS OF NUTRACUTICALS

Cardiovascular Diseases

The nutraceuticals used are antioxidants, dietary fibres, omega-3 fatty acids, vitamins, minerals for prevention and treatment of cardiovascular diseases. Polyphenol (in grape) prevent and control arterial diseases. Flavonoids (in onion, vegetables, grapes, red wine, apples and cherries) block the ACE and strengthen the tiny capillaries that carry oxygen and essential nutrients to all cell(Srivastava Shubhra et ., 2015)

Diabetes

Lipoic acid, an antioxidant is used for treatment of diabetic neuropathy dietary fibres from psyllium have been used for glucose control in diabetic patients and to reduce lipid level in hyperlipidemia. Ethyl esters of n-3 fatty acids may be beneficial in diabetic patients. Docosahexaenoic acid regulates insulin resistance and is also vital for neurovisual development (Kucuk et al., 2002).

Obesity

Herbal stimulants, such as ephedrine. Caffeine, ma huang-guarana, chitosan and green tea help in body weight loss. Buckwheat seed proteins acting similar to fibers present in food. 5-hydroxytryptophan and green tea extract may promote weight loss, while the former decreases appetite, the later increases the energy expenditure. A mixture of glucomannan, chitosan, fenugreek and vitamin C in dietary supplement greatly reduced body weight.

Cancer

Flavonoids which block the enzymes that produce estrogen reduce of estrogen-induced cancers. Phytoestrogens is recommended to prevent prostate/breast cancer. Soy foods are source of Iso-flavones, curcumin from curry and soya isoflavones possess cancer chemo preventive properties. Lycopene concentrates in the skin, testes, adrenal and prostate protects against cancer (Thomas et al., 2006).

CONCLUSIONS

The nutraceuticals are bioactive ingredients, and their components are characterized by either recognized therapeutic activity or chemically defined substances with generally accepted characteristics to contribute to their therapeutic activity. There is a growing interest in nutraceuticals that provide certain health benefits and which may be an alternative to traditional medicine in the future. By using nutraceuticals, it may be possible to reduce or eliminate the need for conventional drugs and reduce the contrary effects of conventional foods. Nutraceuticals give physiological profits or allow protection against chronic diseases and act as a beneficial role in various types of disease and disorders. However, even a large group of compounds is little researched in terms of their health-promoting properties, storage conditions and requires definition of legal prospects.

REFERENCES

1. Ashwini G.C., Vaishali K.S, Ram S.S., Ganesh B.O., Digambar N., 2013. Role of nutraceuticals in various diseases: A comprehensive review. *IJRPC* 3(2), 290–299.
2. Audrey M., Barnett A., Burrows O.J., 2004. Effect of Processing on Nutrient Content of Foods. *Cajanus* 37(3), 160–164.
3. Babbar N., Oberoi H.S., Sandhu S.H., 2015. Therapeutic and Nutraceutical Potential of Bioactive Compounds Extracted from Fruit Residues, *Critical Reviews in Food Science and Nutrition*, 55(3), 319–337, DOI: 10.1080/10408398.2011.653734
4. Bagchi D., Nair S., 2016. *Development of new functional food and nutritional products*, 1st ed. Academic Press, pp. 544.
5. Espín J.C., García-Conesa M.T., Tomás-Barberán F.A., 2007. Nutraceuticals: Facts and fiction. *Fitochemia* 68, 22–24 , 2986–3008, DOI: 10.1016/j.phytochem.2007.09.014
6. <http://www.mayoclinic.org/healthy-living/nutrition-and-healthy-eating/expert-answers/functional-foods/faq-20057816>.
7. Krochmal-Marczak B., Sawicka B., Stryjecka M., Pisarek M., 2017. Wartość odżywcza i pro-zdrowotna wybranych warzyw z rodzaju kapusta (*Brassica L.*) [Nutritional and health benefits of selected vegetable species of the genus (*Brassica L.*)]. *Herbalism* 3(1), 71–79.
8. Kucuk O, Sarkar F. H. , Sakr W, Khachik F , Djuric Z, Banerjee M, Michael N. P, John S. B, David P. W, Lycopene in the Treatment of Prostate Cancer. *Pur Appl. Chem*, 74: 1443- 1450 (2002).
9. Lahiji F.A., Ziarati P., Jafarpour A., 2016. Potential of Rice Husk Biosorption in Reduction of Heavy Metals from *Oryza sativa* Rice. *Biosci. Biotechnol. Res. Asia* 13, 2231–2237.
10. Martinez-Pineda M., Yagüe-Ruiz C., Vercet-Tormo A., 2019. Is it possible to include potato in the diet of patients with chronic kidney disease? New culinary alternatives to reducing potassium. *J. Renal Nutr.*, S1051–2276 (19), 30271–30277, DOI: 10.1053/j.jrn.2019.07.001
11. Merriam Webster Dictionary, 2015. <https://www.merriam-webster.com/words-at-play/word-of-the-year-2015>

12. Mueller C., 1999. The regulatory status of medical foods and dietary supplements in the United States. *Nutrition* 15, 249–51.
13. Neveu V., Perez-Jimenez J., Vos F. et al., 2010. Phenol-Explorer: an online comprehensive data-base on polyphenol contents in foods. DOI: 10.1093/database/bap024.
14. Sakthinathan B., Nandhini U.D., 2017. Phytochemicals – A Nutraceutical Source of Vegetables. *Chem. Sci. Rev. Lett.* 6(24), 2133–2137.
15. Sharifi-Rad J., Carretero A.S., Salehi B., Krochmal-Marczak B., Skiba D., Ceylan D., Coy-Barrera E., Capanoglu E., Bhatt I., Sarac I., Singh L., Kmale M., Kadyks-Gurrea M.L., El Jemli M., Butnariu M., Kumar P., Kamiloglu S., Tripathi V., El Jemli Y, Bouyahya A., Sawicka B., Marmouzi I., 2019. Brassica plants – from farm to food applications and phytothera-py. A Review. *Trends Food Sci. Technol.*
16. Srivastava Shubhra, Pramod Kumar Sharma and S Kumara Guru Nutraceuticals: A Review, *Journal of Chronotherapy and Drug Delivery*, 6 (1): 1-10 (2015).
17. Thomas B, Ghebremeskel K, Lowy C, Crawford M and Bridget affley- Shore R N., Nutrient intake of women with and without gestational diabetes with a Specific focus on fatty acids. *Nutrition*, 22: 230-236 (2006).

