



Review Article

ISSN: 2454-5023
J. Ayu. Herb. Med.
2022; 8(3): 192-196
Received: 01-08-2022
Accepted: 13-09-2022
© 2022, All rights reserved
www.ayurvedjournal.com
DOI: 10.31254/jahm.2022.8310

Ayurveda implications of Nutraceuticals: understating roles in preventive medicine

Vasantha Lakshmi Mutnuri¹

¹ Assistant Professor, Department of Dravyaguna, Dr BRKR Government Ayurvedic college, Hyderabad-500018, India
ORCID ID: <https://orcid.org/0000-0002-9565-4861>

ABSTRACT

Dietary risks factors have raised attention worldwide for non-communicable diseases (NCDs). The recent report form data in the 2019, showed that around 7.9 million deaths and 187.7 million disability-adjusted life-years (DALYs) are linked to dietary risk factors and NCDs [1]. this is an awakening alarm to the health community in food sciences, pharmaceuticals and preventive medicine towards adapting a natural food based lifestyle. These NCDs are mainly due eating junk food, and low intake of dietary fruits or fibers leading to nutritive deficient states and, later diseases [2]. The term nutraceutical (coined by 1989 Dr. Stephen de-Felice) is derived form a combination of two words namely 'nutrition' and 'pharmaceutical'. It is defined as any substance that is a food or a part of food that provides medicinal or health benefits including the prevention and/or treatment of a disease. The food products that provide health benefits and aid in reducing the risk of chronic diseases apart from nutrition may be inclusive under this term [3-5].

There is a paradigm shift in choice of daily food, and related practices towards nutraceuticals, owing to factors such as low risk, potential value and, the therapeutic effects they seem to offer. The nutraceutical market is growing tremendously worldwide and is valued at 74.7 billion in 2020, from its previous value of 36.6 billion dollars in 2016 [6]. Given the importance of nutraceuticals, the changing trends in perception of people and, the growing industrial/ markets, it's imperative to discuss the basic type of dietary supplements with medicinal values (general nutraceuticals) with implications of Ayurveda. The current review is aimed to discuss the basic herbal nutraceuticals, their value in health and disease states.

Keywords: Ayurveda, Diet, Nutraceuticals, Preventive medicine.

INTRODUCTION

Dietary risks factors have raised attention worldwide for non-communicable diseases (NCDs). The recent report form data in the 2019, showed that around 7.9 million deaths and 187.7 million disability-adjusted life-years (DALYs) are linked to dietary risk factors and NCDs.[1] this is an awakening alarm to the health community in food sciences, pharmaceuticals and preventive medicine towards adapting a natural food based lifestyle. These NCDs are mainly due eating junk food, and low intake of dietary fruits or fibers leading to nutritive deficient states and, later diseases. [2] The term nutraceutical (coined by 1989 Dr. Stephen de-Felice) is derived form a combination of two words namely 'nutrition' and 'pharmaceutical'. It is defined as any substance that is a food or a part of food that provides medicinal or health benefits including the prevention and/or treatment of a disease. The food products that provide health benefits and aid in reducing the risk of chronic diseases apart from nutrition may be inclusive under this term. [3-5]

There is a paradigm shift in choice of daily food, and related practices towards nutraceuticals, owing to factors such as low risk, potential value and, the therapeutic effects they seem to offer. The nutraceutical market is growing tremendously worldwide and is valued at 74.7 billion in 2020, from its previous value of 36.6 billion dollars in 2016.[6] Given the importance of nutraceuticals, the changing trends in perception of people and, the growing industrial/ markets, it's imperative to discuss the basic type of dietary supplements with medicinal values (general nutraceuticals) with implications of Ayurveda. The current review is aimed to discuss the basic herbal nutraceuticals, their value in health and disease states.

Concept of nutraceuticals in Ayurveda

Ayurveda (an ancient Indian system of medicine) had mentioned the importance of the food, its benefits in maintenance of the health, and also its usage as medicine or for therapeutic use. Ayurveda had described many dietary supplements in various contexts e.g., *Dinacharya* (daily regimen) and *Ritu Charya* (seasonal regimen) [7,8]. Although, the modern nutraceutical industry dates to 1980s in Japan, its roots can be traced to the Ayurveda. One of the synonyms of treatment in Ayurveda is *pathya* which is defined as 'wholesome food is taken in right time and quantity, that can help to recover from disease condition

***Corresponding author:**

Dr. Vasantha Lakshmi Mutnuri

Assistant Professor, Department of Dravyaguna, Dr BRKR Government Ayurvedic college, Hyderabad-500018
Email: mutnurivasanthalakshmi@gmail.com

either alone or with other medications'. *Pathya ahara* is diet which has beneficial effect over the body and mind of an individual without causing any untoward effect. Food and the methods of consumption were explained by Ayurveda beautifully to prevent, to treat and also to cure the diseases. According to vaidya Lolambara Raju 'one should eat food not only for *sharira poshana* (nutrition) or *dhatu poshana* but also to be *ojovantha* (to stay fit immunologically). Also, the same author had stated that 'If a person eating balanced food with rational he will not be affected with diseases needing no medicines'. Likewise, 'when a person gets disease and using medicines without following dietary protocol (*pathya*) the existing disease may not get cured' [10].

Diet and lifestyle reflect on the properties of *dosha* and unsuitable to *dhatu* (dis-similar in properties of *dhatu*) in their properties cause morbidity in *srotamsi* (channels of transport and transformation) [10]. The acceptance of this fact adds value to very existence to the concept of 'nutraceuticals'. The ideal supplementation of natural foods, antioxidants, milk, dairy products, citrus fruits, vitamins, minerals and cereals forms the essence of Ayurveda with respect to concept of nutraceuticals. The concept of using plant based extracts or herbal nutraceuticals is proposed which overlaps with plant-based food and medicinal lifestyle of Ayurveda [11].

This study clearly defines the various secondary metabolites such as phenols, tannin, flavonoids, saponins, terpenoids, steroids and alkaloids are present in the chloroform leaf extract of *Phyllanthus niruri*, *Emblca officinalis* and *Psoralea corylifolia*.

Concept of basic nutraceuticals therapy in Ayurveda

Table 1: The concept of medicinal food (= translating to modern herbal nutraceuticals)

Type of intervention	Property	Explanation	Ayurveda Example
Medicinal food	<i>Mando vathanulomanam thirt glani dosha shodhanam pachano dhathu samya krthu</i>	formulated to be consumed or administered orally under supervision, having specific nutritional or curative intent	Krutanna varga, peya (thrustna, glani dourbhalya, kukshi roga, jwarahapa, malaanulopani, pathya, peya-(deepana pachani), Velepi-(velepi grhni hrudya trushna, agni deepani, hitha in vrana akshi roga shumsudda durbhala sneha paniyanam)

A brief overview of herbal nutraceuticals

The food derived from plant origin which is of nutritive and medicinal value forms the herbal nutraceuticals. These can be classified into the following

- i. **Dietary fibers:** A dietary fiber is a plant material which by virtue is not hydrolyzed by enzymes secreted by the digestive tract, but digested by the micro flora in the gut. These include non-starch polysaccharides e.g., cellulose, hemicellulose, gums, pectin's, lignin. Foods which are rich in soluble fiber include fruits, oats, barley and beans. These are chemically, carbohydrate polymers. Ayurveda examples in this context is *triphala* and dietary fruits. The fruits such as apple and banana have 2.0 g/100 gm. and 1.9 g/100 gm of fibers [as per association of official agricultural chemistry (AOAC)]. Boiled carrots and baked beans have much more dietary fibers by weight. The dietary fiber owing to their properties of bulking and viscosity, retard the gastric emptying. Soluble shall lower serum low density lipoproteins (LDL) cholesterol, improve glucose tolerance and enhance insulin receptor binding. In this context *Amalaki* (Alma) is reported to be effective in raktapitta and prameha. It is also a superior vrshya with rasayana qualities. Amalaki controls tridoshas in the body by reducing vata dosha owing to its amla taste, controlling pitta

Nutraceuticals derived from various plant sources, are often used in Ayurveda since centuries. The herbal nutraceuticals is given as 'Medical foods' along with a suitable ahara (dietary plan), and sometimes with a rasayana. These medicinal foods are often implicated exclusively in Ayurveda system of medicine. The properties and examples of these are elicited in table 1. Apart from these medicinal foods, the concept of *Ahara* and *rasayanas* are again exclusively prescribed in Ayurveda, which have overall role in health maintenance, and thus may be adjunctive to medicinal foods or herbal nutraceuticals. Ahara perception may be practiced under classification such as *Nithyam hithaahara viharasevi* (= one which highlights the prevention of diseases), *Samadosha samagnischa* (= specific approach in defining health by susruta), *Hithahitham sukham dukham* (= everything that sustains, nurchurs and maintains the life), or *Patyam pathona petham* (= gives the importance of patyam in yapa rogas).

Rasayanam ("*Rasayanam cha tat jneyam yajjaravyadhi nasanam*") on the other hand is one that helps to retard aging and disease. However, modern definitions on rasayana therapy is more individualized and age, dhathu (tissue) and organ specific. They mainly act on rasa (satavari, pravala), agni – enhancing the activity of enzymes (pippali, sunti). srothas -Improving the transport system including cell signaling system (guggulu). In traditional Ayurveda practice, the level at which an ahara becomes preventive or curative depends upon the prakriti, sara and dosha of the individual and also quantity of ahara, and rasa.

dosha by virtue of its madhura taste and sheeta quality and reducing kapha dosha through its rooksha nature and kashay taste [12].

Amla (*Phyllanthus emblica*) is highly nutritious and an important dietary source for amino acids and minerals. The plant also contains phenolic compounds, tannins, phyllemblic acid, phyllembilin, rutin, and emblicol. Medicinal purposes, especially the fruit, which has been used in Ayurveda as a potent rasayana. The immunity boosting capability [being a rich source of ascorbic acid (Vitamin C)] and cancer prevention are additional benefits of this herbal product [13,14]. The excess of dietary fiber may reduce the absorption of vitamins, minerals, proteins and causes diarrhea [5].

- ii. **Probiotics:** It is defined as live microbial food supplement, which when administered in adequate quantity beneficially affects the host animal by improving its intestinal microbial balance (e.g., lactobacilli). They transform the toxic flora of large intestine into a host-friendly colony of bacillus [5]. There are evidences that probiotics decreases the risk of systemic conditions such as allergy, asthma, cancer and other infections like urinary tract [5]. Taking probiotics will aid in digestion by breaking down cellulose and other indigestible substances. They also promote synthesis of

calcium, absorption of vitamins, and minerals which boost certain specific and non-specific host defense mechanisms [15].

Example of probiotics in Ayurveda is *Takra* (butter milk) which possess the qualities like laghu (= ease digest), kashaya (= amla/sour/ astringent), deepana (improves digestion strength), and kaphavatajiti (balances Kapha and Vata, Shopha). It is indicated in inflammatory conditions, Udara (ascites), arsha – (haemorrhoids), grahani (malabsorption), mutradosha, mutragraha (urinary tract infection), dysuria (aruchi), anorexia, pleeha (= splenomegaly), gulma (= abdominal distention), ghrityavyapat (in indigestion caused by excess consumption of ghee), gara visha (chronic intoxication) and pandu (anemia) [16].

- iii. **Prebiotics:** They are dietary ingredients that beneficially affect the host by selectively altering the composition or metabolism of the gut micro biota. The prebiotic consumption generally promotes the lactobacillus and bifido bacterial growth in the gut. They are also found in beans, peas, chicory root, banana, and tomato. The

health benefits of prebiotics include improved lactose tolerance, anti-tumor properties, neutralization of toxins and stimulation of intestinal immune system, relief constipation, blood lipids and blood cholesterol level lowering [17]. Inulin and selenium are examples of prebiotics. Inulin suppresses pathogenic bacteria, increases calcium bio availability and reduces the risk of colon cancer. It may be derived from banana, raspberry, avocado, blue berries, garlic and onions, asparagus root, cabbage and almonds. Ayurveda point of view example of inulin is garlic (*Allium sativum*) which relieves worm infestation, had implications in neuralgia, skin diseases, paralysis, constipation, abdominal tumors, and in improving vigor. Ayurvedic texts mention using of garlic for the purification of mercury owing to the ingredients/ alkaloids like quercetin, allixin and a group of organosulfur compounds. Additionally, garlic is reported to have anti-diabetic, anthelmintic, virucidal, anti-oxidant, anti-bacterial activities [18,19].

Selenium- selenium is an essential trace element that removes reactive oxygen species and regulation of thyroid metabolism. The food sources such as Brazil nuts, egg, chicken, cow milk, sunflower seed, brown rice, spinach, ground nuts have this element. Ayurveda point of view example of selenium is milk, which is used in Ayurveda for many of purification procedures of herbal and mineral drugs to remove their toxins. The cow's milk is reported to have the properties like enlivening, rejuvenating, anti-aging, brain tonic, improves intelligence, improves strength/immunity, improves lactation, laxative, promotes movement of liquids in the channels, boosting of semen, rejoins the broken tissues, for colicky pain, urinary bladder disorder, hemorrhoids, bleeding disorder, genital disorders, and debility.

- iv. **Poly unsaturated fatty acids (PUFA):** They are "essential fatty acids" as these are crucial to the body's function. They aid in reduction of LDL and thus CVDs. Ex: Omega-3, omega-6 fatty acids. Plant food sources are flax seeds, walnuts, sunflower seeds, corn oil, soybean oil, safflower oil [23]. Ayurveda point of view example of PUFA is *Linum usitatissimum* (Atasi- flax seeds). The use of flax seeds may be done both externally and internally in

treating cholesterol, obesity, arthritis, high blood pressure (BP), wounds, abscesses, pneumonia, atherosclerosis, backache, constipation, piles, fistula, cough, pleurisy, gonorrhoea, gout, and rheumatism). Flax seeds are considered as *balya* (health and immunity booster) and *medhya* (brain booster), as these contain omega-3 and omega-6 fatty acids. The use as a dietary supplement is known to prevent epilepsy, Alzheimer's, ADHD, hypertension, and other bipolar disorders [23-25].

- v. **Anti-oxidants:** The role of antioxidants in slowing the aging process, reducing the risk of cancer, and CVDs is well established. The well known examples of such antioxidants are vitamin-C, E, and carotenoids. Vitamin C (ascorbic acid) by its virtue donates hydrogen atom to lipid radicals, quenches singlet oxygen radical and removes molecular oxygen thereby acting as a scavenger of free radicals. This is majorly implicated in cell repair in wound healing and cancer. Vitamin C has an essential role in maintaining and stimulating immune system, by which mediating overall wellbeing can be achieved [26]. Ayurveda point of view example of Antioxidants are the '*hrudyadashemani*' drugs (as per charaka). As mentioned, the Indian gooseberry (*Emblica officinalis*) is the richest source of Vitamin C having properties such as anti-aging, rejuvenation, improves voice, and relieves burning sensation. In Ayurveda, it's a part of treatment for CVDs, bleeding disorders, diabetes, diabetes, urinary tract disorders, and liver disorders [27]. Vitamin C has considerable anti-viral properties as per recent evidence [28].

- vi. **Poly phenols:** They are a large group of phyto-chemicals made to protect themselves from photosynthetic stress and derived reactive oxygen species. There important examples are flavanols, flavones, flavon-3 oils, flavanones and anthocyanins. Dietary polyphenols have implications in neurons cellular processes (gene expression, apoptosis, platelet aggregation, inter cellular signaling) apart from anti-carcinogenic and anti-atherogenic implications [29]. Polyphenols have a major role in preventing diabetes and neuro degenerative diseases. The herbal sources are cloves, peppermint, spinach, blueberries, red onion, olives, green tea (*Camellia sinensis*) [30]. Ayurveda example of polyphenols is *pippali* ('*Piper longum*'), which is unique spice indicated for spleen related disorders. The other therapeutic properties of *pippali* are being anti-inflammatory, analgesic, antioxidant, antimicrobial, anticancer, anti-parkinsonian, anti-stress, anti-epileptic, anti-hyperglycemic, hepato-protective, anti-hyperlipidemia, anti-platelet, immunomodulatory, anti-arthritis, anti-ulcer, anti-asthmatic, and anthelmintic [31].

- vii. **Spices:** They are asoteric food adjuvants these are used for thousands of years to enhance the sensory quality of the foods and stimulate our appetite. The anti-oxidative, chemo protective, anti-mutagenic, anti-inflammatory, immune modulatory effects on cells are discussed in literature. Their action on gastro intestinal, cardio vascular, respiratory, metabolic, neural, and reproduction is also well documented [5]. Ayurveda spice of interest to quote here is *Elettaria cardamomum*. It is used in treating-dysuria, urinary retention, piles, hemorrhoids, asthma, chronic respiratory disorders, cough, cold, tuberculosis, cardiac tonic, congenital heart disorders, anorexia, neuralgia, constipation,

paralysis, relieves pain, burning sensation, and bloating [32]. Table 2 presents summary of these herbal nutraceuticals with Ayurveda

disease implications.

Table 2: overview of herbal nutraceuticals with Ayurveda examples and disease implications

Type of herbal nutraceuticals	Ayurveda example (herbal source)	Ayurveda properties	Diseases implicated
Dietary fibers	<i>Triphala</i> (bananas, Boiled Carrots, baked beans) <i>Amalaki</i> (Indian gooseberry)	Vrshya, rasayana, controlling pitta dosha, reducing kapha dosha	Lower cholesterol, prevent DM, reduces obesity and risk of CVDs, promotes secretion of adrenaline, immunity booster, and cancer prevention.
Probiotics	<i>Takra</i> (butter milk, probiotics with lactobacillus)	Laghu, Kashaya, deepana, Kaphavatajit	allergy, asthma, cancer and other infections like urinary trac, Udara (ascites), Arsha – (haemorrhoids), Grahani (malabsorption), anorexia, Gulma (= abdominal distension) and anaemia.
Prebiotics	Inulin form Garlic (<i>Allium sativum</i>), selenium form cow milk Lactobacillus, beans, peas, chicory root, banana, and tomato.	anti-diabetic, anthelmintic, virucidal, anti-oxidant, anti-bacterial activities	Stimulation of intestinal immune system, relief constipation, blood lipids and blood cholesterol level lowering.
PUFA	Flax seeds	Cardio-protective, neuro-protective	reduction of LDL and thus CVDs and CNS disorders
Antioxidants	Antioxidants from Vitamin C, E and <i>hrudyadashemani</i> Indian gooseberry (<i>Amalaki</i>)	Anti-ageing, anti-cancer, anti-diabetic	Treatment for CVDs, bleeding disorders, diabetes, urinary tract disorders, and liver disorders
Polyphenols	<i>pippali</i> (' <i>Piper longum</i> '),	analgesic, antioxidant, antimicrobial, anticancer, anti-parkinsonian, anti-stress, anti-epileptic, anti-hyperglycemic, hepato-protective, anti-hyperlipidemia, anti-platelet, immunomodulatory, anti-arthritic, anti-ulcer, anti-asthmatic, and anthelmintic	Cancers, infections, DM, CVDs, neurological disorders, GIT disorders and stroke
Spices	Cardamom (<i>Elettaria cardamomum</i> .)	neurons cellular processes (gene expression, apoptosis, inter cellular signaling) apart from anti-carcinogenic and anti-atherogenic	CVDs, cancers, CNS disorders.

CVD, cardiovascular disease; CNS, central nervous system; GIT, gastrointestinal tract; LDL, low density lipoproteins.

CONCLUSION

There is a huge role of herbal nutraceuticals in health and disease. The Ayurveda concept of medicinal foods coincides with the existing implications of nutraceuticals. The identification of dietary foods with specific benefits in right proportions is ideal for disease curative settings. "*Sarvam Dravyam pancha bhoutikam*" which translates to 'rational use of these food will make us healthy and fit immunologically'. There is a huge shift in diet, lifestyle and health practices owing to rapid modernization. Adapting to healthy practices stating from daily diet may curb the mortality and morbidity of non-communicable diseases of lifestyle.

Conflict of Interest

None declared.

Financial support

None declared.

REFERENCE

1. Qiao J, Lin X, Wu Y, Huang X, Pan X, Xu J, et al. Global burden of non-communicable diseases attributable to dietary risks in 1990-2019. *J Hum Nutr Diet.* 2022;35(1):202-13.
2. Dureja H, Kaushik D, Kumar V. Developments in nutraceuticals. *Indian journal of pharmacology.* 2003;35(6):363-72.
3. Espín JC, García-Conesa MT, Tomás-Barberán FA. Nutraceuticals: facts and fiction. *Phytochemistry.* 2007;68(22-24):2986-3008.
4. Andlauer W, Fürst P. Nutraceuticals: a piece of history, present status and outlook. *Food Research International.* 2002;35(2-3):171-6.
5. Das L, Bhaumik E, Raychaudhuri U, Chakraborty R. Role of nutraceuticals in human health. *Journal of food science and technology.* 2012;49(2):173-83.
6. Diez-Gutiérrez L, San Vicente L, Barrón LJ, del Carmen Villarán M, Chávarri M. Gamma-aminobutyric acid and probiotics: Multiple health benefits and their future in the global functional food and nutraceuticals market. *Journal of Functional Foods.* 2020;64:103669.
7. Gurme S, Rathod M. Pathya and Apathaya for seasonal and daily regimen; An Ayurveda and Modern perspective. *Himalayan Journal of Health Sciences.* 2019:1-4.
8. Sharma R, Prajapati PK. Diet and lifestyle guidelines for diabetes: Evidence based ayurvedic perspective. *Romanian Journal of Diabetes Nutrition and Metabolic Diseases.* 2014;15;21(4):335-46.

9. Deshmukh S, Vyas M, Vyas H, Dwivedi RR. Concept of lifestyle in Ayurveda classics. *Global Journal of Research on Medicinal Plants & Indigenous Medicine*. 2015;4(2):30.
10. Sarkar P, Dh LK, Dhupal C, Panigrahi SS, Choudhary R. Traditional and ayurvedic foods of Indian origin. *Journal of Ethnic Foods*. 2015;2(3):97-109.
11. Williamson EM, Liu X, Izzo AA. Trends in use, pharmacology, and clinical applications of emerging herbal nutraceuticals. *British Journal of Pharmacology*. 2020;177(6):1227-40.
12. Buha MM, Acharya R. KAMPILLAKA (*MALLOTUS PHILIPPENSIS* (LAM.) MUELL. ARG.), an overlooked plant of Ayurveda pharmacopoeia: a review. *Journal of Indian System of Medicine*. 2020;8(4):266.
13. Mirunalini S, Krishnaveni M. Therapeutic potential of *Phyllanthus emblica* (amla): the ayurvedic wonder. *Journal of basic and clinical physiology and pharmacology*. 2010;21(1):93-105.
14. Singh E, Sharma S, Pareek A, Dwivedi J, Yadav S, Sharma S, et al. Phytochemistry, traditional uses and cancer chemopreventive activity of Amla (*Phyllanthus emblica*): The Sustainer. *Journal of Applied Pharmaceutical Science*. 2012;(Issue):176-83.
15. Goldin BR. Health benefits of probiotics. *British Journal of Nutrition*. 1998;80(S2):S203-7.
16. Kukkupuni SK, Shashikumar A, Venkatasubramanian P. Fermented milk products: probiotics of ayurveda. *Journal of Medical Nutrition and Nutraceuticals*. 2015 Jan 1;4(1):14.
17. Vinothkanna A, Sekar S. Probiotic properties of intrinsic bacteria isolated from fermented polyherbal preparations of Indian Ayurveda. *LWT*. 2019;103:8-18.
18. Joshi VK, Joshi A. Garlic in Traditional Indian Medicine (Ayurveda) for Health and Healing. *Herbs and Spices-New Processing Technologies*. 2021.
19. Lakshmi T, Roy AN, Kaviya N. Anti-tubercular herbal extracts used in Ayurveda-A mini-review. *Plant Cell Biotechnol Mol Biol*. 2020;24:54-60.
20. Rayman MP. Selenium and human health. *The Lancet*. 2012;379(9822):1256-68.
21. De S, Paradkar P, Vaidya A. Indian Breed Cow Milk-Powerhouse of Health. *J. Pharm. Res*. 2015(1):573-91.
22. Kukkupuni SK, Shashikumar A, Venkatasubramanian P. Fermented milk products: probiotics of ayurveda. *Journal of Medical Nutrition and Nutraceuticals*. 2015;4(1):14.
23. Katare C, Saxena S, Agrawal S, Prasad GB, Bisen PS. Flax seed: a potential medicinal food. *J Nutr Food Sci*. 2012;2(1):120-7.
24. Datta HS, Mitra SK, Patwardhan B. Wound healing activity of topical application forms based on ayurveda. *Evidence-Based Complementary and Alternative Medicine*. 2011.
25. Hussain MS, Kaur G, Mohapatra C. Nutritional composition and functions of flaxseed (*Linum usitatissimum* linn.). *Food Ther Health Care*. 2021;3(4):88-91.
26. Chaitanya NC, Muthukrishnan A, Krishnaprasad CM, Sanjuprasanna G, Pillay P, Mounika B, et al. An insight and update on the analgesic properties of vitamin C. *Journal of pharmacy & bioallied sciences*. 2018;10(3):119.
27. Mirunalini S, Vaithyanathan V, Krishnaveni MA. Amla: a novel ayurvedic herb as a functional food for health benefits-a mini. *Int J Pharma Pharmaceut Sci*. 2013;5.
28. Colunga Biancatelli RM, Berrill M, Marik PE. The antiviral properties of vitamin C. Expert review of anti-infective therapy. 2020;18(2):99-101.
29. Duthie GG, Gardner PT, Kyle JAM. Plant polyphenols: are they the new magic bullet? *Proc Nutr Soc*. 2003;62:599-603.
30. Scalbert A, Johnson IT, Saltmarsh M. Polyphenols: antioxidants and beyond. *Am J Clin Nutr*. 2005;81(suppl):215-17.
31. Singh R. Pippali: Uses, Benefits, Side Effects & More. Available at <https://pharomeasy.in/blog/ayurveda-uses-benefits-side-effects-of-pippali/> Accessed July 26 2022
32. Vijayan KK, Madhusoodanan KJ, Radhakrishnan VV, Ravindran PN. Properties and end-uses of cardamom. *InCardamom*. 2002.pp.285-299.

Creative Commons (CC) License-

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY 4.0) license. This license permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. (<http://creativecommons.org/licenses/by/4.0/>).

HOW TO CITE THIS ARTICLE

Mutnuri VL. Ayurveda implications of Nutraceuticals: understating roles in preventive medicine. *J Ayu Herb Med* 2022;8(3):192-196. DOI: 10.31254/jahm.2022.8310