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Review Article

Emerging Trends in Nutraceuticals

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Nutraceutical: A Plant Based Functional Food and Phytochemicals

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ABSTRACT

Nutraceuticals are pharmaceutically blended products that possess both nutritional as well as medicinal value. Such a product is intended to enhance physical health, combat daily obstacles like stress, prolong life, etc. Due to their increased popularity, attention is now focused on herbs that are used both as food and medicine. Due to dynamic action, nutraceuticals are now more popular than medicines and health products among patients and healthcare providers. This review article focus on a herbs with a wide variety of therapeutic values, such as immunity booster, anti-diabetic, anticancer, antimicrobial, and gastroprotective. These herbs can be better options to formulate as nutraceuticals. Several nutraceuticals are described based on their availability as food, chemical nature, and mechanism of action.

Key words: *Nutraceutical, Food technology, Plant derived Nutraceutical, Medicinal plant.*

INTRODUCTION

Nearly 2500 years ago, Hippocrates (460-377 BC), the father of modern medicine, established the relation between food and its importance for the treatment of various diseases in a highly classical way with emphasizing significant benefits**.** (Yapijakis et al., 2009). Nutraceutical is composed from the words pharmaceutical and nutrient. It is a food supplement that is essential for maintaining a healthy body and provides the nutrients required for various metabolic processes to control body function and prevent disease. (Yapijakis et al., 2009). A wide variety of foods and herbs support, stimulate, and nourish our body systems. Many traditional systems across many countries have employed several, and the present study is now assessing them. Pharmaceutical antibiotic use causes the growth of tolerances, making it ultimately useless. It is preferable to select herbs for our daily lives that are capable of restoring normal body functioning and are preventative, nutritious, and strengthen our immune systems. Herb may not act as precisely as an antibiotic but can act as antibacterial (even antiviral) by boosting our body's own defence mechanism.

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Avoiding stress and other lifestyle problems is one of the main ways to feel as healthy as possible. The following are some examples of herbs that are used both as food and medicine used as immune system boosters and a variety of other disorders. Traditional Chinese medicine uses the herb *Astragalus membranaceus.* It is a very adaptable and powerful immune booster antioxidant with hepatoprotective action. (Zhao et al., 1990). It also showed antidiabetic (Agyemang, et al., 2003) and anticancer activity (Wu et al., 2017). Triphala is one of the most revered tonics in Ayurveda. It is a combination of three important herbs, namely, *Terminalia bellerica* (Combretaceae), *Terminalia chebula* (Combretaceae), and *Emblica officinalis* (Phyllanthaceae). These herbs all act as nutritive tonics. Almost all organ and system in our body benefits from triphala, but especially the skin, liver, eyes, digestive, and respiratory systems. Immunomodulating, antibacterial, antimutagenic, and adaptogenic, among other well-known and well-established therapeutic uses [Peterson et al., 2017 & Belapurkar et al., 2014]. (The northeast region of India is very rich in flora and fauna.) The tribal people of the northeast region follow the principle of Hippocrates.)They use their food as medicine. *Paederia foetida* (Rubiaceae) is one of the tribal plants. A research study established its gastroprotective activity and antioxidant activity [Chanda et al., 2015]. The curry ingredient turmeric, a yellow powder from South Asia, is well known for its curative properties. It has a strong antibacterial, antifungal, antiviral, and parasitic effect. It is a potent HIV inhibitor [Moghadamtousi et al., 2014, & Prasad et al., 2015]. The most westernised herb, Asian ginseng, is used as a tonic. It has been popular to promote immunity [Kang et al., 2015]. Panax ginseng, the most popular ginseng, is protective against neurological diseases. [Chanda et al., 2011]. According to Ayurveda, garlic, onion, and ginger are the basis of all healing food recipes. One of the most popular natural health products is garlic. These are regarded as medicines, spices, and food [Chanda et al., 2011]. It has been the subject of intensive study for its possible effects against heart disease and cancer [Banerjee et al., 2002, & Nicastro et al., 2015]. It boosts the immune systems. Studies have also demonstrated that antimicrobials and AIDS can both be effectively treated. [Schafer et al., 2014, & Ankri et al., 1999].

Medicinal plants used as traditional herbal Nutraceutical

Table.1 Role of some common medicinal used as traditional herbals nutraceutical [Hamid et al., 2000, Mermel et al., 2004, Dulloo et al., 1999, & **Bell et al., 2002]**

sr. no	Plant species	Common name	Role in disease	Form of use
1.	*Agave americana*	Rambans	Antiseptic, diurectic ,	Leaves sap
2.	*Aloe vera*	Aloe vera Ghritkumari	First-degree burns, cuts and abrasions, wound healing, anthelmint, antiulcer	Sunscreen, skin creams, lotions, oral intake
3.	*Allium sativum*	Garlic	Chemoprevention, cancer, diabetes, arteriosclerosis, lowering cholesterol, respiratory infections	Fresh or dried cloves, capsules, odorless tablets, tinctures, aged garlic extracts
4.	*Amaranthus spp.*	Chaulai	cardiovascular disease oil from seeds	oil from seeds
5.	*Avena sativa*	Oat straw	Diuresis, cholesterol control, reducing inflammation, itching Dried herb; capsules, tablets, tinctures	Dried herb; capsules, tablets, tinctures
6.	*Andrographis paniculata*	Kalmegha	Bacillary dysentery, respiratory tract infection	Shoot powder
7.	*Artemisia annua*	Artemisia	Fever, upper respiratory tract infections	Shoot decoction

8.	*Asparagus spp.*	Shatavari	Tonic, astringent	roots
9.	*Borago officinalis*	Bugloss,	Skin care, anti-inflammatory, blood purifier.	Herb, Leaves and Flowers
10.	*Boswellia Serrata*	Salai	Asthma, anti-arthritic	Gum-resin
11.	*Bauhinia purpuria*	Rakta kanchan	Catarrh, boil, glandular swelling	Roots and leaves
12.	*Berberis Asiatica*	Barberry	Roots are used in treating ulcers, urethral discharges, ophthalmia, jaundice, fevers etc	fruit is cooling and laxative Roots and berries
13.	*Calendula spp*	Pot marigold	Anti-inflammatory, may inhibit HIV, anti-bacterial, and anti-tumor. Skin and cancer treatments.	Flower decoction for wound healing
14.	*Capsicum annum*	Red pepper	Anti-arthritic, anti-oxidant action, stimulant, nutrition, rubefacient, nutrition	Fresh and dried fruit, powder
15.	*Cassia senna*	Senna	Constipation	Dried leaf, /pods
16.	*Centella Asiatica*	Gotu	Improving memory, sedative, stress reduction, immune-stimulant, venous insufficiency, wound healing pregnancy-related stretch marks, venous tonic	Herb, powdered, capsules, tablets, tinctures, teas
17.	*Curcuma longa*	Turmeric	Reducing inflammation, indigestion, antioxidant, liver problem	Dried root, whole, powdered
18.	*Commiphora wightii*	Guggal	Cardioprotective, anti-inflammatory, rheumatic diseases	Gum -resin
19.	*Cymbopogon citratus*	Lemon grass	Stomachache, expelling gas	Dried leaf, cut and sifted, tea
20.	*Echinacea angustifolia*	Echinacea	Cold, flu, minor infections, immuno-stimulant	Dried whole herb or root, capsules, expressed juice of fresh flowering plants, flex-tabs, tablets, tinctures
21.	*Ephedra sinica*	Ephedra	Mild anti-asthmatic, nasal congestion, broncho-dilator, fluid retention, obesity Dried-stems; capsules, tablets, tinctures	Dried-stems; capsules, tablets, tinctures
22.	*Echinacea angustifolia*	Coneflower	Antibiotic, antiviral and anti allergic used in reducing the common cold.	Whole plant
23.	*Foeniculum vulgare*	Fennel	Stomach bloating, stimulant, digestive spasms, catarrh aphrodisiac, galactogogue	Whole seed, capsules, tinctures
24.	*Ginkgo biloba*	Ginkgo	Age-related memory	Dried leaf, tea
25.	*Glycyrrhiza glabra*	Licorice	Anti-inflammatory, congestion, coughs, stomach or duodenal ulcers	Root powder, capsules, extracts, tablets, tinctures
26.	*Garcinia cambogia*	Garcinia fruit	Weight loss	Extracts of fruit
27.	*Hypericum perforatum,*	St.-John's-Wort	Mild to moderate epilepsy, depression, cuts and abrasions	Dried herb, flowering tops for tea, in oil for external use, capsules tablets, tinctures
28.	*Hibiscus subdariffa*	Motherwort	CNS depressant	Calyx powder or decoction
29.	*Linum usitatissimum*	Flaxseed	Constipation, irritable bowel syndrome, source of omega-3-essential fatty acids, cholesterol control, chemoprevention, anti-arthritic	Seed powder, expressed oil of seed
30.	*Matricaria chamomilla*	Chamomile	Sedative, indigestion, insomnia, nausea, inflammation, wound	Dried flowers, capsules, cream, salve, tea, tincture,

			healing	bath products
31.	*Medicago sativa*	Alfalfa	Appetite stimulation, anti-arthritic, nutrition	Dried leaf, capsules, extracts, tablets, tinctures, teas
32.	*Moringa oleifera*	Moringa	Uses include as an antimicrobial, antiviral, hepatoprotective, anti-cancerous, antiseptic and in treating rheumatism, skin diseases, asthma and venomous bites	tree's bark, roots, fruit, flowers, leaves, seeds, and gum
33.	*Panax quinquefolius*	Ginseng	Convalescence, fatigue, diabetes, cholesterol control, improving concentration and well-being, aphrodisiac	Dried root, steamed root, capsules, extracts, tablets, tinctures, teas
34.	*Plantago ovata*	Psyllium	Constipation, lowering cholesterol, type 2 diabetes	Dried seed, husk,
35.	*Pueraria tuberosa*	Bilikand	Eases bowel movement, useful in relieving constipation, used in skin diseases	tubers
36.	*Rosmarinus officinalis*	Rosemary	Digestion, rheumatism, stimulating appetite, stimulating circulation.	Leaf powdered, tinctures, extracts
37.	*Phyllanthus Emblica*	Amla	Stress, diuretic, liver function, anti-ageing, diabetes	Fruit pulp fresh or dry
38.	*Serenoa repens*	Saw	palmetto Benign prostatic hyperplasia, inflammation, impotence Dried fruit whole, ground, capsules, tablets, tinctures	Dried fruit whole, ground, capsules, tablets, tinctures
39.	*Silybum marianum*	Milk thistle	Liver disorders, lactation problems, anti-oxidant	Whole or powdered seed, capsules, tablets, tinctures
40.	*Swertia chirata*	Charity	Migraine headaches	Fresh or dried whole plant
41.	*Trigonella foenum-graecum*	Fenugreek	Gastritis, excess cholesterol, diabetes, nutrition, skin inflammation	Seed , whole or powdered; capsules, tinctures
42.	*Urtica dioica*	Stinging nettle	Benign prostatic hyperplasia (BPH), diuresis, anemia, osteoarthritis	Dried leaf, dried root; capsules, tablets, tinctures
43.	*Terminalia chebula*	Harar	Antioxidant	Fruit pulp
44.	*Valeriana officinalis*	Valerian	Anxiety, insomnia, hypertension	Root, powder, tea, capsules, tablets, tinctures, extracts
45.	*Withania somnifera*	Ashwagandha	Stress, insomnia, cataract prevention	Root powder, standardized extracts, tinctures
46.	*Zingiber officinale*	Ginger	Indigestion, motion sickness, nausea, anti-oxidant, cholesterol control	Fresh or dried root, capsule, tablets, tinctures

Neutraceutical food technology:

Nutraceutical food technology or industry places special significance on quality control and in this proper inspections are direct to throughout the manufacturing process, including raw material verification, homogeneity testing, weight deviation measurements and package quality sampling (Allen et al.,1997, kasbia, 2005, & Wildman et al., 2001). A natural colour fraction, an aroma fraction, an anti-oxidant fraction, and/or a flavour fraction can all be obtained by fractionating botanicals. This is crucial for the production of nutraceuticals because it allows the unwanted strong flavours in some botanicals, like rosemary and garlic, to be removed from the nutraceutical ingredients. Supercritical fluid technology will enable the nutraceutical industry to develop products with standardised concentrations of active ingredients. In addition, supercritical fluid technology will enable the production of nutraceutical products with much higher concentrations (higher yields and purity), quality (with less artefact creation), and yields (than possible by conventional chemical

engineering unit operations, such as liquid/liquid extraction, distillation, mechanical micronization), than those currently possible. For the nutritional needs of children, lactating mothers, and elderly persons, special meal preparations are needed, such as nourishing biscuits or laddoos. The following ingredients, along with any other appropriate ingredients, should be used in this type of preparation: wheat, chickpea, and soybean flours, sesame, amaranth, spinach leaves, jaggery, etc. Food safety in relation to genetically modified foods, food borne diseases, and novel nutraceuticals may be significantly impacted by molecular diagnostics. By enabling the simultaneous analysis of enormous sets of genes in the components of food, DNA microarray technology adds a new level of power to molecular diagnostics (Ernst et al., 2001, Hathcock et al., 2001, & Andlauer et al., 2002).

Plant derived-nutraceuticals and market:

The Nutraceutical industry is still in its formative period, and there is no universal agreement or legal definitions of the terms and designations used by this industry sector. A nutraceutical is defined as "any substance that is a food or part of a food that provides medicinal or health advantages, including the prevention and treatment of disease" under the generally recognised definition. Products include dietary supplements, processed foods like cereals and soups, as well as beverages and isolated nutrients. With the advent of major food and pharmaceutical companies into the neutraceutical market, the market is becoming increasingly competitive. A wide product line is another reason why many food companies have established their Neutraceutical departments. Pharmaceutical firms have also entered the fray by acquiring producers of dietary supplements. Major food and pharmaceutical companies, including Kellogg, Heinz, M&M, Quaker Oats, Unilever, Cargill, Hormel, Glaxo-SmithKline, Warner-Lambert, Johnson & Johnson, and Wyeth, have recently joined the nutraceutical sector. The nutraceuticals market is extremely competitive and is influenced by several criteria, including price, safety, effectiveness, packaging, and brand loyalty. The retail level of the worldwide nutraceutical market was estimated to be worth $176.7 billion in 2013, expanding at a compound annual growth rate of 7.4%. Due to customer demand to live a healthy lifestyle and growing scientific evidence in support of health foods, it is expected to exceed US$243 billion by 2015. With a combined market share of more than 85%, the United States, Europe, and Japan dominate the world market. With its enormous biodiversity, India has the potential to become one of the world's top manufacturers of plant-based nutraceuticals. The Indian nutraceuticals industry is expected to expand at a rate of 16% per year for the next five years, eventually reaching US$5 billion, according to Frost & Sullivan-FICCI. (Ahmad, et al., 2011, Kaushik et al., 2009).

CONCLUSION

Since ancient times, natural products have been recognized for their healing properties. In the modern era, these substances have been employed as anti-diabetic, anticancer, antimicrobial, and gastro-protective drugs. Therefore, it may be better options to formulate these herbs as nutraceuticals.

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Author contribution

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