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Implications of Ayurvedic Nutraceuticals as Preventive Medicine and Therapy: With Special Reference to Moringa (Moringa oleifera)

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Abstract

Diet is the best medicine. Change in diet patterns globally has thrown the world into the risk of Non-Communicable Diseases (NCDs). A recent report from 2019 indicated that approximately 7.9 million deaths and 187.7 million Disability-Adjusted Life Years (DALYs) were attributable worldwide to dietary risk factors for NCDs, with DALYs being more significantly linked to these risks. This data serves as a pressing call to all governments throughout the world to take necessary steps to develop healthy communities. The convergence of Food Science, Pharmaceuticals, and Preventive Medicine is encouraging a return to a natural food-based lifestyle. Modern dietary shifts, characterized by the consumption of junk food and low-fibre diets, have led to widespread nutritional deficiency states, further leading to disease. The term Nutraceutical was coined in 1989 by Dr. Stephen DeFelice, a portmanteau combining the words Nutrition and Pharmaceutical. It is defined as any substance, be it a food or a part of food, that provides medicinal and health benefits, including the prevention and further treatment of a disease. Food products that provide health benefits and aid in reducing the risk of chronic disease, apart from their basic nutritional value, may also be covered under this term. Globally, the nutraceutical market is experiencing fast growth, valued at $74.7 billion in 2020. This review is therefore aimed to discuss the basic concept of herbal nutraceuticals, their role in health and in disease states, with special reference to *Moringa oleifera*.

Key words: Ayurveda, Diet, Nutraceuticals, Prevention, Preventive Medicine.

Introduction

There is a **paradigm shift** occurring in global food habits, which is increasing dietary risk factors and drawing the attention of the health community to the growing prevalence of **Non-Communicable Diseases (NCDs)**. Keeping in view of changing trends in the perception of people, growing markets, and industries, it is imperative to discuss the basic types of dietary supplements and nutraceuticals with Ayurvedic implications. This review aims to comprehensively discuss general nutraceuticals and nutritions, highlighting their importance in health preservation, preventive measures, and the management of various disease states.

Concept of Nutraceuticals in Ayurveda

The concept of holistic health management within Ayurveda gives significant importance to the principles of **Dinacharya** (daily regimen) and **Ritucharya** (seasonal regimen), as referenced by classical texts such as **Pathya** by **LOLAMBARA RAJU**. Central to these regimens is the emphasis on **Pathya** (wholesome food and diet), recognizing the profound **importance of food** in maintaining health and preventing disease. Although the modern nutraceutical industry officially dates back to the 1980s in Japan, its fundamental roots and philosophy can be accurately traced to the principles of Ayurveda. The substances (Dravyas) used in Ayurveda are classified based on their actions as ahara and oushadha, and the profound principles of food (Ahara) and its proper method of consumption were meticulously detailed and well explained in Ayurvedic classics. According to LOLAMBARAJU, one should consume food not merely for *Sharira Poshana* (nourishment of the body) or *Dhatu Poshana* (nourishment of tissues), but primarily for the attainment of *Ojas*, which is the state of being immunologically fit and vigorous. He further emphasizes that a person eating a balanced diet with proper rationale will not be easily affected by diseases, needing no medicine. Likewise, when a person contracts a disease and is using medicine without strictly following the required dietary protocol (*Pathya*), the existing disease may not be effectively cured. Proper diet and lifestyle support the maintenance of the Doshas (physiological humors) in suitable proportion and quality relative to the Dhatus (body tissues). An imbalance in these properties is the fundamental cause of morbidity, including conditions like stroke and other Non-Communicable Diseases (NCDs).

The acceptance of this fundamental principle adds value to the very existence of the nutraceutical concept in Ayurveda. The ideal and rational supplementation of natural foods—including antioxidants, milk and dairy products, citrus fruits, spices, vitamins, minerals, and cereals—perfectly encapsulates the essence of Ayurveda in respect to the concept of nutraceuticals.

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Moringa (*Moringa oleifera*): Nutritional and Therapeutic Profile

Table 1: Nutritional Data of Moringa Leaves

S. No.	Component	Content in Fresh Leaves	Content in Dried Leaves	Pharmaceutical Action
1	**Arginine**	406.6 mg	1325 mg	**Semi-essential amino acid with important medicinal value as a nitric oxide precursor.** It acts as an immunonutrient and metabolic regulator, clinically used as a supplement for cardiovascular support, erectile dysfunction, and wound healing, and is a key part of immunonutrition protocols in critical illness and in Cancer care. It is a crucial precursor for Nitric Oxide Synthase (NOS) enzymes, enabling vasodilation, supporting immune modulation, and resulting in endothelial function improvement.
2	**Histidine**	149.8 mg	613 mg	**It is an essential amino acid. It shows action through protein synthesis, metal chelation, antioxidant activity, is a crucial precursor to histamine, and plays a significant role in influencing immune modulation and inflammation.** Histidine acts as a potent chelating agent for metals like copper, iron, and zinc, thereby mitigating oxidative stress. Its immunomodulatory effects are beneficial in conditions such as rheumatoid arthritis, certain cancers, eczema, allergic diseases, and anaemia.
3	**Isoleucine**	299.6 mg	825 mg	**Isoleucine is an essential, branched-chain amino acid (BCAA).** It plays a key role in protein synthesis, muscle growth and repair, energy production, and blood sugar regulation. It aids in hemoglobin synthesis for oxygen transport, improves insulin sensitivity, and supports immune function, wound healing, and tissue repair.
4	**Leucine**	492.2 mg	1950 mg	**Leucine is an essential, branched-chain amino acid (BCAA).** It is uniquely potent in activating the mTOR signaling pathway, which stimulates protein synthesis and promotes muscle anabolism and repair. This pharmacodynamic effect promotes myofibril growth, net protein accretion, and accelerates recovery from stress or trauma.
5	**Lysine**	342.4 mg	1325 mg	**Lysine is an essential amino acid that primarily supports protein synthesis, collagen formation, and calcium absorption.** It is vital for producing antibodies, hormones, and enzymes. Lysine exhibits notable antiviral effects against the Herpes Simplex Virus (HSV) by antagonizing Arginine. Furthermore, it is a precursor to carnitine, which transports fatty acids for energy production, leading to lowered cholesterol levels.
6	**Methionine**	170.7 mg	350 mg	**Methionine is an essential, sulphur-containing amino acid.** It serves as a precursor for cysteine and S-adenosylmethionine (SAM), supports protein synthesis, methylation reactions, and antioxidant defense. It also acts as a hepatoprotective agent by reducing oxidative stress through its sulfur-mediated free radical scavenging. Furthermore, it promotes hair growth and participates in homocysteine metabolism.
7	**Phenylalanine**	310.3 mg	1388 mg	**Phenylalanine is an essential amino acid** and a direct precursor to the synthesis of neurotransmitters like dopamine, norepinephrine, and epinephrine. These neurotransmitters collectively influence mood, cognition, and the body's stress response.
8	**Threonine**	170.7 mg	188 mg	**Threonine is an essential amino acid.** It primarily supports protein synthesis, the formation of structural proteins like collagen and elastin, and fat metabolism in the liver (preventing fatty liver). It acts as a precursor to glycine and serine. Furthermore, it regulates cell growth, proliferation, and protein synthesis, and, via its metabolic products, contributes to nucleotide and phospholipid production (essential for cell membranes).
9	**Tryptophan**	107 mg	425 mg	**Tryptophan is an essential amino acid** that primarily acts as a precursor for serotonin and melatonin synthesis, influencing mood, sleep, and appetite regulation. It also yields niacin (Vitamin B3). Tryptophan's metabolism for energy and B3 synthesis requires cofactors like Iron and Vitamin B6.
10	**Valine**	374.5 mg	1063 mg	**Valine is an essential, branched-chain amino acid (BCAA).** It promotes muscle growth, tissue repair, and mental vigor, and aids in muscle coordination. It enhances mitochondrial function by supporting biogenesis, supports immunological function, blood sugar homeostasis, and energy generation during exercise.

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Table 2: Vitamin and Mineral Content of Moringa Leaves (per 100 g Edible Portion)

S. No.	Component (Vitamin/Mineral)	Content in Fresh Leaves (per 100 g)	Content in Dried Leaves (per 100 g)
1	\beta-Carotene (Vitamin A)	6.78 mg	18.9 mg
2	Thiamin B1	0.6 mg	2.64 mg
3	Riboflavin B2	0.05 mg	20.5 mg
4	Niacin B3	0.8 mg	8.2 mg
5	Vitamin C	220 mg	17.3 mg
6	Calcium	440 mg	2000 mg
7	Calories	92 kcal	205 kcal
8	Carbohydrates	12.5 g	38.2 g
9	Copper	0.07 mg	0.57 mg
10	Fat	1.70 g	2.3 g
11	Fibre	0.90 g	19.2 g
12	Iron	85 mg	28.2 mg
13	Magnesium	4.2 mg	368 mg
14	Phosphorus	70 mg	204 mg
15	Potassium	2.259 mg	1324 mg
16	Protein	6.70 g	27.1 g
17	Zinc	0.16 mg	3.29 mg

Conclusion

There is a demonstrable role of herbal nutraceuticals in maintaining health and managing disease conditions. The core Ayurvedic concepts of medicated foods (Pathya) strongly concur with the existing implications of modern nutraceutical science. The identification of dietary foods with specific benefits, when used in the right proportion and rational manner in disease and therapeutic settings, serves as a powerful foundation for integrated healthcare. This principle is encapsulated by the Ayurvedic phrase "Sarvam Dravyam Panchabhautikam," which highlights that "Every substance is a medicinal substance and is composed of the five elements." If used in proper method, rational it is said to be food and medicine

Logically, there is a huge shift in diet, lifestyle, and health practices moving toward rapid modernization. Adopting healthy practices, starting from the daily diet, may curb the rising mortality and morbidity associated with Non-Communicable Diseases (NCDs) of lifestyle.

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