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Potential use of Pinus gerardianaWallichex D. Don as a nutraceutical: A comprehensive overview.

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ABSTRACT
The concepts "nutritional" and "pharmaceutical" are combined to form the term "nutraceutical." Nutraceuticals are generally defined as meals or dietary components that have a significant impact in modifying and maintaining a person's normal physiological function and strengthening the immunity. Pharmaceutical formulations pills, powders, capsules, syrups, vials, etc. including food bioactive ingredients as active ingredients. Bioactive phytochemicals are now a significant source of ingredients for nutraceuticals. Numerous research investigations have demonstrated the biological activity of certain dietary phytochemicals. Which can be regraded in two ways as Potential nutraceuticals and Established nutraceuticals. Any supplement that makes a specific health or medicinal benefit guarantee qualifies as a potential nutraceutical. Foods containing omega-3 fatty acids, probiotics, prebiotics, dietary fiber, antioxidants, and polyphenols are categorized as nutraceuticals.Broad-spectrum biological therapies known as nutraceuticals aim to improve health, halt malignant processes, and relieve symptoms. These fall into one of three primary categories.Broad-spectrum biological therapies known as nutraceuticals aim to improve health, halt malignant processes, and relieve symptoms. These fall into one of three primary categories. First being the compounds with recognized nutritional value, including vitamins, minerals, amino acids, and fatty acids. Seconds as the botanical products or plants as concentrates and extracts - Herbal remedies. And for third differently sourced additives (such pyruvate, chondroitin sulfate, and steroid hormone precursors) that are utilized for specific applications including meal replacements, sports nutrition, and dietary supplements for weight loss. Every therapeutic area has been addressed by nutraceuticals, including cancer prevention, osteoporosis, blood pressure, cholesterol, depression, diabetes, cold and cough remedies, pain relievers, and digestive issues. Pinus gerardiana One other name for Wallichex D. Don. (P. gerardiana) is "chilgoza or neoza pine." Mountain ranges in the eastern regions of India, Pakistan, and Afghanistan, together with scattered areas of the Himalayan Hindu Kush, are the only places where the world is dispersed (30o to 37o N latitude and 66o to 80o E longitude). According to Chib (1978), the Northwest Himalayas in India span latitudes 31° 55′ to 32° 05′ N and longitudes 77° 45′ to 79° 35′ E. They are between 1600 and 3300 meters high. Macroscopic features include an off-white color, an oval form with a tip at the micropylar end, a length of 1.5 to 2 cm, oleaginous texture, a mild terebinthine flavor, and a pleasant scent. Chilgoza comprises a number of phytochemicals Unsaturated fatty acids as Linoleic acid and Oleic acid, Vitamin E, Polyphenols, Xanthenes, Carotenoids, Catechin, Lutein, Lycopene, Epicatechin, Catechin, Taxifolin dihydroquercetin, Quercetin,Phenolic acids, Vitamins: Thiamine (B1), Beta carotene, Riboflavin (B2), Pantothenic acid (B5), Niacin (B3), Vitamin B6(Pyridoxine), Vitamin k, Folate (B9), and Minerals including Magnesium, Calcium, Manganese, Phosphorous, Potassium, Iron, Zinc. Each have specific therapeutic properties that make them useful for managing, treating, and preventing a wide range of illnesses. Thus, it is possible that chilgoza has potential therapeutic benefits and can be utilized as an efficient nutraceutical. In order to achieve or improve the various therapeutic actions, a number of different powerful additives can be combined with nutraceutical doses for this several nutraceutical dosages can be prepared as per the requirements, along with this several other potent additives can be used in combination to enhance or to attain the multiple therapeutics activities.

Keywords: Nutraceuticals, Nutrition, Healthcare, Immunity, Supplements, Pinus gerardiana, Chilgoza

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I. INTRODUCTION

Nutraceutical is a combination of the terms "nutritional" and "pharmaceutical." Nutraceuticals, in general, are foods or parts of foods that have an important role in changing and sustaining normal physiological function in humans **(Das et al., 2012).**

Epidemiological studies reveal a correlation between plant-derived meals and a variety of health advantages. These advantages have been linked, at least in part, to phytochemical ingredients, particularly polyphenols. Nutraceuticals have emerged on the market in recent years. These are pharmaceutical formulations (pills, powders, capsules, vials, etc.) that include as active principles food bioactive components. Bioactive phytochemicals have emerged as an important source of nutraceutical components. Many of these dietary phytochemicals have been shown to have biological action in studies, however the health claims attributed to the final marketed nutraceutical products have little or no scientific evidence **(Espín et al., 2007)**. Nutraceuticals (also known as phytochemicals or functional foods) are natural bioactive, chemical substances with health-promoting, disease-prevention, or therapeutic characteristics. Nutraceuticals can be found in a variety of goods originating from (a) the food industry, (b) the herbal and dietary supplement sector, (c) the pharmaceutical industry, and (d) newly integrated pharmaceutical/agribusiness/nutrition conglomerates. Nutraceuticals may include isolated nutrients, herbal items, nutritional supplements, and diets, as well as genetically altered "designer" meals and processed products. The Dietary Supplement Health and Education Act of 1994 expanded the definition of nutraceuticals to include vitamins, minerals, herbs and other botanicals, amino acids, and any dietary substance for use by humans to supplement the diet by increasing total dietary intake, which dramatically increased the use of nutraceuticals**(Dureja et al., 2003).**

NUTRACEUTICAL CLASSIFICATION

The prospective of nutraceuticals should be regarded in two ways:

- Potential nutraceuticals
- Established nutraceuticals **(Pandey et al., 2010)**

Potential nutraceutical: A potential nutraceutical is one that offers the promise of a certain health or medical benefit; such a potential nutraceutical only becomes established if adequate clinical evidence is accumulated to indicate such a benefit. It is disheartening to observe that the vast majority of nutraceutical products are in the 'potential' category, awaiting approval **(DeFelice, 1995).** Nutraceutical food items are classified as follows:

- Omega 3 fatty acid
- Probiotic
- Prebiotic
- Dietary fiber
- Antioxidant **(Kokate CK, 2002)**
- Polyphenols
- Spices **(Verma and Mishra, 2016)**

Antioxidant:

Antioxidants are compounds that slow down or stop oxidation-related degradation, damage, or destruction. Recent studies have established that a large number of common diseases, including CVS, diabetes, cataracts, high blood pressure, infertility, respiratory infections, and rheumatoid arthritis, are linked to tissue deficiencies and/or low dietary levels of antioxidant-rich compounds. As such, antioxidants play a critical role in the nutraceutical market. Free radicals are produced during oxidation, and these radicals burn everything they come into contact with on a molecular level. Antioxidants are highly abundant and diverse in nature. They work against oxidation mostly by neutralizing free radicals at low concentrations. They may also prevent the chain events that result from oxidants and eventually repair damaged membranes**(Singh et al., 2012).** Antioxidants are highly abundant and diverse in nature. They work against oxidation mostly by neutralizing free radicals at low concentrations. They may also prevent the chain events that result from oxidants and eventually repair damaged membranes **(Shahidi, 2000)**. Vegetable oils, such as soybean, canola, maize, oat, wheat germ, palm, and evening prime rose oil, contain antioxidants **(Devasagayam et al., 2004).**

Probiotic:

Live microbial dietary components, or probiotics, are good for your health. Survival in and adherence to certain regions of the gastrointestinal system, as well as competitive exclusion of pathogens or toxic antigens, are prerequisites for probiotic function. Probiotics are classified as functional or health foods, meaning that people consume them for their alleged benefits in the digestive tract and/or systemic areas such as the

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bloodstream, liver, brain, or vagina **(Gibson, 2004)**.

Prebiotic:

Prebiotics are the chemicals that enter the colon intact—that is, unaffected by the pH and digestive acids of the stomach. These prebiotics serve as fertilizers for colonial probiotic bacteria by specifically encouraging their growth6. These all refer to non-digestive but fermentable dietary carbohydrates that may specifically promote the growth of specific colonic bacterial species, such Bifidobacteria. Lactobacilli that are thought to be advantageous to the human host include inulin, a soluble dietary fiber that is resistant to digestive enzymes and makes it to the colon or large intestine intact where it is fermented by hardy bacteria, Lactobacillus.

Polyunsaturated fatty acids:

Essential fatty acids are necessary for healthy growth and development, but the body is unable to produce them. Omega-3 fatty acids fall within this category. Fish that feed on algae and plankton accumulate long chain omega-3 fatty acids like docosagexanoic acid and eicosapentaoic acid. Safflower oil, corn oil, soybean oil, mustard oil, evening primrose oil, flax oil, hemp seed, and borage seed are examples of natural vegetable oils and marine animal oils that contain polyunsaturated fatty acids that are part of the linoleic group (omega 6-type and omega 3-fatty acid) and that aid in lowering cholesterol formation/deposition and preventing the formation of thromboxane. The disorders listed below are best treated with polyunsaturated fatty acids:

- Stroke and heart disease
- Asthma
- Cancer
- Chronic lung failure
- Rheumatoid arthritis
- Inflammatory arthritis
- Kidney transplants
- Inflammatory bowel disease

Dietary fibers:

Dietary fibers help to normalize intestinal transit time in health food products. They affect intestinal transit in two ways. The first impact, which is related to insoluble fibers, is on the bulk feces, which are frequently raised in a large proportion (127% after ingesting 20 g of wheat bran). Dietary fibers also have an impact on transit time, which returns to normal after 48 hours. Short travel times become longer while lengthy transit times get shorter. There are two categories of dietary fibers **(Singh et al., 2012).**

Polyphenols:

Polyphenols belong to a broad group of substances obtained from plants that are categorized as either flavonoids or non-flavonoids. Phenolic acids and stilbenes are examples of non-flavonoids. Polyphenols function as antioxidants, primarily by blocking lipogenesis, which lowers the buildup of liver fat. Diets high in plant polyphenols may protect against diabetes, osteoporosis, cancer, neurodegenerative and cardiovascular diseases, and osteoporosis. These findings are supported by epidemiological research and meta-analyses. Because polyphenols enhance fatty acid oxidation while reducing oxidative stress, insulin resistance, and inflammation—the primary causes of the transition from non-alcoholic fatty liver disease (NAFLD) to non-alcoholic steatohepatitis (NASH)—they may have hepatoprotective benefits **(Del Ben et al., 2017).**

Categories of nutraceutical:

Nutraceuticals are broad-spectrum biological treatments that are intended to enhance health, stop cancerous processes, and manage symptoms. These can be divided into the three main groups listed below:

1. Substances known to have nutritional properties, such as fatty acids, vitamins, minerals, and amino acids
2. Botanical goods or plants as extracts and concentrations - Herbals
3. Additives obtained from different sources (such as pyruvate, chondroitin sulfate, and steroid hormone precursors) that are used for certain purposes, such sports nutrition, dietary supplements for weight loss, and meal replacements **(Dureja et al., 2003).**

Nutrients:

The nutrients that are most well recognized include water, fat-soluble vitamins, and antioxidants. Antioxidant supplementation or dietary consumption has been linked to several possible advantages.

In general, antioxidants may help prevent cerebral vascular disease and cancer. Elevated vitamin E consumption may avert Parkinson's disease.

Dehydroascorbic acid, an oxidized form of vitamin C, is easily absorbed via the blood–brain

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barrier. Some believe that these results might improve the way Alzheimer's disease is treated since they have implications for enhancing antioxidant absorption in the central nervous system. Vitamin E, C, and beta-carotene have been shown by Jialal and Fuller to be effective in lowering low density lipoprotein oxidation and the ensuing atherosclerosis.

Because vitamin supplements stimulate macrophages and T cells, they are linked to an enhanced antibody titre response to tetanus and hepatitis B vaccinations. Due to the low serum levels of selenium in those who are genetically prone to pancreatic cancer, it is thought that taking supplements of the mineral may assist to avoid this illness. Selenium has also been tested for its use in treating skin cancer and asthma, although the results have not proven conclusive. More than a hundred enzymes involved in digestion, metabolism, and wound healing depend on zinc as a necessary component. A semi-essential amino acid that serves as a substrate for the synthesis of nitric oxide is L-arginine.L-arginine supplementation increased angina patients' ability to exercise **(Dureja et al., 2003).**

Herbals:

Since the dawn of human civilization, herbal medicine has offered a vast array of cures for both acute and chronic illnesses. Over thousands of years, the knowledge of herbal remedies has grown, providing us with several efficient ways to provide health care today. The main ingredients in medicinal plants are a variety of nutraceuticals **(Dureja et al., 2003).**

Several herbal extracts, such as cernilton (pollen extract), β-sitosterols (found in Saw Palmetto fruit), and pygeumafricum (African plum), have been clinically tested for the treatment of benign prostatic hyperplasia(Braeckman, 1994). Research has shown that echinacea is a popular natural remedy for treating and preventing colds and the flu **(Melchart et al., 1995)**. Because ofSt. John's wort modest monoaminoxidase inhibitor properties, it should not be used with meals high in tyramine or antidepressants **(Mai et al., 2000)**. Numerous phenolic chemicals, terpenoids, sulfur compounds, pigments, and other naturally occurring antioxidants found in vegetables, fruits, whole grains, nuts, and seeds have been linked to the prevention and/or treatment of diseases including cancer and cardiovascular disease. The most potent anticancer foods and plants include soybeans, garlic, cabbage, ginger, licorice root, and umbelliferous vegetables. Apart from being a rich source of vitamin C, folic acid, potassium, and soluble fiber, citrus also includes a variety of active phytochemicals. Thus far, clinical research have not been able to confirm the beneficial effects that supplementation is said to have **(Winston and Beck, 1999).** According to experimental and epidemiological research, dietary phytosterols may provide protection against the most prevalent malignancies in Western nations, including prostate, breast, and colon cancer **(Awad and Fink, 2000).** There have been suggestions that making garlic powder might have some therapeutic benefits for those with moderate hypertension. **(Dureja et al., 2003).** Proven antibacterial action exists in honey. Green tea lowers the risk of cardiovascular disease and several malignancies while boosting humoral and cell-mediated immunity. Ginseng increases the formation of natural killer cells, B and T cells, macrophages, and the ability of bone marrow to form colonies **(Klein et al., 2000).**

Despite the paucity of scientific research on the subject, herbal products remain the most often used medical supplies. Due to the known pharmacological effects of many of these components and the possibility of their interacting with therapeutic medications, a patient's history of using herbal remedies should be considered while taking a standard medical history. This should be done before beginning any medical procedures or changing prescription medication **(Schwartz, 2000)**.

Dietary Supplements:

Additionally, dietary supplements have been created to treat a wide range of illnesses. Prepackaged meals that are nutritionally balanced and adhere to national health organizations' recommendations are one example influenced a number of cardiovascular disease patients' risk variables and improved patient adherence to dietary restrictions **(Dureja et al., 2003)**.

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List of marketed nutraceutical products(Verma and Mishra, 2016).

Product	Category	Contents	Manufacturer
Coral calcium	Calcium supplement	Calcium and trace minerals	Nature's answer, Hauppauge, NY, USA
Weight smart™	Nutritional supplement	Vitamins and trace elements	Bayer corporation, Morristown, NL, USA
Omega woman	Immune supplement	Antioxidants, vitamins and phytochemicals (eg.Lycopene, and resveratrol)	Wassen, Surrey, U.K.
Appetite Intercept™	Appetite suppressant	Caffeine, tyrosine and phenylalanine	Natrol, Chatsworth, CA, USA
Chaser™	Hangover supplement	Activated calcium carbonate and vegetable carbon	Living essentials, Walled lake, MI, USA
Rox®	Energy drink	Taurine, caffeine and glucuronolactone	Rox America, Spartanburg, SA, USA
Biovinca™	Neurotonic	Vinpocetine	Cyvex nutrition, Irvine, CA, USA
Proplus®	Nutritional supplement	Soy proteins	Campbell soup company, Camden, NJ, USA
Snapple-a-day™	Meal replacement beverage	Vitamins and minerals	Snapple beverage group, White Plains, NY, USA
WelLife®	Amino acid supplement	Granulated-L-glutamine	Daesang America Inc., Hackensach, NJ, USA
PNerplus™	Neuropathic pain supplement	Vitamin and other natural supplement	NeuroHelp, San Antonio, Texas, USA
Olivenol™	Dietary supplement	Natural antioxidant, hydroxytyrosol	Cre Agri, Hayward, CA, USA
Threptin® Diskettes	Protein supplements	Proteins and vitamin B	Raptakos, Brett & Co. Ltd., Mumbai, India
GRD®	Nutritional supplement	Proteins, vitamins, minerals and carbohydrates	Zydus Cadila Ltd. Ahmedabad, India
Proteinex®	Protein supplement	Predigested proteins, vitamins, minerals and carbohydrates	Pfizer Ltd., Mumbai, India
Calcirol D-3®	Calcium supplement	Calcium and vitamins	Cadilla healthcare limited, Ahmedabad, India.

Physiological properties of dietary fibers and proposed health benefits (Verma and Mishra, 2016).

Physiological property	Proposed effect	Health benefits
Soluble dietary fiber	Delays gastric emptying and prolonging intestinal phase	Contribute to safety.
	Prevent the digestive enzymes from reaching lipid substrates, inhibits enzyme activity	Lowers glucose, insulin and lipid level after meal.
	Prevent or delays nutrients uptake in small intestine	Lower blood cholesterol level.
	Prevent the reabsorption of bile acid	Prevents breast cancer.

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Interaction/binding	Binding to bile acids	Lower blood cholesterol level.
	Interaction with digestive enzymes	Lowers glucose, insulin and lipid level after meal.
Fermentation	Growth of health promoting bacteria	Protect against inflammation and colorectal cancer.
	Production of short chain fatty acids	Lowers blood cholesterol level and protect against cancer.
Insoluble dietary fiber	Increase stool weight	Reduce the incidence of colorectal cancer and intestinal diseases.
	Accelerate transit time	Reduce time for nutrients to absorb, lowers glucose, insulin and lipid level.

Common nutrients and their associated health benefits (Verma and Mishra, 2016).

Nutrients	**Health benefits**
Fat Soluble Vitamins Vitamin A	Antioxidant, essential, for growth and development, maintains healthy vision, skin and mucous membranes, may aid in the prevention and treatment of certain cancers and in the treatment of certain skin disorders
Vitamin D	Essential for formation of bones and teeth, helps the body absorb and use calcium
Vitamin E	Antioxidant, helps form blood cells, muscles, lung and nerve tissue, boosts the immune system
Vitamin K	Essential for blood clotting
Water Soluble Vitamins	Antioxidant, necessary for healthy bones, gums, teeth and skin, helps in wound healing,
Vitamin C	may prevent common cold and attenuate its symptoms
Vitamin B1	Helps to convert food in to energy, essential in neurologic functions
Vitamin B2	Helps in energy production and other chemical processes in the body, helps maintain healthy eyes, skin and nerve function
Vitamin B3	Helps to convert food in to energy and maintain proper brain function
Vitamin B6	Helps to produce essential proteins and convert protein in to energy
Vitamin B12	Helps to produce the genetic material of cells, helps with formation of red blood cells, maintenance of central nervous system and synthesize amino acids and is involved in metabolism of fats, protein and carbohydrates
Folic acid	Necessary to produce the genetic materials of cells, essential in first three months of pregnancy for preventing birth defects, helps in red blood cell formation, protects against heart disease
Pantothenic acid	Aids in synthesis of cholesterol, steroids and fatty acids, crucial for intra-neuronal synthesis of acetylcholine
MineralsCalcium	Essential for building bones and teeth and maintaining bone strength, important in nerve, muscle and glandular functions
Iron	Helps in energy production, helps to carry and transfer oxygen to tissues
Magnesium	Essential for healthy nerve and muscle function and bone formation, may help prevent premenstrual syndrome (PMS)

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Phosphorous	Essential for building strong bones and teeth, helps in formation of genetic material, energy production and storage
Trace elements Chromium	With insulin helps to convert carbohydrates and fats into energy
Cobalt	Essential component of vitamin B12, but ingested cobalt is metabolized in vivo to form the B12coenzymes
Copper	Essential for hemoglobin and collagen production, healthy functioning of the heart, energy production, absorption of iron from digestive tract
Iodine	Essential for proper functioning of the thyroid
Selenium	Antioxidant, essential for healthy functioning of the heart muscle
Zinc	Essential for cell reproduction, normal growth and development in children, wound healing, production of sperm and testosterone
Vitamin like compounds Biotin	Required for various metabolic functions
L- Carnitine	Oxidation of fatty acids, promotion of certain organic acid excretion and enhancement of the rate of oxidative phosphorylation
Choline	Lipotropic agent used to treat fatty liver and disturbed fat metabolism
Vitamin F	Involved in proper development of various membranes and synthesis of prostaglandins, leukotrienes and various hydroxyfatty acids
Inositol	Lipotropic agent necessary for amino acid transport and movement of potassium and sodium
Taurine	Aids in retinal photoreceptor activity, bile acid conjugation, white blood cell antioxidant activity, CNS neuromodulation, platelet aggregation, cardiac contractility, sperm motility, growth and insulin activity

Nutraceuticals and their uses (Verma and Mishra, 2016).

Chemical constituents	Source	Uses
Carotenoids		
Lycopene	Guava, papaya, water melon, Tomatoes, pink colored grape fruit.	They reduce cholesterol levels, antioxidants, protects against cancer
β-Carotene	Vegetables, fruits, oats, Carrots.	Antioxidants, protection of cornea against UV light
Lutein	Spinach, corn, avocado, egg yolk	Protect eyes against age related muscular degenerations, cataracts, anticancer activity(colon)
Tocotrienol	Palm oil, different grains	Improves cardio vascular health, fight against cancer (breast cancer)
Saponins	Beans like soya beans, chickpeas	Very effective against colon cancer, reduces cholesterol level
Polyphenolic Compounds		
Flavonones	All citrus fruits	Different types of anti-oxidant and anticancer activity
Flavones	Different types of fruits, soya beans, vegetables.	Different types of anti-oxidant and anti-cancer activity
Flavonols	Broccoli, tea, onions, fruits like apple	Antioxidant activity
Curcumin	Turmeric root	Strongly anti-inflammatory and strongly antioxidant,effective anti-clotting agent

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Glucosinolates	Cauliflower, cruciferous vegetables	Anticancer activity, protect against bladder cancer
Phytoestrogens		
Isoflavones	Legumes, beans like soy beans	It Lowers LDL cholesterol, antioxidants, protects against prostate, breast, bowel and other cancers
Lignans	Vegetables, rye and flaxseed	Protect against development of cancer like colon and breast cancer
Dietary fibre		
Soluble fibre	Beans like Legumes, cereals like oats,barley, some fibrous fruits	They help in maintenance of a healthy digestive tract & have anticancer activity
Insoluble fibre	whole grain foods wheat and cornbran, nuts	They help in maintenance of a healthy digestive tract, and have Anticancer (colon) activity.
Sulphides/Thiols	Present in Cruciferous vegetables	Help in maintenance of healthy immune function
Fatty Acids		
Omega 3 fatty acids	Present in salmon and flax seed	They are the Potent controllers of the inflammatory processes, help in Maintenance of brain function & Reduce cholesterol disposition.
Monosaturated fatty acids	Present in tree nuts	Reduce the risk of coronary heart disease
Prebiotics/Probiotics	Lactobacilli, bifidobacteria present in yogurt, other dairy and nondairy applications	They help to improve gastrointestinal health and systematic immunity
Minerals like zinc, calcium, selenium, copper, potassium	Food	They are the important constituents of balanced diet
Polyols sugar alcohols (xylitol, sorbitol)	Present in foods	They may reduce the risk of dental caries(cavities)

The domain included by nutraceuticals:

Nutraceuticals have addressed every therapeutic area, including anti-arthritic, pain relievers, cold and cough, sleeping problems, digestion, cancer prevention, osteoporosis, blood pressure, cholesterol, depression, and diabetes **(Pandey et al., 2010).**

Nutraceuticals and disease:

Cardiovascular disease:

Anti-oxidants, Dietary fibers, Omega-3 polyunsaturated fatty acids, vitamins, and minerals can help prevent and cure CVD. Polyphenols (found in grapes) help to prevent and regulate vascular disease. Flavonoids (found in onions, vegetables, grapes, red wine, apples, and cherries) inhibit ACE and strengthen the small capillaries that transport oxygen and nutrients to all cells. Rice bran decreases serum cholesterol levels in the blood, lowers (LDL) levels, and enhances (HDL) levels in cardiovascular health. The higher the ratio, the greater the risk of coronary heart disease. Rice bran includes both lutein and zeaxanthin, which enhances vision and lowers the risk of cataracts. The essential fatty acids, omega-3, omega-6, omega-9, and folic acid, found in rice bran, are also beneficial to eyes. It has been shown that a poor consumption of fruits and vegetables is connected with a high death rate in CVD **(Temple and Gladwin, 2003).**

Alzheimer's disease:

β-carotene, curcumin, lutein, lycopene, and turmerin may have beneficial benefits on some disorders by counteracting the detrimental effects

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of oxidative stress, mitochondrial malfunction, and different kinds of brain degeneration.

Parkinson's disease:

Food containing vitamin E may be protective against Parkinson's disease. According to Canadian experts, vitamin E in diet may protect against Parkinson's disease. Creatine appears to change Parkinson's disease characteristics as indicated by a decrease in clinical symptoms **(Brower, 2005).** Although exploratory studies have shown some potential benefits, it is crucial to note that there is not enough scientific data to prescribe nutritional supplements for Parkinson's disease at this time. Patients should be warned that over-the-counter medicines have negative effects and combinations with other prescriptions, and they are often pricey **(Verma and Mishra, 2016).**

Osteoarthritis

Osteoarthritis (OA), a crippling joint ailment, is the most frequent kind of arthritis in the United States, where an estimated 21 million individuals suffer from it. The direct and indirect health-care expenses connected with all kinds of arthritis totaled roughly 86 billion USD in 2004. Individuals suffering from OA and other joint ailments may restrict their physical activity, resulting in energy imbalance and weight gain. Increased weight can aggravate existing issues by putting additional strain on joints **(Kaliora et al., 2006).** Glucosamine (GLN) and chondroitin sulfate (CS) are commonly used to treat OA symptoms. These nutraceuticals have both nutritive and pharmacological qualities and appear to modulate gene expression and NO and PGE2 generation, offering a reasonable explanation for their anti-inflammatory actions **(Verma and Mishra, 2016).**

Anti-inflammatory activities:

Curcumin (diferuloylmethane), a polyphenol found in turmeric, has anticarcinogenic, antioxidative, and anti-inflammatory activities. Top of Form Anti-tumor action has been documented for beet roots, cucumber fruits, spinach leaves, and turmeric rhizomes. Gamma linolenic acid (found in green leafy vegetables, nuts, vegetable oils such as evening primrose oil, blackcurrant seed oil, and hemp seed oil, as well as cyanobacteria and spirulina) is used to treat inflammation and auto-immune illnesses.

Glucosamine and chondroitin sulfate are anti-arthritic agents that modulate gene expression and PGE2 production. Cat's claw is a powerful anti-inflammatory agent. Uncariaguianensis, historically used for wound treatment, and Uncariatomentosa, which has several medical benefits and is most usually found in supplements, are the two recognized species of cat's claw. Cat's claw is high in phytochemicals, including 17 alkaloids, glycosides, tannins, flavonoids, sterol fractions, and other substances **(Balch et al., 2003).**

Adrenal Dysfunction:

Adaptogens are natural herbs that have nonspecific, normalizing effects on physiology; they impact normal bodily functions just enough to promote nonspecific tolerance to stresses. Eleutherococcussenticosus, Ginkgo biloba, Ocimum sanctum, Panax ginseng, and Withaniasomnifera are all adaptogens, as is the fungus Cordyceps sinensis. Each one is described briefly below. Ginkgo biloba has been used by the Chinese for thousands of years to treat a variety of ailments, including vertigo, short-term memory loss, and a lack of focus or attentiveness. Ginkgo extracts have been found to have antioxidant and neuroprotective characteristics, including the ability to halt the course of dementia **(Sembulingam et al., 1997).**

Ocimum sanctum (Holy basil or tulsi) is utilized in Ayurvedic medicine and has antistressor properties **(Sembulingam et al., 1997)**.

Obesity:

Obesity is a global public health problem and is defined as accumulation of unhealthy amount of body fat. It is a well-established risk factor for many disorders like angina pectoris, congestive heart failure (CHF), hypertension, hyperlipidemia, respiratory disorders, renal vein thrombosis, osteoarthritis, cancer and reduced fertility **(Caterson and Gill, 2002**).

Diabetes:

Diabetic individuals may benefit from n-3 fatty acid ethyl esters. Docosahexaenoic acid is essential for neurovisual development as well as insulin resistance. Lipoic acid, an antioxidant, is used to treat diabetic neuropathy. Psyllium dietary fibers have been utilized to improve glucose management in diabetics and to lower cholesterol levels in hyperlipidemic individual.

Disease linked to diet:

The prevalence of diet-related illnesses is rising in Western nations as a result of a sedentary

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lifestyle and increased access to high-calorie foods.Low-grade inflammation is a common pathogenic denominator among major diet-related illnesses, including obesity, diabetes, atherosclerosis, and neurodegeneration because they have the potential to induce anti-inflammatory responses, functional foods and nutraceuticals may provide a unique therapeutic strategy to prevent or reduce diet-related illness. Activation of intestinal T cells and gut microbiota homeostatic modulation in particular may be able to lessen low-grade inflammation in disorders linked to food.

Lung cancer and Heart attack:

In addition to its high fiber content, maize also provides a substantial quantity of folate, which contributes to heart health. Corn helps to sustain homocysteine, an intermediate product of the methylation cycle, a crucial metabolic activity. Damage to blood vessels caused by heart attacks, strokes, or peripheral vascular disease is directly related to homocysteine. According to estimates, consuming 100% of the daily value (DV) of folate would alone result in a 10% decrease in the frequency of heart attacks. The natural carotenoid pigment cryptoxanthin is also present in corn. When taken regularly, cryptoxanthin has been shown to lower the incidence of lung cancer by 27% **(Verma and Mishra, 2016).**

Non- alcoholic fatty liver acid (NAFLD):

Grouped into flavonoids and non-flavonoids, polyphenols are a wide family of chemicals originating from plants. Both stilbenes and phenolic acids are non-flavonoids. Inhibiting lipogenesis is the primary way that polyphenols function as antioxidants to prevent the buildup of liver fat. Diets high in plant polyphenols may provide protection against diabetes, osteoporosis, cancer, cardiac and neurological disorders, and more, according to epidemiological research and meta-analyses. Since polyphenols promote fatty acid oxidation and reduce oxidative stress, insulin resistance, and inflammation—the primary variables that lead to the development from non-alcoholic fatty liver disease (NAFLD) to non-alcoholic steatohepatitis (NASH)—they may have hepatoprotective benefits **(Del Ben et al., 2017).**

Pinus geradianaWallichex D. Don:

Pinus gerardianaWallichex D. Don. (P. gerardiana) is also known as "chilgoza or neoza pine." The world's dispersion is limited to mountain ranges in the east of India, Pakistan, and Afghanistan, as well as dispersed sections of the Himalayan Hindu Kush (30o to 37o N latitude and 66o to 80o E longitude). The Northwest Himalayas in India extend from latitude 31o 55 'to latitude 32o05′ N and longitude 77o 45 'to 79o35′ E (Chib, 1978) and range in height from 1600 to 3300 meters"**(Sharma, 2018).**

On Macroscopic level it is off-white in colour; oval in shape and pointed at the micropylar end; ranging from 1.5 to 2 cm long; oleaginous; possess a delicate terebinthine flavour; odour sweet **(INDIA et al., 2008)**.

List of the chemical constituents present in the seeds of the Pinus gerardiana plant (Chilgoza)

S.No.	Chemical constituents	References
1.	Linoleic acid , Unsaturated fatty acids, Oleic acid	**(Muhammad Abdul Haq, 2013), (Cai et al., 2017)**
2.	Vitamin E (α-tocopherol)	**(Cai et al., 2017)**
3.	Albumenoids and Oil starch	**(Dash, 2021)**
4.	Polyphenols, Xanthenes, Carotenoids	**(Fahey, 2016)**
5.	Gallocatechin, Catechin, Lutein, Lycopene	**(Hoon et al., 2015)**
6.	Epicatechin, Catechin, Taxifolin dihydroquercetin, Quercetin and Phenolic acids	**(Rehman et al.,2017**)
7.	Vitamins: Thiamine (B1), Beta carotene, Riboflavin (B2), Pantothenic acid (B5), Niacin (B3), Vitamin B6(Pyridoxine), Vitamin k, Folate (B9), and Minerals including Magnesium, Calcium, Manganese, Phosphorous, Potassium, Iron, Zinc.	**(Rehman et al., 2017)**

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S.No.	Chemical constituents	References
8.	Palmitic (3.7%), Stearic acid (1.2%), Oleic acid (52.3%) and Linoleic (42.8%), Palmito-dilinolein (2.4 %), Palmito-oleolinolein (2.4 %), Triolein 3-4 %, Dioleolinolein (47.4 %), Stearo-oleolinolein (3.2 %), trilinolein (0.4 %), Oleiodilinolein (32.5 %)	**(Singh et al., 2021)(India, 1992; Khare, 2015**).

USES OF THE CHEMICAL CONSTITUENTS OF CHILGOZA:

1) **Linoleic acid (LA)**: Human arterial pressure has been demonstrated to decrease in response to polyunsaturated fatty acids of the omega-6 series, as have a number of experimental hypertension models **(Hui et al., 1989).** There is confirmation that LA has neuroprotective properties in vitro and in vivo against Parkinson's disease **(Alarcon-Gil et al., 2022**).
2) **Oleic acid (OA):** Oleic acid is a mono-unsaturated omega-9 fatty acid found in plants as in olive oil and nuts**(Granado-Casas and Mauricio, 2019)** and animals. Oleic acid is used in pharmaceuticals as an excipient and in aerosol goods as an emulsifying or solubilizing agent. It may slow the progression of adrenoleukodystrophy, a deadly condition affecting the brain and adrenal glands, as well as improve memory**(Choulis, 2011).** It is also known that oleic acid has an influence on the cardiovascular system by decreasing the rate of myocardial infarction, platelet aggregation, and TXA2 production, as well as lowering systolic blood pressure **(Karacor and Cam, 2015).**
3) **α-tocopherol (Vit.E):** Alpha-tocopherol, one of vitamin E's eight isoforms, is nature's most effective fat-soluble antioxidant **(Tucker and Townsend, 2005**). For cancer the ability of vitamin E, particularly α -tocopherol, to reduce free radical damage, induce apoptosis, and influence oncogene expression makes it a promising target for chemotherapeutic techniques.**(Tucker and Townsend, 2005)**Vitamin E, in addition to enhancing apoptotic pathways, can also suppress tumour survival factors such as protein kinase C (PKC)**(Neuzil et al., 2001**). α-TS has been named the most effective form of vitamin E in the adjuvant therapy of cancer due to its demonstrated efficacy in multiple cancer cell tests and encouraging outcomes from early clinical trials.**(Prasad et al., 2003)** when combined with additional micronutrients used in chemotherapy or radiation, such as vitamin C, retinoic acid, and carotenoids **(Prasad, 2004).**
4) **Xanthenes:** A unique group of tricyclic chemicals that include oxygen is known as xanthenes.(Aza) xanthene derivatives shown biological activity as neuroprotectors, antitumors, and antimicrobials, among other things, demonstrating the nucleus' adaptability for many biological uses **(Maia et al., 2021).**
5) **Carotenoids**: In cells, tissues, and entire animals, carotenoids improve the immune response, prevent mutagenesis, reduce induced nuclear damage, and protect against numerous neoplastic processes. Carotenoids also protect tissue from photo-induced damage. Under certain circumstances, several carotenoids, particularly -carotene, quench highly reactive singlet oxygen and can impede free radical-mediated processes. Consumption of carotenoid-rich fruits and vegetables has been linked to a lower risk of some types of cancer, notably lung cancer, in epidemiological studies **(Bendich and Olson, 1989).**
6) **Catechin:** Catechins are naturally occurring polyphenolic compounds found in food and medicinal plants. A growing body of research has linked the consumption of catechin-rich foods to the prevention and treatment of chronic disorders in humans, such as inflammatory bowel disease (IBD).Some studies have shown that catechins can significantly inhibit excessive oxidative stress via either direct or indirect antioxidant effects and promote the activation of antioxidative substances such as glutathione peroxidases (GPO) and glutathione (GSH), thereby reducing oxidative damage to the colon. Furthermore, catechins can regulate the infiltration and proliferation of immune-related cells such as neutrophils, colonic epithelial cells, macrophages, and T lymphocytes, hence reducing inflammatory relationships and providing advantages to IBD **(Fan et al., 2017).**
7) **Lutein:** One of the most common carotenoids in both the natural world and the human diet is

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lutein. It is highly concentrated as macular pigment in the foveal retina of primates, where it works in conjunction with zeaxanthin to reduce blue light exposure, offer protection from photo-oxidation, and improve visual function. Recently, research on lutein has moved beyond the retina to examine its potential effects on brain growth and function. Only primates build up lutein in the brain, and nothing is known about its physiological significance or distribution **(Erdman et al., 2015)**.It is also an effective antioxidant **(Perrone et al., 2016).**

As previously noted, the only caroteoids that are preferentially deposited in the fovea to create the macular pigment are lutein and its isomer zeaxanthin. Given that the retina, like the brain, is made up of neural tissue, lutein is being studied for its potential significance in cognitive function **(Johnson, 2014; Johnson et al., 2013; Vishwanathan et al., 2014**).

8) **Lycopene:** Lycopene is a tetraterpene chemical and one of the carotenoids. It is basically acknowledged as a strong antioxidant and a carotenoid that is not a pro-vitamin A. Cancer recurrence, diabetes mellitus, cardiac difficulties, oxidative stress-mediated malfunctions, inflammatory events, skin and bone illnesses, hepatic, neurological, and reproductive abnormalities have all been reported to be significantly improved by lycopene. Additionally, toxicity and safety are reviewed, as well as its protective properties against the recommended concentrations of toxic agents **(Imran et al., 2020)**.
9) **Epicatechin**: A natural flavonoid is epicatechin. It has been demonstrated that eating epicatechin lowers blood sugar levels in diabetic people. Epicatechin's anticancer effects were linked to its antioxidant, antiangiogenic, and direct cytotoxic effects on cancer cells. Epicatechin is a viable contender as a replacement, despite the fact that its precise mode of action is currently under investigation**(Abdulkhaleq et al., 2017)**.
10) **Taxifolin dihydroquercetin**: Taxifolin (3,5,7,3,4-pentahydroxy flavanone or dihydroquercetin) is a flavonoid. Promising pharmacological actions were demonstrated by taxifolin in the treatment of malignancies, oxidative stress, microbial infections, inflammation, and liver and cardiovascular diseases. Compared to other activities, the anti-cancer activity was more noticeable **(Sunil and Xu, 2019)**.
11) **Quercetin:** One of the flavonoids with antioxidant qualities is quercetin. It is said that quercetin has numerous positive health impacts, including preventing diseases like osteoporosis, lung cancer, and cardiovascular disease **(Anand David et al., 2016)**.
12) **Phenolic acids**: As phenolic acids are a subclass of plant phenolics, they have resonance stabilized structures and phenol moieties. Through radical scavenging, the H-atom donation in phenolic acids results in antioxidant properties.Dietary polyphenols, or natural antioxidants, include phenolic acids as a major class. They perform a number of tasks, such as defense, development, and plant growth. They are building blocks for other important bioactive compounds that are frequently employed in the food, cosmetics, and pharmaceutical sectors. Oxidative stress is the source of these dietary antioxidants' defences against the growth and progression of pathological diseases **(Kumar and Goel, 2019)**.
13) **Thiamine**:Thiamine, often known as vitamin B1, is now recognized as being essential for energy metabolism. It was discovered as a result of early study on the 'anti-beriberi component' found in rice polishing. Following its synthesis in 1936, it prompted several years of investigation to determine its activity in curing beriberi**(Lonsdale, 2006)**.
14) **Beta carotene:** Beta-carotene's health benefits and dietary needs are linked. This orange-red pigment has been extensively studied for its ability to treat a variety of chronic conditions, including cancer, cystic fibrosis, and COVID-19. However, due to multiple reported twin outcomes, this class of phytoconstituents has seen a significant study deficit**(Anand et al., 2022)**.
15) **Riboflavin:** Riboflavin has also been linked to the protection of a wide range of health problems, including migraine, anaemia, cancer, hyperglycaemia, hypertension, diabetes mellitus, and oxidative stress, either directly or indirectly. Riboflavin shortage has a significant impact on iron absorption, tryptophan metabolism, mitochondrial dysfunction, gastrointestinal system, brain dysfunction, and vitamin metabolism in general, as well as skin diseases**(Thakur et al., 2017)**.

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16) **Pantothenic acid:** Pantothenic acid (vitamin B5) is a B-complex vitamin that is water soluble. It is biologically significant due to its incorporation into coenzyme A and acyl carrier protein, both of which are important in fatty acid metabolism**.(Intakes, 1998)**It has been hypothesized that pantethine has a positive impact on hyperlipidaemia **(Sampedro et al., 2015)**.
17) **Niacin:** Niacin, also known as nicotinic acid, has long been used to treat cardiovascular disease and lipid abnormalities. Niacin boosts apo A-I-containing lipoproteins (high-density lipoprotein [HDL]) and has a positive effect on apolipoprotein (apo) B-containing lipoproteins (e.g., very-low-density lipoprotein [VLDL], low-density lipoprotein [LDL], and lipoprotein[a**]) (Kamanna and Kashyap, 2008)**.
18) **Pyridoxine:** Pyridoxine (vitamin B6) is a cofactor in numerous enzymatic pathways involved in amino acid metabolism, with pyridoxal 5-phosphate being the most physiologically active form. Pyridoxine has been used as an antidote to isoniazid overdose, Gyromitra mushroom or fake morrel (monomethylhydrazine) toxicity, and hydrazine exposure**(Lheureux et al., 2005).**
19) **Vitamin k**: Vitamin K has long been associated with blood coagulation, as it is required for the posttranslational alteration of seven proteins involved in this cascade. However, it is also involved in the development of additional 11 or 12 proteins that play various functions, including the control of connective tissue calcification. Because this procedure is biologically necessary in bones **(Mladěnka et al., 2021)**.

II. CONCLUSION:

From the rational the findings evident that nutraceuticals are the part of major pharmaceutical health care system and pharmaceutical companies, which may be taken from natural sources or synthesized in a lab and are essential to daily living and aid in the treatment and prevention of a number of diseases. The natural sources of these nutraceuticals may include plants, shrubs and animals, etc., which consumed as dietary food, in the form of supplements, proteins, minerals, vitamins and ions. Nutraceuticals are acknowledged in the pharmaceutical industry for their therapeutic and preventative qualities in treating a range of medical conditions. This pattern indicates a move toward a more comprehensive approach to healthcare that places an emphasis on nutrition's role in prevention. Nutraceuticals are being used more often in daily life to help individuals manage chronic illnesses, strengthen immunity, and complement their diets. Nutraceuticals provide a wide range of solutions to support and improve general health, from vitamin supplements to plant extracts. As the relationship between health and nutrition becomes more widely recognized, there is a rising need in the pharmaceutical industry for nutraceutical-based products. Numerous phytoconstituents found in Pinus gerardianawallichex D. Don. seeds, commonly known by the name of Chilgoza may be useful in the management, treatment, or prevention of a number of diseases, including neurological disorders.As all the constitunets present in the chilgoza have their own specific therapeutic actions. Consequently, it may be said that Chilgoza is a useful nutraceutical.

For this several nutraceutical dosages can be prepared as per the requirements, along with this several other potent additives can be used in combination to enhance or to attain the multiple therapeutics activities.

REFERENCE

[1]. Abdulkhaleq LA, Assi MA, Noor MHM, Abdullah R, Saad MZ and Taufiq-Yap YH (2017) Therapeutic uses of epicatechin in diabetes and cancer. Vet World**10**:869-872.
[2]. Alarcon-Gil J, Sierra-Magro A, Morales-Garcia JA, Sanz-SanCristobal M, Alonso-Gil S, Cortes-Canteli M, Niso-Santano M, Martínez-Chacón G, Fuentes JM and Santos A (2022) Neuroprotective and anti-inflammatory effects of linoleic acid in models of Parkinson's disease: The implication of lipid droplets and lipophagy. Cells**11**:2297.
[3]. Anand David AV, Arulmoli R and Parasuraman S (2016) Overviews of Biological Importance of Quercetin: A Bioactive Flavonoid. Pharmacogn Rev**10**:84-89.
[4]. Anand R, Mohan L and Bharadvaja N (2022) Disease Prevention and Treatment Using β-Carotene: the Ultimate Provitamin A. Rev Bras Farmacogn**32**:491-501.
[5]. Awad AB and Fink CS (2000) Phytosterols as anticancer dietary

components: evidence and mechanism of action. The Journal of nutrition**130**:2127-2130.

[6]. Balch S, McKenney C and Auld D (2003) Evaluation of gamma-linolenic acid composition of evening primrose (Oenothera) species native to Texas. HortScience**38**:595-598.

[7]. Bendich A and Olson JA (1989) Biological actions of carotenoids 1. The FASEB journal**3**:1927-1932.

[8]. Braeckman J (1994) The extract of Serenoa repens in the treatment of benign prostatic hyperplasia: a multicenter open study. Current therapeutic research**55**:776-785.

[9]. Brower V (2005) A nutraceutical a day may keep the doctor away: Consumers are turning increasingly to food supplements to improve well-being when pharmaceuticals fail. EMBO reports**6**:708-711.

[10]. Cai L, Cao A, Luo Z, Mao L and Ying T (2017) Ultrastructure characteristics and quality changes of low-moisture Chilgoza pine nut (Pinus gerardiana) during the near-freezing-temperature storage. CyTA-Journal of Food**15**:466-473.

[11]. Caterson ID and Gill TP (2002) Obesity: epidemiology and possible prevention. Best Practice & Research Clinical Endocrinology & Metabolism**16**:595-610.

[12]. Choulis NH (2011) Chapter 49 - Miscellaneous drugs, materials, medical devices, and techniques, in Side Effects of Drugs Annual (Aronson JK ed) pp 1009-1029, Elsevier.

[13]. Das L, Bhaumik E, Raychaudhuri U and Chakraborty R (2012) Role of nutraceuticals in human health. Journal of food science and technology**49**:173-183.

[14]. Dash A (2021) Pinus gerardiana Wallichex. D. Don. -A Review. Phytomedicine**1**.

[15]. DeFelice SL (1995) The nutraceutical revolution: its impact on food industry R&D. Trends in Food Science & Technology**6**:59-61.

[16]. Del Ben M, Polimeni L, Baratta F, Pastori D and Angelico F (2017) The role of nutraceuticals for the treatment of non-alcoholic fatty liver disease. British journal of clinical pharmacology**83**:88-95.

[17]. Devasagayam T, Tilak J, Boloor K, Sane KS, Ghaskadbi SS and Lele R (2004) Free radicals and antioxidants in human health: current status and future prospects. Japi**52**:4.

[18]. Dureja H, Kaushik D and Kumar V (2003) Developments in nutraceuticals. Indian journal of pharmacology**35**:363-372.

[19]. Erdman JW, Smith JW, Kuchan MJ, Mohn ES, Johnson EJ, Rubakhin SS, Wang L, Sweedler JV and Neuringer M (2015) Lutein and Brain Function. Foods**4**:547-564.

[20]. Espín JC, García-Conesa MT and Tomás-Barberán FA (2007) Nutraceuticals: Facts and fiction. Phytochemistry**68**:2986-3008.

[21]. Fahey J (2016) Reference Module in Food Science. Encyclopedia of Food and Health, Oxford: Elsevier Ltd.

[22]. Fan FY, Sang LX and Jiang M (2017) Catechins and Their Therapeutic Benefits to Inflammatory Bowel Disease. Molecules**22**.

[23]. Gibson GR (2004) Fibre and effects on probiotics (the prebiotic concept). Clinical Nutrition Supplements**1**:25-31.

[24]. Granado-Casas M and Mauricio D (2019) Chapter 14 - Oleic Acid in the Diet and What It Does: Implications for Diabetes and Its Complications, in Bioactive Food as Dietary Interventions for Diabetes (Second Edition) (Watson RR and Preedy VR eds) pp 211-229, Academic Press.

[25]. Hoon LY, Choo C, Watawana MI, Jayawardena N and Waisundara VY (2015) Evaluation of the total antioxidant capacity and antioxidant compounds of different solvent extracts of Chilgoza pine nuts (Pinus gerardiana). Journal of Functional Foods**18**:1014-1021.

[26]. Hui R, St.-Louis J and Falardeau P (1989) Antihypertensive Properties of Linoleic Acid and Fish Oil Omega-3 Fatty Acids Independent of the Prostaglandin System. American Journal of Hypertension**2**:610-617.

[27]. Imran M, Ghorat F, Ul-Haq I, Ur-Rehman H, Aslam F, Heydari M, Shariati MA, Okuskhanova E, Yessimbekov Z, Thiruvengadam M, Hashempur MH and Rebezov M (2020) Lycopene as a Natural Antioxidant Used to Prevent Human Health Disorders. Antioxidants (Basel)**9**.

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 1 Jan-Feb 2024, pp: 844-859 www.ijprajournal.com ISSN: 2249-7781

[28]. INDIA GO, WELFARE MOHAF and DEPARTMENT OF AYURVEDA YN (2008) THE AYURVEDIC PHARMACOPOEIA OF INDIA. **VI**:1-458.
[29]. India Wo (1992) A dictionary of Indian raw materials and industrial products, Publication and information Directorate, Council of Scientific and ….
[30]. Intakes IoMSCotSEoDR (1998) Pantothenic Acid. Dietary reference intakes for thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, pantothenic acid, biotin, and choline.
[31]. Johnson EJ (2014) Role of lutein and zeaxanthin in visual and cognitive function throughout the lifespan. Nutrition reviews**72**:605-612.
[32]. Johnson EJ, Vishwanathan R, Johnson MA, Hausman DB, Davey A, Scott TM, Green RC, Miller LS, Gearing M and Woodard J (2013) Relationship between serum and brain carotenoids,-tocopherol, and retinol concentrations and cognitive performance in the oldest old from the Georgia Centenarian Study. Journal of aging research**2013**.
[33]. Kaliora A, Dedoussis G and Schmidt H (2006) Dietary antioxidants in preventing atherogenesis. Atherosclerosis**187**:1-17.
[34]. Kamanna VS and Kashyap ML (2008) Mechanism of Action of Niacin. The American Journal of Cardiology**101**:S20-S26.
[35]. Karacor K and Cam M (2015) Effects of oleic acid. Medical Science and Discovery**2**:125-132.
[36]. Khare CP (2015) Ayurvedic pharmacopoeial plant drugs: expanded therapeutics, CrC Press.
[37]. Klein C, Sato T, Meguid MM and Miyata G (2000) From food to nutritional support to specific nutraceuticals: a journey across time in the treatment of disease. Journal of gastroenterology**35**.
[38]. Kokate CK PA, Gokhale SB. (2002) Nutraceutical and Cosmaceutical. Pharmacognosy, 21st edition, , Nirali Prakashan, 2002, Pune, India:
[39]. Kumar N and Goel N (2019) Phenolic acids: Natural versatile molecules with promising therapeutic applications. Biotechnology reports**24**:e00370.
[40]. Lheureux P, Penaloza A and Gris M (2005) Pyridoxine in clinical toxicology: a review. European Journal of Emergency Medicine**12**:78-85.
[41]. Lonsdale D (2006) A Review of the Biochemistry, Metabolism and Clinical Benefits of Thiamin(e) and Its Derivatives. Evidence-Based Complementary and Alternative Medicine**3**:349513.
[42]. Mai I, Krüger H, Budde K, Johne A, Brockmöller J, Neumayer H and Roots I (2000) Hazardous pharmacokinetic interaction of Saint John's wort (Hypericum perforatum) with the immunosuppressant cyclosporin. International journal of clinical pharmacology and therapeutics**38**:500-502.
[43]. Maia M, Resende D, Durães F, Pinto MMM and Sousa E (2021) Xanthenes in Medicinal Chemistry - Synthetic strategies and biological activities. Eur J Med Chem**210**:113085.
[44]. Melchart D, Linde K, Worku F, Sarkady L, Holzmann M, Jurcic K and Wagner H (1995) Results of five randomized studies on the immunomodulatory activity of preparations of Echinacea. The Journal of Alternative and Complementary Medicine**1**:145-160.
[45]. Mladěnka P, Macáková K, Kujovská Krčmová L, Javorská L, Mrštná K, Carazo A, Protti M, Remião F, Nováková L, researchers tO and collaborators (2021) Vitamin K – sources, physiological role, kinetics, deficiency, detection, therapeutic use, and toxicity. Nutrition Reviews**80**:677-698.
[46]. Muhammad Abdul Haq MJA, Abid Hasnain (2013) Gum Cordia: A novel edible coating to increase the shelf life of Chilgoza (Pinus gerardiana),
[47]. LWT - Food Science and Technology. **50**:306-311.
[48]. Neuzil J, Weber T, Schröder A, Lu M, Ostermann G, Gellert N, Mayne GC, Olejnicka B, NÈGRE-SALVAYRE A and Stícha M (2001) Induction of cancer cell apoptosis by α-tocopheryl succinate: molecular pathways and structural requirements. The FASEB Journal**15**:403-415.

[49]. Pandey M, Verma RK and Saraf SA (2010) Nutraceuticals: new era of medicine and health. Asian J Pharm Clin Res**3**:11-15.

[50]. Perrone S, Tei M, Longini M and Buonocore G (2016) The Multiple Facets of Lutein: A Call for Further Investigation in the Perinatal Period. Oxidative Medicine and Cellular Longevity**2016**:5381540.

[51]. Prasad KN (2004) Rationale for using high-dose multiple dietary antioxidants as an adjunct to radiation therapy and chemotherapy. The Journal of Nutrition**134**:3182S-3183S.

[52]. Prasad KN, Kumar B, Yan X-D, Hanson AJ and Cole WC (2003) α-tocopheryl succinate, the most effective form of vitamin E for adjuvant cancer treatment: a review. Journal of the American College of Nutrition**22**:108-117.

[53]. Rehman A-u, Naz S, Zaman M, Saeed-ul-Hassan S, Iqbal J and Zaidi AA (2017) A preliminary investigation of in vitro anti-thrombotic and anti-platelet activity of Pinus gerardiana. Biomedical Research and Therapy**4**:1098-1109.

[54]. Sampedro A, Rodriguez-Granger J, Ceballos J and Aliaga L (2015) Pantothenic acid: an overview focused on medical aspects. European Scientific Journal**11**.

[55]. Schwartz J (2000) Nutraceuticals: sorting out fact, fiction, and uncertainty. The Journal of Gender-specific Medicine: JGSM: the Official Journal of the Partnership for Women's Health at Columbia**3**:30-32, 37.

[56]. Sembulingam K, Sembulingam P and Namasivayam A (1997) Effect of Ocimum sanctum Linn on noise induced changes in plasma corticosterone level. Indian Journal of Physiology and Pharmacology**41**:139-143.

[57]. Shahidi F (2000) Antioxidants in food and food antioxidants. Food/nahrung**44**:158-163.

[58]. Sharma A, Lalit Sharma, and Rohit Goyal. (2018) "A review on himalayan pine species: Ethnopharmacological, phytochemical and pharmacological aspects.". Pharmacognosy Journal **10.4**.

[59]. Singh A, Dubey R, Paliwal R, Saraogi GK and Singhai A (2012) Nutraceuticals-an emerging era in the treatment and prevention of diseases. International Journal of Pharmacy and Pharmaceutical Sciences**4**:39-43.

[60]. Singh G, Kumar D and Dash AK (2021) Pinus gerardiana Wallichex. D. Don. -A review. Phytomedicine Plus**1**:100024.

[61]. Sunil C and Xu B (2019) An insight into the health-promoting effects of taxifolin (dihydroquercetin). Phytochemistry**166**:112066.

[62]. Temple NJ and Gladwin KK (2003) Fruit, vegetables, and the prevention of cancer: research challenges. Nutrition**19**:467-470.

[63]. Thakur K, Tomar SK, Singh AK, Mandal S and Arora S (2017) Riboflavin and health: A review of recent human research. Critical Reviews in Food Science and Nutrition**57**:3650-3660.

[64]. Tucker JM and Townsend DM (2005) Alpha-tocopherol: roles in prevention and therapy of human disease. Biomed Pharmacother**59**:380-387.

[65]. Verma G and Mishra MK (2016) A review on nutraceuticals: classification and its role in various diseases. International Journal of Pharmacy & Therapeutics**7**:152-160.

[66]. Vishwanathan R, Iannaccone A, Scott TM, Kritchevsky SB, Jennings BJ, Carboni G, Forma G, Satterfield S, Harris T and Johnson KC (2014) Macular pigment optical density is related to cognitive function in older people. Age and ageing**43**:271-275.

[67]. Winston C and Beck L (1999) Phytochemicals: health protective effects. Canadian Journal of Dietetic Practice and Research**60**:78.