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Review Article

A Review of Three Ancient Chinese Herbs, Goji Berry, Ginger and Ginseng in Pharmacological and Modern Science

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ABSTRACT

Goji berry, Ginger and Ginseng are ancient Chinese herbs which have been used for thousand years as Traditional Chinese Medicine in China and other Asian countries as foods to promote good health and as drugs to treat disease. The keywords of Goji berry, ginger, ginseng, traditional Chinese medicine were searched in Google Scholar, Scopus, Research Gate and PubMed. The most important Goji pharmacological usages are improving function, enhances the bodys ability to adapt to a variety of noxious stimuli; it significantly inhibits the generation and spread of cancer cells and can improve eyesight and increase reserves of muscle glycogen and liver glycogen which may increase human energy and has anti-fatigue effect. Ginger has been widely used for arthritis, cramps, sprains, sore throats, rheumatism, muscular aches, pains, vomiting, constipation, indigestion, hypertension, dementia, fever and infectious diseases. Several pharmacological activities have been reported for ginseng extracts including effects on the central nervous system; antipsychotic action; tranquilizing effects; protection from stress ulcers; increase of gastrointestinal motility; endocrinological effects; enhancement of sexual behaviour; or synthesis of carbohydrates, lipids, RNA, and proteins. These versatile medicinal plants are unique sources of various types of chemical compounds which are responsible of the various activities of the plant. Traditional medicinal plants are cheaper, locally available and easily consumed as medicinal preparations and of course they are organic.

Keywords: Goji berry, Ginger, Ginseng, Ancient Chinese Herbs

INTRODUCTION

Traditionally, Chinese medicine includes herbal medicines and acupuncture (Ogbaji *et al.* 2018; Shahrajabian *et al.*, 2018). TCM in China is partly integrating with western medicine science, researchers shall learn more from TCM and carry out more studies and researchers in order to explore (Shahrajabian *et al.*, 2019a,b,c,d). Known in Asia as an extremely nutritious food, Goji Berry (*Lycium barbarum*) fruits have been extensively eaten raw, consumed as juice or wine, brewed into herbal tea or prepared as a tincture, eaten as salads and used widely in other culinary preparations. Its leaves are made into tea. Besides its uses in food and culinary, goji berries have long played important roles in traditional Chinese medicine (TCM) (Shahrajabian *et al.*, 2019e, f, g, h, i, j; Sun *et al.*, 2019). Ginger (*Zingiber officinale* Roscoe.) has a long history of being used as a medicine and herbal since ancient time and had been used as an important cooking spice throughout the world. It is a plant that is used in folk medicine from south-east Asia, and in Greco-Roman traditions, Brazil, Australia, Africa, China, India, Bangladesh, Taiwan, Mexiceo, Japan, Jamaica, the India, the middle east and parts of the United states also cultivate the rhizomes for medicinal purpose. *Panax ginseng* (Giseng) is well-known herb in traditional Chinese medicine (TCM). Panax means cure for all disease, as it combines the Greek words pan meaning all and zxos meaning medicine. In traditional Chinese medicine (TCM), it is believed that food and medicine come from the same origin but with different uses and applications. In these years, traditional Chinese medicine has become more integrated into medical practice in the West, there is a need to bridge the many conceptual and practical differences between Western medicine and Chinese medicine. The aim of this review is survey composition, potential health benefits and pharmacological benefits of three ancient medicinal herbs from China, which are goji berries, ginger and ginseng.

Composition, clinical aspects and health beneficial of Goji berries

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Goji berries can provide almost twice vitamin A that a person needs in a day (Liu *et al.*, 2018). It has almost a third of the daily recommended vitamin C. Moreover, Goji berries are rich in some important and essential minerals including iron and potassium. Potterat (Zhao *et al.*, 2019) reported that this crop includes essential oils, vitamins (A, A, and C), amino acids, mineral elements (K, P, Ca, Mg, Fe, and Na), and betaine. A diet that contains Goji berries can help with the treatment and prevention of various health issues, but the most important ones are:

High blood sugar: Goji berries are said to be able to lower blood sugar in addition to helping to relieve insulin resistance which can be able to reduce risk of developing diabetes. Goji berries contain high levels of fibre and protein, which means that they can help to provide a feeling of fullness without the need to take in an inordinate amount of calories. Regular consumption of Goji berries can enhance lymphocyes, which are the red blood cells that protect the body from harmful bacteria. The nutritional and functional properties of Goji berries are provided by a rich variety of components, including amino acids, polyphenols, carotenoids, polysaccharides, organic acids and their derivatives (Mocan *et al.*, 2018). Mocan *et al.* (2018) reported that Goji berries are a rich source of bioactive compounds with functional properties that need further risk/benefit evaluation when used in foods or health promoting formulations. There are many varieties of Goji Berry grown in many parts of the world. As the popularity of the berry continues to grow, more and more varieties will likely appear as the vine is cultivated for commercial purposes. But it is said that the most powerful and nutrient rich Goji Berries in China still come from the vines of Himalayan valleys.

Goji is a good source of fiber, protein, carotenoids, and polysaccharides. It also has a lot of biological activities, including antidiabetes, antiproliferative activity, preserving retinal function, and antioxidant activity. Donno *et al.* (2015) mentioned that Goji berry is identified as a rich source of antioxidant compounds, with health promoting properties comparable with other common fruit species. Recent studies have shown that antioxidant activities of some natural products are correlated with defence against oxidative stress and different human diseases including cancer, arteriosclerosis and aging process. Compounds of nutritional value of Goji are very diverse, including polysaccharides, carotenoids, polyphenols, essential oils, betaine, vitamins, amino acids and oligo elements (Forino *et al.*, 2016).

Yan *et al.* (2014) in their experiment indicated that the contents of nutritional components in the different tissues were significantly different. The ratios of essential amino acids/total amino acids and ratios of essential amino acids/non-essential amino acids for the leaf, pollen, and flower were all higher than the criteria provided by FAO/WHO. The pollen and the fruit contained highly unsaturated fatty acids. All the tissues were good sources of mineral elements, polysaccharides and phenolic compounds. Furthermore, they have found that Ningxia wolfberry pollen, leaf and flower can be a potential resource of nutrients for humans and animals. It has also effectiveness in aging, increased metabolism, immune system, liver function and glycemic control (Silva *et al.*, 2017). However, their benefits are attributed to the bioactive component polysaccharide-protein complex 4 (LBP4), which is composed of six monosaccharides (galactose, glucose, rhmnose, arabinose, mannoseandxylose) (Carnes *et al.*, 2013). Goji has a complex rich in vitamins and minerals that protect the central nervous system, reduces the risk of glaucoma and has antitumor activity, prevents chronic diseases such as hypercholesterolemia, diabetes, hepatitis, and also helps in reducing fatigue and greater resistance in exercise, being a strong ally in the prevention of aging. It has been found that the flavonoids from wolf berries protect the blood cells and mitochnodria against oxidative damages. *L. barbarum* polysaccharides has various important biological activities, such as antioxidant, immunomodulation, antitumor, neuroprotection, radioprotection, anti-diabetes, hepatoprotection, anti-osteoporosis and antifatigue. Gao *et al.* (2008) also mentioned that Goji berries have a long history of use for treatment of eye problems, skin rashes, psoriasis, allergies, insomnia, chronic liver disease, diabetes, tuberculosis, and kidney disorders. Masci *et al.* (2018) also concluded that the purified components of the Goji berry may be potentially useful as adjuvants in the treatment of diabetes and its correlated illnesses. Wolfberry polysaccharides were reported to have shown antioxidant activity in vitro. A glucopyranoside and phenolic amides isolated from wolfberry root bark have also been found to have an inhibitory activity in vitro against human pathogenic bacteria and fungi. A human supplementation trial showed that daily intake of wolfberries increased plasma levels of zeaxanthin (Hempel *et al.*, 2017). On the contrary, it is also reported in some literature that in the west, none of this research has been scientifically verified, confirmed in clinical studies, of accepted by regulatory authorities. Some health benefits of Goji berry are boosted immune system and flu

protection, potential weight loss aid, antioxidants for eyes and skin, maintain blood sugar, increased testosterone, It helps to restore body homeostasis and strengthen body energy (Protti *et al.*, 2017). Their results also indicating that females seem to benefit from the methanol extract of *L. barbarum* more than males in terms of anxiety and depression like behaviours as well as spatial learning behaviour. Some researchers reported that the carotenoid profile of Goji berries is the subject of different reports, where zeaxanthin-dipalmitate confirms as the major carotenoid of Goji berries (Protti *et al.*, 2017). Fratianni *et al.* (2018) mentioned that the dried samples of Goji berries could be used as a dietary source of carotenoid and be worthy of development and utilization.

Dried fruits can be eaten raw and used in confectionary goods or in bakery products, added to trail mix, cereals, muffins, energy bars or soups. According to the findings, the dried fruits are red-orange, seeded, rich in vitamins of group B, C, E, contain 21 microelement including anticancer germanium, 18 amino acids, 8 of which the human body does not produce, 4 irreplaceable polysaccharides which do not exist in products of food. Goji berries contain not only high amounts of antioxidants, carotenoids, vitamin A and zeaxanthin, but also rich in vitamins B and C and polysaccharides (Skenderidis *et al.*, 2018). In addition, flavonoids such as rutin, gentistic acid and quercetin are the main active compounds present in the leaves of *Lycium barbarum* (Dermesonlouoglou *et al.*, 2018). Lopatriello *et al.* (2017) found *L. barbarum* flowers and pruned stems as sources of beneficial compounds.

L. barbarum extracts were proven to possess prosperity biological activities, e.g. anti-ageing effects, increased metabolism, antioxidant properties, anti-diabetes and glucose control, immunomodulation, anti-glaucoma, neuroprotection, anti-fatigue/endurance, cytoprotection and antitumour activity. Numerous studies indicated the powerful antioxidant potentialities achieved from *L. barbarum* molecules, to act as promotions for various health protective effects (Abdennacer *et al.*, 2015). It is well documented that several traditional herb and plant extracts have antioxidant properties and are potential candidates for the prevention and treatment of ROS-induced diseases (reactive oxygen species) (Li *et al.*, 2007). Dried Goji fruits (*L. Chinese*) has the highest content of total polyphenols and vitamin C based on the cellular juice concentration due to fruits dehydration. Extraction with alcohol 80% as well as with hydrochloric acid 2% have resulted in the highest values of the polyphenols content while the highest antioxidant activity was found by using as solvent the hydrochloric acid 2%, normally used for vitamin C determination. The DPPH method was affected by the content of vitamin C. Yu *et al.* (2006) mentioned that the pharmacological activities associated with *L. barbarum* include hypoglycemic, immunomodulation, anti-hypertension, lipotropic, protecting hepatic function, anti-aging, anti-fatigue, antioxidant and so on. Some Researches indicated that components of berry fruits especially Goji berry may inhibit replication of the virus both directly and indirectly, e.g. by blocking surface flycoproteins of influenza virus and stimulating immune system of the organism; in consequence to its properties berry fruits, Goji berry included, are raw materials of potential use in the prevention and treatment of influenza (Chan *et al.*, 2009).

Macronutrients include carbohydrates, protein, fat, and dietary fiber. 68% of the mass of dried wolf berries exists as carbohydrate, 12% as protein, and 10% each as fiber and fat, giving a total caloric value in a 100 gram serving of 370 (kilo) calories, of which 272 come from carbohydrates and 90 of which come from fat.

Micronutrients include the following:

1. 11 essential and 22 trace dietary minerals
2. 18 amino acids
3. 6 essential vitamins
4. 5 unsaturated fatty acids, including the essential fatty acids, linoleic acid, and alpha-liolenic acid
5. Beta-sitosterol and other phytosterols
6. 5 carotenoids, including beta-carotene and zeaxanthin (below), lutein, lycopene and cryptoxanthin, a xanthophyll
7. Numerous phenolic pigments (phenols) associated with antioxidant properties

Table 1. The most important health benefits of Goji berry.

Helps to slow down the growth of cancer cells
Helps to improve gastrointestinal functions
Aids in improving eyesight and protects skin against UV rays
Effective in increasing semen quantity and improving sperm quality
Beneficial in reducing stress and fatigue
Reduces risk of cardiovascular diseases
Contains high level of anti-oxidant
Helps to protect liver against infections
Helps to reduce high cholesterol
Aids in controlling diabetes
Protects brain cells from damage
Help lower blood sugar level
Boosts immune system
Promote restorative sleep

Medicinal Uses and Potential Health Benefits of Ginger in Modern Medicine industry

Minerals content of ginger for ginger root (Ground) consists of Calcium (114 mg per 100 g), Iron (19.8 mg per 100 g), Magnesium (214 mg per 100 g), Manganese (33.3 mg per 100 g), Phosphorus (168 mg per 100 g), Potassium (1320 mg per 100 g), Sodium (27 mg per 100 g), and Zink (3.64 mg per 100 g), and minerals contents for ginger root (Raw) are Calcium (16 mg per 100 g), Iron (0.6 mg per 100 g), Magnesium (43 mg per 100 g), Phosphorus (34 mg per 100 g), Potassium (415 mg per 100 g), Sodium (13 mg per 100 g), and Zink (0.34 mg per 100 g). It was found that ginger contained 1.5%-3% essential oil, 2-12% fixed oil, 40-70% starch, 6-20% protein, 3-8% fibre, 8% ash, 9-12% water, pungent principles, other saccharides, cellulose, colouring matter and trace minerals (Soltani *et al.*, 2018). The antiemetic effect of ginger has been known as a treatment method in traditional medicine especially the Chinese and Iranian Medicine (Niksokhan *et al.*, 2014). Niksokhan *et al.* (2014) reported that ginger has been used in Traditional Medicine of Iran as an anti-edema drug and is used for the treatment of various diseases including nausea, gastrointestinal disorders, respiratory disorders, athero-sclerosis, migraine, depression, gastric ulcer, cholesterol; and other benefits of giner are reducing pain, rheumatoid arthritis, anti-inflammatory, and antioxidant effects. 6-gingerol was reported as the most abundant bioactive compound in ginger with various pharmacological effects including antioxidant, analgesic, anti-inflammatory and antipyretic properties. The shogaols can be partially transformed to paradols upon cooking or metabolized to paradols in the animals' body after being consumed and absorbed by digestive system. Gingerol and shogaol in particular, is known to have anti-oxidant and anti-inflammatory properties (Oludoyin and Adegoke, 2014). Ginger extract can remove disorders caused by oxidative stresses as a strong anti-oxidant. Studies have shown that extant phenolic compounds and anthocyanins including gingerols and the sugevals had many neuro protective effects such as analgesic effects, memory improvement, and learning caused by the aging process. For culinary purposes ginger is suitable for all dished both sweet such as drinks, puddings, apple pie, cakes, breads, candies, etc; and savory such as soups, sauces, stews, savory puddings, grills, roasts, etc). Oludoyin and Adegoke (2014) stated that the active hypoglycemic component of ginger was not affected by heat, hence, the consumption of ginger in raw and cooked forms in different cuisines maybe an effective regimen in the management of diabetes. Similarly, the medicinal uses of ginger are enormous such as exert anti microbial, anti nausea, anti pyretic, analgesic, anti-inflammatory, hypoglycaemic, anti ulcer, antiemetic, cardio tonic, anti-hypertensive, hypolipidemic, anti-platelet aggregation effects in both laboratory animals and human subjects. Turmeric is one of the main ingredients for curry powder, and used as an alternative to medicine and can be made into a drink to treat colds and stomach complaints. In folk medicine, turmeric has been used in lowering blood pressure and as tonic and blood purifier. Phytochemical investigation of several types of ginger rhizomes has indicated the presence of bioactive compounds, such as gingerols, which are antibacterial agents and shogaols, phenylbutenoids, diarylheptanoids, flavanoids, diterpenoids, and sesquiterpenoids (El Makawy et al, 2019). It has been proved in some researches that ginger leaves has great potential to be developed into functional foods and other health products, because it has higher antioxidant activity than rhizomes and flowers. When compared to the Indian varieties, the Chinese ginger is low in pungency and is principally exported as preserves in sugar syrup or as sugar candy. Semwal *et al.* (Semwal *et al.*, 2015) reported that an infusion of ginger rhizomes with brown sugar is administered to relieve common

colds, while scrambled eggs with powdered ginger is taken as a home remedy to reduce coughing in China. While, ginger is used in the United States as a remedy to alleviate motion sickness and morning sickness during pregnancy and to reduce hear cramps. Furthermore, there are many studies that proved their beneficial effects against the symptoms of diseases, acting as anti-inflammatory, anti-tumour, anodyne, neuronal cell protective, anti-fungal and anti-bacterial agent. Various ginger compounds and extracts have been tested as anti-inflammatory agents, where the length of the side chains determines the level of the effectiveness. But, a combination of ginger extracts is more effective in decreasing inflammatory mediators than an individual compound. The active ingredients in ginger are thought to reside in its volatile oils. The major ingredients in ginger oil are bisabolene, zingiberene, and zingiberol. Some other scientists noted that the interest in ginger is endorsed to its several biologically active compounds content such as gingerol, shogaols, gingerdiol, gingerdione, α-zingiberene, curcumin, and β-sesqui-phellandrene. Ginger has been part of the folk medicine and popular nutraceuticals. Ginger consists of a complex combination of biologically active constituents, of which compounds gingerols, shogoals and paradols reportedly account for the majority of its anti-cancer inflammatory properties. 6-paradol was suggested as a therapeutic agent to effectively protect the brain after cerebral ischemia, likely by attenuating neuroinflammation in microglia. *Zinger officinale* used as a condiment in several countries but also it acts as a treatment for ailments; for instance, gastrointestinal disorders, colds, arthritis, hypertension and migraines. The anti-spasmodic effect of Ginger is due to the blocked of cyclooxygenase and 5-lipoxygenase. Also, it has been reported that ginger lowers blood pressure through blockade of voltage dependent calcium channels. Khaki *et al.* (2012) reported that ginger has a protective effect against DNA damage induced by H_2O_2 and maybe promising in enhancing healthy sperm parameters. In Iran, traditionally ginger rhizome was used for enhancing male sexuality, regulating female menstrual cycle, and also reducing painful menstrual periods. Adib Rad *et al.* (2018) reported that ginger as well as Novafen is effective in relieving pain in girls with primary dysmenorrhea, and treatment with natural herbal medicine, non-synthetic drug, is recommended to reduce primary dysmenorrhea. Karangiya *et al.* (2016) concluded that the supplementation of garlic improves the performance of broilers when added at the rate of 1% of broiler and can be a viable alternative to antibiotic growth promoter in the feeding of broiler chicken. Manju and Nalini (2010) found that ginger supplementation to 1,2-dimethyl hydrazine (DMH) treated rats inhibited colon carcinogenesis, as evidenced by the significantly decreased number and incidence of tumours; in addition ginger optimized tissue lipid peroxidation and antioxidant status in DMH treated rats. Dinesh *et al.* (2015) suggested that for growth promotion and management of soft rot disease in ginger, GRB35 B. amyloliquefaciens and GRB68 S. marcescens could be good alternatives to chemical measures; they also recommend the use of B. amyloliquefaciens for integration into nutrient and disease management schedules for ginger cultivation. Mahsani and Bukhari (Mahassni and Bukhari, 2019) found that the extract of ginger rhizome have different effects on cells and anti-bodies of the immune system in smokers and non-smokers, although both benefited from enhancement of the thyroid gland. In their research, it has been found that ginger maybe beneficial for smokers with anemia, while for non-smokers, it may lead to a stronger antibody response or humoral immunity against infections. Malhotra and Singh (2003) also mentioned the effect of ginger on lowering cholesterol, and anti-hyperlipidemic agent, the role of ginger in the treatment of nausea and vomiting (anti-emetic), ginger possesses anti-skin tumour promoting effects, and that the mechanism of such effects may involve inhibition of tumour promoter-caused cellular, biochemical, and molecular changes (Chemo-protective), anti-viral activity, anti-motion and anti-nauseant effects, anti-inflammatory, diminishing or eliminating the symptoms of hyperemesis gravidarum, ginger influence on exert abortive and prophylactic effects in migraine headache without any side effects and anti-ulcerogenic, Ginger and its constituent play pharmacological effects in cancer management via modulation of molecular mechanism, and the mechanism consist of Inhibition of VEGF, Activation of Bax, Inhibition of Lypoxygenase, Activation o P53, Inhibition of Interlukin, Inhibition of Bcl2 & Survivin, Inhibition of Cycloxygenase, Inhibition of IFN-γ, Suppression of TNF & NF-kB and Activation of G0/G1 phase (Rahmani et al, 2014). Accumulating evidence suggests that many dietary factors maybe used alone or in combination with traditional chemotherapeutic agents to prevent or treat disease, and ginger is example of medicinal plants which is gaining popularity amongst modern physicians (Beccaria *et al.*, 2018).

Bioactive phytochemicals and their therapeutic roles of Ginseng

Panax ginseng is constituted of organic (80%-90%) and inorganic substances (approximately 10%) and consists of a number of active constituents, such as saponins or ginsenosides, carbohydrates, nitrogenous substances, phytosterol, essential oils, organic acids, amino acids, peptidoglycans, carbohydrate, nitrogen-containing compounds, fatty acids, vitamins, minerals and other phenolic compounds (Pace *et al.*, 2015). Medicinal plants can be important source of previously unknown chemical substances with potential therapeutic effect. They have shown that the main active components of *Panax ginseng* are ginsenosides which have been shown to have a variety of beneficial effects. Ginsenosides are classified into two main groups known as protopanaxadiol (PPD) and protopanaxatriol (PPT), based on the hydroxylation pattern at C6 and attachment of sugar moieties (Patel and Rauf, 2017).

Table 2. *Panax* bioactive phytochemicals and their proven therapeutic roles.

Panax ginseng (Chinese ginseng) *Panax quinquefolius* (American ginseng)	
Ginsenoside (Rb, Rc, Rd, re, Rf, Rg, Rh) Polysaccharides Oligosaccharides Saponins	
1)	Anticancer effect
2)	Protection against Diabetic retinopathy and cardiomyopathy
3)	Neural stem cell proliferation
4)	Attenuation of β-amyloid generation
5)	Protection from ischemia-induced oxidative stress and apoptosis
6)	Protection from impairment of hippocampal neurons
7)	Attenuation of pathogen virulence factors production
8)	Treatment of erectile dysfunction
9)	Fatigue alleviation in multiple sclerosis
10)	Prevention of atopic dermatitis and rheumatoid arthritis
11)	Amelioration of high fat diet-induced obesity

Table 3. Classification of ginsenosides in *Panax spp*.

Protopanaxadiol group (PPD)	**Protopanaxatriol group (PPT)**	**Others**
Rb1, Rb2, Rb3	Re	F11 ocotillo saponin (*P. quinquefolius* only)
Rc	Rf (*P. ginseng* only)	Oleanane saponins
Rd	Rg1, Rg2	Quinquenosides
Rg3	Rh1	
Rh2		
Rs1		

Table 4. Different concepts of the Ginseng products between countries.

Country (Region)	**Type**	**Type**
	Root	Processed product
Korea	Food	Food
China	Drug	Health food/New resource for food
Hong Kong	Food	Food
Taiwan	Drug	Food
Japan	Food	Food
Vietnam	Drug	Food
The US	Food	Dietary supplement
Canada	Food	Food/Health Food
France	Drug	Food supplement
Russia	Drug	Drug/Food
Thailand	Drug	Food
Spain	Drug	Food

Table 5. Some pharmacological effects of ginsenosides.

Compound	Pharmacological action
Rb1	Estrogen- like activity
	Anti-diabetic, insulin sensitizing
	Antiobesity
	Angiogenesis inhibitor
	Neurotropic, neuroprotective
Rc	Inhibit proliferation of breast cancer cells
Re	Anti-diabetic
	Antioxidant, cardioprotective
Rg1	Neurotropic, neuroprotective
	Ligand for glucocorticoid
	Receptor
	Suppresses oxidative stress
	Promotes angiogenesis
Rg2	Neuronal Ach inhibitor
Rg3	Inhibits proliferation of prostate cancer cells
Rh1	Activates estrogen receptor
Rh2	Cytotoxic, inhibits breast cancer cell proliferation
	Inhinits prolideration of prostate cancer cells
F11	Assists memory improvement Neuroprotective

Patel and Rauf (2017) also mentioned antioxidant, anti-inflammation, anti-fatigue, anti-diabetic, anti-tumor, immunomodulation, anti-obesity, cardioprotective, anti-microbial, neuroprotective and aphrodisiac properties. They have presented the potential of ginseng as a complementary and alternative medicine (CAM). Ginseng polysaccharides are composed of starch-like glucan and pectin with pectin accounting for around 20% of water-soluble polysaccharides (Sun *et al.*, 2019). Ginsenosides are distributed in many parts of the ginseng plant including the root, leaf and berry. Different parts of the plant contain distinct ginsenoside profiles, which may exhibit different pharmacological activities (Wan *et al.*, 2015). Wan *et al.* (2015) concluded that the contents of malonyl ginsenosides, amino acids, and polysaccharides, based on decreasing order, ranked as follows: fresh ginseng >frozen ginseng >white ginseng >stoved ginseng >red ginseng >black ginseng. They have also mentioned that processing should be paid more attention for the quality control of ginseng products. A lot of studies have been conducted on the pharmacological properties of Ginseng extract such as lipid-lowering, anti-allergic, anti-diabetic, anti-inflammatory, hypoglycemis and anti-stress, anti-aging, anti-diabetic, anti-carcinogenic, anti-fatigue, anti-adhesive, anti-depressive, hypocholesterolemic and hypolipidemic, hepatoprotective activities, immune-modulatory activities, improving working memory and perceptual systems, stimulation and inhibition of central nervous system, and inhibiting the growth of tumor cells, especially in female reproductive system (Balusamy *et al.*, 2019). Kim *et al.* (2011) confirmed the use of Ginseng as an anti-oxidant supplement. Kim *et al.* (2018) also found that *P. ginseng* might be a potential alternative medicine for the prevention and treatment of natural aging-induced osteoporosis in human. Kuo *et al.* (2003) reported that glutamine and arginine were the two major free proteinogenic amino acids in the ginseng plants and together they constituted over 50% of all the free amino acids detected in the root. Lee and Rhee (2017) reported that the potential use of ginseng in the prevention and treatment of chronic inflammatory diseases such as diabetes, rheumatoid arthritis, and allergic asthma.

Table 6. Important ginseng ‘s effects and its possible actions on different body ‘s systems.

Subject	Ginseng ‘s effect	Possible action
Whole body	General tonic and adaptogen	1) Resistance against adverse conditions (Physical, chemical and biological factors).
		2) Restores body ‘s homeostasis
		3) Anti-aging effects
Central Nervous System	Neuroprotection either in vivo or in vitro	1) Potentiates nerve growth factor
		2) Anti-oxidative and anti-apoptotic mechanisms
		3) Reduces lipid peroxidation
		4) Inhibits excitotoxicity and Ca^{2+} over-influx

		into neurons 5) Maintains cellular ATP levels 6) Preserves structural integrity of neurons
	Glial cells	1) Prevents astroglial swelling 2) Inhibits microglial respiratory burst activity and NO production by activated microglia
	Increasing cognitive performance (learning & memory)	1) Modulates neurotransmission 2) Direct effect on hippocampal neurons
Cardiovascular system	Antihypertensive	1) Relax vascular smooth muscle cells through NO and Ca^{2+} medicated mechanisms 2) Inhibits production of endothelin which plays a role in blood vessel constriction
	Anti-atherosclerotic effect	1) Prevents platelet aggregation 2) Shows antagonistic action for platelet activity factor 3) Suppresses thrombin formation
	Acceleration of wound healing	1) Promotes functional neovascularisation through endothelial proliferation
Inflammation and allergy	Anti-inflammatory and anti-allergic effects	1) Inhibits cytokine production such as IL-1β, IL-6 and TNF-α 2) Abrogates cycooxygenase-2 gene expression 3) Suppresses histamine and leukotrienes release from mast cells 4) Stabilizes inflammatory cells such as neutron-phils and lymphocytes 5) Antifibroblastic activity
Immune system	Immunostimulant	1) Enhances interferon induction, phagocytosis, natural killer cells, and B and T cells
Carcinogenesis	Anti-carcinogenic effect	1) Suppresses malignant transformation 2) Inhibits proliferation of tumor cells 3) Inhibits tumor invasiveness, metastasis and angiogenesis
Aphrodisiac effect	Enhancement of male copulatory behaviour	1) Relaxes corpus cavernosum smooth muscles via NO mediated processes 2) Increases serum testosterone levels and reduces plasma levels of prolactin hormone 3) Direct effects on anterior pituitary and hypo-thalamic dopaminergic mechanisms
Hyperglycemia	Anthihyperglycemic activity	Increases plasma insulin levels, the number of insulin receptors and insulin sensitivity

Table 7. Key points about Panax ginseng.

Efficacy	1) Psychologic functioning: effective; conflicting evidence 2) Physical performance: ineffective 3) Immune system: effective 4) Diabetes: modest effect; evidence limited
Adverse effects	Nausea, diarrhea, euphoria, insomnia, headaches, hypertension, hypertension, mastalgia, vaginal bleeding, blood pressure abnormalities
Interactions	Caution advised about concomitant use with phenelzie (Nardil), warfain (Coumadin), oral hypoglycemics, insulin, or caffeine, and about use in patients with hypertension or bleeding
Bottom line	A safe, well-tolerated herbal medicine that may be used for a variety of medical conditions

CONCLUSIONS

Traditional Chinese Medicine (TCM) has been used for thousands of years by different generations in China and other Asian countries as foods to promote good health and as drugs to treat disease. Goji berry contains polysaccharides, carotenoids, including zeaxanthin, vitamins, and flavonoids. The roots contain alkaloids, flavonoids, betaine, and vitamins E, B1, B2 and B6. Additionally, Goji berries are rich in ascorbic acid, thiamine and riboflavin. Moreover, Goji berries contain carbohydrates (arabinose, rhamnose, xylose, galactose, mannose and glucose), organic acids (malic acid, citric acid, shikimic acid, and fumaric acid), and so many minerals like potassium, sodium, phosphorus, magnesium, iron, calcium, zinc and selenium. Modern Goji pharmacological actions are improving function, enhances the body 's ability to adapt to a variety of noxious stimuli; it significantly inhibits the generation and spread of cancer cells and can improve eyesight and increase reserves of muscle glycogen and liver glycogen which may increase human energy and has anti-fatigue effect. Goji berries may improve brain function and enhances learning and memory. It may boost the body 's adaptive defences, and significantly reduce the levels of serum cholesterol and triglyceride, it may help weight loss and obesity and treats chronic hepatitis and cirrhosis. Ginger is used worldwide as a cooking spice, condiment and herbal remedy, and it is also extensively consumed as a flavouring agent. Ginger, a plant in the *Zingiberaceae* family, is a culinary spice that has been as an important herb in Traditional Chinese Medicine for many centuries. More than 60 active constituents are known to be present in ginger, which have been broadly divided into volatile and non-volatile compounds. The pharmacological activities of ginger were mainly attributed to its active phytocompounds 6-gingerol, 6-shogaol, zingerone beside other phenolics and flavonoids. Gingerol and shogaol in particular, is known to have anti-oxidant and anti-inflammatory properties. Medicinal properties associated with ginger are, anti-inflammatory properties, anti-thrombotic properties, cholesterol-lowering properties, blood pressure-lowering properties, anti-microbial properties, anti-oxidant properties, anti-tumor properties, and hypoglycaemic properties. Consumption of ginger also has beneficial effects on heart disease, cancer, hypertension, obesity, diabetes, osteoarthritis, and bacterial infections. In most parts of the world, especially western countries, Ginseng has been increasingly used in the last decades and has become well known for its significant role in preventing and treating so many diseases *Panax ginseng* has consisted of a number of active constituents, such as saponins or ginsenosides, carbohydrates, nitrogenous substances, phytosteril, essential oils, organic acids, amino acids, peptidoglycans, carbohydrate, nitrogen-containing compounds, fatty acids, vitamins, minerals and other phenolic compounds. Ginsenosides are classified into two main groups known as protopanaxadiol (PPD), and protopanaxatriol (PPT). Pharmacological activities of ginseng extracts are effects on the central nervous system; antipsychotic action; tranquilizing effects; protection from stress ulcers; increase of gastrointestinal motility; anti-fatigue action; endocrinological effects; enhancement of sexual behaviour; acceleration of metabolism; or synthesis of carbohydrates, lipids, RNA, and proteins. In Traditional Chinese Medicine, ginseng help to maintain a healthy immune system. All in all, this review article allowed verifying that Goji berries, Ginger and Ginseng are sources of compounds with valuable nutritional and bioactive properties and, therefore, they could be useful for incorporation into foods with functional properties. These ancient medicinal herbs can also provide industrial sustainability and could be considered as organic food, fruits and medicine in both Asian countries but also western countries.

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