Print ISSN: 2958-3675 || Online ISSN: 2958-3683
Original Article
International Journal of Medical and Pharmaceutical Research
Journal Home Page: www.ijmpr.in
Vol-2 Iss-1, JAN-JUN 2021

A Brief Study On Ginseng *(Panax Ginseng)*

Navneet Kumar Verma[1*]; Ankur Yadav, Vikas Yadav[1]
Associate Professor, Buddha Institute of Pharmacy, GIDA, Gorakhpur, UP, India

A B S T R A C T
Ginseng has been around since prehistory. Shennong, also known as Emperor Yan, the Yellow Emperor, or one of the "Three Emperors" (the Emperor who is supposed to have founded herbal medicine some 5,500 years ago), is said to have tasted hundreds of plants in order to discover many medicinal herbs in China. For thousands of years, humans have used diverse plants as nutrients, beverages, cosmetics, dyes, and medicines to maintain health and improve quality of life. Panax ginseng C.A. Meyer is regarded the most valuable plant among herbs, particularly in Asia, and ginseng has been in the spotlight globally. Even in the Western world, where modern research facilities and highly qualified man-power are accessible and are thought to be capable of curing any difficult-to-cure condition, many people have recently been reported to use herbal medicine, particularly ginseng. Many scientists contributed papers on "Chemopreventive effects of ginseng" to the current collection of papers. I categorised this collection as follows to help readers grasp it better and easier: The spiritual aspect of ginseng in the Far East, the history of ginseng, ginseng nomenclature and geographical distribution, and the various ginseng products.

Keywords: *Ginseng; Chemoprevention; Panax ginseng.*

***Corresponding Author**
Navneet Kumar Verma
Associate Professor, Buddha Institute of Pharmacy, GIDA, Gorakhpur, UP, India

INTRODUCTION

Ginseng is the root of various plant species of the genus Panax (C. A. Meyer Araliaceae). Panax ginseng is the most often used ginseng and is native to the Far East (most notably China and Korea). Panax ginseng was initially grown around 11 BC and has a more than 5,000-year medical history. Panax ginseng's genus name "Panax" was provided by Russian botanist C.A. Meyer and is derived from the Greek words "pan" meaning "all" and "axos" meaning "cure." Because ginseng root resembles the human body, the species name "ginseng" is derived from the Chinese term "rensheng" which meaning "human" [1]. Ginseng roots are gathered in China when the plant is 3-6 years old, and the roots are either air dried (white ginseng) or steamed (red ginseng). Surprisingly, the saponin content of the roots differs following these two treatments [1], which could explain why different ginseng preparations have distinct effects. Panax quinquefolius (found in southern Canada and the United States), Panax japonicus (grown in Japan), and the less common Panax notoginseng (grown in China), Panax pseudoginseng (grown in Nepal and the eastern Himalayas), and Panax vietnamensis (grown in Vietnam) [2]. Ginseng is a common herbal medication [3], and it has been used in many Chinese prescriptions for thousands of years [4, 5]. Today, it retains a constant and prominent position on the herbal (best-sellers) list and is usually regarded as the most extensively used herbal product in the world [6]. Furthermore, it is believed that more than six million Americans consume ginseng products on a regular basis [7]. They believe taking ginseng will not only provide bodily benefits, but will also improve their cognitive performance and well-being. Ginsenosides, also known as ginseng saponins, are the primary active elements in ginseng, with over thirty distinct ginsenosides found [8, 9]. Ginsenosides are only found in Panax species and are thought to be responsible for the majority of ginseng's activities [10-13]. Furthermore, ginsenosides have a variety of modes of action, and it has been proposed that each ginsenoside has its own unique tissue-dependent effects [14]. Ginsenosides have a similar fundamental structure. They are made up of a gonane steroid nucleus and 17 carbon atoms organised in four rings. The changes in the type, position, and amount of sugar moieties connected by glycosidic bond at C-3 and C-6 are related to the distinct biological reactions of each ginsenoside [15]. They are categorised into three groups based on their structural differences: the panaxadiol group (e.g. Rb1, Rb2, Rb3, Rc, Rd, Rg3, Rh2, Rs1), the panaxatriol group (e.g. Re, Rf, Rg1, Rg2, Rh1), and the oleanolic acid group (e.g. Ro) [5, 16]. Interestingly, the ginsenoside concentration of ginseng varies depending on Panax species, plant age, plant portion, preservation method, harvest season, and extraction method [17, 18].

Table.1; Scientific Classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids

Order:	Apiales
Family:	Araliaceae
Genus:	*Panax*
Species:	*Panax ginseng*

Fig.1; *Panax ginseng*

Fig.2; *Panax quinquefolius* L.

Pharmaceutical Constituents

Panax ginseng includes triterpene glycosides, sometimes known as saponins or ginsenosides. Many active substances, such as amino acids, alkaloids, phenols, proteins, polypeptides, and vitamins B1 and B2, can be found in all parts of the plant.3 Thin layer chromatography (TLC) and methanol extraction tests have found up to 40 different ginsenosides. Ginsenosides are designated by the abbreviation Rx, where x signifies the retention factor (Rf) value from the bottom to top sequence of spots on TLC. Ginsenosides are categorised into two primary sub-types: protopanaxadiol and protopanaxatriol, based on the arrangement and amount of sugar residues - glucose, rhamnose, xylose, and arabinose - on the ginsenosides. Rb1, Rb2, Rc, and Rd are examples of protopanaxadiol ginsenosides. Re, Rf, Rg1, and Rg2 are examples of protopanaxatriols. [19-24] These ginsenosides have varying concentrations in red and white Panax ginseng extracts due to different processing method that affect deacetylating enzymes within the raw plant material.[25]

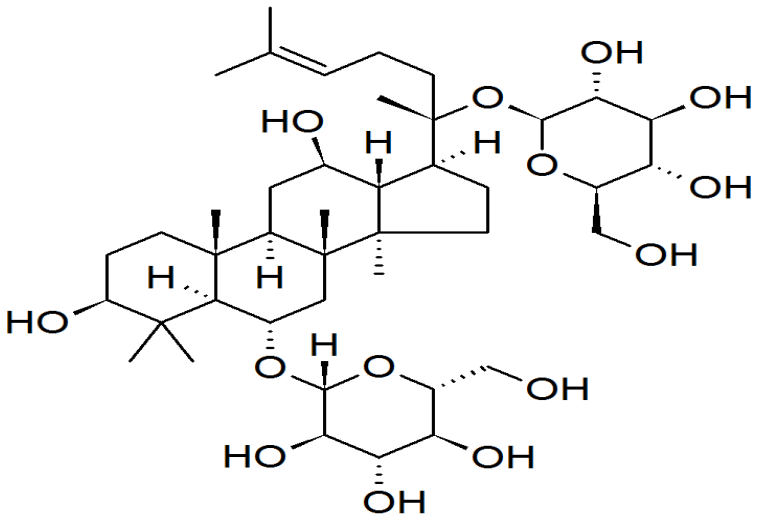

Fig.3; Ginsenosides

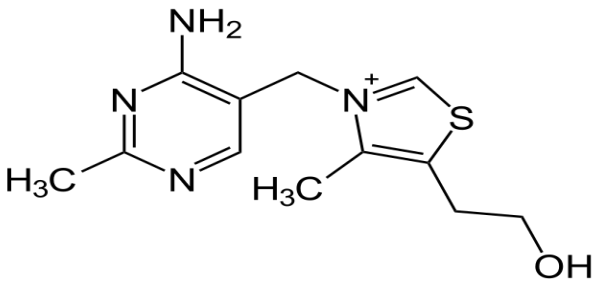

Fig4; Vitamin B1

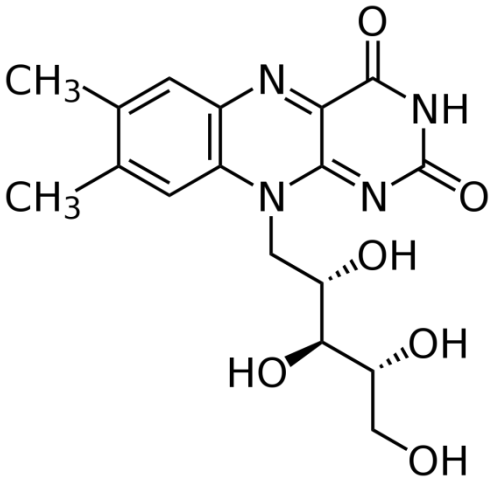

Fig.**5**; Vitamin B2

Pharmacokinetics

Recent study supports the concept that gut bacteria activate ginsenosides via deglycosylation and esterification. Protopanaxadiol and protopanaxatriol glycosides enter the bloodstream or lymphatic system and are delivered to target tissues for esterification with stearic, oleic, or palmitic fatty acids. M1 (20S-protopanaxadiol 20-O-B-D-glucopyranoside) and M4 (20S-protopanaxatriol) are ginsenoside metabolites that alter excretion and utilisation.[26]

Mechanism of Action

Panax ginseng is often referred to as an adaptogen, which suggests it has varied actions and effects on the body that support nonspecific resistance to biochemical and physical stressors, improve vitality and longevity, and enhance mental capacity. [20,27,28] Reviews suggest Panax ginseng has immunomodulating activity by affecting the hypothalamic-pituitary-adrenal (HPA) axis.3,11In vitro experiments reveal enhanced natural killer (NK) cell activity and increased immune cell phagocytosis after ginsenoside exposure.[20] According to a 1999 World Health Organization review, ginseng saponins "are thought to decrease serum prolactin, thereby increasing libido" in male impotence.[29]

Immune Modulation

A double-blind, placebo-controlled eight-week study examined the immune effects of 100 mg Ginsana (G115), 100 mg liquid ginseng extract, or placebo twice daily in 60 healthy volunteers. Blood samples collected at baseline, week four, and week eight examined polymorphonuclear (PMN) cell chemotaxis, phagocytosis, total lymphocytes, T-helper and T-suppressor cells, and NK-cell activity. The groups receiving ginseng experienced consistent improvement in immune system activity at week four and statistically significant Differences at week eight, evidenced by improvements in PMN cell chemotaxis, phagocytosis, and total number of T-helper and T-suppressor cells. The authors concluded ginseng extract stimulates the immune system and the standardized extract is more effective than the liquid ginseng extract.[30] Some of the same researchers examined the effects of Panax ginseng extract on the immune response to vaccination. The multicenter, 12-week, double-blind RCT compared immune response in 227 participants, measured as NK-cell activity, at weeks eight and 12, post influenza vaccine given at week four. The treatment group received 100 mg G115 twice daily. NK-cell activity for the ginseng group was double that of the placebo group ($p<0.0001$) at weeks eight and 12. Serum antibody titers were 272 units in the ginseng group compared to 171 units in the placebo group. A significant decrease in the frequency of upper respiratory infections during weeks 4-12 was noted in the treatment group compared to placebo; 15 cases versus 42 cases, respectively. This study supports the role of ginseng in immune system modulation. [31] An RCT compared the effects of red Panax ginseng on HIV-1 infected patients (n=61).[32] The purpose of this study was to determine the effects of red Panax ginseng after accounting for HLA type (I or II and class A, B, and C), on CD4 counts, CD8 counts, and the trend toward decreased resistance to anti-Retroviral drugs. HLA type can be associated with an improved prognosis in HIV patients, based on an algorithm that also predicts risk of disease progression.[33] The treatment group received 5.4 g red Panax ginseng daily. Blood samples were taken from the control group (n=199) and HIV-1 infected patients every six months throughout the study. Data analysis revealed an inverse

correlation between the HLA score and the decrease of CD4 T cells over time, a decrease in the decline of CD4 T cells associated with the intake of red Panax ginseng, and a significant ($p<0.05$) decline of CD4 T cells, independent of the HLA class I effects on immune system cells. The authors concluded that red Panax ginseng and HLA type independently affect the slow depletion of CD4 T cells in HIV-infected patients.

Diabetes

Eclectic medicine texts reference Panax ginseng for its beneficial use in blood sugar regulation. [19,34] In a double-blind RCT, Sotaniemi et al examined the efficacy of Panax ginsengin newly diagnosed type 2 diabetics.[24] Parameters measured included physical performance, mood, serum lipids, fasting blood glucose, hemoglobin A1c (HbA1c), amino terminal propeptide (PIIINP) concentration, and body weight. PIIINP serum levels are associated with coronary artery disease and were used as a safety parameter in this study. The study participants (n=36) were given 100 mg ginseng extract, 200 mg ginseng extract, or placebo daily for eight weeks. Compared to the placebo group, the 200-mg ginseng group experienced elevated mood, improved physical performance, and reduced fasting blood glucose. The authors concluded ginseng warrants further study as an adjuvant to diabetes management. A 2005 double-blind, crossover RCT examined the effects of Panax ginseng on blood glucose levels and cognitive performance during sustained mental activity.[35] Healthy young adults (n=30) took a 10-minute test battery for baseline results, then were given 200 mg G115, 400 mg G115, or placebo. One hour later the test battery was repeated six times in rapid succession. Blood sugar levels were assessed at baseline and twice during the testing procedure. The 200-mg and 400-mg G115 doses reduced blood glucose levels significantly ($p<0.005$). Significant improvement was also noted in the ability to complete the serial sevens subtraction task after taking 200 mg G115 ($p<0.05$). The authors concluded Panax ginseng improves mental performance, possibly by regulating glucose metabolism. A double-blind, 12-week RCT examined the effect of red Panax ginseng on HbA1c levels in 19 subjects with well-controlled type 2 diabetes.[36] Study participants received 2 g ginseng or placebo three times daily before meals. Plasma glucose and insulin, insulin sensitivity, and oral glucose tolerance were secondary measures of efficacy, while blood pressure checks and liver and kidney function tests assessed safety. Although no change was seen in HbA1c levels with ginseng, the participants remained well controlled throughout the study without pharmaceutical intervention – with average levels of HbA1c of 6.5 percent. A significant 8- to 11-percent decrease in glucose on the oral glucose tolerance test and 33-percent decrease in plasma insulin ($p<0.05$) was seen in the ginseng group compared to placebo. No change was reported in safety parameters throughout the study, which led the authors to conclude red Panax ginseng is safe to use in the treatment of type II diabetes.

Cancer Prevention

Numerous in vitro and animal studies have examined the interaction of Panax ginseng with carcinogenesis, apoptosis, angiogenesis, and metastasis.[24,37-40] A recent paper proposed an anti-inflammatory role of Panax ginseng in the sequence of progression to promotion in a model of carcinogenesis.[41] Panax ginseng affects multiple points within the inflammatory cascade, including inhibition of cyclooxygenase-2 (COX-2), inducible nitric oxide synthase (iNOS), and nuclear factor kappa B (NF-κB).[42,43] In a review, Lee et al concluded Panax ginseng has a radio protective effect associated with antioxidant and immune-modulation properties.8An epidemiological study examined the protective effect of a variety of Panax ginseng products on 3,974 patients with different types of cancer compared to case-matched controls for 67 weeks.[44] Patients taking ginseng demonstrated a 50-percent lower risk of cancer recurrence compared to patients not taking ginseng. Red ginseng offered greater protection than white ginseng. Cancer incidence decreased by 36- and 69 percent in subjects taking ginseng for one year or five years, respectively. A greater protective effect was seen in cancers of the lip, esophagus, pharynx, lung, and liver. A prospective study examined non-organ specific cancer prevention of Panax ginseng.[45] This cohort study used case-controlled matches (n=4,587) of Koreans over age 40. A questionnaire was used to determine pattern of ginseng intake, initial age of ginseng intake, frequency, duration, and form of ginseng (fresh, dried, etc.) used by study participants. Ginseng intake correlated with a 60-percent reduction in cancer incidence, with a direct dose-response relationship. Drug-Botanical Interactions According to a review by Blumenthal et al, there are no known interactions between Panax ginseng and pharmaceuticals, as reported by the German Commission E.[20,46] Caution is advised with concomitant use with phenelzine, coumadin, oral hypoglycemics, insulin, and caffeine, based on preclinical studies and proposed mechanisms of action.[28,47] A recent review by Seely et al suggests cautious use of Panax ginseng in pregnancy and lactation, although no specific teratogenic or hormone-disrupting activity was noted.[22]

Common names [48]

American ginseng, Asiatic ginseng, Chinese ginseng, five- fingers,Japanese ginseng, jintsam, Korean ginseng, ninjin , Oriental ginseng, schinsent, seng and sang, tartar root, Western ginseng

Plant Descriptions

Botanical description Panax ginseng belongs to the Araliaceae family and is found throughout East Asia and Russia.[49-50] It grows natively in remote forests of Manchuria and North Korea, but has become over-harvested in other parts of Asia.4 It is cultivated in Korea, China, and Japan for export and use as a medicinal herb.Panax ginseng is a shade- loving, deciduous perennial with five- fingered leaves, tiny white flowers, red berries, and a yellowish- brown root.5- 7 The root is utilized medicinally, although active compounds are present in all other parts of the plant. The root of Panax ginseng is a thick structure

that resembles a human- like form, whichis responsible for its name in Chinese, jen shen, or "man- root."5 Panax is derived from the Latin word panacea, which refers to its historical usage for many conditions. There are two distinct forms of Panax ginseng, red and white ginseng. The difference is the method of processing that results in different pigment compositions; white ginseng is produced by harvesting the root and drying it in the sun,6 while red ginseng is steamed after harvest and dried. The content of ginsenoside compounds differs slightly between the red and white forms. Growing time also impacts ginsenoside content,with roots from plants older than five years being more potent than roots from one- to two- year- old plants.6,7 Ginseng is a perennial herb long known for the reputed medicinal and aphrodisiac properties of its aromatic root. The genus name Panax reflects the reputed value of various species of ginseng as a cure all- - or panacea. The unbranched stem is 20 - 40 cm (8 - 15 in.)high and is topped by a single whorl of 1 to 5 palmately compound leaves. Usually, three compound leaves are produced, each with five serrate (pointed and toothed) leaflets. The tiny flowers are produced in a single, ball- like cluster in the fork where the leaf stalks meet the stem. The five- petalled flowers are white or greenish- yellow and are scented like lily- of- the- valley. They appear from late June to mid July. Fruits, bright red drupes one cm (0.4 in.) in diameter, are easily seen in the fall. (Ginseng plants less than three years old usually bear no fruit, and it takes 18- 22 months between the time when the ripe fruit drops to the ground and the time the seed will germinate.)

CONCLUSION

Different bioactivities of Panax ginseng and Panax quinquefolium have lately been established not only clinically, but also at the cellular and molecular levels. The pharmacological effects are influenced by the content of each bioactive component, as well as its efficacy and/or potency. However, as with other botanic goods, P ginseng and P quinquefolium suffer from variation in quality. Ginsenosides (ginseng saponins) are the pharmacologically active compounds in ginseng. There is currently growing data in the literature on the pharmacological and physiological activities of ginseng. Ginseng was traditionally used as a tonic to energise tired bodies and aid in the restoration of equilibrium. However, recent in vivo and in vitro research have revealed that it is advantageous in a variety of clinical conditions such as cardiovascular disease, cancer, immunological insufficiency, and hepatotoxicity. Furthermore, new study suggests that certain of ginseng's active components may help with ageing, CNS problems, and neurodegenerative diseases. In general, antioxidant, anti-inflammatory, antiapoptotic, and immunostimulant actions are mostly responsible for the potential protective mechanisms produced by ginseng.

REFERENCES

1. Nocerino E, Amato M, Izzo AA(2000). The aphrodisiac and adaptogenic properties of ginseng. *Fitoterapia*;71:1-5.
2. Yun TK(2001). Brief introduction of Panax ginseng C.A. Meyer. *J Korean Med Sci*;16:53-55.
3. Rhim H, Kim H, Lee DY, Oh TH, Nah SY(2002). Ginseng and ginse-noside Rg3, a newly identical active ingredient of ginseng, modulate Ca^{2+} channel currents in rat sensory neurons. *Eur J Pharmacol*; 463:151-158.
4. Himi T, Saito H, Nishiyama N(1989). Effects of ginseng saponins on the survival of cerebral cortex neurons in cell cultures. *Chem Pharm Bull (Tokyo)*; 37:481-484.
5. Wen TC, Yoshimura H, Matsuda S, Lim JH, Sakanaka M(1996). Gin-seng root prevents learning disability and neuronal loss in gerbils with 5-minute forebrain ischaemia. *Acta Neuropathol*; 91:15-22.
6. Blumenthal M(2001). Asian ginseng: potential therapeutic uses. *Adv Nurse Pract*; 2:26-28.
7. Smolinski AT, Pestka JJ(2003). Modulation of lipopolysacchride-induced proinflammatory cytokine production in vitro and in vivo by the herbal constituents apigenin (chamomile), ginse-noside Rb1 (ginseng) and parthenolide. *Food and Chem Toxicol*; 41:1381-1390.
8. Liu CX, Xiao PG(1992). Recent advances on ginseng research in China. *J Ethnopharmacol*; 36:27-38.
9. Back NI, Kim DS, Lee YH, Park JD, Lee CB, Kim SI(1996). Ginse-noside Rh4, a genuine dammarane glycoside from korean red ginseng. *Planta Med*; 62:86-87.
10. Attele AS, Wu JA, Yuan CS(1999). Ginseng pharmacology: multiple constituents and multiple actions. *Biochem Pahrmacol*; 58:1685-1693.
11. Fleming T(1998). Physician desk references for herbal medicine. First ed Medical Economics Company, Montvale, NJ.
12. Tyler VE(1993). The Honest Herbal-A Sensible Guide to the Use of Herbs and Related Remedies. Third ed The Haworth Press, New York.
13. Wakabayashi C, Hasegawa H, Murata J, Saiki I(1997). In vivo antime-tastatic action of ginseng protopanaxadiol saponins is based on their intestinal bacterial metabolism after oral administration. *Oncology Res*; 9:411-417.
14. Murphy LL, Lee TJ(2002). Ginseng, sex behavior and nitric oxide. *Ann NY Acad Sci*; 962:372-377.
15. Byun BH, Shin I, Yoon YS, Kim SI, Joe CO(1997). Modulation of protein kinase C activity in NIH 3T3 cells by plant glycosides from Panax ginseng. *Planta Med*; 63:389-392.
16. Tackikawa E, Kudo K, Harada K, Kashimoto T, Miyate M, Kakizaki A(1999). Effects of ginseng saponins on responses induced by various receptor stimuli. *Eur J Pharmacol*;369:23-32.
17. Liberti LE, Der Mardersian A(1978). Evaluation of commercial gin-seng products. *J Pharm Sci*;10:1487-1489.
18. Phillipson JD, Anderson LA(1984). Ginseng-quality safety and effi-cacy? *Pharm J*;232:161-165.
19. Duke J(2000). The Green Pharmacy Herbal Handbook: Your Comprehensive Reference to the Best Herbs for Healing.Emmaus, PA: Rodale:115-116.

20. Blumenthal M(2003). The ABC Clinical Guide to Herbs.New York, NY: Theime:211-225.
21. Weiss R(1988). Herbal Medicine. Gothenburg, Sweden: Beaconsfield Publishers LTD:176-177.
22. Seely D, Dugoua JJ, Perri D, et al(2008). Safety and efficacy of Panax ginseng during pregnancy and lactation. Can J Clin Pharmacol;15:e87-e94.
23. Chong SK, Oberholzer VG(1988). Ginseng – is there a use in clinical medicine? Postgrad Med J;64:841-846.
24. Lee TK, Johnke RM, Allison RR, et al(2005). Radioprotective potential of ginseng. Mutagenesis;20:237-243.
25. Shibata S(2001). Chemistry and cancer preventing activities of ginseng saponins and some related triterpenoid compounds. J Korean Med Sci;16:S28-S37.
26. Hasegawa H(2004). Proof of the mysterious efficacy of ginseng: basic and clinical trials: metabolic activation of ginsenoside: deglycosylation by intestinal bacteria and esterification with fatty acid. J Pharmacol Sci;95:153-157.
27. Hoffmann, D. (2003). Medical herbalism: the science and practice of herbal medicine. Simon and Schuster.
28. Kiefer, D. S., & Pantuso, T. (2003). Panax ginseng. American family physician, 68(8), 1539-1542.
29. World Health Organization(1999). Radix Ginseng. WHO Monographs on Selected Medicinal Plants Vol. 1. Geneva, Switzerland: World Health Organization:168-182.
30. Scaglione F, Ferrara F, Dugnani S, et al(1990). Immunomodulatory effects of two extracts of Panax ginseng C.A. Meyer. Drugs Exp Clin Res; 16:537-542.
31. Scaglione F, Cattaneo G, Alessandria M, Cogo R(1996). Efficacy and safety of the standardised ginseng extract G115 for potentiating vaccination against the influenza syndrome and protection against the common cold [corrected]. Drugs Exp Clin Res; 22:65-72.
32. Sung H, Kang SM, Lee MS, et al(2005). Korean red ginseng slows depletion of CD4 T cells in human immunodeficiency virus type 1-infected patients. Clin Diagn Lab Immunol; 12:497-501.
33. Kaslow RA, Carrington M, Apple R, et al(1996). Influence of combinations of human major histocompatability complex genes on the course of HIV-1 infection. Nat Med;2:405-411.
34. Sotaniemi EA, Haapakoski E, Rautio A(1995). Ginseng therapy in non-insulin-dependent diabetic patients. Diabetes Care; 18:1373-1375.
35. Reay JL, Kennedy DO, Scholey AB(2005). Single doses of Panax ginseng (G115) reduce blood glucose levels and improve cognitive performance during sustained mental activity. J Psychopharmacol;19:357-365.
36. Vuksan V, Sung MK, Sievenpiper JL, et al(2008). Korean red ginseng (Panax ginseng) improves glucose and insulin regulation in well-controlled, type 2 diabetes: results of a randomized, double-blind, placebo-controlled study of efficacy and safety. Nutr Metab Cardiovasc Dis;18:46-56.
37. Yue PY, Mak NK, Cheng YK, et al(2007). Pharmacogenomics and the yin/yang actions of ginseng: anti-tumor, angiomodulating and steroid-like activities of ginsenosides. Chin Med;2:6.
38. Surh YJ, Na HK, Lee YJ, Keum YS(2001). Molecular mechanisms underlying anti-tumor promoting activities of heat-processed Panax ginseng C.A. Meyer. J Korean Med Sci;16:S38-S41.
39. Wargovich MJ(2001). Colon cancer chemoprevention with ginseng and other botanicals. J Korean Med Sci;16:S81-S86.
40. Volate SR, Davenport DM, Muga SJ, Wargovich MJ(2005). Modulation of aberrant crypt foci and apoptosis by dietary herbal supplements (quercetin, curcumin, silymarin, ginseng and rutin). Carcinogenesis;26:1450-1456.
41. Hofseth LJ, Wargovich MJ(2007). Inflammation, cancer, and targets of ginseng. J Nutr;137:183S-185S.
42. Keum YS, Han SS, Chun KS, et al(2003). Inhibitory effects of the ginsenoside Rg3 on phorbol ester-induced cyclooxygenase-2 expression, NF-kappaB activation and tumor promotion. Mutat Res;523-524:75-85.
43. Friedl, R., Moeslinger, T., Kopp, B., & Spieckermann, P. G. (2001). Stimulation of nitric oxide synthesis by the aqueous extract of Panax ginseng root in RAW 264.7 cells. British Journal of Pharmacology, 134(8), 1663-1670.
44. Yun TK, Choi SY(1995). Preventive effect of ginseng intake against various human cancers: a case-control study on 1987 pairs. Cancer Epidemiol Biomarkers Prev; 4:401-408.
45. Yun TK, Choi SY(1998). Non-organ specific cancer prevention of ginseng: a prospective study in Korea. Int J Epidemiol; 27:359-364.
46. Blumenthal M, Goldberg A, Brinkmann J(2000). Herbal Medicine: Expanded Commission E Monographs. Austin, TX: Integrative Medicine Communications;170-177.
47. Brinker FJ(2001). Herb Contraindications and Drug Interactions. 3rd ed. Sandy, OR: Eclectic Medical Publications;107-109.
48. WHO (1999), "Radix Ginseng", in, WHO Monographs on Selected Medicinal Plants, Geneva: World Health Organization, 168-182
49. Seely D, Dugoua JJ, Perri D, et al(2008). Safety and efficacyof Panax ginseng during pregnancy and lactation. CanJ Clin Pharmacol;15:e87- e94.
50. Chong SK, Oberholzer VG(1988). Ginseng – is there a usein clinical medicine? Postgrad Med J; 64:841- 846.