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A Review article on – "Study of Ginseng plant and its Anti-obesity Action"

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Abstract:
Ginseng is a well known herb used for various purposes that possesses many beneficial effects for the human body and aids in recovery or cure for several diseases. There has been much research and many clinical trials designed to ascertain what these beneficial effects are studies have investigated ginseng effects on diabetes, osteoporosis, the immune system, and many other diseases. Research has also shown ginseng to be effective as an anti-obesity treatment. Ginsenoside components inhibit differentiation inducers in adipocyte tissues. This review summarizes the in vivo and in vitro effects of various ginseng crude extracts / ginsenosides on obesity via activation of AMPK- and/or CAMP-dependent pathways. Additional proteins, markers, and pathways are suggested for which the effects of ginseng saponins may be promising.

Keywords: *Panax ginseng*, Pharmacological action, Ginsenoside Antioxidant, Anti diabetic activity.

Introduction:

Adipocytes are essential to maintain energy balance and adipocytes mediate numerous factors involved in immunological responses, vascular diseases, and appetite regulation. In order to maintain health and prevent diseases, adipocyte regulation is necessary. Changes in adipocyte size and number often involve a complex interplay between the differentiation and proliferation of pre-adipocytes Adipose tissue stores lipid in the form of triglycerides, and cholesterol esters within lipid droplets represent specialised organelles inside the adipocytes. Adipocytes are highly active endocrine cells that regulate physiological functions. Impaired adipogenesis may result in obesity or insulin resistance and diabetes, so prevention of metabolic diseases has become an important issue of consideration to maintain a healthy body. Studies have found that bioactive natural compounds may be potent agents for curing various diseases, so natural products that modulate protein expression have attracted research attention The ginseng plant has a long history in Asian countries and is extensively used for various purposes. It has a wide range of beneficial effects.

ANTI-OBESITY :

Biology of Adipose Tissue: Adipose tissue is loose connective tissue composed of adipocytes and obtained from lipoblasts. The main role of adipose tissue is to store energy in the form of lipids .The 2 types of adipose tissue are white adipose tissue(WAT) and brown adipose tissue (BAT). The formation of adipose tissue is controlled in part by the adipose gene. In mammals, the 2 main deposition sites of WAT are subcutaneous and intra-abdominal. In obesity, int ra-abdominal fat accumulation is strongly associated with development of related diseases, but accumulation of subcutaneous fat exhibits no correlations with related disease WAT, through the process of differentiation, forms matured adipocytes for storage of lipid droplets . BAT is involved in thermogenesis and is positioned in discrete pockets in paravertebral,

supraclavicular, and periadrenal sites. BMI, WC, and WHR are highly interrelated and it is believed that a combination of these parameters is better for use in identification of people at risk of cardio vascular disease (CVD) than use of any single parameter .The process of differentiation, known as adipogenesis, is synchronized through an enlarged network of transcription factors that coordinate expressions of hundreds of proteins that are responsible for formation of mature fat cell phenotypes. At the core of this network are the 2 main adipogenesis regulators PPARγand C/EBPα, which supervise the entire terminal differentiation process. PPARγ, in particular, is believed to be the master regulator of adipogenesis. Without PPARγ, precursor cells are unable to express any known aspect of the adipocyte phenotype . Conversely, cells deficient in C/EBPα are susceptible to adipocyte differentiation; however, these C/EBPα-deficient cells are insulin resistant . Once the adipogenes is program begins, a transcriptional cascade starts to induce expression of the metabolic genes and adipokines that are associated with the adipocyte phenotype, such as fattyacid-binding protein 4 (FABP4, also known as aP2), glucose transporter 4 (GLUT4, also known as SLC2A4),leptin, and adiponectin. This is known as the terminal differentiation stage . Ginsenoside, or its extracts, have been shown to act on these genes and to stimulate or inhibit differentiation.

PLANT PROFILE:

1.Plant taxonomy:

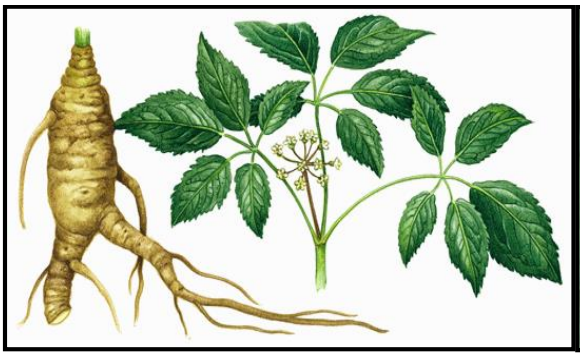
Kingdom: Plantae, **Division:**Angiosperms, **Sub division:** Eudicots, **Class**: Asterids
Order: Apiales, **Family:** Araliaceae, **Subfamily:** Aralioideae, **Genus:** Panax
Species: Ginseng.

2.Common Name : 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 DESCRIPTION:

1.Botanical description:

Panax ginseng belongs to the Araliaceae family and is found throughout East Asia and Russia. It grows natively in remote forests of Manchuria and North Korea, but has become over harvested in other parts of Asia. 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. 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, which is responsible for its name in Chinese, jenshen, or “man-root.” Panaxis 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, 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. 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.



Fig,: Leaves, flowers and roots of panax ginseng.

Fig: Fruits of panax ginseng

Species of ginseng as acure 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. The 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.

Phyto chemical constituents :-

Panax ginseng contains triterpene glycosides, or saponins, commonly referred to as ginsenosides. Many active compounds can be found in all parts of the plant, including amino acids, alkaloids, phenols, proteins, polypeptides, and vitamins B1 and B2.6 The two major sub-types of ginsenosides, (protopanaxadiol and protopanaxatriol, are classified according to the arrangement and number of sugar residues glucose, rhamnose, xylose, and arabinose – on the ginsenoside. Rb1, Rb2, Rc, and Rd are examples of protopanaxadiol ginsenosides. Re, Rf, Rg1, and Rg2 are examples of protopanaxatriols.

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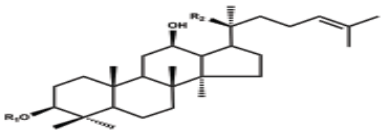
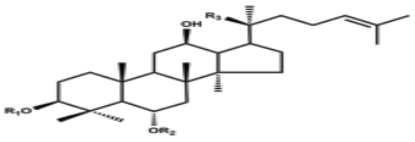


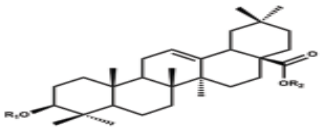
PPD

	R1	R2
Ginsenoside Rb_1	Glc-glc-	Glc-glc-O-
Ginsenoside Rd	Glc-glc-	Glc-O-
Ginsenoside Rg_3		HO-
Ginsenoside Ra_3	Glc-glc-	Xyl-glc-glc-
Ginsenoside Rh_2	Glc-	HO-
Compound K	H	Glc-O-
20S-protopanaxadiol	H	HO-



PPT

	R1	R2	R3
Ginsenoside Re	H		
Ginsenoside Rg_1	H	Glc-	Glc-O-
Ginsenoside Rf	H	Glc-glc-	HO-
Ginsenoside Rh_1	H	Glc-	HO-
Notoginsenoside R1	H	Xyl-glc-	Glc-O-
Gisnenosdie F1	H	H	Glc-O-
20S-protopanaxatriol	H	H	OH



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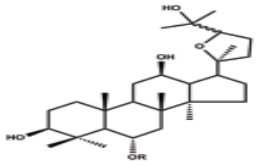
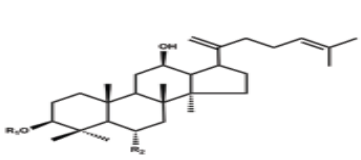


Octotillol

	R1	R2
Ginsenoside Ro	GlcA-glc-	Glc-
Chikusetsusaponin IVa	GlcA-	Glc-

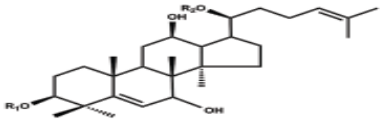
	R
Majonoside R2	Xyl-glc-
Pseudogiinsenoside RTt5	Glc-



Modified PPD and PPT

	R1	R2
Ginsenoside Rk_1	Glc-glc-	H-
Ginsenoside Rk_2	Glc-	H
Ginsenoside Rk_3	H	Glc-O-

	R1	R2
Ginsenoside Rg_5	Glc-glc-	H
Ginsenoside Rh_3	Glc-	H
Ginsenoside Rh_4	H	Glc-O-



Modified ginsenoside

	R1	R2
Quinquinoside IV	Glc-glc-	Glc-glc-
Notoginsenoside G	Glc-glc	Glc-

	R1	R2
Vina-ginsenoside R3	Glc-glc-	Glc-

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 non-specific resistance to biochemical and physical stressors, improve vitality and longevity, and enhance mental capacity. Reviews suggest *Panax ginseng* has immuno-modulating activity by affecting the hypothalamic-pituitary-adrenal(HPA) axis. On the basis of research article concluded that *In vitro* experiments reveal enhanced natural killer (NK) cell activity and increased immune cell phagocytosis after ginsenoside exposure. According to a 1999 World Health Organization review, ginseng saponins "are thought to decrease serum prolactin, thereby increasing libido" in male impotence Ginsenoside also has cardiovascular activity, it cause vascular relaxation & lowered blood pressure by activating Ca+ & K+ channel. It has Anticancer activity & Anti-diabetic activity. Ginsenoside also shows Anti-inflammatory & Antioxidant effect. It shows nano neuro protection.

The main active agents in Panax ginseng are ginsenosides, which are triterpene saponins. The majority of published research on the medicinal activity of Panax ginseng has focused on ginsenosides. These are the compounds to which some ginseng products are now standardized. Research reviews postulate that extracts of Panax ginseng affect the hypothalamus-pituitary-adrenal axis and the immune system, which could account for many of the document defects. Animal models and in vitro studies mentioned in thesere views

indicate that Panax ginseng enhances phagocytosis natural killer cell activity, and the production of interferon; improves physical and mental performance in mice and rats; causesvasodilation; increases resistance to exogenous stress factors; and affects hypoglycemic activity.

Obesity and Ginseng Mechanisms:

Ginseng (Panax) belongs to the Araliaceae family. The 2 main types of ginseng are Panax ginseng C.A. Meyer (Asian ginseng) and Panax quinquefolius (American ginseng). Asian ginseng is again divided into red and white ginseng, depending on the drying method of the root .Many studies using diabetic mice and rats from 7 research centers in 6 different nations have reported that both Asian ginseng (P. ginseng) and American ginseng (P. quinquefolius) contain functional anti-hyperglycemic components that putatively act via improvement in insulin secretion, insulin sensitivity, islet protection, obesity reduction, antioxidation, energy expenditure, and fat absorption . To study obesity, the 3T3-L1, 3T3-F422A, 1246, Ob1771,TA1, and 30A5 cell lines are used because they are unipotent preadipocytes and can either remain as pre-adipocytes or be converted to adipose tissue. These cells are ideal for studying molecular events related to conversion of preadipocytes into adipocytes. A total of 3 classes of transcription factors have been found that directly influence this conversion. These are PPARγ, C/EBPs, and the basic helix-loop-helix family known as ADD1/ SREBP1c . Most studies of ginseng and obesity have been completed at the cellular level using the 3T3-L1 mouse cell line are used because they are unipotent preadipocytes and can either remain as pre-adipocytes or be converted to adipose tissue. These cells are ideal for studying molecular events related to conversion of preadipocytes into adipocytes. A total of 3 classes of transcription factors have been found that directly influence this conversion. These are PPARγ, C/EBPs, and the basic helix-loop-helix family known as ADD1/ SREBP1c . Most studies of ginseng and obesity have been completed at the cellular level using the 3T3-L1 mouse cell line.Ginseng (or saponin) has been shown to inhibit expression of PPARγ, resulting in inhibition of adipogenesis, which can combat obesity collected. 20(S)-protopanaxatriol (PPT), one of the ginsenoside metabolites that includes Re,Rf, Rg1, Rg2, and Rh1, has been shown to increase PPARγ transactivation activity in a dose dependent manner at a concentration of 10 μM, and to increase activation activityby 5.5×, similar to the activity of troglitazone, a well known PPARγ agonist. PPT induces adipogenesis by increasing expression of the PPARγ target genes aP2, LPL, and PEPCK . Another study showed that treatment of 3T3-L1 adipocytes with ginsenoside Rb1 at a concentration of 10 μM resulted in increased expression of PPARγ2 and C/EBPα, and increased lipid accumulation at 56%, which accelerated adipocyte differentiation. Ginsenoside Rb2 is an important component in the development of drugs for lowering lipid When the diets of experimental animals under high fatty acid conditions were supplemented with 10 μg/mL of ginsenoside Rb2, the TAG level was significantly reduced by 4%-47% at different time intervals .Along with lowering TAG levels in 3T3-L1 adipocytes, ginsenoside Rb2 also stimulated expression of SREBP and leptin-mRNA. When ginsenosides were digested in vitro using artificial gastric and intestinal fluids (10 μM, 50 μM, and 100 μM) an inhibitory effect on lipid accumulation in 3T3- L1 adipocytes was observed. PD-type saponins have more potent anti-obese effects than PT-type saponins, indicating that PD-type saponins are the major contributors to the ginseng anti-obesity effects.

CONCLUSION:

In conclusion, ginseng and ginsenoside components have been shown to be useful for treatment of obesity. Adipocytes have been the target of treatment studies using various ginsenosides. Most studies have focused on transcriptional gene regulators, but many other genes may be involved in adipogenesis. Although much work has been performed on ginseng, human studies are currently insufficient to understand the actual impact of ginseng onobesity. Further studies will lead to a better understanding of the relevant markers and will help to develop improved treatments. All ginsenosides do not have anti-obesity effects. TheRb1 and Rh2 ginsenosides have been shown to cause obesity at the cellular level . In these cases, how genes are involved should be studied. Further studies and work on the MAPK and cAMP-like pathways is suggested related to adipogenesis. Proteins located in the nuclear membrane or on lipid surfaces can be studied for inhibition effects on adipocyte maturation into fat cells.

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