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Effect of panax ginseng root powder on some biochemical parameters in rabbits

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Abstract

This study was conducted to investigate the effect of orally administered panax ginseng Powder on some biochemical parameters in normal male rabbits. MATERIALS AND METHODS:The rabbits were divided into 3 equal groups; a 1st normal control received the treatment vehicle, distilled water., a 2nd normal rabbit treated with the, Powder suspension of Panax ginseng root at 150mg/kg, and a 3rd normal rabbit treated with the Powder suspension of Panax ginseng root at 300mg/kg . Treatment lasted for 15 days before sacrifice. RESULTS: The results revealed that administration of Powder suspension of Panax ginseng root at 150mg/kg body weight or 300mg/kg body weight significantly reduced glucose, triglycerides and cholesterol levels compared with control group, and an insignificant change in AST, ALP activities and urea, creatinine levels compared with control group. We concluded that Powder suspension of Panax ginseng root at dose 150 or 300 mg/kg body weight was beneficial in decreasing serum glucose, triglycerides and cholesterol levels, but it's no significant change on serum urea, creatinine levels and AST, ALT activities in normal rabbits.

Keywords: *panax ginseng, biochemical parameters, panax ginseng root powder, rabbits*

1. Introduction

Ginseng is one of the most widely recognized herbal drugs and reported to have a wide range of therapeutic and pharmacological uses. The word Ginseng comes from Chinese word gin (man) Seng (essence) derived from the Chinese ideogram for “crystallization of the essence of earth in the form of a man”. Ginseng’s genus name Panax is derived from the Greek word pan (all) akos (cure), meaning cure- all [1]. Two major species of Ginseng are *Panax ginseng* C.A. Meyer

(Asian ginseng), and *Panax quinquefolius* L. (North American ginseng). Both species contain active saponin glycosides, such as ginsenoside and panaxoside, but have significant differences in their identity and distribution. *Panax quinquefolius* plants grow in rich woods throughout eastern and central North America, especially along the mountains from Quebec and Ontario to Georgia. *Panax ginseng* plants are slightly larger, native of Korea and China and cultivated in Korea, Japan, China, and Russia. Other less frequently encountered species include *Panax notoginseng* and *Panax japonica* [2]. *Panax ginseng* C.A.Mey. has been widely consumed as food/diet supplements from natural sources, and its therapeutic properties have also aroused widespread concern [3] is widely used in Asian countries as a traditional medicine for enhancing body strength, recovering physical balance, and stimulating metabolic function. Therapeutic properties of *Panax ginseng* C.A.Mey. such as anti-inflammatory, altering the composition and metabolism of the microbiota, ameliorating chronic inflammation, enhancing the immunity, resisting the oxidation again, and regulating the glucose and lipid metabolism have been widely reported [4,5,6,7]. Is widely used in Asian countries as a traditional medicine for enhancing body strength, recovering physical balance, and stimulating metabolic function [8]. When it is steamed, it is called Red Ginseng (RG) [9]. Chemical analysis of ginseng revealed the presence of many ingredients, including organic acids, vitamins, sugars, inorganic salts, sterols, oligopeptides, polysaccharides, volatile oils, and saponins. Of these, the saponins (commonly known as ginsenosides) are well studied for their biological properties. In general, the ginseng saponins can be divided into three groups according to the structure of the non-sugar (aglycon) part of the molecule: (a) oleanolic acid type, such as ginsenoside R0; (b) 20(S)-protopanaxadiol type, such as ginsenosides Ra, Rb, Rc, Rd, Rg3, Rh2 and Rs; and (c) 20(S)-protopanaxatriol type, such as ginsenosides Re, Rf, Rg1, Rg2 and Rh1. To date, more than 30 ginsenosides have been found in the roots and other parts of P. ginseng, and a total of over 60 ginsenosides were isolated from members of the Panax genus [10]**.** The pharmacological properties of ginseng are mainly attributed to ginseng saponins, commonly called ginsenoisdes, the major and bioactive constituents [11, 12]. Various studies have been published claiming € acts on the central nervous system (memory, learning, and behaviour), neuroendocrine function, carbohydrate and lipid metabolism, immune function, and the cardiovascular system [13]. Several studies have indicated benefits of ginseng in the treatment of renal damage [11] and hepatotoxicity [12].

The aim of Our study was to investigate the effect of the *Panax ginseng* root powder on the some blood parameters which indicates to liver and kidney functions, such as: activaties of Aspartare amino transferase (AST), Alanine amino transferase (ALT), and cholesterol, triglycerids , glucose , creatinine and urea concentrations .

2. Materials And Methods

Experimental Animals:

A total of 15 local domestic adult male rabbits weighing 2.00 -2.32 kg were used in the present study. The animals were grouped and housed in cages (100 x 85x 45 cm) at the laboratories of the zoology department, Omar AL- Mukhtar University. The photoperiod was regulated at 12 hours light / 12 hours dark cycle and temperature was adjusted at 25±1˚C. The rabbits were fed on commercial standard pellet and offered drink water ad libitum. The animals were acclimatized to laboratory conditions for one week before commencement of the experiment.

Plant Material and Preparation:

The dry root of Panax ginseng, were obtained from a local herbal market. The root was identified and authenticated by the Herbarium of Botany Department, Faculty of Science, Omar ALMukhtar University. The root was powdered using a commercial blender. Known weight of their powders was used as suspension in constant distilled water volume.

Experimental groups and protocol:

Rabbits were randomly distributed into three groups (five rabbits/group). Group I: control (G1) normal control rabbits were given distilled water orally daily. Group II: rabbits were given 150 mg /kg b.wt. *Panax ginseng* [14] in 2 ml distilled water orally daily. Group III**:** rabbits were given 300

mg /kg b.wt. *Panax ginseng* [14] in 2 ml distilled water orally daily. All groups of rabbits were experimented for 15 days.

Collection of blood at the end of the experimental period (15 days), overnight fasting rabbits were deprived of food but allowed for free access of drinking water. Animals were sacrificed by decapitation and the shed blood was collected in cleaned vials, without anticoagulant for serum separation. These vials were centrifuged at 3000 rpm for 20 minutes. The serum was analyzed to determine the Aspartare amino transferase (AST), Alanine amino transferase (ALT), cholesterol, triglycerids and glucose. In addition, creatinine and urea concentrations were also determined.

Statistical Analysis:

The results were expressed as mean ± standard error (SE) for five animals in each group. The data were analyzed using IBM computer and SPSS statistical package. The One-way analysis of variance (ANOVA) and Student's t test were used to detect differences between the control group and the other experimental groups of animals. The significant differences were considered at $P<0.05$. [15]

3. Results

Table 1 and figures 1,2,3 shows levels of serum glucose, triglycerides and cholesterol. Serum glucose, triglycerides and cholesterol concentrations was significantly decreased ($p<0.05$) in group 2 which was administered 150 mg/kg *Panax ginseng* root powder, the percentage decrease was (23.91%), (38.30%) and (49.75%) respectively when compared to control group, also, these concentrations decreased significantly in group 3 which was administered 300 mg/kg *Panax ginseng* root powder the percentage decrease was (45.95%), (39.48%) and (62.60%) respectively when compared to control group.

There was not significantly decrease ($p>0.05$) in the activities of liver function markers (AST, ALT) in group 2 and in grouo 3, by 8.64%, 11.02%, and by 0.95%, 2.86% respectively when compared with the control's rabbits Table 2 and figures 4,5.

A non-significant increase (p>0.05) in urea concentrations when administration whit 150mg/kg or 300mg/kg Panax ginseng root powder (24.26 %), (7.43%) respectively, and in creatinine concentrations when administration whit 150mg/kg or 300mg/kg *Panax ginseng* root powder (2.22%), (15.56%) respectively, when compared to control rabbits (Table 3, and figures 6,7).

Table 1: Effect of *Panax ginseng* root powder on glucose, triglycerides and cholesterol in control and treated rabbits.

Groups / **Parameters**	**(G1) Control**	**(G2) *Panax ginseng* 150mg/Kg**	**(G3) *Panax ginseng* 300mg/Kg**
Glucose (mg/dl)	96.20±8.16	73.20±8.73 [a]	52.00±2.93 [a]
% of Change from G1		23..91%	45.95%
% of Change from G2			28.96%
Triglycerides(mg/dl)	84.60±0.98	52.20±1.71 [a]	51.20±1.39 [a]
% of change from G1		38.30%	39.48%
% of change from G2			1.92%
Cholesterol(mg/dl)			
% of Change from G1	119.80±1.46	60.20±2.84 [a]	44.80±1.46 [ab]
% of Change from G2		49.75%	62.60
			25.58%

Values are given as mean ± SE for 5 rabbits in each group.
[a] significant (P< 0.05) as compared with control group (G1).
[b] significant (P< 0.05) as compared with the (G2).

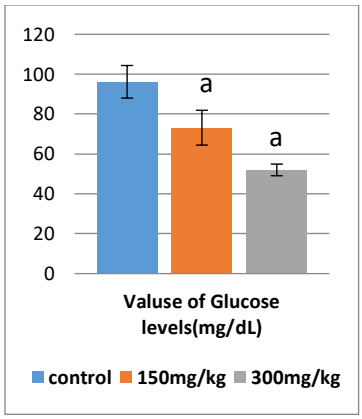

Figure 1

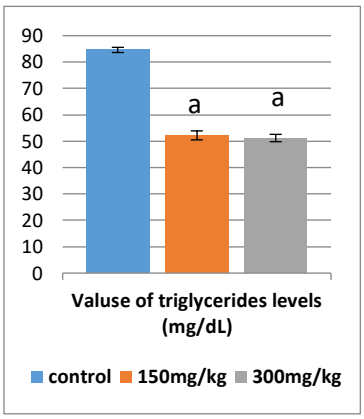

Figure2

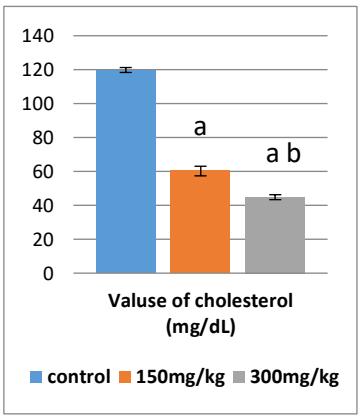

Figure3

Values are given as mean ± SE for 5 rabbits in each group.
[a] significant (P< 0.05) as compared with control group (G1).
[b] significant (P< 0.05) as compared with the (G2).

Table 2: Effect of *Panax ginseng* root powder on activities of AST and ALT in control and treated rabbits.

Parameters \ Groups	(G1) Control	(G2) *Panax ginseng* 150mg/Kg	(G3) *Panax ginseng* 300mg/Kg
AST (U/L)	92.60±2.16	84.60±4.66	82.40±3.08
% of Change from G1		8.64%	11.02%
% of Change from G1			2.60%
ALT(U/L)	104.80±5.64	103.80±5.09	101.80±4.79
% of Change from G1		0.95%	2.86%
% of Change from G1			1.93%

Values are given as mean ± SE for 5 rabbits in each group.

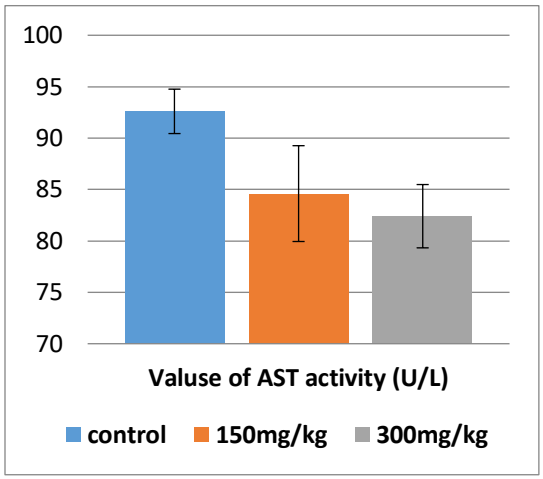

Figure 4

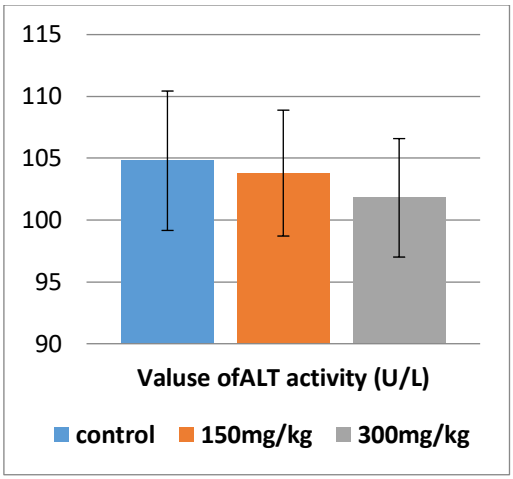

Figure 5

Table 3: Effect of *Panax ginseng* root powder on urea and creatinine in control and treated rabbits.

Parameters \ Groups	(G1) Control	(G2) *Panax ginseng* 150mg/Kg	(G3) *Panax ginseng* 300mg/Kg
urea (mg/dl)	40.40±1.03	50.20±2.82	43.40±5.66
% of Change from G1		24.26%	7.43%
% of Change from G1			13.55%
creatinine(mg/dl)	0.90±0.00	0.92±0.05	1.04±0.09
% of Change from G1		2.22%	15.56%
% of Change from G1			13.04%

Values are given as mean ± SE for 5 rabbits in each group.

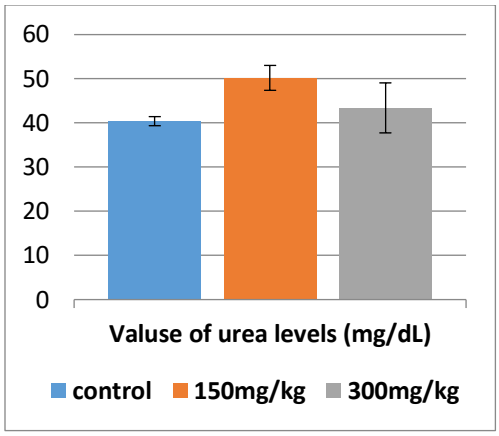

Figure 6

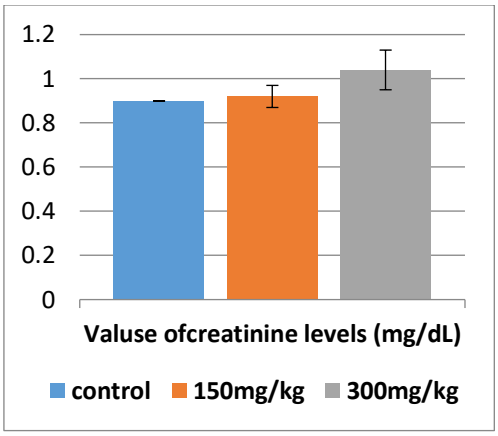

Figure 7

4. Discussion

The present study demonstrated that the *Panax ginseng* root powder a significant hypoglycemic effect to rabbits. Similarly, oral administration of the aqueous alcoholic extract of ginseng root caused a decrease in blood sugar of rabbits [16], while Lei and Wang [17] found that ginseng did not show such an effect when a 50 percent ethanol extract was given to male dogs daily with meals. Ando, *et al* [18] reported clarified that the water extract of ginseng powder contained a peptide (Peak II) which inhibited adrenaline-induced lipolysis in isolated fat cells. This peptide was separated by Avicel cellulose column chromatography. The anti-lipolytic activity of the peptide was not inactivated by heat treatment and by treatments with trypsin and chymotrypsin, but was reduced by treatment with pronase. Similarly, Takeuchi [19] observed that ginseng saponins reduced the adrenaline-induced hyperglycemia, whereas, Bykhovtsova [20] reported that ginseng panaxoside produced an increase of blood sugar. Such in vivo experiments were so complicated that consistent results could not be necessarily obtained. Therefore, adopted a simpler method to examine the physiological action of ginseng extract. It is well known that insulin strongly inhibited adrenaline-induced lipolysis in isolated fat cells [21]. Recently, Waki *et al.* [22], Sievepiper *et al*. [23], and Sotaniemi *et al*. [24] reported that RG improved blood glucose and insulin regulation in non-insulin-dependent diabetic mellitus patients. Lee *et al.* [25] reported that ginsenoside Rh2, a main constituent of RG, increases insulin secretion in animal experiment.

In addition, Oshima *et al.* [26] reported that panaxans from ginseng exhibited the lowering effect of blood glucose and liver glycogen. Nevertheless, the studies on the effective constituents of RG for hyperglycemia have not been thoroughly studied. TRINH *et al.* reported that Orally administered RG potently inhibited blood glucose elevation after loading with maltose or starch. The inhibitory effect of the polysaccharide fraction was stronger than the saponin fraction. To understand whether the hypoglycemic effect of RG can be increased by fermentation, Trinh *et al* [27] fermented RG by Bifidobacterium H-1 and investigated its antihyperglycemic effect. However, the hypoglycemic effects of the saponin and polysaccharide fractions isolated from RG and those of FRG have not been thoroughly studied [28]. Sievenpiper *et al*. [23] reported that RG improves non-insulin-dependent diabetic mellitus patients and Lee *et al.* [25] reported that ginsenoside Rh2 increases insulin secretion in animal experiment. These findings suggest that the hypoglycemic activity of RG and FRG may be due to the inhibition of blood glucose elevation by their polysaccharides and/or the stimulation of insulin secretion by their ginsenosides [28].

The current data demonstrated a significant occurrence of serum hypotriglyceridemia and hypocholesterolemia in rabitts when administration whit 150mg/kg or 300mg/kg Panax ginseng root powder. These findings agree with Ismail *et al.* [28] who indicated that the RG lowered blood cholesterol level in animal models. Cui *et al.* [29] reported that ginseng extract reduced blood total cholesterol and triglyceride levels in hepatectomized rats. Cho *et al.* [9] reported that ginsenoside Re exhibited a hypolipidemic effect in streptozotocin-induced diabetic rats. Rho *et al.* [30] reported that polyacetylenes from RG inhibited acyl-CoA cholesterol acyltransferase.

Trinh *et al* [27] suggested that the hypotriglyceridemic effect of polysaccharides of RG and FRG may be due to the inhibition of triglyceride absorption, and the hypocholesterolemic effect of the saponin fractions, particularly ginsenosides, may be due to the inhibition of biosynthesis of cholesterol and triglyceride, such as HMGCoA reductase and acyl-CoA: cholesterol acyltransferase.

Several studies have indicated benefits of ginseng in the treatment of renal damage [31] and hepatotoxicity [**32**]. In the current study, *Panax ginseng* root powder non-significantly decrease activities of ALT and AST in serum. Ginseng extracts have been reported to show protective

effects on hepatocytes in vitro and liver injury in various animal, and clinical models induced by a wide variety of hepatotoxins [33]. Ginseng has also found to protect liver cells from radiation [34] and viral hepatitis [35]. The mechanisms which provide ginseng's hepatoprotective effects are closely attributed to antioxidation properties. Ginseng enhanced the antioxidant defense mechanism [36] and increased self-antioxidant enzyme activities of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glutathione reductase (GR), glutathione-S-transferase (GSH), and heme oxygenase-1 in the aged-rat liver [37]. Ginseng treatments inhibited oxidative stress damage such as lipid peroxidation [32], alanine aminotransferase (ALT), aspartate aminotransferase (AST), and lactate dehydrogenase (LDH) [38]. The protective effects have been histologically and histochemically monitored. Recently, further molecular mechanism studies found that ginseng suppresses mitogen-activated protein kinase (MAPK) signals [32], nuclear factor-kappa B (NF-kB), and inducible nitric oxide synthase (iNOS) protein expression [39]. Ginsenoisde Rb1, a major ginseng saponin, protects hepatocytes against t-BHP and CCl4 by regulating inducible hepatic enzymes of ALT and AST [40] and may be associated with modulating liver CYP activation [41] and protein phosphorylations [42].

Intriguing new data suggest that Panax ginseng C.A.Mey. could minimize renal injury by inhibiting oxidative stress, inflammatory responses, epithelial-mesenchymal transition, and fibrosis [7, 43, 44, 45, 46]. A non-significant increase ($p>0.05$) in urea and creatinine concentrations when administration whit 150mg/kg or 300mg/kg *Panax ginseng* root powder when compared to control rabbits in the present study. Panax ginseng C.A.Mey. triol (PT) saponins are also the main representative components of ginsenosides Rg1, Rd, Rb1, which have a high content of active parts and strong activity [47]. Panax ginseng C.A.Mey. can relieve renal innate cells damage and has a protective effect of Panax ginseng C.A.Mey. on the glomerular filtration barrier. The kidney filtration barrier is surrounded by three layers: 1) a fenestrated endothelium, 2) a basement membrane, and 3) the podocytes. The glomerular filtration barrier can effectively prevent albumin and larger molecular weight substances in the plasma from entering the urine. The changes in the structure and function of the glomerular filtration barrier caused by various reasons are the pathophysiological basis of proteinuria [48]. Studies have shown that proteinuria reflects not only kidney damage but also an independent risk factor leading to the progression of kidney disease

[49]. Therefore, understanding the molecular structure and function of the glomerular filtration barrier are essential for delaying the progression of KD. Jin *et al.* [50] reported, the Panax ginseng C.A.Mey. have role on kidney protection in the kidney filtration barrier and innate renal cells.

3. Conclusions

Panax ginseng root powder at dose 150 or 300 mg/kg body weight was beneficial in lowering serum glucose, serum total cholesterol, serum triglycerides, but it's no significant change on serum urea, creatinine levels and AST, ALT activities in normal rabbits.

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