Nigella Sativa and Panax Ginseng Supplementation Ameliorate Induced-Hyperlipidemia in Male Rats

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ABSTRACT

The present work was conducted to study the effect of ginseng powder, ginseng oil, Nigella sativa seeds, Nigella sativa oil and combination of two oils on total cholesterol, triglycerides, adiponectin and some hormonal levels as testosterone, T3, T4 and serum glucose level in rats fed either normal chow or high fat diet. Nigella seed and oil, ginseng powder and oil and the combination of both oils decreased the highly level of cholesterol and triglycerides induced by fructose and high fat diet. The potent one was nigella seed. Nigella seed, Ginseng powder in addition to nigella and ginseng oils treatment ameliorate adiponectin suppression induced by high fat diet. Rats fed normal diet supplied with nigella oil, ginseng oil and both oils show a highly significant decrease in adiponectin level. Although nigella seed, nigella oil and the mixture of nigella and ginseng oils restored the hyperglycemia resulting from fructose administration to the normal level, but ginseng powder failed to affect this hyperglycemia. High fat diet increased T3 and T4 levels, nigella oil and ginseng powder treatment reduced T3 level, however nigella seed restored T4 level. Regarding the testosterone hormone, there was a significant increase in all hyperlipidemic group that received ginseng and nigella compared to positive control. Ginseng powder increased testosterone in rats fed normal diet.

In conclusion, administration of nigella and ginseng ameliorate the harmful changes in lipids and hormonal parameter induced by high fat diet. As in lowering blood lipids, improving adiponectin level and regulating the body basal metabolic rates by controlling thyroid hormones level as well as increase the testosterone level in hyperlipidemic groups.

Keywords: Hyperlipidemia, Adiponectin, Thyroid Hormone, Rats

INTRODUCTION

Medical plants have been a major source of therapeutic agent since ancient times to cure some human diseases. The world health organization (WHO) estimated that up to 80% of people still rely on herbal remedies for their health care (Asgary et al, 2012). The Nigella Sativa is an annual flowering plant belongs to family Ranunculacae, commonly known as black cumin seed known to have a great medicinal importance possessing many medicinal properties particularly in Greco –Arab, Unani - Tibb (Agel and Shhaheen, 1996).

The seeds are very rich and diverse in chemical composition. They contain amino acids, proteins, carbohydrates, fixed and volatile oils (Rajeskhar and Kuldeep, 2011). Active materials that are extracted by cold water and ethyl alcohol for the black seeds (Nigella Sativa) contain thymoquinone which is the main flavonoids, alkaloids, tannins, and sterol (Mohsen et al, 2009). Sterol is metabolized in the body, producing testosterone (Datau et al, 2010), which restores the metabolic disturbance and increase adiponectin. Nigella Sativa oil was found to be rich in polyphenols and tocopherols (Meziti et al, 2012), it has a good antibacterial activity on the isolated bacteria causing wound. The oil gave good inhibitory effects on Staph (Khuder, 2012).
The administration of 1 ml-Kg-day of Nigella Sativa oil stimulated the secretion of sexual hormones that led to improve protein synthesis of hepatic enzymes, white blood cell count and decreased the serum cholesterol concentration in blood (Juma and Abdulrahman, 2011). Nigella Sativa either in powder or oil forms was shown to significantly reduce total cholesterol and LDL -cholesterol levels and enhance HDL –cholesterol after several weeks (Al-Naqeep et al, 2011).

Nigella seeds have been reported to exhibit many pharmacological effects including immunomodulator (Salem, 2005), anticancer, (Salomi et al, 1992), anti-bacterial activity and anti-helminthic (Agarwal et al, 1979) and anti-inflammatory (Al-Ghamdi, 2001).

Panax Ginseng is one of the most widely used medicinal plants, particularly in the traditional oriental medicine, for the treatment of various diseases. There are extensive reports showing that ginseng has many pharmacological effects on the central nervous system, endocrine, immune and cardiovascular systems (Nah et al, 1995). The principal bioactive components of ginseng are a series of triterpenoid saponins with steroids structures known as the ginsenosides (Chan et al, 2000). There is an evidence in the literature that the medicinal efficacy of ginseng is closely linked to its protective properties against free radical attack (Lee et al, 1999). Ginseng extract has also been reported to scavenge superoxide radicals to inhibit lipid peroxidation through transition metal chelation (Zhang et al, 1996).

Traditionally the ginseng root, available in white or red, is used. White ginseng is prepared by air – drying after harvest, and red ginseng is prepared by a steaming or heating process (Wang et al, 2007).

Panax ginseng has been widely used in Chinese medicine for over 2000 years. It has been used for the treatment of variety of conditions, and hence it is considered as anti-lipemic (Roy et al, 1998).

Panax Ginseng has a broad range of beneficial effects including tonic, adapt genic, immunomodulatory, anti-oxidant, anti-aging, anti-diabetes, anti- mutagenic, anti – carcinogenic (Kiefer and Pantuso, 2003). Ginseng has been used to treat a wide variety of diseases including anemia, insomnia with neurasthenia, gastritis, blood pressure abnormalities, dyspepsia, over – strain and fatigue due to decrease in blood coagulation (Wesnes et al, 2000). A previous study reported that ginseng contains about 20 gensing polysaccharides, all of which have anti hyperglycemic effects (Miyazaki 1989).

Adiponectin is a protein hormone produced and secreted exclusively by adipocytes (fat cells) that regulates the metabolism of lipids and glucose. It also has anti-inflammatory effects on the cells lining the walls of blood vessels (Diez and Iglasiás, 2003). High blood levels of Adiponectin are associated with a reduced of heart attack. The consumption of hyper-lipidemic diets, rich in saturated fat, reduces the level of adiponectin, while the diet, rich in polysaturated fatty acids and supplementation, increases its plasma level (Reis et al, 2010).

Thyroid hormone is a key metabolic regulator coordinating short- term and long – term energy needs (Oetting and Yen, 2007), metabolism of glucose, and lipids (Chubb et al, 2005). Thyroid hormones have a major effect on the growth and development of animals (Zanouny et al, 2013).

There is limited information about the effect of Nigella Sativa seeds, Nigella oil, Ginseng powder and ginseng oil supplementation on testosterone. Therefore, the objective of this study was to make comparison between the effect of Panax Ginseng and Nigella Sativa on some lipids, some blood metabolites (thyroid hormones), glucose, adiponectin and testosterone, cholesterol and triglycerides in male albino rats.
MATERIALS AND METHODS

Animals

Adult Male Albino rats (Rattus Rattus) weighing 180-200 g were used throughout the study. These animals were obtained from National Research Center, Dokki, and Cairo, Egypt. Animals were maintained under standard conditions of ventilation, temperature (25 ± 2 °C), humidity (60 – 70 %) and light/dark condition (12/12 hrs). The rats were housed in stainless steel cages and provided with free access to food and drinking water ad libitum. The local committee approved the design of the experiments, and the protocol complied with the guidelines of the National Institutes of Health (NIH, USA).

After two weeks of acclimatization, the animals were divided into 12 groups each of five, as follows:

**Group 1**: rats fed on a balanced diet for 4 weeks, served as control.

**Group 2**: rats fed on a balanced diet and administered orally with (400 mg/kg body weight rat / day) ginseng powder in water, for 4 weeks.

**Group 3**: in addition to the balanced diet, rats were daily administered Ginseng oil (6 ml/kg b.w.) for 4 weeks.

**Group 4**: rats received orally Nigella sativa seeds (1.0 g/kg b.w.) in water, daily for 4 weeks.

**Group 5**: rats received orally Nigella sativa oil (2 ml/kg b.w.) daily for 4 weeks.

**Group 6**: in addition to balanced diet, rats were daily administered Ginseng oil (6 ml/kg b.w.) combined with Nigella sativa oil (2 ml/kg b.w.) daily for 4 weeks.

Preparation of Hyperlipidemic Rats

Rats were randomly fed on a high fat diet, prepared by mixing 500 g butter with 3kg rat Shew diet, and received fructose solution (0.1 g/L) in drinking water for 2 weeks to induce hyperlipidemia

**Group 7**: hyper-lipidemic rats served as positive control

**Group 8**: hyper-lipidemic rats, received ginseng powder dose as in group 2 for two weeks

**Group 9**: hyperlipidemic rats received a dose of Ginseng oil as in group 3, for two weeks

**Group 10**: hyperlipidemic rats received a dose of Nigella sativa seeds as in group 4, for two weeks

**Group 11**: hyperlipidemic rats received a dose of Nigella sativa oil as in group 5, for two weeks

**Group 12**: hyperlipidemic rats received a dose of Ginseng oil combined with Nigella sativa oil as in group 6, for two weeks.

Whole blood samples were obtained from orbital plexus vein for rats of groups 7 to 12, to determine lipid profile.

At the end of the experiment, the animals were scarified using ether anesthesia. Blood samples were collected through heart puncture and left to clot and then centrifuged at 3500 rpm for 10 min. serum obtained stored at -20 till analysis.

Biochemical Analysis

Chemicals

Ginseng powder, Nigella seeds, Ginseng oil and Nigella oil were purchased from local commercial supplier.

All biochemical analyses were determined by using commercial kits derived from Spectra according to the following methods:
Serum glucose, cholesterol and triglycerides were determined calorimetrically according to the methods of (Caraway and Watts, 1987), (Ellefason and Caraway 1976), and (Bucolo and David 1973), respectively. Serum thyroxine (T4), Triiodothyronine (T3) and total testosterone hormones were determined using commercial solid-phase radio-immunoassay kits derived from, Siemens (CA USA) according to the method of Britton et al., (1975) Hollander et al., (1971) and Furuyama et al., (1970) respectively. Serum Adiponectin was measured using Rat Adiponectin ELISA Assay Kits derived from BioVision, USA.

Statistical Analysis

This was performed using one-way analysis of variance (ANOVA) to assess significant differences among different groups. The results are considered to be significant when P<0.05. All statistical analyses were performed using SPSS software program version 16 (SPSS Inc USA).

RESULTS

Table (1) shows a significant decrease in serum cholesterol level only in healthy rats treated with Nigella Sativa seeds (NS) when compared with negative control. Non significant changes were noticed in all other healthy groups. Ginseng powder (GP), Ginseng oil (GO), Nigella oil (NO), and a combination of Ginseng oil and Nigella oil (GONO) when compared to negative control. On the other hand, a highly significant increase in serum cholesterol level was observed in positive control compared to negative control. As for hyperlipidemic rats receiving Ginseng powder (GP) and Nigella Sativa (NS) there were significant decrease in serum cholesterol levels when compared to positive control compared to negative control. However other hyperlipidemic groups received Ginseng oil (GO), Nigella oil (NO), combination of Ginseng oil and Nigella oil (GONO). There were non-significant changes in cholesterol level compared to positive control.

Table (1): Changes in serum of total cholesterol (mg/dl), triglycerides (mg/dl) and adiponectin (ng/ml) levels in control and treated groups

<table>
<thead>
<tr>
<th>group</th>
<th>Cholesterol</th>
<th>TG</th>
<th>Adiponectin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr 1</td>
<td>80.8±1.42</td>
<td>72.2±0.97</td>
<td>5614±160</td>
</tr>
<tr>
<td>Gr 2</td>
<td>74.7±2.08</td>
<td>61.6±1.74</td>
<td>5742±337</td>
</tr>
<tr>
<td>Gr 3</td>
<td>75.9±3.10</td>
<td>69.4±0.96</td>
<td>3485±501</td>
</tr>
<tr>
<td>Gr 4</td>
<td>66.3±2.79a</td>
<td>55.1±1.22</td>
<td>5308±275</td>
</tr>
<tr>
<td>Gr.5</td>
<td>73.7±1.47</td>
<td>70.5±1.66</td>
<td>2291±103</td>
</tr>
<tr>
<td>Gr.6</td>
<td>77.7±1.95</td>
<td>71.7±1.26</td>
<td>2074±143</td>
</tr>
<tr>
<td>Gr.7</td>
<td>94.0±1.97a</td>
<td>123.0±2.21</td>
<td>960±22a</td>
</tr>
<tr>
<td>Gr.8</td>
<td>85.6±0.08b</td>
<td>83.1±1.59</td>
<td>2235±80b</td>
</tr>
<tr>
<td>Gr.9</td>
<td>89.2±0.76</td>
<td>91.6±2.44</td>
<td>1123±46</td>
</tr>
<tr>
<td>Gr.10</td>
<td>82.8±1.60b</td>
<td>76.0±2.61</td>
<td>2285±165b</td>
</tr>
<tr>
<td>Gr.11</td>
<td>87.2±1.28</td>
<td>87.8±2.13</td>
<td>1546±162</td>
</tr>
<tr>
<td>Gr.12</td>
<td>91.6±0.82</td>
<td>93.3±3.16</td>
<td>1860±89b</td>
</tr>
</tbody>
</table>

Mean ±SEM from number of samples indicated (n=5). Using one way ANOVA test P<0.01

As shown in table (1) there was a highly significant decrease in serum triglyceride concentration in groups that were treated with nigella seeds and Ginseng powder compared to negative control. However insignificant changes in serum level of triglyceride were recorded in groups treated with Ginseng oil, Nigella oil, and combination of Ginseng and Nigella oils compared with negative control.
High significant elevation in the level of serum triglyceride was observed in positive control group compared to negative control group. As for the hyperlipidemic animals, there was a highly significant decrease in serum triglyceride concentration in animals that received Ginseng oil Nigella oil mixture, Ginseng oil, Nigella oil and Ginseng powder compared to positive control group.

The data depicted in table (1) reveal a highly significant decrease in Adiponectin level in positive control compared to negative control. These data also showed insignificant change in Adiponectin level in groups that received Nigella Sativa seeds and Ginseng powder compared to negative control. Moreover, there was a highly significant decrease in Adiponectin level in groups that received Ginseng oil, Nigella oil and combination of ginseng and Nigella oils compared to negative control group. On the other hand, there was a highly significant increase in Adiponectin level in hyperlipidemic groups that received mixture of Ginseng and Nigella oils, Ginseng powder and Nigella Sativa seed compared to positive control.

Data in Figure (1) demonstrated that serum glucose level in the three groups that received Nigella seeds, Nigella oil and mixture of Ginseng and Nigella oils was insignificant compared to negative control group. Highly significant increase was observed in serum glucose level among Ginseng powder and Ginseng oil treated groups compared with negative control group. Also there was a highly significant increase in serum glucose level in positive control group compared to negative control group Fig. (1). While the oral administration of Ginseng powder in hyperlipidemic group caused insignificant change in glucose level compared to positive control group. Moreover, our study demonstrated a significant decrease in glucose level of hyperlipidemic rats that received Ginseng oil compared to positive control group.

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Table (2) shows that a highly significant increase in the level of T3 was evoked in the groups which were administrated with Nigella seeds, Nigella oil, Ginseng seeds and combination of Ginseng and Nigella oils compared to negative control. The highly significant increase in T3 level was found to be much higher in Ginseng oil group and positive control than negative control group. However, hyperlipidemic groups restored T3 level to the level of negative control when treated with Nigella oil and Ginseng powder. There was a highly significant increase in serum T4 levels in groups that received Ginseng oil, Nigella seeds, Nigella oil and combination of Ginseng and Nigella oils compared to negative control group. Also, T4 levels showed a highly significant increase in group treated with Ginseng oil and positive control compared to negative control group. While Nigella seeds administrated in hyperlipidemic rats restored T4 level to negative control as shown in table (2).
Table (2): Changes in serum levels of total $T_3$ (nmol/l) and $T_4$ (nmol/l) in control and treated groups

<table>
<thead>
<tr>
<th>Group</th>
<th>$T_3$</th>
<th>$T_4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr. 1</td>
<td>0.30±0.02</td>
<td>48.1±2.58</td>
</tr>
<tr>
<td>Gr. 2</td>
<td>0.51±0.02a</td>
<td>70.6±2.01a</td>
</tr>
<tr>
<td>Gr. 3</td>
<td>0.97±0.08a</td>
<td>82.0±4.36a</td>
</tr>
<tr>
<td>Gr. 4</td>
<td>0.50±0.01a</td>
<td>68.5±2.53a</td>
</tr>
<tr>
<td>Gr. 5</td>
<td>0.59±0.03a</td>
<td>63.4±3.62a</td>
</tr>
<tr>
<td>Gr. 6</td>
<td>0.54±0.02a</td>
<td>69.0±2.51a</td>
</tr>
<tr>
<td>Gr. 7</td>
<td>0.59±0.01a</td>
<td>60.1±1.97a</td>
</tr>
<tr>
<td>Gr. 8</td>
<td>0.45±0.02</td>
<td>54.7±3.38b</td>
</tr>
<tr>
<td>Gr. 9</td>
<td>0.53±0.03</td>
<td>52.5±2.45</td>
</tr>
<tr>
<td>Gr. 10</td>
<td>0.49±0.03</td>
<td>40.9±1.66b</td>
</tr>
<tr>
<td>Gr. 11</td>
<td>0.40±0.03b</td>
<td>57.7±3.25</td>
</tr>
<tr>
<td>Gr. 12</td>
<td>0.38±0.02b</td>
<td>57.6±1.29</td>
</tr>
</tbody>
</table>

Mean ±SEM from number of samples indicated (n=5). Using one way ANOVA test P<0.01

*a*: significance by LSD at significance level P< 0.01 from neg. c group.

*b*: significance by LSD at significance level P< 0.01 from H. lip group

Data presented in figure (2), illustrate that there was insignificant change in testosterone level in positive control group compared to negative control group. On the other hand, the testosterone level in the group that was supplemented Ginseng powder was significantly higher than negative control group.

**DISCUSSION**

Lipid metabolism normally maintains an elegant balance between synthesis and degradation (Goldstein et al., 1973). When the balance is lost, hypertriglyceridemia and hypercholesterolemia may develop. This can cause a lot of complications.
In the present study the cholesterol level was significantly decreased in healthy rats that received Nigella seeds compared to negative control group. Results of the current study can be confirmed by El-Saadany et al, (2008), who worked on lactating Zaribi goats and reported that the decrease of cholesterol concentration as a result of Nigella Sativa seeds supplementation may be due to the higher content of unsaturated fatty acids in Nigella, Bamosa et al, (1997) reported that a marginal reduction in total cholesterol is observed after one week of daily treatment with 2 g/day Nigella Sativa seeds. Ismail et al, ( 2010 ) reported that , thymoquinon the active constituent of Nigella seeds, has been demonstrated to attenuate oxidative stress in hypercholesterolemic rats . Also Huda et al, 2012, reported that, Nigella Sativa is a potential protective natural agent against atherosclerosis and cardiovascular complications in hyperlipidemic patients. Our study demonstrated a highly significant decrease in serum triglyceride in rats supplemented nigella seeds and Ginseng powder compared to negative control, while other investigators reported non significant decrease in serum lipids after Nigella Sativa seeds supplementation in adults (Qidwai et al, 2009).

The results obtained from the present work indicated that, there was highly significant decrease in cholesterol level in hyperlipidemic groups that received Ginseng powder and Nigella seeds compared to positive control. The results in agreement with Zakaria et al, ( 2011 ) who found that , a reduction in serum cholesterol level was observed after treatment with Ginseng powder, in addition Hwang et al, (2008) who indicated that the administration of Ginseng Saponins to rabbits fed high cholesterol diet decreased the serum cholesterol level. Also our results agree with the results of Dixit et al, (1991), who reported that, Ginseng markedly reduced serum Cholesterol level in hyperlipidemic monkeys. Similar results were obtained by Surh et al, (2001) as they reported that Ginseng extract attenuate lipid peroxidation, it is attributed to saponins which play a major role in antioxidant activities, in addition ginsenosides which are important components heavily present in ginseng production of powerful antioxidant activities by stimulating gene expression of antioxidant enzymes and enhancing their activities. Our results are also in agreement with Roy et al, (1998) and yoshikawa et al, (1998) who reported that Ginseng extract or its fraction such as saponins have pronounced antilipidemic properties.

Cui et al, (1998) and Inoue et al, (1999) studies on rats, rabbits and human, found that ginseng powder exhibited the hypolipidemic action by decreasing serum triglycerides and total cholesterol in hypercholesterolemic rabbits, high cholesterol diet-fed rats and patients with hyperlipidemia which in agreement with our findings. Gehan, 2001 found that the hypercholesterolemic action of Panax Ginseng is attributed to the ability to suppress cholesterol biosynthesis, while Sahar et al, (2013) reported that, Panax Ginseng administration for 21 consecutive days decreased the total cholesterol and triglyceride levels may be due to the effect of panax ginseng on genes associated with lipid metabolism or cholesterol metabolism which were up regulated by high fat diet.

In contrast to data presented in this study, the study of Michung et al,( 2003) reported that ginseng powder elevated the serum triglycerides in mice. Also Ismail et al, (1999) reported that administration of Ginseng powder failed to exert any beneficial effects on hypercholesterolemia in rabbits.

The present study indicated that glucose level in the three groups that received Nigella seeds, Nigella oil and mixture of Nigella and ginseng oils was insignificant compared to the negative control group. However, highly significant increase was observed in serum glucose level among Ginseng powder and ginseng oil supplemented groups compared to negative control. On the other hand our data revealed that, a significant decrease in glucose level of hyperlipidemic group that received Nigella sativa seeds, oil and combined ginseng oil compared with positive control , these results are in agreement with (Hedaya, 1995), who reported that the decrease in glucose level may be related to the increase of insulin secretion by B-cells of pancreas due to dietary Nigella Sativa seeds supplementation and a high metabolic rates of cellular activities, and rapid synthesis of cellular materials and growth of body, which required moderate quantities of energy (Omima ,1993).
Adiponectin is the most abundant plasma protein synthesized for the most part in adipose tissue, and it is a hormone, playing a central role in glucose and lipid metabolism (de Oliveira et al, 2011). This study reveals that high-fat diet, highly significant decrease adiponectin level compared to negative control rats. This is in agreement with results that showed that the level of adiponectin is significantly lower in animals fed on a high fat compared to control group (Moreno et al, 2014). The high fat diet led to decreased insulin sensitivity accompanied by impaired activity of adiponectin-related enzymes in skeletal muscles but not in the liver. These results suggest that the high fat diet has a tissue-specific effect on adiponectin and associated enzyme expression (Barnea et al 2006).

Adiponectin decreases insulin resistance by decreasing the triglyceride content in muscle and liver in obese mice. This effect results from increased expression of molecules involved in both fatty-acid combustion and energy dissipation in the muscle. Moreover, insulin resistance in lipoatrophic mice was completely reversed by the physiological dose of adiponectin. These data also indicate that the replenishment of adiponectin might provide a novel treatment modality for insulin resistance and type 2 diabetes (Yamauchi et al, 2001). Supplementation of adiponectin was able to improve insulin control, blood glucose and triglyceride levels in mouse models (Nedvídková et al, 2005).

It was previously demonstrated that feeding a Dietrich in saturated fat and polyunsaturated fatty acids (PUFA) for 2 days resulted in decreased serum adiponectin concentrations and adiponectingene expression in the retroperitoneal adipose tissue of mice. Similar results were observed after 8 weeks of a PUFA-rich diet treatment only (Bueno et al, 2008). Other results of studies involving animal models indicate that the consumption of hyperlipidemic diets rich in saturated fat reduces the levels of adiponectin, while the diets rich in polyunsaturated fatty acids and supplementation with omega-3 increase both gene expression and plasma levels (Gonçalvez Reis et al, 2010). Hyperglycemia, resulting from a high-fat diet is associated with an increase in the expression of the adiponectin receptors in muscle (de Oliveira et al, 2011). Although the present study evaluated the effect of a high-fat diet on adiponectin level in rats, interestingly a highly significant decrease in adiponectin level was observed in animals fed normal chow supplied with ginseng oil, nigella oil and combination of both oils as compared with control group. These results may be due to the high oils contents of unsaturated fatty acids. It was mentioned before that Linoleic acid and alpha-linolenic acid induced a significant decrease in adiponectin secretion (Pérez-Matute et al, 2007). The main unsaturated fatty acids of nigella were oleic acid and linoleic acid. The last one constituted 57% of the total fatty acids of nigella oil (Hassanein et al, 2011). Also ginseng seed oil contained >95% unsaturated fatty acids (Lee et al, 2013).

In the present study, a highly significant increase in serum adiponectin level was indicated in high fat diet rats when treated with combination of nigella and ginseng oils, nigella seed powder and ginseng powder. The potent one of them was nigella seed powder. Serum adiponectin level decreased significantly in both aged rats fed high fructose diet and rats fed high fructose diet supplemented with ground seeds of Nigella sativa groups compared to control group but increased significantly in rats fed high fructose diet supplemented with ground seeds of Nigella sativa group compared to rats fed high fructose diet group (Bahgat and Soliman, 2011). The level of adiponectin was lowered profoundly by high fat diet in mice. Korean red ginseng extract treatment (Krge) increased this level back to normal. Krge was found to down-regulate genes associated with lipid metabolism or cholesterol metabolism which were up-regulated by high fat diet (Song et al, 2012). Yeo et al, 2011, have shown that Panax ginseng extract (PGE) with a known amount of ginsenosides is capable of suppressing preadipocyte growth, reducing lipid acquisition and triglycerides, while increasing adiponectin expression in 3T3-L1 murine adipocytes.

Thyroid hormones play a major role; they enhance protein synthesis and oxygen utilization. Measures of the amount of triiodothyronine (T3) and thyroxine (T4) in the blood plasma are considered a substantive evaluation of thyroid function (Dharmananda, 1991). The present study concerning the effect of ginseng and Nigella on thyroid hormone concentrations, both T3 and T4 were significantly higher in the first six groups. Similar trends were found by (Zanoung et al, 2013), they recorded that, supplementation of Nigella sativa seeds to male lambs were significantly increase T3 and T4 compared to control. The significant increase of both T3 and T4 secretions in groups received...
ging and nigella sativa may be due to increased metabolism of carbohydrates, fats and also protein, which was reflected as a positive effect on digestibility coefficient of carbohydrates, fats and protein and also the increase of total digestible nutrients (TDN) intake and metabolizable energy. There was a positive relationship between energy intake and the thyroid hormones concentration (Kassab 2007).

Sharif et al, (2012) reported that, daily oral administration of Nigella sativa L. ethanolic extract (1 g/kg Bwt.) for 14 days significantly increased the serum concentration of T₄ in the normal Wistar albino rats. On the other hand the results revealed that treatment returned the serum concentration of T₃ to the normal level in the Alloxan-induced diabetic rats. Ismail et al, (2003) concluded that N.S. could raise the lowered serum triiodothyronine concentration without changing the concentration of serum TSH. Thus, it could be suggested that the mechanism of action could be in part due to antioxidant defense system (Meral et al, 2001).

Results obtained from the present work indicate that the testosterone level in the group that supplemented Ginseng powder increased significantly compared to negative control group in accordance with Fahim et al 1982, who reported that, rats that received 5% ginseng experienced a significant increase in blood testosterone level (rho less than 0.001). Prostate weight in the treated animals was significantly reduced as compared to the control animals. Rajesh et al, 2012, concluded that, ginsenoside Rg1 is one such example of a purified ingredient from ginseng which has been shown to have a direct effect on male copulatory behavior. In in-vivo and in-vitro male mouse models, Rg1 increased mouse mounting, intromission frequency and pelvic thrusts. Serum testosterone concentration, nitrous oxide release, and cyclic GMP accumulation in the penile corpus cavernosum were all increased in these models. Ginsenoside Rg1 appeared to play a key role in male sexual function by acting on the NO/cGMP pathway in the corpus cavernosum.

In conclusion, administration of nigella and gingsing ameliorate the harmful changes in lipids and hormonal parameter induced by high fat diet. As in lowering blood lipids, improving adiponectin level. This also regulates the body basal metabolic rates by controlling thyroid hormones level as well as increase the testosterone level in hyperlipidemic groups.

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