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THE EFFECT OF *SOLENOSTEMMA ARGEL* LEAVES EXTRACT ON STATUS OF INDUCED LIPID CONSTITUENTS IN ALBINO RATS

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ABSTRACT

All cultures and societies have knowledge best described as folk medicine, and Sudanese people used *S. argel* to treat many diseases among them Hyperlipidemia. In this study the effect of ethanolic leaves extract of *S. argel* on lipid profile was examined in two groups of albino rats (control and experimental) each of six animal, after being provided with 2% cholesterol diet. Rats of the experimental group were each given 600 mg/kg of *S. argel* extract for 21 day and then each rat in the two groups was sampled for blood after zero, 7, 15 and 21 days and measured for lipid parameters namely: cholesterol (Chol), triacylglycerol (TG), low density lipoprotein (LDLP) and high density lipoprotein (HDLP). After this period, the control group was fed with normal diet only but provided with 600 mg/kg of *S. argel* extract for more two weeks after which each rat was similarly measured for lipid constituents after 7 and 14 days. The results revealed that *S. argel* extraction did not lead to any change in levels of all lipid constituents in the experimental group while uptake of cholesterol diet alone in the control group had lead to significant increase ($p < 0.05$) in each constituent by day 21. With the exception of HDLP, the high-produced levels of all remaining constituents in the control group were significantly reduced ($p < 0.05$) after two weeks of being provided with *S. argel* extraction. The present study concludes that *S. argel* is of high effect in reducing hyper cholesterolemia.

INTRODUCTION

It is well known that many drugs of those commonly used for remedy are of herbal origin (Tapsell *et al*., 2006; Tirapelli *et al*., 2007; Sameh and Abdelhalim, 2011). As a medicinal plant, *S. argel* is used in Sudanese folkloric medicine against a wide range of diseases and health problems. It was used as antispasmodic (Innocenti *et al*., 2010), anti-inflammatory (Innocenti *et al*., 2005; Innocenti *et al*., 2010; Mohamed *et al*., 2012) and anti- oxidant Shafek *et al*. (2012). The plant was used for the treatment of diabetes mellitus Trojan-Rodrigues *et al*. (2012), and cancer (Amr *et al*., 2009; Hanafi and Mansour, 2010), and inhalation of its smoke against measles and cold (El-Kamali and Khalid, 1996). Moreover, infusion of the leaves of the whole plant was described for the treatment of gastrointestinal cramps, jaundice and urinary tract infections Shafek *et al*. (2012) as well as anti-colic and anti-syphilitic when used for prolonged period of 40 to 80 days (Kamali and Khalid 1996; Boulos, 1983). Moreover, the leaves of the plant possess purgative properties Kamali and Khalid (1996) and in the crushed form were used to treat suppurating wounds Shafek *et al*. (2012). The smoke of the plant is also considered useful for nasal congestion of common cold Kamali and Khalid (1996). Recently, *S. argel* was reported to reduce aluminum toxicity Osman *et al*. (2013). In addition to having remedial properties, *S. argel* was also reported to contain various percentages of minerals, carbohydrates and proteins Murwan KS, Murwa (2010) together with a number of organic compounds including flavonoids, kaempferaol, quercetin, rutin, flavonols, flavanones, chalcones and alkaloids Kamel (2003). However, the present study is aimed to elucidate the effects of *S. argel* on induced constituents of the lipid profile in experimental animals fed with high cholesterol diet.

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MATERIALS AND METHODS

Leaves of *S. argel* were collected from local market. Prior to extraction, the leaves were first rinsed with distilled water, dried in shade or open air in the Laboratory, pulverized to powder by a mechanical grinder and stored in a desiccator for later use. After that, the powder was completely extracted with ethanol (80 %) by Soxhlet apparatus. Then the 80% ethanol extract was dried in Rotary Evaporator apparatus, weighed and dissolved in distilled water to give the final concentration of 600 mg extract /kg. The doses were administrated orally by Gavage. Albino rats (150 – 200 g) were obtained from central animals' house. The animals were maintained at normal temperature in 12 hr light and 12 hr dark condition, the rats were divided into two groups each of six animals, and were used as experimental and control groups to elucidate the effect of *S. argel* on blood cholesterol. Both groups were provided with powdered cholesterol of 2% (high cholesterol diet) being mixed with normal diet and hah access to water *ad libitum* Annamária *et al.* (2003).

The experimental group was given *S. argel* extract 600 mg/kg daily for 21 days using gastric Gavage. Then, from each rat, blood sample was collected in a plain tube after zero, 7, 14 and 21days and each was centrifuged for serum measurement of lipid profile including cholesterol (Chol), triacylglycerol (TG), low density lipoprotein (LDLP) and high density lipoprotein (HDLP). However, the blood samples were collected from retro-orbital plexus of the albino rats after being anesthetized by diethyl ether. Subsequently, after day 21, the high cholesterol diet was replaced for the control group with the normal diet but started to receive *S. argel* 600 mg/kg daily for more two weeks after which each rat was sampled for blood and then measured for the lipid profile, after 7 and 14 days using automated analyzer (Hitachi 902). Comparison of mean values for each lipid constituent with the level at day zero for both control and experimental groups after each period was conducted by student T- test using computer package program (PASW Statistics 18). However, the significance level and sample size were explained with the data presented.

RESULTS

The results of constituents of lipid profile; cholesterol, TG, LDLP and HDLP for both control and experimental animals are shown in Tables 1 and 2.

Table 1. Mean values of lipid profile in control group of rats (C) provided with high cholesterol diet only and in experimental group (EX) provided with high cholesterol diet and *S. argel* (600 mg/kg) and both for 30 days

Parameters	Zero day	After 7 days	After 14 days	After 21 days
Chol. (C)	69 ± 6	69.4±6.1	74±8.4*	81±7.3**
Chol. (EX)	69.1 ±3.7	69.4±4.2	69.5±4.5	70.6±4.7
TG (C)	44.1±5.5	45±6.9	51±7.2**	80±8.2**
TG (EX)	44.2±5.1	44.3±5.4	44.4±5.6	45.5±6.2
LDLP (C)	9±2.2	9.6±2.5	10.1±3.7	11.3±3.1*
LDLP (EX)	9±3.7	9.1±3.5	9.1±3.7	9.2±4.3
HDLP (C)	56±8.2	55.5±8.5	50.8±9.5	47.4±9.4**
HDLP (EX)	56.1±9.7	55.3±9.9	55.7±10.5	55.9±10.6

Values are means ± SD, n= 6. * = P≤0.05, ** = P≤0.01. The 7 days, 14 and 14 days versus zero day.

Table 2. Mean values of lipid profile of control provided only with normal diet and treated with *S. argel* (600 mg/kg) for 14 days

Parameters	By day 21	day 7 of treatment	After treating for 14 days
Chol.	81±7.3	72±7.6**	69±7.1**
TG	80±8.2	74±8.7	61±8.9**
LDLP	1.3±3.1	10±3.9	8.3±3.8*
HDLP	47.4±9.4	48.1±9.8	49.7±9.9

Values are means ± SD, n= 6. * = P≤0.05, ** = P≤0.01. The 7 days and 14 days versus 21 days.

The results showed that uptake of cholesterol diet alone in the control group had lead to significant increase in each constituent by day 21 while each constituent remained without a significant change in experimental group provided with *S. argel* extraction. The results also showed that those increased in the control group were reduced significantly after two weeks of administration of the plant except for HDLP.

DISCUSSION

Regular intake of dietary enriched fat-containing meals causes serious health problems and eventually leads to incidence of cardiovascular diseases. Recently, a strong relationship between high cholesterol concentration in blood and increased risk of coronary heart disease and atherosclerosis was confirmed in medical studies Cohen (2013). In this context, perhaps the main reason to induce hyperlipidemia by cholesterol enriched diets in experimental animals was to study these diseases Annamária *et al.* (2003). In the present study, however, providing high cholesterol diet to albino rats was aimed to elucidate the effect of *S. argel* on the levels of lipid constituents namely: cholesterol, TG, LDLP and HDLP. It was evident that administration of this plant parallel with the intake of cholesterol diet maintained the level of each constituent without a significant change after being provided daily for 21 days.

The effect of this plant became prominent and reflected in a significant reduction on induced lipid constituents, particularly, cholesterol, TG and LDLP after two weeks of being given to albino rats treated with the cholesterol diet alone. However, this protective role of *S. argel* against hyperlipidemia might be attributed to its ingredients having ability to interfere with the interchange of lipid constituent at the site of synthesis in liver and adipose tissues. However, previous studies showed that flavonoids could possibly lead to reduction in antioxidant activity, hence suggesting them to have a preventive role in coronary heart diseases including atherosclerosis Chularojmontri *et al*. (2013). Similarly, several lines of evidence showed that plants with phenolic compounds had antilipidemic and antioxidative activities that would protect the liver and heart against hyperlipidemia Yang *et al*. (2010). Moreover, flavonoids which serve to activate liver cells to be more efficient in turnover LDLP from blood would reduce its level in blood Yi *et al*. (2011). The high cholesterol diet (2%) was sufficient to exert significant effect on the lipid profile after 21 days of daily intake. In conclusion, alcoholic extracts of *S. argel* leaves was able to decrease the high serum lipid profile in rats fed with high cholesterol diet for four weeks. Our result is in agreement with those reported elsewhere Shafek *et al*. (2012).

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