



# Hyperlipidemic Effect of Argel (*Solenstomma argel*) Leaves Powder in Male Albino Rats

Ragab Sherif, Ahmed Abeer Nazeeh, Abo Youssef Esraa

Department of Nutrition and Food Sciences, Faculty of Home Economics, Menoufia University, Shibin El Kom, Egypt

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### Corresponding author:

Esraa Abo Yousef  
[esraakhodod@gmail.com](mailto:esraakhodod@gmail.com)  
 Mobile: +010903167092

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### ABSTRACT:

This study aimed to investigate the possible hyperlipidemic effect of Argel (*Solenstomma Argel*) leaves powder in adult male albino rats. Thirty-six adult male albino rats weighing  $160 \pm 10$  g were divided into six equal groups ( $n=6$ ). The first group was kept as a control negative (-ve) group (fed basal diet). The second group was a positive (+ve) control group fed a lipid-rich diet without Argel supplementation. In contrast, the other groups were fed a basal diet supplemented with 1.5% cholesterol and 10% animal fat for 30 days for hyperlipidemia induction. Argel leaves powder was added at 1%, 2%, 3%, and 4% to the diet for groups G3, G4, G5, and G6, respectively. The feeding course was extended for 28 consecutive days. Body weight gain, feed intake, feed efficiency ratio, serum lipid profile (TG, TC, HDL-c, LDL-c, and VLDL-c), serum liver activity enzymes (ALT, AST, and ALP), and kidney function enzymes (creatinine, uric acid, and urea levels) were evaluated at the end of the experiment. The obtained results concluded that feeding on a diet containing Argel leaves powder caused a significant ( $P \leq 0.05$ ) increase in HDL-c and a significant ( $P \leq 0.05$ ) decrease in body weight gain, blood lipid profile, kidney functions, and liver enzymes. According to the results, Argel leaves powder could successfully treat hyperlipidemia associated with lipid-rich diet intake.

**Keywords:** *S. Argel* - Hyperlipidemia - Biochemical analysis - Triglycerides - Rats

### INTRODUCTION

Hyperlipidemia is an increase in one or more of the plasma lipids, including triglycerides, cholesterol, cholesterol esters and phospholipids and or plasma lipoproteins including very low-density

lipoprotein and low-density lipoprotein and reduced high-density lipoprotein levels (1, 2).

Hypercholesterolemia and hypertriglyceridemia were reported as the main causes of atherosclerosis which

is strongly related to ischemic heart disease (IHD) (3). There is a strong relationship between IHD and the high mortality rate. Furthermore, elevated plasma cholesterol levels cause more than four million deaths in a year (4).

Hyperlipidemia relates to increased oxidative stress causing significant production of oxygen free radicals, which may lead to oxidative modifications in low-density lipoproteins, which present a significant function in the initiation and progression of atherosclerosis and associated cardiovascular diseases (5).

The pharmacological treatment of disease began long ago with the use of herbs. Methods of folk healing throughout the world commonly use herbs as part of their tradition. Some of these traditions are briefly described (6). *Solenostemma argel* is a species of plant related to the Apocynaceae family, which was first described as a genus in 1825. It contains only one known species, *Argel*, which grows as a native flora in North Africa and the Arabian Peninsula. The high cholesterol diet (up to 2%) was sufficient to exert a significant effect on the lipid profile after 28 days of daily intake. *Argel* leaves powder was able to decrease the high serum lipid profile in rats fed a high-cholesterol diet for four weeks.

This study aims to study the effect of *Argel* as powder in different concentrations on hyperlipidemic rats, which were fed a high-fat and cholesterol diet.

## **MATERIALS AND METHODS**

### **MATERIALS:**

#### **The used leaves:**

*The Argel plant was obtained from the Herbal Store in Cairo, Egypt.*

#### **The used fats:**

*Sheep fat was obtained from the local butcher in Cairo.*

### **Experimental animals:**

A total of 36 adult normal male albino rats Sprague- Dawley strains weighting  $160 \pm 10$ g were obtained from the Faculty of Agriculture at Cairo University, Giza, Egypt and fed on a basal diet for a week as an adaptation period. Diet was offered to the experimental rats in special food cups to avoid loss conditions of feed, and water was provided to the rats by glass tubes supported to one side of the cage. Feed and water provided ad-labium and checked daily.

### **Basel diet composition of tested rats:**

The standard diet was formulated according to AIN (7) guidelines Reeves et al. (8). Salt mixture and vitamins mixture were prepared according to Hegested et al. (9) and Campbell (10).

### **Chemical kit and reagents:**

Were purchased from El-Gomhoria Company for Trading Drugs, Chemicals and Medical Instruments, Cairo, Egypt.

### **METHODS:**

#### **Preparation of Argel powder:**

The herbal leaves were crushed by an electrical blender and turned into a fine powder by double sieving.

## The induction of experimental hyperlipidemia:

Hyperlipidemia was induced in normal healthy male albino rats by feeding them a sheep fat (20%)-containing diet for 30 days.

### Biological experiments:

#### Animal grouping

The first main group fed on a basal diet as a control negative group (n=6).

The second main group (Hyperlipidemic rats) (n=30 rats). Hyperlipidemia was induced in normal healthy male and female albino rats by the addition of animal fats and were divided into 5 sub-groups (6 rats per group) as follows:

Group 2: Hyperlipidemic rats fed on hyperlipidemic diet as a control positive group.

Group 3: Hyperlipidemic rats fed on hyperlipidemic diet supplemented with 1% of Argel leaves powder.

Group 4: Hyperlipidemic rats fed on hyperlipidemic diet supplemented with 2% of Argel leaves powder.

Group 5: Hyperlipidemic rats fed on hyperlipidemic diet supplemented with 3% of Argel leaves powder.

Group 6: Hyperlipidemic rats fed on hyperlipidemic diet supplemented with 4% Argel leaves powder.

During the experimental period, body weight gain and feed intake were estimated weekly.

### Blood sampling:

At the end of the experimental period (28 days), each rat was weighted separately, followed by short-term fasting (12 hours)

then slaughtered for collect blood samples Blood samples were centrifuged at 4000 rpm for ten minutes to separate blood serum, then kept in a deep freezer until used.

### Biological evaluation:

During the experimental period (28 days), the daily diet consumed was recorded, while body weight was recorded weekly. The body weight gain (B.W.G.) and feed efficiency ratio (F.E.R.) were determined according to Chapman et al. (11). Using the following equations:

$$B.W.G. = \text{final weight} - \text{initial weight}$$

$$F.E.R. = \frac{\text{Grams gain in body weight}(g)}{\text{Grams feed consumed}(g)}$$

### Biochemical analytical methods:

The following techniques were applied for determination of different parameters in serum.

#### Estimation of serum lipid:

Triglycerides estimation was carried out according to Fassati and Prencipe technique (12).

Total cholesterol was determined according to Allain method (13).

HDL-cholesterol was determined by the method of Lopez (14).

VLDL and LDL- cholesterol estimation was carried out according to the calculation method of Lee and Nieman (15) as follows:

$$VLDL \text{ (mg/dl)} = \text{Triglycerides}/5$$

$$LDL \text{ (mg/dl)} = (\text{Total cholesterol} - \text{HDL}) - VLDL$$

ALP was carried out according to Belfield and Goldberg method (16).

AST and ALT were determined according to the method described by Yound (17) and Tietz (18).

Urea was determined according to the enzymatic method of Patton and Crouch (19)

Creatinine was determined according to the kinetic method of Henry (20).

#### **Statically analysis:**

The results are recorded as the mean  $\pm$  SD. The experimental data were subjected to an analysis of variance (ANOVA) for a completely randomized design using the statistical analysis system SAS (21). Duncan's multiple range tests were used to determine the differences among means at the level of 5%.

### **RESULTS AND DISCUSSION**

The data presented in Table (1) showed the effect of Argel leaves powder on body weight gain, feed intake and feed efficiency ratio in experimental groups of rats. In the case of body weight gain the highest value was recorded in the positive control group, while the negative control group recorded the significant lowest value ( $P \leq 0.05$ ). The mean values were  $4.76 \pm 0.91$  and  $2.03 \pm 0.18$  g / 28 day, respectively.

For treated groups, the highest body weight gain value was recorded in the rat group which fed a diet supplemented with 1% of Argel leaves powder, while the group fed 4% of Argel powder recorded lowest value with a significant ( $P \leq 0.05$ ) differences with other examined groups.

The mean values were  $3.60 \pm 0.49$  and  $2.35 \pm 0.22$  g/28 day, respectively. There was no significant ( $P \leq 0.05$ ) difference between animal groups fed both 1% and 2% Argel leaves powder.

The highest feed intake value was recorded in the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) difference. The mean values were  $20.25 \pm 0.42$  and  $19.13 \pm 0.20$  g / day, respectively.

For rat groups fed a supplemented diet with Argel leaves powder, the highest feed intake value recorded was in the rat group fed a level of 1% Argel leaves powder supplementation, while a diet supplementation level 3% of Argel leaves powder was recorded to induce the lowest value with a significant ( $P \leq 0.05$ ) difference. The mean values were  $19.71 \pm 0.47$  and  $18.48 \pm 0.71$  g / day, respectively. There were no significant ( $P > 0.05$ ) differences between the negative control and the animal group fed a supplementation of 2% Argel leaves powder. Also, there were no significant ( $P \leq 0.05$ ) differences between supplementation levels of 3% and 4% in the Argel leaves powder groups.

In the case of feed efficiency ratio, the highest value was recorded in the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $0.24 \pm 0.04$  and  $0.103 \pm 0.015$ , respectively.

For treated groups the highest feed efficiency ratio value was recorded for the groups treated with 1% and 2% Argel leaves powder, while feeding a supplemented diet with 4% Argel leaves powder recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $0.18 \pm 0.025$ ,  $0.18 \pm 0.03$  and  $0.13 \pm 0.01$ , respectively. There were no significant ( $P \leq 0.05$ ) differences between groups fed supplementation levels of 1%, 2% and 3% of Argel leaves powder. These results agreed with those stated by Rosas et al. who concluded that treating hypercholesterolemic rats with Argel, either alone or mixed with *Costus speciosus* and *Phyllanthus emblica*, (400 mg/kg) resulted in a reduced body weight gain, feed intake and improved feed efficiency ratio (22).

Also, El-Sahar et al. reported that treating obese rats with herbal mixture in either

powder or extract form, and among these herbs, Argel showed the highest significant decrease in body weight gain and feed efficiency ratio compared to the positive control group (23).

Also, El-Shiekh et al. concluded that feeding animals on a high-fat diet exhibited a significant increase in body weight (101.63%) compared to the control group. After treating these animals with an ethanolic extract of Argel significantly ( $P < 0.05$ ) suppressed the body weight gain by 11–27% after 4 weeks of treatment, and this difference significantly increased ( $P < 0.05$ ) by 29–44% after 8 weeks of treatment (24).

Aziz et al. (25) reported that soybeans, which are from the same family as Argel, can reduce weight when mixed with some other natural compounds.

**Table (1): Effect of Argel leaves powder on body weight gain, food intake and feed efficiency ratio of hyperlipidemic rats:**

Parameters	Body weight gain (g/28 day)	Feed intake (g/day)	Feed efficiency ratio
G1:- (-ve)	2.03 d $\pm$ 0.18	19.13 b $\pm$ 0.20	0.103 d $\pm$ 0.015
G2:- (+ve)	4.76 a $\pm$ 0.91	20.25 a $\pm$ 0.42	0.24 a $\pm$ 0.04
G3:- 1% argel powder	3.60 b $\pm$ 0.49	19.71 ab $\pm$ 0.47	0.18 b $\pm$ 0.025
G4:- 2% argel powder	3.51 b $\pm$ 0.80	19.46 b $\pm$ 0.80	0.18 b $\pm$ 0.03
G5:- 3% argel powder	2.88 bc $\pm$ 0.15	18.48 c $\pm$ 0.71	0.16 b $\pm$ 0.01
G6:- 4% argel powder	2.35 cd $\pm$ 0.22	18.55 c $\pm$ 0.36	0.13 c $\pm$ 0.01
LSD ( $P \leq 0.05$ )	0.61	0.46	0.022

Each value represents mean  $\pm$  standard deviation. Mean under the same column bearing different superscript letters are different significantly ( $p \leq 0.05$ ).

Data presented in Table (2) show the effect of Argel as leaves powder on serum triglycerides (T.G) and serum total

cholesterol (T.C) levels in hyperlipidemic rats. The obtained results indicated that the highest value of serum cholesterol

levels was recorded for the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $158.00 \pm 6.00$  and  $77.00 \pm 2.00$  mg/dl, respectively.

For treated groups, the highest value of serum cholesterol levels was recorded for 1% Argel powder, while the 4% Argel powder group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $108.33 \pm 2.08$  and  $85.67 \pm 4.62$  mg/dl, respectively. There were no significant ( $P \leq 0.05$ ) differences between the 1% and 2% Argel leaves powder groups.

In the case of serum triglycerides, it could be concluded that the highest value of serum triglycerides levels was recorded for the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $153.33 \pm 17.95$  and  $60.33 \pm 2.52$  mg/dl, respectively.

For treated groups, the highest serum triglyceride levels were recorded for 1%

Argel leaves powder, while in the case of the rat group fed with 4% Argel leaves powder supplementation, the lowest value was recorded with significant ( $P \leq 0.05$ ) differences. The mean values were  $122.33 \pm 7.02$  and  $73.67 \pm 7.23$  mg/dl, respectively. These results agreed with Taha, who reported that Argel aqueous extract reduced TC levels in diabetic rats (26).

Rosas et al. stated that treating hypercholesterolemic rats with Argel, either alone or mixed with *Costus speciosus* and *Phyllanthus emblica*, by (400 mg/kg) was effective in reducing TC and TG, so Argel had the ability to treat hypercholesterolemia (22).

Also, Elbashir et al. reported that Argel extract exhibited activity against the pancreatic lipase enzyme. Thus, Argel was effective against obesity and high blood lipids (27). El-Dashlouty et al. proved that sunflower seeds, which are from the same family as Argel, have reduced triglycerides and total cholesterol levels in diabetic rats (28).

**Table (2): Effect of Argel leaves powder on serum cholesterol and triglycerides levels of hyperlipidemic rats:**

Groups	Parameters	Total cholesterol (mg/dl)	Triglycerides (mg/dl)
G1:- (-ve)		77.00 e $\pm$ 2.00	60.33 e $\pm$ 2.52
G2:- (+ve)		158.00 a $\pm$ 6.00	153.33 a $\pm$ 17.95
G3:- 1% argel powder		108.33 b $\pm$ 2.08	122.33 b $\pm$ 7.02
G4:- 2% argel powder		103.00 b $\pm$ 0.10	98.67 c $\pm$ 9.07
G5:- 3% argel powder		95.00 c $\pm$ 3.61	84.67 cd $\pm$ 5.69
G6:- 4% argel powder		85.67 d $\pm$ 4.62	73.67 de $\pm$ 7.23
LSD ( $P \leq 0.05$ )		5.58	16.45

Each value represents mean  $\pm$  standard deviation. Mean under the same column bearing different superscript letters are different significantly ( $p \leq 0.05$ ).

Data presented in the Table (3) shows the effect of Argel leaves powder on serum lipoprotein levels. High density lipoprotein cholesterol (HDL-c), low density lipoprotein cholesterol (LDL-c) and very low-density lipoprotein cholesterol (VLDL-c) of hyperlipidemic rats. It's clear to notice that the highest high-density lipoprotein cholesterol levels were recorded for the negative control group, while the positive control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $61.67 \pm 1.15$  mg/dl and  $37.33 \pm 2.08$  mg/dl, respectively.

On the other hand, the highest level of high-density lipoprotein cholesterol levels in treated group was recorded for the 4% Argel powder group, while the 1% Argel powder group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $59.67 \pm 2.08$  mg/dl and  $42.66 \pm 1.53$  mg/dl, respectively.

The obtained data also indicated that the highest low-density lipoprotein cholesterol level was recorded in the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $91.33 \pm 10.90$  and  $3.27 \pm 1.21$  mg/dl, respectively.

For treated groups with Argel leaves powder the highest serum low density lipoprotein cholesterol levels were recorded in a rat group fed a supplemented diet with 1% Argel leaves

powder, while 4% Argel powder supplementation was associated with the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $41.07 \pm 4.56$  and  $11.27 \pm 4.21$  mg/dl, respectively.

In case of very low-density lipoprotein cholesterol level, the highest value was recorded in the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $30.67 \pm 3.59$  and  $12.07 \pm 0.50$  mg/dl, respectively.

For treated groups fed a supplemented diet with Argel leaves powder, the highest value of very low-density lipoprotein cholesterol levels was recorded for 1% Argel powder, while 4% of Argel leaves powder supplementation, is was recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $24.47 \pm 1.40$  and  $14.73 \pm 1.45$  mg/dl, respectively. These results agreed with Taha et al. who reported that Argel aqueous extract was related to increased HDL-c levels in diabetic rats (26).

Also, El-Sahar et al. reported that treating obese rats with a herbal mixture of powder and extract, and among these herbs was Argel showed decreased LDL-c levels and, on the other hand, increased HDL-c levels. compared to the positive control group (23).

As well as, El-Shiekh et al. reported that treating animals that were fed on high fat

diets with an ethanolic extract of Argel improved their lipid profile, as they

showed nearly normal values of LDL and HDL (24).

**Table (3): Effect of Argel leaves powder on serum lipoproteins levels of hyperlipidemic rats:**

Parameters	HDL-c (mg/dl)	LDL-c (mg/dl)	VLDL-c (mg/dl)
G1:- (-ve)	61.67 a ± 1.15	3.27 d ± 1.21	12.07 e ± 0.50
G2:- (+ve)	37.33 e ± 2.08	91.33 a ± 10.90	30.67 a ± 3.59
G3:- 1% argel powder	42.66 d ± 1.53	41.07 b ± 4.56	24.47 b ± 1.40
G4:- 2% argel powder	47.33 c ± 3.21	37.40 b ± 4.61	19.93 c ± 1.62
G5:- 3% argel powder	51.67 b ± 0.58	26.00 c ± 3.70	17.33 cd ± 0.81
G6:- 4% argel powder	59.67 a ± 2.08	11.27 d ± 4.21	14.73 de ± 1.45
LSD (P≤0.05)	3.81	9.25	3.60

Each value represents mean ± standard deviation. Mean under the same column bearing different superscript letters are different significantly ( $p \leq 0.05$ ). HDL-c = High density lipoprotein cholesterol. LDL-c = Low density lipoprotein cholesterol. VLDL-c = Very low-density lipoprotein cholesterol

Data presented in Table (4) show the effect of Argel powder on serum liver enzymes levels (ALP, AST and ALT) in hyperlipidemic rats. The obtained results indicated that the highest serum ALP levels were recorded for the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $175.67 \pm 6.03$  and  $85.67 \pm 8.62$  U/L, respectively. These results are in agreement with Al-Sieni et al. they reported that hyperlipidemia has significantly ( $p \leq 0.05$ ) increased liver enzymes activity (ALT and AST) (29).

For treated groups, the highest value of serum ALP levels recorded in the rat group fed on 1% Argel leaves powder supplementation, while 4% Argel leaves powder supplementation was recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $149.00 \pm 14.00$  and  $108.67 \pm 11.15$  U/L, respectively.

In case of serum AST, it could be concluded that the highest value of serum AST levels were recorded for the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $232.67 \pm 1.15$  and  $159.33 \pm 3.79$  U/L, respectively.

In rat groups fed on argel leaves powder, the highest serum AST levels was recorded in case of 1% supplementation, while 4% Argel leaves powder supplementation was correlated directly with the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $221.33 \pm 5.13$  and  $181.00 \pm 1.00$  U/L, respectively. There were no significant ( $P \leq 0.05$ ) differences between the 3% and 4% Argel leaves powder groups.

The obtained data also indicated that the highest value of serum ALT levels was recorded for positive control group, while the negative control group recorded the



lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $65.33 \pm 2.52$  and  $35.00 \pm 2.00$  U/L, respectively. For treated groups, the highest value of serum ALT levels was recorded in 1% Argel leaves powder, while diet supplementation with 4% Argel leaves powder recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were  $58.67 \pm 2.52$  and  $39.33 \pm 1.53$  U/L, respectively. These findings agree with Ahmed et al. who reported that Argel leaves extract showed a clear hepatoprotective effect against ethanol-induced hepatotoxicity, where Argel reduced the level of ALT and AST enzymes. That could be attributed to the free radical scavenging activity of the Argel extract. This finding was referred mainly to the presence of significant concentrations of polyphenolic

compounds together with an abundant amount of tannins and polyflavonoids contents (30) which play a sound role in hepatoprotective actions.

Also, Suliman et al. found that the damaging influence of CCl<sub>4</sub> was improved by the retreatment with Argel leaves powder via reducing the activity of alanine aminotransferase, which could also be observed in the normal appearance of the liver tissue (31). As well, Azer et al. reported that treating male rats suffering from chronic liver damage with Argel leaves had a significantly ( $p \leq 0.05$ ) improving effect on liver enzymes (AST, ALT and ALP). These results illustrated that Argel's hepatoprotective effect could be attributed to its high content of antioxidant constituents and its potential free radical scavenging action (32).

**Table (4): Effect of Argel leaves powder on liver enzymes of hyperlipidemic rats:**

Parameters	ALP (U/L)	AST (U/L)	ALT (U/L)
G1:- (-ve)	85.67 e $\pm$ 8.62	159.33 e $\pm$ 3.79	35.00 f $\pm$ 2.00
G2:- (+ve)	175.67 a $\pm$ 6.03	232.67 a $\pm$ 1.15	65.33 a $\pm$ 2.52
G3:- 1% argel powder	149.00 b $\pm$ 14.00	221.33 b $\pm$ 5.13	58.67 b $\pm$ 2.52
G4:- 2% argel powder	127.33 c $\pm$ 4.16	202.67 c $\pm$ 9.07	51.67 c $\pm$ 2.08
G5:- 3% argel powder	122.00 cd $\pm$ 1.73	188.33 d $\pm$ 6.03	44.33 d $\pm$ 2.52
G6:- 4% argel powder	108.67 d $\pm$ 11.15	181.00 d $\pm$ 1.00	39.33 e $\pm$ 1.53
LSD( $p \leq 0.05$ )	15.06	7.89	4.09

Each value represents mean  $\pm$  standard deviation. Mean under the same column bearing different superscript letters are different significantly ( $p \leq 0.05$ ). ALP: Alkaline phosphatase. AST: Aspartate transaminase. ALT: Alanine aminotransferase.

Data presented in Table (5) show the effect of Argel leaves powder on serum kidney functions parameters (urea, uric acid and creatinine) in hyperlipidemic rats. It's clear to notice that the highest

serum urea levels recorded for the positive control group, while the negative control group recorded the lowest value with a significant ( $P \leq 0.05$ ) differences. The mean values were  $48.67 \pm 0.58$  and

41.00 ± 1.73 mg/dl, respectively. These results agreed with Al-Sieni et al. as they found that renal parameters were also greatly affected by hyperlipidemia condition, as revealed by the increased levels of creatinine, uric acid and urea (29).

For treated groups, the highest value of serum urea levels recorded in a rat group fed a supplemented diet with 1% of Argel leaves powder, while 3%, 4% Argel leaves powder supplementation level was correlated with the lowest values with a significant ( $P \leq 0.05$ ) differences. The mean values were 47.00 ± 1.00, 42.00 ± 1.00 and 42.00 ± 2.00 mg/dl, respectively. There were no significant ( $P \leq 0.05$ ) differences between the positive control rat group and those fed on supplemented diets with levels of 1% and 2% of Argel leaves powder. Also, there were no significant ( $P \leq 0.05$ ) differences between the negative control rat group and those fed on supplementation level of 3% and 4% of Argel leaves powder.

Our data also showed that the highest serum uric acid levels were recorded in a positive control group of rats, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were 3.43 ± 0.06 mg/dl and 2.00 ± 0.10 mg/dl, respectively.

On the other hand, for treated groups, the highest value of serum uric acid level was noticed in the rat group fed on a supplemented diet with 1% of Argel leaves powder, while in the case of diet

supplementation with a level of 4% of Argel leaves powder was recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were 2.93 ± 0.06 and 2.27 ± 0.06 mg/dl, respectively. In the case of serum creatinine, it could be concluded that the highest value was recorded for the positive control group, while the negative control group recorded the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were 1.023 ± 0.03 and 0.80 ± 0.02 mg/dl, respectively.

For treated groups of rats, the highest value of serum urea levels recorded in the rat group fed on 1% Argel leaves powder supplemented diet, while diet supplementation with 4% Argel leaves powder was associated with the lowest value with significant ( $P \leq 0.05$ ) differences. The mean values were 0.95 ± 0.006 and 0.81 ± 0.01 mg/dl, respectively. There were no significant ( $P \leq 0.05$ ) differences between the groups which fed on diet supplemented with 1% and 2% of Argel leaves powder. Also, there were no significant ( $P \leq 0.05$ ) differences between the negative control and those fed a supplemented diet with 4% Argel leaves powder. These findings are in agreement with those reported by El-Sahar et al. who noticed a significant improvement in kidney functions by reducing urea, uric acid and creatinine levels in obese rats after treating by S. argel with other herb mixture without causing any toxicity (23).

Table (5): Effect of Argel leaves powder on kidney functions of hyperlipidemic rats:

Parameters	Urea (mg/dl)	Uric acid (mg/dl)	Creatinine (mg/dl)
Groups			
G1:- (-ve)	41.00 b ± 1.73	2.00 f ± 0.10	0.80 d ± 0.02
G2:- (+ve)	48.67 a ± 0.58	3.43 a ± 0.06	1.02 a ± 0.03
G3:- 1% argel powder	47.00 a ± 1.00	2.93 b ± 0.06	0.95 b ± 0.006
G4:- 2% argel powder	46.67 a ± 1.53	2.67 c ± 0.06	0.94 b ± 0.01
G5:- 3% argel powder	42.00 b ± 1.00	2.43 d ± 0.06	0.91 c ± 0.015
G6:- 4% argel powder	42.00 b ± 2.00	2.27 e ± 0.06	0.81 d ± 0.01
LSD	2.73	0.13	0.027

Each value represents mean ± standard deviation. Mean under the same column bearing different superscript letters are different significantly ( $p \leq 0.05$ ).

## CONCLUSION

In conclusion, our results showed that feeding experimental hyperlipidemic rats with Argel leaves powder could improve their serum lipid profile and liver and kidney functions. This reflects the strong therapeutic action of Argel leaves powder and, therefore, could represent a sound and powerful tool for the treatment of hyperlipidemia and its associated conditions.

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التغذية وعلوم الاطعمة

### التأثير المحتمل لعشبة الحرجل على الفئران المصابة بارتفاع دهون الدم

شريف صبرى رجب ، عيبر نزيهة عبد الرحمن، إسراء إسماعيل أبو يوسف

قسم التغذية وعلوم الاطعمة .كلية الاقتصاد المنزلي . جامعة المنوفية، شبين الكوم، مصر

<p><b>الملخص العربي:</b> تهدف هذه الدراسة إلى معرفة تأثير مسحوق الحرجل على الفئران المصابة بارتفاع دهون الدم. تم استخدام 36 فأر في هذه الدراسة يتراوح أوزانها (10±160) و تم تقسيمها الى 6 مجموعات متساوية, 6 فئران في كل مجموعة, تركت إحدهم كمجموعة ضابطة سالبة, أما المجموعات الخمسة الأخرى تم تغذيتها على الوجبة الاساسية بالإضافة إلى 1.5% من الكوليسترول و 10% دهن حيواني لمدة 21 يوم لإحداث الإصابة. تم إضافة نبات الحرجل بنسبة 1%, 2%, 3% , 4% من الوجبة الاساسية. تم تحديد الوزن المكتسب, المأخوذ من الغذاء, معدل الكفاءة الغذائية, صورة دهون الدم (الجليسريدات الثلاثية – الكوليسترول الكلى – البروتين الدهنى مرتفع الكثافة – البروتين الدهنى منخفض الكثافة – البروتين الدهنى منخفض الكثافة جدا), إنزيمات الكبد (ألانين أمينوترانسفيريز -أسبارتات أمينوترانسفيريز - الألكالين فوسفاتيز), وظائف الكلى (مستوي الكرياتينين – حمض اليوريك – اليوريا). من النتائج التي تم الحصول عليها يمكن استنتاج أن التغذية على مسحوق نبات الحرجل تسببت في زيادة معنوية (<math>p \leq 0.05</math>) في البروتين الدهنى عالى الكثافة, من ناحية أخرى انخفاض ملحوظ في الوزن المكتسب, دهون الدم, وظائف الكلى ووظائف الكبد. وفقا للنتائج, فإنه يمكن استخدام الحرجل في علاج ارتفاع دهون الدم.</p>	<p><b>نوع المقالة</b> بحوث اصلية</p>
<p><b>المؤلف المسؤول</b> اسراء أبو يوسف <a href="mailto:esraakhodod@gmail.com">esraakhodod@gmail.com</a> الحوال 010903167092</p>	<p>DOI:10.21608/mkas.2024.172019.1190</p>
<p><b>الاستشهاد الي:</b> Ragab et al., 2024, Hyperlipidemic Effect of Argel (Solenstomma argel) Leaves Powder in Male Albino Rats. JHE, 34 (1), 16-29</p>	<p><b>تاريخ الاستلام:</b> ٣١ اكتوبر ٢٠٢٢ <b>تاريخ القبول:</b> ٢٣ ديسمبر, ٢٠٢٣ <b>تاريخ النشر:</b> ١ يناير ٢٠٢٤</p>

الكلمات الكاشفة: حرجل، ارتفاع دهون الدم، التحاليل الكيمائية الحيوية، الجليسريدات الثلاثية، الفئران