Effect of standard and low protein diets containing Gum Arabic on hyperuricemic rats

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Abstract

Hyperuricemia is a common disorder that affects patients of all ages and genders. The most common manifestation of hyperuricemia is gout. Gum Arabic (GA) is a complex polysaccharide , believed to be an excellent curative for hyperuricemia,The present study is aimed to investigate the effect of diets containing gum arabic on hyperuricemic rats. A specimen of forty nine albino rats were divided into two main groups. The first main group (7 rats) fed on basal diet (BD) as control negative group, the second main group (42 rats) treated with 30% fructose in drinking water for 6 weeks to induce hyperuricemia ,and treated with standard diet or low protein diet plus gum arabic in different proportions (5% and 10%).The experiment lasted for 4 weeks.Groups which treated with standard or low protein diet containing 10% Gum arabic recorded the best results as decrement the % of body weight gain and kidney weight / body weight% as compared to the other groups with hyperuricemia. the best results in decreasing glucose and kidney functions which including serum uric acid, urea nitrogen and creatinine were recorded for the hyperuricemic group fed on a low protein diet containing 10% Gum arabic, followed by the group which suffer from hyperuricemia and treated with a standard diet containing 10% Gum arabic. Also feeding rats with hyperuricemia on a standard diet or low protein diet containing (5% and 10% Gum arabic) improved the lipid profile and the liver enzymes (AST, ALT and ALP), as compared to the positive control groups. conculsion low protein diet plus to gum arabic improve both liver and kidney function, specially for rats suffering from hyperuriecemia.

Keywords: Hyperuricemia ,Gout ,Gum arabic , Basal diet, Low protein diet and Rats

Introduction

Hyperuricemia is a common disorder that affects patients of all ages and gender. The most common manifestation of hyperuricemia is gout, which can be very painful and is easily

treatable ***(George and Minter, 2021)*** **.**Hyperuricemia is an elevated uric acid level in the blood. The normal upper limit is 6.8mg/dL, and anything over 7 mg/dL is considered saturated, and symptoms can occur. Hyperuricemia can lead to gout and nephrolithiasis. It has also been implicated as an indicator for diseases like metabolic syndrome, diabetes mellitus, cardiovascular disease, and chronic renal disease ***(Barkas et al.,2018).***

Gout is recognized as one of the most acute painful symptoms that affect human beings,Gout is the most common inflammatory arthritis in older people, with an incidence of in women and 4.0 in men per 1,000 persons ***(Abhishek et al ,2017).***

Uric acid (UA) is the end product of purine metabolism, largely derived from endogenous synthesis, but a minor part also arises from exogenous sources such as foods with purine content, alcohol, and fructose drinks. UA is synthesized mainly in the liver and intestines but is also synthesized in other tissues, such as muscles, kidneys, and the vascular endothelium ***(El Ridi and Tallima., 2017).***

Merriman et al., (2014) reported that, dietary sources that can contribute to hyperuricemia and gout include consumption of animal food such as seafood (e,g., shrimpand lobster), organs (e.g., liver, and kidney), and red meat (pork and beef). Some drinks like alcohol, sweetened beverages, sodas, and high-fructose corn syrup may also contribute to this disease***(Neogi.,2016).***

Gum Arabic (GA) is defined by the Food and Agriculture Organization-World Health Organization Joint Expert Committee for Food Additives (JECFA) as ‘a dried exudate obtained from the stems of Acacia Senegal tree or closely related species of Acacia *(family Leguminosae)*. GA has a beneficial role to modify the physiological system in humans. It is claimed to have many physiological and therapeutic effects which were investigated in several studies ***(Ali et al.,2013).***

This study aimed to investigate the effects of a normal and low protein diet containing Gum Arabic (GA) on rats with hyperuricemia as a major symptom of gout.

Materials and Methods

Materials:

1. Casein, vitamins, minerals, cellulose and choline chloridewere obtained from El -Gomhorya Company, Cairo, Egypt.
2. Fructose was obtained from a pharmacy, Cairo, Egypt.
3. Gum arabic (GA),was obtained from Sudan governorate, Egypt .
4. Kits of analyzed items was purchased from El -Gomhorya company, Cairo, Egypt.

Animals:

Forty-nine (49) Normal female albino rats (*Sprague – Dawely Strain*) weighing 200±10 g from the Agricultural Research Center, Giza, Egypt.

Methods:

Experimental Animals:

Animals: Forty-nine female albino rats of Sprague-Dawley strain weighting (200± 10g)were used in this study. All rats were fed the control diet (basal diet). Each rat was housed in an individual stainless steel cage under hygienically controlled conditions. Diets were introduced to rats in a special non - scattering feeding cup to avoid loss and contamination of food.

Induction of Hyperuricemia:

Hyperuricemia was induced in Forty-two normal healthy rats by fed on basal diet and treated with 30% fructose in drinking water for 6 weeks to induce hyperuricemia***(Yang et al.,2015).***

Basal Diets: The rats were fed on basal diet according to***(Reeves,et a.l, 1993)*** .The Salt mixture which used in this study according to***(Hegstedet al., 1941)*** and the vitamin mixture prepared according to***(Campbell, 1963)***.

Preparation of Gum Arabic for rat's diet:-

At two different supplementation groups 5% and 10% (GA) (50g and 100g) of *powder* Gum Arabic was added to each kg standard diet and low protein diet according to ***Khedr(2017)*** and mixed well manually instead of corn starch ratio.

* ***Khedr (2017)*** Who indicated that the use of gum arabic by 10% was more effective.

After adaptation period, the rats were divided into two main groups as follows :

The first main group: (7 rats): fed on basal diet only "as a negative control group"

The second main group: (42 rats): fed on basal diet and treated with 30% fructose in drinking water for 6 weeks to induce hyperuricemia***(Yang et al.,2015).***

After confirming the hyperuricemia of mice,

The rats in the second main group was divided after confirmation of hyperuricemia into sixsubgroups as a following:

- ***The first subgroup (7 rats):***fed on a basal diet, as a positive control group (1), ***the second and the third subgroups (7 rats/group):***fed on a basal diet containing 5% and 10% gum arabicof diet content***,,the fourth subgroup (7 rats):*** fed onalow protein dietas a control positive group (2), ***The fifth and The sixth subgroups (7 rats/group):*** fed on a low protein diet containing 5% and 10%gum Arabicof diet content .

**** Low protein diet: diet containing 7% protein.***

Each of the above groups was kept in a single cage. The diets were introduced to rats in special non – scattering feeding cups. Tap water was provided to rats by means of glass tubes projecting through wire cages from inverted bottles supported to one side of the cage. Rats were weighed before, after and during the experiment.

After completing the treatments: -

During the experimental period (4 weeks), the diets were consumed and body weights were recorded twice weekly according to ***Chapman et al., (1959)***. After night fasting all rats were sacrificed under anesthesia. Blood samples were withdrawn from the hepatic portal vein in non-heparinized tubes. Blood was centrifuged at 3500 (rpm). for 15 min., serum samples were carefully separated and stored frozen at – 20°c for different biochemical analyses. glucose ***(Trinder,1959)***, cholesterol ***(Allain et al., 1974),*** triglycerides ***(Foster and Dumns, 1973),*** high density lipoprotein HDL-c (Lopes-Virella et al., 1977), low density lipoprotein LDL-c

and VLDL-c calculated according to ***(FriedWald et al., 1972)***, Aspartate Amino Transferase (AST) and Alanine Amino Transferase (ALT) by ***Reitman and Frankel, (1957),*** alkaline phosphatase (ALP) by ***Belfield and Goldberg, (1971).***

Statistical Analysis:

The statistical analysis was carried out by using SPSS, PC statistical software (version 25.0; SPSS Inc, Chicago. USA). The results were expressed as mean $\pm$SD. Data were analyzed by one-way analysis of variance (ANOVA). The Differences between means were tested for significance using Least Significant Difference (LSD) test at $P<0.05$ ***(Steel &Torri, 1980).***

Results and discussion

Data presented expressed in the table (1) showed that the mean value of feed consumption of rats in the control positive groups which were fed on standard and low protein diets (control

+ve)[1&2] showed non-significant deference's, as compared to control –ve group. On the other hand,The mean values of feed intake in all treated groups which fed on standard or low protein diets containing 5% and 10% Arabic gum showed non-significant changes, as compared to the negative and positive control groups.

The results in the same Table revealed that the mean value of BWG% in rats (control +ve group)[1] showed a significant increase $p \leq 0.05$, as compared to the BWG% in rats (control –ve group). Treating hyperuricemic rats with standard or low protein diet containing 5% and 10% Arabic gum caused significant decrease $p \leq 0.05$ in BWG%, as compared to the positive control groups (control +ve)[1&2]. Groups which treated with standard or low protein diet containing 10% Arabic gum recorded the best results in decreasing the % of body weight gain, as compared to the other groups with hyperuricemia.

The data in this Table revealed that the mean value of kidney weight/body weight% of rats fed on a basal diet or low protein diet and treated them with 30% fructose in the drinking water (control +ve group)[1&2] showed a significant increase $p \leq 0.05$, as compared to the mean value of kidney weight/body weight% in rats fed on a basal diet without fructose "control – ve group. The best results in kidney weight/body weight % in all treated groups recorded for the groups treated with standard or low protein diets containing 10% Arabic gum (0.862 ± 0.063 & 0.925 ± 0.079), these treatments showed a significant decrease $p \leq 0.05$ in kidney weight/body weight%, as compared to the other treated groups with 5% Arabic gum.

Table (1): Effect of standard and low protein diets containing gum Arabic on feed intake, body weight gain% and kidney weight/body weight% of hyperuricemic rats.

Parameters / Groups	Feed intake g/day/each rat	Body weight gain%	Kidney weight / body weight%
Rats fed on standard diets			
Control (-ve)	17.114 [a] ± 2.2	28.415 [e] ± 1.864	0.612 [f] ± 0.05
Control (+ve)[1]	17.555 [a] ± 1.5	46.565[b] ± 2.139	1.246 [ab] ± 0.06
5% AG	17.505 [a] ± 1.35	38.185 [c] ± 1.398	1.030 [cd] ± 0.1
10% AG	17.160 [a] ± 1.56	32.792 [d] ± 1.367	0.862 [e] ± 0.06
Rats fed on low protein diets			
Control (+ve) [2]	17.682 [a] ± 1.86	51.892 [a] ± 1.942	1.322[a] ± 0.08
5% AG	18.551 [a] ± 0.65	40.625[c] ± 1.442	1.140 [bc] ± 0.06
10% AG	17.997 [a] ± 1.19	34.832 [d] ± 1.655	0.925 [de] ± 0.07

AG: Arabic Gum

LSD: Least significant differences (P<0.05)

Mean values in each column with same letters are not significantly differed.

In this respect **Elliott et al., (2002)** reported that increased consumption of fructose may be detrimental in terms of body weight and adiposity and the metabolic indexes associated with the insulin resistance syndrome. On the other side, **(Howarth et al., 2001)**reported that consumption of 30 g of Arabic gum for six weeks decreased body mass index and the % of body fat. On the other hand, **Chandalia et al., (2000)** reported that, consumption of Arabic gum prevented or treated overweight. Gum Arabic influence on energy intake and body weight regulation remains controversial. A growing body of scientific evidence indicates that GA ingestion causes a significant reduction in caloric intake with an increased subjective feeling of satiety **(Calame et al., 2011).**

Light et al (2009) reported that after 8 weeks, rats drinking a high fructose solution had heavier final body weights compared

to rats consuming the distilled water control . ***(Chaumontet,. et al.,2019)*** .

The data in the table (2)revealed that rats with hyperuricemia who fed on standard diet (control +ve)**[1]** showed a significant increase (P<0.05) in the mean value of serum glucose, as compared to the control negative group (-ve) fed on the same diet. Serum glucose increased in the (control +ve)**[1]**by 44.622% than that of the negative control group.Feeding hyperuricemic rats on a low protein diet(control +ve)**[2]**induced significant increase in the mean value of serum glucose, as compared to the negative control group, on the other hand, a low protein diet caused a significant decrease in this parameter, as compared to a standard diet.

The best result in serum glucose was recorded for the group fed on a low protein diet containing 10% GA, followed by the group fed on a standard diet containing 10% GA, respectively.

Table (2): Effect of standard and low protein diets containing gum Arabic on serum glucose of hyperuricemic rats.

Parameters Groups	Glucose mg/dl
Rats fed on standard diets	
Control (-ve)	109 ± 3.7^{e}
Control (+ve)[1]	158 ± 3.4^{a}
5% AG	146 ± 1.7^{b}
10% AG	139 ± 3.3^{c}
Rats fed on low protein diets	
Control (+ve) [2]	148 ± 2.5^{b}
5% AG	140 ± 4.0^{c}
10% AG	129 ± 1.8^{d}

AG: Arabic Gum

LSD: Least significant differences (P<0.05)

Mean values in each column with same letters are not significantly differed.

In this respect, **(Rositsa et al., 2015)** reported that, rats maintained on a fructose-rich diet for 8 weeks showed abnormal weight gain, increased circulating triglycerides, blood glucose and fat deposits.

Larson et al., (2021) reported that, AG improves satiety response and may lower peak glucose response at certain time points, and it is well tolerated in healthy human subjects. AG can be added to beverages and foods in doses that can help meet fiber recommendations. ***Samia et al, (2006)*** indicated that 5% Gum Arabic has some positive effect on decreasing glucose levels in the bloodstreamof the animals studied.Our results is similar to the result of ***(Nasir, 2014; Babiker et al., 2018; and Jarrar et al., 2021)*** concluded that the non-fasting blood glucose was insignificantly decreased during gum Arabic treatment in mice***).*** GA can be used for experimental purposes since it has the ability to reduce the sugar level of the experimental animal ***(Eyibo et al., 2018).***

Data presented in Table (3) showed that feeding rats on a basal diet and treated with 30% fructose in drinking water for 6 weeks to induce hyperuricemia increased the mean value of serum uric acid,urea nitrogen andcreatinine as compared to healthy rats fed on the basal diet.On the other hand, feeding rats on a low protein diet and treated with 30% fructose in drinking water led to a significant increase in the mean value of serum uric acid and urea nitrogen, as compared to healthy rats fed on a basal diet.The data in the same table showed non-significant differences in the mean value of serum creatinine between the positive control groups which were fed on basal diet & low protein diet.

Feeding rats that were suffering from hyperuricemia on a basal diet or low protein diet containing (5% and 10%) gum Arabic induced a significant decrease $p \leq 0.05$ in the mean value of serum uric acid, as compared to the positive control groups.The results in this Table revealed that with increasing the level of gum Arabic in the basal diet or low protein diet serum urea nitrogen decreased gradually.All treated groups which were fed on (basal diet or low protein diet) containing (5% & 10% gum Arabic) showed a significant decrease $p \leq 0.05$ in serum creatinine, as compared to the positive control groups. on the other hand, these

treatments recorded non-significant changes in this parameter, as compared to the negative control group.

The best results in decreasing serum uric acid, urea nitrogen and creatinine were recorded for the hyperuricemic group fed on a low protein diet containing 10% Arabic gum, followed by the group which suffer fromhyperuricemia and treated with a standard diet containing 10% Arabic gum.

Table (3): Effect of standard and low protein diets containing gum Arabic on kidney functions of hyperuricemic rats.

Parameters / Groups	Uric acid	Urea Nitrogen	Creatinine
	mg/dl		
Rats fed on standard diets			
Control (-ve)	2.30 ^{d} ± 0.11	24.50 ^{e} ± 1.29	0.437 ^{b} ± 0.478
Control (+ve)[1]	3.02 ^{a} ± 0.22	58.00 ^{a} ± 5.59	0.600 ^{a} ± 0.057
5% AG	2.67 $^{b c}$ ± 0.15	49.50^{b} ± 1.91	0.487 ^{b} ± 0.025
10% AG	2.55 $^{c d}$ ± 0.12	37.50 ^{d} ± 4.04	0.475 ^{b} ± 0.050
Rats fed on low protein diets			
Control (+ve)[2]	2.912 $^{a b}$ ± 0.085	46.50 $^{b c}$ ± 2.51	0.53 $^{a b}$ ± 0.04
5% AG	2.550 $^{c d}$ ± 0.238	43.00 ^{c} ± 4.24	0.50 ^{b} ± 0.11
10% AG	2.525 $^{c d}$ ± 0.150	35.50 ^{d} ± 2.88	0.45 ^{b} ±0.05

AG: Arabic Gum

LSD: Least significant differences (P<0.05)

Mean values in each column with same letters are not significantly differed.

In this respect,***(Al-Majed et al.,2002)***who stated that the consumption of gum Arabic in drinking water (7% for 8 days) was effective in protecting rat kidneys from GM-induced acute renal failure. Also ***(Said et al., 2019)*** reported that a significant reduction in serum concentration of urea, creatinine, and uric acid was observed in adenine-induced CKD rats receiving a daily oral dose of gum Arabic. GA has been used recently in several developing countries to treat CKD since it has been reported to

decrease serum urea nitrogen concentration and increase fecal nitrogen excretion by utilizing the bowl as a substitute kidney.

Elamin and colleges (2017) noticed a significant decrease in C-reactive protein level in CKD patients when diet supplemented with 10–40 g/day of gum Arabic, with no noticeable effect on blood urea nitrogen and indoxyl sulfate.

It has been assumed that GA increases the available energy to the intestinal bacteria which ferment dietary fibers and obtain their nitrogen requirement from the nitrogen waste product of the host ***(Ali et al. 2009).***

Data presented in Table (4) showed that feeding rats on a basal diet and treated with 30% fructose in drinking water for 6 weeks to induce hyperuricemia (control +ve)[1] increased the mean value of serum cholesterol , triglycerides, LDL-c and VLDL-c but decreased in serum HDL-c, as compared to healthy rats fed on the basal diet.

Treating groups that were suffering from hyperuricemia with normal or low protein diets containing (5% and 10% gum Arabic) (groups 3,4,6,7) led to a significant decrease $p \leq 0.05$ in the mean value of serum cholesterol, triglycerides, LDL-c and VLDL-c but increased in serum HDL-c, as compared to the (positive control groups)[1&2]. The results in this Table revealed that with increasing the level of gum arabic in the basal diet or low protein diet decreased the mean value of serum LDL-c , VLDL-c and triglycerides decreased gradually. All treated groups which were fed on (low protein diet) containing (5% & 10% gum Arabic) showed non-significant differences in the mean value of serum cholesterol, as compared to the groups fed on standard diet containing the same levels from GA.

Table (4): Effect of standard and low protein diets containing gum Arabic on serum cholesterol and triglycerides of hyperuricemic rats.

Parameters / Groups	Cholesterol	Triglycerides	HDL-c	LDL-c	VLD L-c
	mg/dl				
Rats fed on standard diets					
Control (-ve)	81.75 ^{d} ±5.25	45.25^{c} ±5.56	60.50^{a} ± 1.29	12.20 ^{f} ± 2.93	9.05^{c} ± 1.11
Control (+ve)[1]	113.00^{a} ±3.46	60.25^{a} ±4.71	50.00 ^{f} ± 0.81	50.95^{a} ± 2.89	12.05^{a} ± 0.94
5% AG	105.00^{b} ±3.46	56.00^{ab} ±2.44	52.25^{e} ± 1.50	41.55^{c} ± 1.61	11.20^{ab} ± 0.48
10% AG	91.00 ^{c} ±1.15	48.75^{c} ±1.73	54.00$^{c\ d}$ ± 1.15	27.25 ^{d} ± 1.27	9.75^{c} ± 1.17
Rats fed on low protein diets					
Control (+ve)[2]	110.00^{ab} ±3.45	57.50^{ab} ±1.73	53.00$^{d\ e}$ ± 1.41	45.50^{b} ± 2.12	11.50^{ab} ± 0.34
5% AG	106.50^{b} ±4.04	51.50$^{b\ c}$ ±1.73	55.50^{c} ± 0.57	40.70^{c} ± 3.11	10.30$^{b\ c}$ ± 0.34
10% AG	90.50^{c} ±0.57	46.75^{c} ±3.2	57.50^{b} ±0.57	23.56 ^{e} ± 0.64	9.35^{c} ± 0.64

AG: Arabic Gum

LSD: Least significant differences (P<0.05)

*Mean values in each column with same letters are not significantly differed***.**

Alasdair et al. (1984) found that gum Arabic decreased the serum cholesterol level. (**Kishimoto et al. 2006)** showed that a Prevotellaruminicola-like the bacterium was the predominant organism that is most likely responsible for fermentation of GA to propionate.

In chicken, ***El-khier et al. (2009)*** reported that Gum Arabic in the basal laying hen diet significantly reduced serum cholesterol in a gradual manner.In this respect, ***Eyibo et al., (2018)*** reported that, treating Albino rats with oral dose of gum Arabic at different concentrations (200 mg/kg, 400 mg/kg and 600 mg/kg) for nine (9) weeks of ageshowed a significant decrease in total cholesterol and triglyceride, as compared to the control group.These results are also in agreement with the results obtained by ***Topping et al. (1985)*** who showed that, in rats fed

GA plasma triacylglycerols were significantly lower than in controls.

Ahmed et al (2016) reported that when taking normal fed rats on diet and treated with 0.5% aqueous solution of GA for seven days, then 10% aqueous solution for an additional six weeks demonstrated a reduction in total cholesterol and LDL.

Fedail et al., (2016) reported that, treatment with GA significantly ($P < 0.05$) decreased plasma TG, LDL-c concentrations when compared to the diabetic rat group. In contrast, the treatment of GA significantly increased plasma HDL-c concentration compared to the diabetic rat group.

Data presented in Table (5) showed that rats that were fed on basal diet and treated with drinking water containing 30% fructose (Control +ve group)[1] increased the mean value of serum AST, ALT and Alkaline Phosphates enzymes than that of rats fed on the same diet without fructose (control –ve group). The data presented in table (5) showed that feeding rats on a low protein diet and treating with fructose to induce hyperuricemia (Control +ve)[2] caused a significant increase ($p\leq 0.05$) in serum AST enzyme, as compared with healthy rats (control –ve group) (86.250 ± 3.500 vs. 70.500 ± 3.872 U/l), respectively. On the other hand, low protein diet in the presence of fructose led to significant decrease ($p\leq 0,05$) in this parameter, as compared to standard diet

The results in this Table revealed that with increasing the level of gum Arabic in the basal diet or low protein diet serum AST enzyme decreased gradually.The best results in ALT and ALP recorded for the group which treated with low protein diet containing 10% GA, followed by the groups fed on low protein diet containing 5% GA and standard diet containing 10% GA, respectively.

In this respect, ***(Babiker et al., 2017)*** reported that, Daily gum Arabic dose for twelve weeks significantly affected the liver antioxidant activity of Sprague-Dawley rats.Also ***(Hamid et al.,***

2021) reported that dietary administration of GA has a beneficial result on the hepatic apoptosis, oxidative stress, and inflammatory response in experimentally-induced hepatotoxicity in rats.GA is reported to has robust anti-oxidant effects; it has been able to ameliorate the cardiac, renal and hepatic lipid peroxidation and toxicity, besides its anti-inflammatory, antimicrobial, antidiarrheal, anti-obesity and antihypertensive effects**(*Ali et al., 2009 and Elshama, 2018)***.

Ahmed et al., (2015)reported that, Gum Arabic (GA) has strong antioxidant properties; therefore, it could beone of the mechanisms of hepatoprotective. ***Al-Kenanny et al., (2012)***noted that elevated in ALT and AST mean a marked for liver injury. Mice treated with AG showed amelioration in enzymatic level (ALT +AST) but not reach to normal level as in control group, these results indicated that AG have ability as a protective factor to decrease liver damage.

Table (5): Effect of standard and low protein diets containing gum Arabic on liver enzymes of hyperuricemic rats.

Parameters / Groups	AST	ALT	ALP
	U/l		
Rats fed on standard diets			
Control (-ve)	70.50 ^{e} ± 3.87	32.00 ^{e} ± 2.94	152.00 ^{e} ± 3.55
Control (+ve)[1]	99.50 ^{a} ± 6.55	55.50 ^{a} ±2.38	269.75 ^{a} ± 10.78
5% AG	91.25^{b} ± 7.58	45.00 $^{b\,c}$ ± 4.618	242.25 ^{b} ± 5.85
10% AG	81.00 $^{c\,d}$ ± 2.94	43.00 $^{c\,d}$ ± 1.154	213.25 ^{c} ± 9.21
Rats fed on low protein diets			
Control (+ve)[2]	86.25 $^{b\,c}$ ± 3.50	48.50^{b} ± 3.0	240.00^{b} ± 9.55
5% AG	82.00 $^{c\,d}$ ± 3.82	39.50 ^{d} ± 4.04	210.25 ^{c} ± 3.68
10% AG	77.50$^{d\,e}$ ± 4.35	34.25 ^{e} ± 1.50	180.00 ^{d} ± 10.32

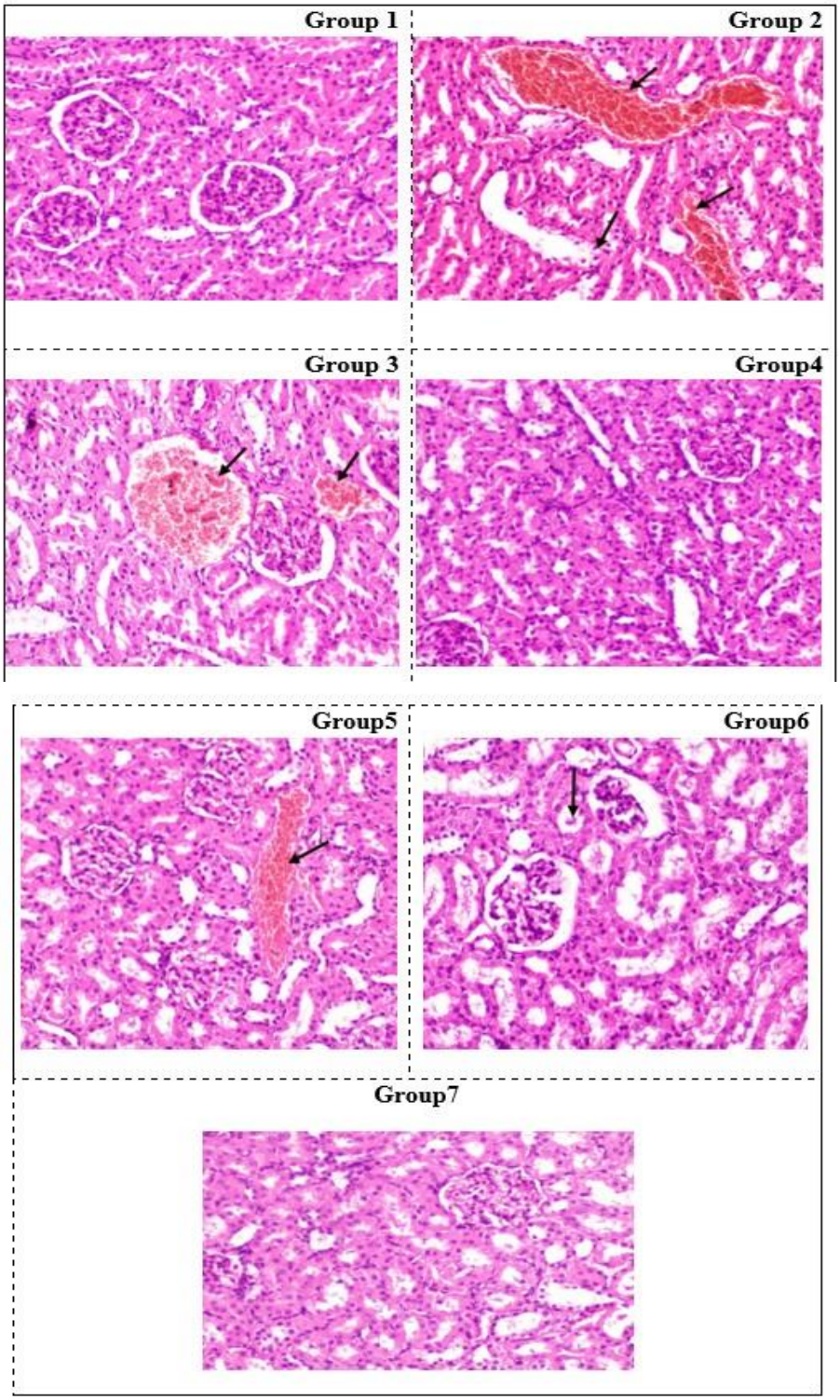
AG: Arabic Gum

LSD: Least significant differences (P<0.05)

*Mean values in each column with same letters are not significantly differed***.**

Histopathological examination of kidneys:

Microscopically, the kidneys of rats from group 1 revealed the normal histological structure of renal parenchyma. On contrary, kidneys of rats from group 2 showed congestion of renal blood vessels, proteinaceous casts in the lumen of renal tubules, vacuolar degeneration of epithelial lining renal tubules and congestion of glomerular tuft . Some examined sections from group 3 which was fed on a standard diet containing 5% AG revealed congestion of renal blood vessel and vacuolar degeneration of epithelial lining some renal tubules , whereas, other sections from this group showed apparent normal renal parenchyma .Moreover, some sections from group 4 which was fed on a standard diet containing (10% AG) exhibited slight vacuolar degeneration of epithelial lining renal tubules and endothelial lining glomerular tuft as well as congestion of renal blood vessels , whereas, other sections revealed no histopathological alterations . On the other hand, kidneys of rats from group 5 which was fed on a low protein diet and treated daily with fructose showed congestion of renal blood vessels, vacuolar degeneration of renal tubular epithelium, proteinaceous casts in the lumen of renal tubules , necrobiosis of renal tubular epithelium and congestion of glomerular tuft. Meanwhile, some sections from group 6 which was fed on a low protein diet containing 5% AG showed pyknosis of the nuclei of epithelial lining some renal tubules and proteinaceous material in the lumen of some renal tubules, whereas, other sections revealed no histopathological alterations. However, kidneys of rats from group 7 which fed on a low protein diet containing (10% AG) described no histopathological alterations except slight congestion of renal blood vessels .


Group 1
Group 2
Group 3
Group4
Group5
Group6
Group7

Conclusion:

From this study it is concluded that, Feeding rats on standard or low-protein diet containing gum arabic has the ability to reduce high levels of uric acid, urea nitrogen, creatinine and serum glucose, improved also the lipid profile and the liver enzymes in rats suffering from hyperuricemia and the ratios used for gum arabic did not result in any negative effects.

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