The Biological Study on the Effect of Different Doses of Bael Fruit Powder *(Aeglemarmelos* L*, Correa)* on Hypercholesterolemia in Rats

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Abstract

The present study was conducted to investigate the biological effects of Aegle marmelos (*Aegle marmelos* L, Correa) powder (5,10 and 15%) on the biological and histological activities of rats. The experiment was carried out on 40 male Albino rats divided into 5 equal groups (8 rats per each); the first group fed on basal diet and kept as a (control-). Rats in the other four groups fed on basal diet containing 1.5% cholesterol plus 0.25% bile salts for 2 weeks to induce hypercholesterolemia, then those rats were subdivided into the following groups: a group that remained as hypercholesterolemic (control+) [2nd group], a group that fed on hypercholesterolermic diet plus Aegle marmelos powder 5% [3rd group]; a group that fed on hypercholesterolemic diet plus Aegle marmelos powder 10% [4th group]; a group that fed on hypercholesterolermic diet plus Aegle marmelos powder 15% [5th group]. The statistical analysis showed a significant decrease in total cholesterol of all treated groups with aegle marmelos powder when compared with (control +). The lowest decrease in all treated group in cholesterol was recorded in aegle marmelos powder 15% (112.490 ± 2.441). Also, the best result of serum triglycerides level was observed in the group fed on basal diet containing aegle marmelos powder 15% (11.167±1.975).

The results showed that with increasing the amount of Aegle marmelos powder, the total cholesterol, triglycerides, LDL-C, AST, ALT, uric acid, urea nitrogen, creatinine and glucose levels decreased significantly ($P<0.05$) when compared with control (+). It was concluded that, percentage of aegle marmelos (15%) supplementation gave the best results in modification of lipid profile and other biochemical parameters in hypercholesterolemic rats. Encouraging increase aegle marmelos fruit cultivation in Egypt and increasing the area of propagation of this plant in different botanical gardens in Egypt. Nutrition education programs should be encouraged to inform the public about the nutritive and therapeutic value of aegle marmelos fruit.

Keywords: Aegle marmelos, Hypercholesterolemia, Triglycerides, Rats and Histopathology.

INTRODUCTION

Hypercholesterolemia is directly associated with an increased risk for coronary heart disease and other sequelae of atherosclerosis **(Pitter et al., 2002).** Familial hyperchole-sterolemia is characterized by significantly elevated low-density lipoprotein cholesterol (LDL-c) that leads to atherosclerotic plaque deposition in the coronary arteries and proximal aorta at an early age **(Ison et al., 2025).** The evaluation, diagnosis, and treatment of hypercholesterolemia (high blood lipids, high cholesterol), be it caused by genetics or poor lifestyle choices, is of paramount importance in managing cardiovascular disease's escalating development **(Ibrahim et al., 2023)**

Many herbal medicinal preparations have potential hypocholesterolemic activity and encouraging safety profiles **(Thompson-Coon and Ernst., 2023).** Preparations that derived from natural sources often contain compounds that contribute to antioxidant defense system and apparently play a role in the protection against heart and degenerative diseases **(Brijesh et al., 2009).**

Aegle marmelos belongs to family Rutaceae. Its golden colored fruit resembles golden apple hence the generic name-Aegle, and the species name is derived from marmelos in contained in the fruit **(Bag et al., 2009).** The bael tree is one of the most useful medicinal plants of India. All parts of this tree including stem, bark, root, leaves and fruits have medicinal virtues and a long tradition as herbal medicines **(Parmar and Kaushal,1982).**

The roots and fruits of aegle marmelos possess antiamoebic and hypoglycemic activity (**Ponnachan et al 2023).** Aegle marmelos is reported for various medicinal properties such as anticancer, antibacterial, hepatoprotective, radioprotective, antiulcer, antidiabetic, antioxidant and anti-inflammatory activities **(Sekar et al., 2011).** Due to its endless uses, Aegle marmelos is also known as Mahaphala or Great fruit **(Parichha, 2004).**

In India, a popular drink colloquially called as “bael sherbet” is prepared from the ripe fruit. The soft pulp is scooped, deseeded and blended with milk, sugar and cardamom and is consumed as a cooling drink **(Roy and Khurdiya, 1995).** In Indonesia, the pulp of the fully ripe fruit is scooped dressed with palm sugar and consumed for breakfast **(Roy and Khurdiya, 1995).** Bael fruits are considered as an excellent remedy for diarrhea **(Das and Das, 1995).** The fruit pulp acts as a mild stimulant to the intestinal

mucus membrane and stops diarrhea. The ripe fruits are aromatic, cooling and acts as a laxative **(Das and Das, 1995).**

Aegle marmelos (L.) Correa (Bael) fruit, a member of the Rutaceae family, is a major cultivated fruit plant in tropical and subtropical regions in countries of southeast Asia. Bael fruit has been a major topic for studies in recent years mainly due to its high nutritional (carbohydrates, proteins, minerals, and vitamins) value and presence of various phytochemicals, which attributed to its high medicinal value. These phytochemicals include various compounds, e.g., alkaloids, flavonoids, and phenolic acids (protocatechuic acid, gallic, and ellagic acid) **(Niharika et al., 2022).** The present study was conducted to the biological and histological studies (heart and liver) on the effect of different doses of aegle marmelos L, correa (5, 10 &15%) on hypercholes-terolemia in rats

Materials and Methods

Aegle marmelos L, correa was collected in July 2024 from El-Zohrya Botanical Garden, Giza, Egypt.

Chemicals and Rats:

All chemicals use in this experiment were of analytical grade. Kits use for the quantitative determination of the different parameters were purchased from Biodiagnostic Co., Dokki, Giza, Egypt. 40 male Albino rats of Sprague Dawley strain, weighing about 150±10g were obtained from Agricultural Research Center, Giza, Egypt

Methods:

Preparation of aegle marmelos powder:

Fruits of Aegle marmelos were washed with running tap water. The pulp was removed from the peel, cut into slices and dried.

Experimental Design:

Albino rats were housed in well aerated cages under hygienic condition and fed on basal diet for one week for adaptation ad-libitum in animal house ARC. The basal diet consists of casein 12.5 %, corn oil 10%, choline chloride 0. 25 %, vitamin mixture1 % **(Campbell, 1963),** salt mixture4% (**Hegested, 1941**), cellulose (5%) and the remainder (71.07 %) are corn starch **(Reeves et al., 1993),** and this diet were modified in its content of (casein and starch) before giving to the groups fed on aegle marmelos powder. After the period

of adaptation on basal diet, the rats were divided into 5 equal groups (8 rats per each).

The first group fed on basal diet as a negative control, the other groups fed on basal diet containing cholesterol (1.5%) and bile salt (0.25%) for two weeks to induce hypercholesterolemia **(Al-Bahy *et al.,* 1999).** We were select a rat randomly to check for induction hypercholesterolemia. then divided into the following groups: Group 2: Were fed on basal diet plus 1.5% cholesterol plus 0.25% bile salts (positive control). Groups 3: Were be fed as the positive control group + Aegle marmelos Powder with 5%. Group 4: Were be fed as the positive control group + Aegle marmelos Powder with 10%. Group 5: Were be fed as the positive control group + Aegle marmelos Powder with 15%. At the end of the experimental period (6 weeks), rats were fasted overnight, then anaesthetized &incised longitudinally and blood samples were collected from the aorta. The blood samples were centrifuged and serum were separated to estimate some biochemical parameters.

Biological Evaluation:

Feed intake was recorded daily and animals were weighed at the beginning and twice a week throughout the experimental period. Body weight gain and feed efficiency ratio were calculated at the end of the experiment according to the method of **Chapman et al., (1959).**

Biochemical Analysis:

Serum will be used to determine the following parameters: Lipid profile: Serum cholesterol **(Allain et al., 1974),** Triglycerides **(Fossati and Prencipl., 1982),** HDL-c **(Lopes-Virella et al., 1977),** LDL-c and VLDL-c **(Friedewald et al., 1972);** liver functions: aspartate amino transferase (AST) and Alanine amino trasferase (ALT) **(Ritman and Frankl.,1957)** and kidney functions: Urea nitrogen, uric acid and creatinine and glucose **(Srikanth et al., 2004).**

Statistical Analysis:

All data obtained results were analyzed using Statistical Package for the Social Sciences (SPSS) for Windows, version 20 (**SPSS Inc., Chicago, IL, USA**). Collected data were presented as mean ± standard deviation (SD). Analysis of Variance (ANOVA) test were used for determining the significances among different groups. All differences were considered significant if P-values were ($P < 0.05$).

Results and Discussion

Biological Evaluation:

Table (1): The Effect of different doses of aegle marmelos powder (Aegle marmelos L, Correa) on feed intake, FER and BWG (%) on hypercholesterolemia in rats. The results reported that group (1) showed very highly significant differences ($P<0.05$) in FI, FER and body weight, BWG% as compared with group (2). Groups treated with aegle marmelos powder at dose level of 5, 10 and 15% demonstrated very low significant differences in all biological parameters ($P<0.05$) when compared with control group (1&2) The results also showed that FI, FER and BWG% in hypercholesterolemia groups treated with aegle marmelos powder recorded very low significant differences ($P<0.05$) with respect to untreated group. Moreover, BWG% in hypercholesterolemia group treated with 15% aegle marmelos powder recorded very highly significant differences ($p<0.005$)when compared with both 5 and 10% aegle marmelos powder treated groups. Administration of aegle marmelos powder induced significant improvement in FI and FER, especially at level of 15%, which recorded highly significant differences ($P<0.05$) as compared with groups treated at a5 and 10%

Effect of different doses of aegle marmelos powder on serum lipid profile on hypercholesterolemia in rats

Table (2) illustrated the effect of aegle marmelos powder on lipid fractions. The values of serum cholesterol triglycerides, VLDL-c, HDL-c and LDL-c mg/dl) showed significant increase ($p<0.05$) for control positive group in compared with control negative group while HDL-c value (mg/dl) for control positive group was significantly lower than that of control (-) group.

Data in this table showed that, total cholesterol (mg/dl) were increased significantly ($p<0.05$) for rats fed on hypercholesterolemic diet (control +). The statistical analysis showed a significant decrease in total cholesterol of all treated groups with aegle marmelos powder when compared with (control +). The lowest decrease in all treated group in cholesterol was recorded in aegle marmelos powder 15% (112.490 ± 2.441). Also, the best result of serum triglycerides level was observed in the group fed on basal diet containing aegle marmelos powder 15% (11.167 ± 1.975).

The antioxidative effect of Aegle marmelos fruit was explained by **Manjula and Kumar (2016)** who found that its fruit has a potent in vitro

antioxidant activity which was correlated with its content of bioactive compounds. The ameliorated effect of aegle marmelos fruit on lipid peroxidation may be attributed to the antioxidative phytochemicals present in it especially flavonoids. Flavonoids are the most promising agents for treatment of oxidative stress-related disease (**Babu et al., 2013**).

HDL-c is an effective scavenger of cholesterol molecules from several locations, possibly even from some early plaque formation. Therefore, HDL-c has been considered to be a good lipoprotein and the cholesterol associated with HDL has been referred to be good cholesterol. HDL-c among all groups fed on hypercholestreolemic diet containing aegle marmelos powder 5%, 10% and 15% showed significant ($P< 0.05$) increase compared with (control +) and the best results for HDL-c was from the group fed on aegle marmelos powder 15% (44.370 ± 3.441) followed by that fed on aegle marmelos powder 10% (42.963± 5.180).

LDL-c of all treated rats with basal diet containing aegle marmelos powdered decreased significantly ($P<0.05$) compared with control (+). Meanwhile these treatments for rats led to increase LDL-c significantly, compared to (control -). VLDL-c of rats fed on basal diet containing cholesterol (hypercholesterolemic diet) increased significantly ($P<0.05$) compared to control (-) group.

Treating hypercholesterolemic rats with aegle marmelos powdered (5, 10 & 15%) led to a significant ($P < 0.05$) reduction in serum VLDL-c compared with (control +). The lipid lowering effect of the aegle marmelos extract might be due to the action of flavonoids and other phenolic compounds, triterpenoids, alkaloids, steroids and glycosides. Normalized rate of lipogenesis is due to the insulin-like activity of triterpenoids (**Sakurai *et al.*, 2002**) or activating normoglycemia by the insulinotropic effect of flavonoids (**Pinent *et al*., 2008)**.

Effect of different doses of aegle marmelos powder on liver functions on hypercholesterolemia in rats:

Results of AST and ALT are presented in table (3), AST in all treated groups recorded significant decrease ($P<0.05$) except aegle marmelos 5% when compared with (control +). On the other hand, the lowest levels of AST enzymes were found in group of rats fed on hypercholesterolemia diet containing aegle marmelos 10% (11.490±0.935). Also, results obtained from this table showed a significant increase ($P<0.05$) in the mean values of ALT

enzyme in the group fed on control + when compared with all treated groups. The best results were observed in the groups that fed on the aegle marmelos 15% by 10% & 5% respectively. In similar study, **Manjula and Kumar (2016)** reported that phytochemicals screening of aegle marmelos ethanolic fruit extract revealed the presence of alkaloids, carbohydrates, glycosides, flavonoids, tannins, coumarins and triterpenoids.

Effect of different doses of aegle marmelos powder on serum uric acid, urea nitrogen and creatinine levels on hypercholesterolemia in rats:

Uric acid value, urea nitrogen and creatinine (mg/dl) of the control positive group showed highly significant ($p<0.05$) increase as compared to (control -) group the mean values were 2.240 ± 0.115; 31.353 ± 0.904 and 3.99± 0.02 vs. 1.590 ± 0.502; 16.767 ± 2.009 and 0.47± 0.06 respectively. Results in Table (4) indicated that, the mean values of uric acid decreased in the groups fed on aegle marmelos by 5, 10 and 15% compared with controls. Also, the highest decrease in serum urea nitrogen in all treated groups was found in the group fed on hypercholesterolemia diet containing aegle marmelos by 5%. While the highest increase in serum urea nitrogen was observed in aegle marmelos 15% group.

Effect of different doses of aegle marmelos powder on serum glucose on hypercholesterolemia in rats:

Data in Table (5) showed that, serum glucose levels in positive control group increased significantly, as compared to negative control group 114.330±2.921 mg/dl vs. 98.110±2.113 mg/dl respectively. Feeding rats on **aegle** marmelos powder 15% showed significant decrease in serum glucose levels as compared to positive control group.

This agrees with the finding of **Kamalakkannan and Prince (2005)** who observed that aegle marmelos fruit administration improved the functional state of the pancreatic cells. The effect of aegle marmelos fruit can be attributed to its antioxidant activity by scavenging free radicals and improving the antioxidant status.

Recommendations:

From the obtained results it can be concluded that, supplementation with high percentage of aegle marmelos (15%) exerts a positive impact on the lipid profile and other biochemical parameters in hypercholesterolemia in rats. Also., further studies must be warranted to investigate different ingredients of aegle marmelos fruit on mammals' wellbeing.

Encouraging increase aegle marmelos fruit cultivation in Egypt and increasing the area of propagation of this plant in different botanical gardens in Egypt. Nutrition education programs should be encouraged to inform the public about the nutritive and therapeutic value of aegle marmelos fruit.

Table (1): The Effect of different doses of aegle marmelos powder (Aeglemarmelos L, Correa) on feed intake, FER and BWG (%) on hypercholesterolemia in rats

Parameters / Animal groups	Feed Intake (g/day/rat)	FER Mean ± SD	BWG (%) Mean ± SD
Negative control (-)	13.1	0.101± 0.001[a]	16.589± 0.134[a]
Positive control (+)	4.6	0.062± 0.002[b]	12.748± 0.807[b]
Aegle marmelos (5%)	3.84	-0.007± 0.001[c]	-1.637± 0.219[c]
Aegle marmelos (10%)	7.69	-0.046± 0.002[e]	-9.639± 0.947[e]
Aegle marmelos (15%)	8.71	-0.025± 0.001[d]	-13.006± 1.001[d]
L. S. D	-	0.003	2.21

* Non-significant differences between the values had the same letter.

* LSD: Least Significant Difference at level ($P < 0.05$)

Table (2): The Effect of different doses of aegle marmelos powder on lipid profile on hypercholesterolemia in rats

Lipid Function / Animal groups	Total cholesterol (mg/dl) Mean ± SD	TG (mg/dl) Mean ± SD	VLDL-c (mg/dl) Mean ± SD	HDL-c (mg/dl) Mean ± SD	LDL-c (mg/dl) Mean ± SD
Negative control (-)	74.440± 1.565^{d}	41.103± 1.496^{e}	7.413± 0.951^{c}	55.170± 4.324^{a}	15.550± 2.119^{d}
Positive control (+)	140.563± 1.758^{a}	83.480± 2.183^{a}	15.570± 1.382^{a}	23.960± 7.652^{c}	90.193± 2.098^{a}
Aegle marmelos (5%)	114.860± 2.850^{b}	70.510± 2.344^{b}	12.200± 2.047 ^{b}	41.830± 2.082^{b}	53.980± 2.522^{b}
Aegle marmelos (10%)	112.490 ± 2.441^{b}	63.940± 2.500^{c}	11.167± 1.975^{b}	42.963± 5.180^{b}	46.683± 2.240^{c}
Aegle marmelos (15%)	102.133± 2.320^{c}	59.623± 1.717^{d}	10.830± 2.082^{b}	44.370± 3.441^{b}	43.183± 1.962^{c}
L. S. D	3.83	4.22	2.93	8.26	4.09

Table (3): The effect of different doses of aegle marmelos powder on serum liver functions AST and ALT levels (U\L) on hypercholesterolemia in Rats

Liver function / Animal groups	AST (U/L) Mean ± SD	ALT (U/L) Mean ± SD
Negative control (-)	8.413± 1.115^{c}	4.720± 0.580^{b}
Positive control (+)	16.097± 1.621^{a}	6.267± 0.982^{a}
Aegle marmelos (5%)	11.480± 0.935^{b}	5.297± 0.691^{ab}
Aegle marmelos (10%)	10.317± 1.314^{bc}	5.230± 0.905^{ab}
Aegle marmelos (15%)	9.590± 1.026^{bc}	5.500± 0.648^{ab}
L. S. D	2.32	1.30

Table (4): The Effect of different doses of aegle marmelos powder on serum kidney functions uric acid, urea nitrogen and creatinine levels (U\L) on hypercholesterolemia in ats

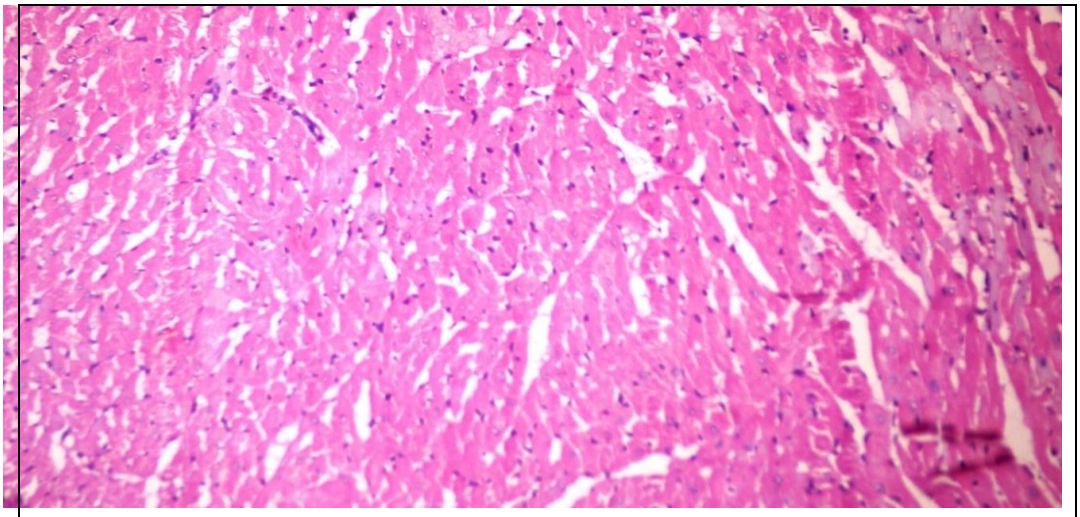
Kidney function / Animal groups	Uric acid (mg/dl) Mean ± SD	Urea nitrogen (mg/dl) Mean ± SD	Creatinine (mg/dl) Mean ± SD
Negative control (-)	1.590± 0.502^{b}	16.767± 2.009^{d}	0.47± 0.06^{f}
Positive control (+)	2.240± 0.115^{a}	31.353± 0.904^{a}	3.99± 0.02^{a}
Aegle marmelos (5%)	1.410± 0.278^{b}	23.307± 2.421^{b}	3.03± 0.05^{b}
Aegle marmelos (10%)	1.573± 0.127^{b}	22.660± 2.572^{bc}	2.24± 0.04^{c}
Aegle marmelos (15%)	1.367± 0.470^{b}	18.247± 3.171^{d}	1.85± 0.03^{d}
L. S. D	0.564	3.98	0.735

Table (5): The effect of different doses of aegle marmelos powder on serum glucose levels (mg/dl) on hypercholesterolemia in rats

Parameters / Groups	Glucose Mean ± SD
Negative control (-)	98.110± 2.113^{b}
Positive control (+)	114.330± 2.921^{a}
Aegle marmelos (5%)	90.050± 1.768^{c}
Aegle marmelos (10%)	88.637± 3.288^{c}
Aegle marmelos (15%)	82.103± 3.012^{d}
L. S. D	4.72

Histopathological examination of heart:

The histological assessment of the 5 groups shows a spectrum of pathological abnormalities from mild degenerative changes to severe necrosis of heart. Of all, Aegle marmelos (10%) showed the most persistent and severe lesions in all studied heart, including diffuse cardiac damage, these characteristics make Aegle marmelos (10%) the most representative for showing advanced pathological alterations. Aegle marmelos (15%) likewise revealed roughly as severe changes, albeit with somewhat less structural clarity. Groups 2–3 showed substantial lesions. Thus, Aegle marmelos (15%) is regarded as the most pathologically demonstrative and diagnostically relevant group in total.



Photo(1): Myocardial fibers exhibit coagulative necrosis with interstitial lymphocytic infiltration and focal hemorrhage. (H&E X 400).

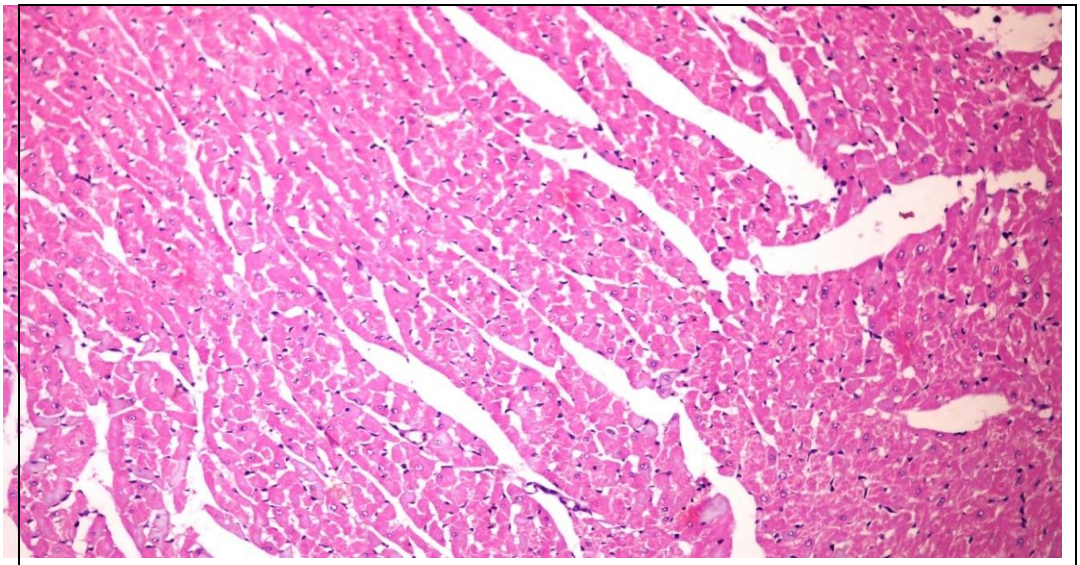


Photo (2): Focal myocardial degeneration with mononuclear cell infiltration and loss of striations. (H&E X 400).

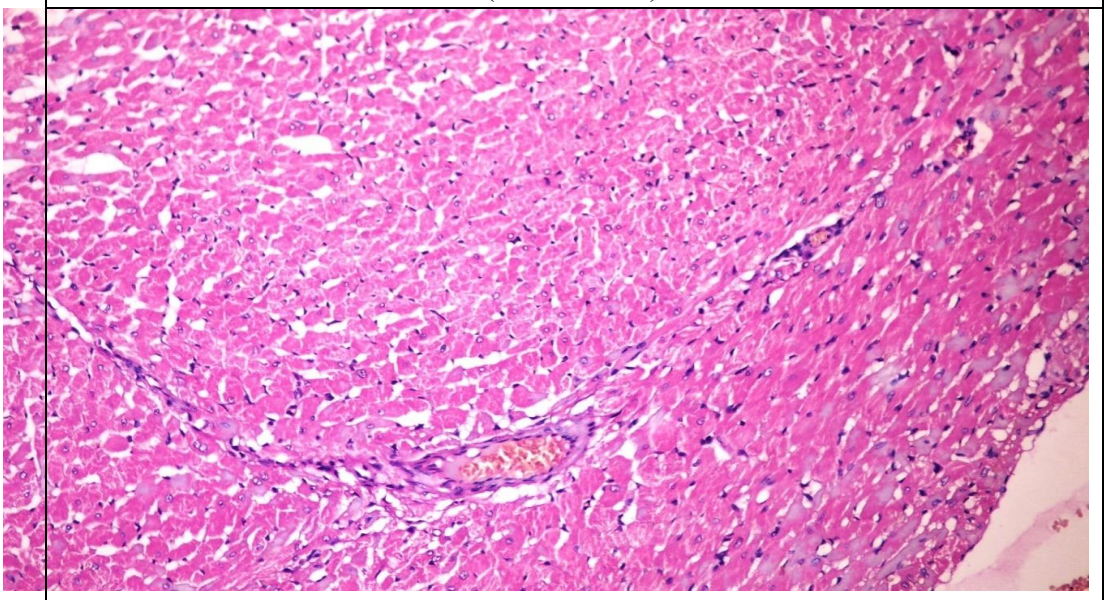


Photo (3): Mild myocarditis with scattered inflammatory cells between myocardial fibers. (H&E X 400).

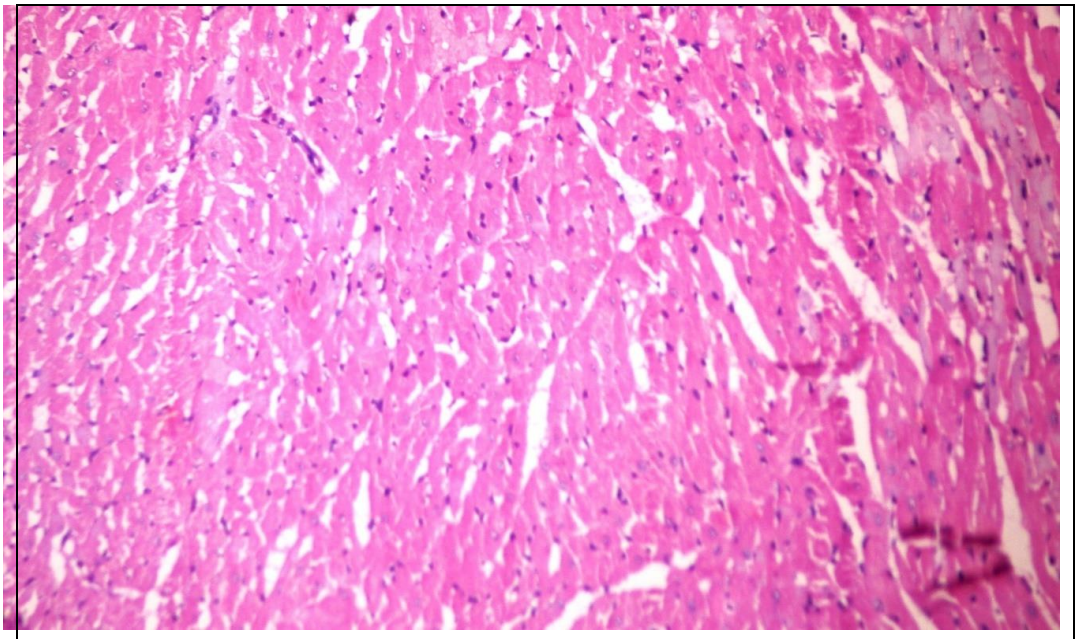


Photo (4): Diffuse myocardial necrosis with lymphocytic infiltration and fiber fragmentation. (H&E X 400).

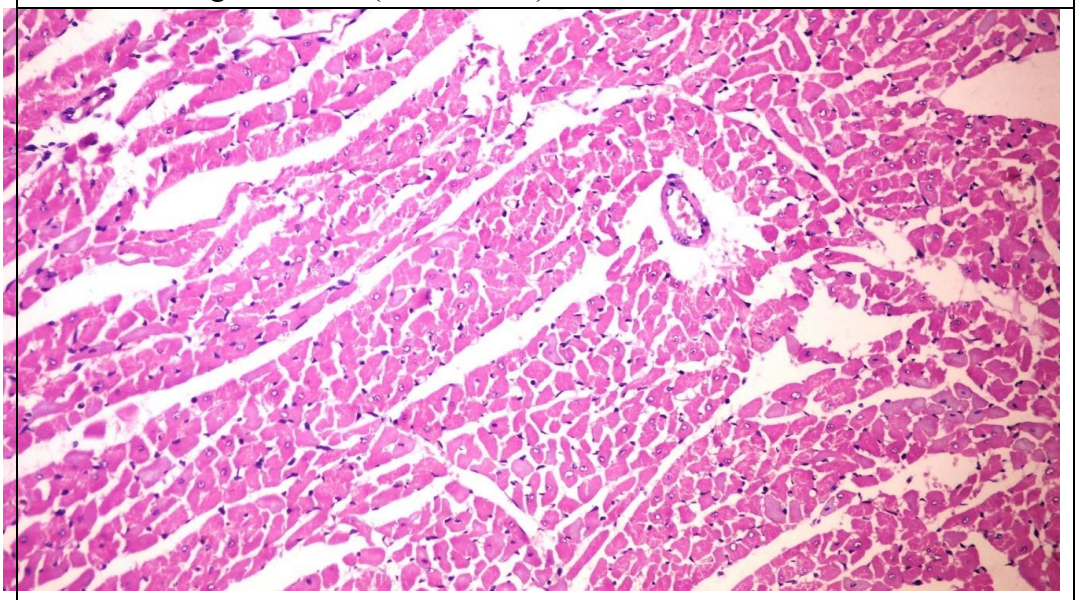


Photo (5): Massive myocardial necrosis, fiber fragmentation, and dense mononuclear infiltration. (H&E X 400).

Histopathological examination of liver:

Photo (6): Hepatocytes show ballooning degeneration, sinusoidal congestion, and areas of focal necrosis. Photo (7); Centrilobular necrosis of hepatocytes with sinusoidal congestion and Kupffer cell activation. Photo (8): Diffuse hepatocellular degeneration with focal hemorrhage and moderate inflammation. Photo (9): Extensive hepatocellular necrosis, disorganized architecture, and hemorrhagic areas. Photo (10): (Hepatocytes exhibit panlobular necrosis and central vein congestion.

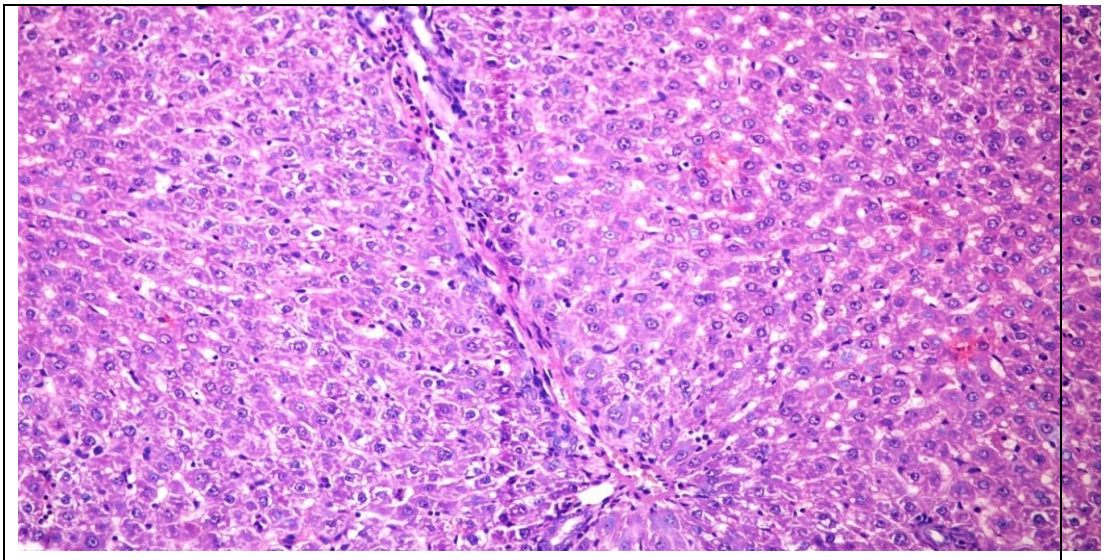


Photo (6): Hepatocytes show ballooning degeneration, sinusoidal congestion, and areas of focal necrosis. (H&E X 400).

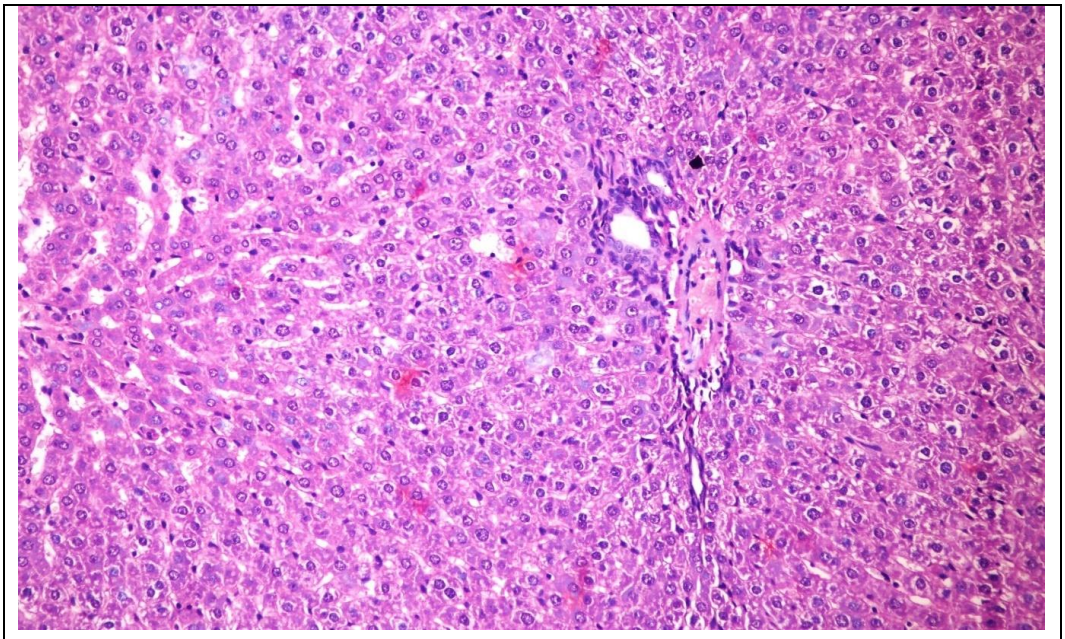


Photo (7): Centrilobular necrosis of hepatocytes with sinusoidal congestion and Kupffer cell activation. (H&E X 400).

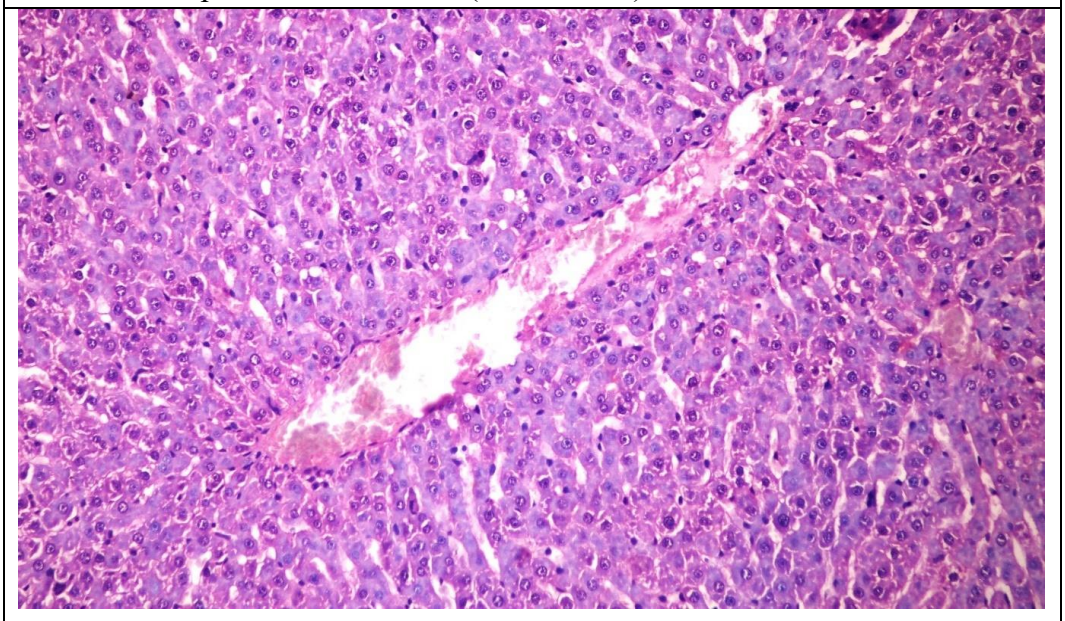


Photo (8): Diffuse hepatocellular degeneration with focal hemorrhage and moderate inflammation. (H&E X 400).

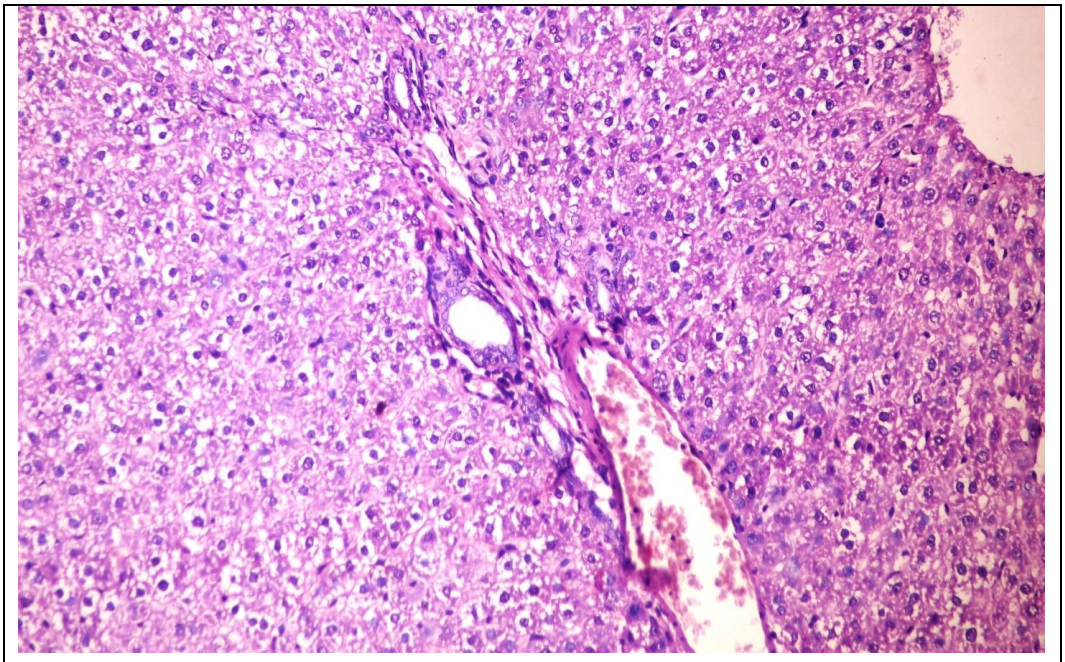


Photo (9): Extensive hepatocellular necrosis, disorganized architecture, and hemorrhagic areas. (H&E X 400).

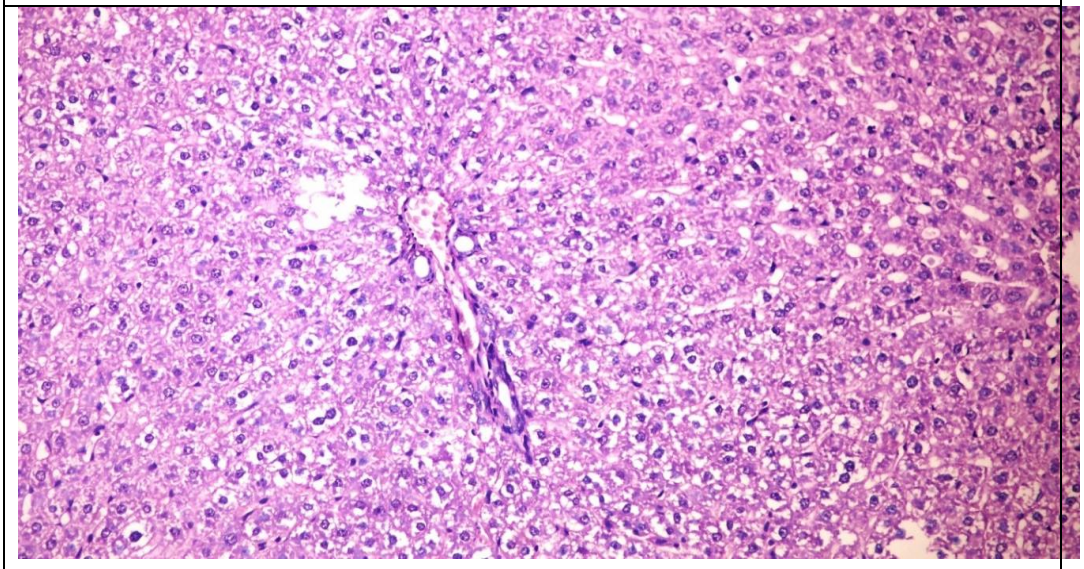


Photo (10): Hepatocytes exhibit panlobular necrosis and central vein congestion. (H&E X 400).

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دراسة بيولوجية عن تأثير جرعات مختلفة من مسحوق فاكهة البيل على الجرذان المصابة بإرتفاع مستوى الكوليستيرول فى الدم

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أجريت هذة الدراسة لمعرفة التأثير البيولوجي والهستوباثولوجى لمسحوق فاكهة الايجل مارمليوس بنسب (٥ و١٠ و١٥٪) على جرذان التجارب. أجريت التجربة بإستخدام ٤٠ جرذ ذكر من سلالة الألبينو مقسمة إلى ٥ مجموعات متساوية (٨ جرذان / مجموعة)؛ المجموعة الأولى تغذت على غذاء أساسي وأصبحت مجموعة ضابطة سالبة ،وتغذت الجرذان في المجموعات الأربع الأخرى على نظام غذائي أساسي يحتوي على ١,٥٪ كوليستيرول بالإضافة إلى ٠,٢٥٪ أملاح الصفراء لمدة أسبوعين لإحداث ارتفاع فى مستوى الكوليسترول في دم الجرذان ، ثم تم تقسيم تلك الجرذان إلى المجموعات التالية على التوالى: مجموعة جرذان بقيت على ارتفاع مستوى الكوليستيرول في الدم (مجموعة ضابطة موجبة) [المجموعة الثانية]، مجموعة جرذان تتغذى على نظام غذائي مرتفع فى الكوليستيرول بالإضافة إلى مسحوق فاكهة ايجل مارميليوس بنسبة ٥٪ [المجموعة الثالثة]؛ مجموعة جرذان تتغذى على نظام غذائي مرتفع الكوليستيرول في الدم بالإضافة إلى مسحوق فاكهة ايجل مارميليوس بنسبة ١٠٪ [المجموعة الرابعة]؛ مجموعة جرذان تغذت على نظام غذائي عالي الكوليستيرول بالإضافة إلى مسحوق فاكهة ايجل مارميليوس بنسبة ١٥٪ [المجموعة الخامسة].

أظهر التحليل الإحصائي انخفاضًا معنوياً في مستوى الكوليستيرول الكلي لجميع مجموعات الجرذان المعالجة بمسحوق فاكهة إيجل مارميليوس عند مقارنتها بالمجموعة الضابطة الموجبة (+). تم تسجيل أقل انخفاض في مستوى الكوليسترول الكلى في جميع

المجموعات المعالجة بمسحوق فاكهة إيجل مارميلوس بنسبة ١٥٪ (١١٢,٤٩٠ ± ٢,٤٤١). كما لوحظ أن أفضل نتيجة لمستوى الدهون الثلاثية في السيرم كان في مجموعة الجرذان التي تغذت على الغذاء الأساسي الذى يحتوي على مسحوق فاكهة إيجل مارميليوس بنسبة ١٥٪ (١١,١٦٧ ± ١,٩٧٥). كما أظهرت النتائج أنه مع زيادة كمية مسحوق فاكهة إيجل مارميليوس انخفضت مستويات الكوليستيرول الكلي والدهون الثلاثية وكوليستيرول الليبوبروتينات الدهنية المنخفضة الكثافة وإنزيمات الكبد وحمض اليوريك ونيتروجين اليوريا والكرياتينين والجلوكوز بشكل ملحوظ ($P < 0.05$) عند مقارنتها بالمجموعة الضابطة الموجبة (+). كما اوضحت الدراسة أن إضافة نسبة ١٥٪ من مُكمّلات فاكهة الايجل مارميليوس أعطت أفضل النتائج في خفض مستوى صورة الدهون وغيرها من القياسات البيوكيميائية لدى الجرذان المُصابة بإرتفاع مستوى الكوليسترول بالدم. علاوة على ذلك ، لابد من إجراء المزيد من الدراسات للتحقق في المكونات المختلفة لفاكهة المارميليوس على صحة الثدييات وكذلك تشجيع زراعة فاكهة الايجل مارميليوس في مصر، وزيادة مساحتها المزروعة في مختلف الحدائق النباتية، بالإضافة لنشر برامج التثقيف الغذائي لتعريف أفراد المجتمع بالقيمة الغذائية والعلاجية لفاكهة الايجل مارميليوس.

الكلمات المفتاحية :
إيجل مارميليوس، إرتفاع مستوى الكوليستيرول فى الدم ، الجليسريدات الثلاثية، الجرذان ، والفحص الهيستوباثولوجي