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Effect of Different Barley Leaves Extracts On Blood Lipid Profiles in High Fat Diet of Experimental Rats

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Abstract

The present study aimed to investigate the phytochemicals constituent of water and ethanolic extracts of barley leaves at 15 and 20 day old sprout. Also, evaluated the protective effect of these extracts against the blood lipid profile levels in high fat diet (HFD) of experimental rats. Finally, histopathological evaluation of liver and kidney were performed. The phenolic compounds content in barley leaves aged 15th day of germinated were found to be 5425.4 and 7237.6 mg GAE/100 g, for both water and ethanol extracts while, in barley leaves aged 20th day of germinated of water and ethanol extracts were 5960.4, 8792 mg GAE/100 g. However, total flavonoids (TF) of both water and ethanol extracts of barley leaves aged 15th and 20th day of germinated were found to be (83.82 and 145.2 mg QE/100 g) and (167.9 and 191.8 mg QE/100 g) of DW, respectively. While, the antioxidant activity in the germinated barley for both water and ethanol extracts aged15th day showed 55.68 and 67.16% for (DPPH) and were found to be 77.68, 42.21% for (ABTS). However, barley leaves both water and ethanol extracts aged 20th day of germinated were 65.66 and 68.84% for (DPPH) and for (ABTS) were 79.33 and 52.30 %, respectively. Total carotenoids content were found to be (0.064, 0.072, 0.185 and 0.134 mg/100 g) but β-glucan contents were found to be (9.16, 5.47, 1.89 and 1.2 µg/mL) for water and ethanol extracts of barley leaves aged 15th and 20th day of germination, respectively . sixity rats used for Biological Experiment to study the effect of different barley leaves extracts on lipid profiles in HFD.

From the obtained results, it could be seen that the serum TG, TC, LDL-C, VLDL-C, and risk factor had a significant reduced in all HFD groups treated with different extracts of barley leaves when compared with positive control . Also, both water and ethanol extracts of barley leaves extracts were found to be improved in serum ALT and AST of experimental rats .In addition the treated and protected rats with barley leaves extract groups showed a significant decrease in urea, creatinine and uric acid levels when compared to hyperlipidemic group. Histopathological variation observed in liver and kidney tissue of high fat groups when treated with barley leaves extracts showed improved their tissues. Finally, it could be concluded that barley green leaves extracts (ethanol and water) can be used as a lowering hyperlipidemic rats subsequently prevent from heart diseases caused by arteriosclerosis. Moreover, this extracts might be improve liver and kidney function.

Keywords: Barley leaves- Antioxidant activity - Phenolic compound -β-glucan -High fat diet -Lipid profiles.

Introduction

Barley (*Hordeum vulgare)* is a considered one of the oldest cultivated plants that played an important role in the development of human civilization, agronomic, physiological, genetic sciences and plant breeding. Regular consumption of barley and its hydroalcoholic extract reduces the risk of chronic diseases (diabetes, cancer, obesity, cardiovascular disease, etc.), based on phytochemicals including β-glucan, phenolic acids, flavonoids, lignans, tocols, phytosterols, and folate. Also, has therapeutic qualities, enhanced by the treatment of certain conditions **(Idehen *et al.*, 2017 and Sakellariou and Mylona, 2020).**

Germination grains process an enhanced nutritive value than the original dry grains. The process of soaking, germination and subsequent sprouting contain many various physiologically active substances compared with the full-grown mature. Also, increased the content of essential fatty acids and carbohydrates by activating lipases, and β-glucanases. Sprouting increases the availability of protein content, phosphorus, calcium, and iron in sprouts, as phytases are produced in the sprouted seeds, which degrade the phytate compounds and release minerals **(Dung *et al*., 2010; Fazaeli *et al*., 2012 and Gebremedhin, 2015).** Antioxidant activity in sprouted grains is mainly attributed to accumulations polyphenols **(Kim *et al*., 2013 and Ahmad *et al*., 2016).** Also, barley sprout extract improves blood lipid metabolism refer to presence of antioxidant as lutomarin, saponarin, and SOD, which have ant diabetic effect; regulate blood pressure; protect liver; antidepressant, anticancer, anti-inflammatory, antioxidant and hypolipidemic effects; prevent cardiovascular diseases. **(Lahouar *et al*., 2015 and Lee *et al*., 2016).**

Yang *et al.* (2016) reported that the barley grass contains significant quantities of calcium, copper, iron, magnesium, potassium, zinc, β-carotene, folate, pantothenic acid, vitamins C, and E, superoxide dismutase, catalase, vitamine B1, B2, B6, and chlorophyll.

Gao *et al.* (2017) and **Zeng *et al.* (2017)** found that young green barley contain 37 flavonoids and a hydroxyl cinnamates include saponarin, lutonarin, isoorientin, C-glycosyl flavones, O-diglycosyl-flavones, isoscoparin-7-O-glucoside derivatives and -7-O- [6-acyl]-glc-4'-glucoside of isovitexin**,** the major flavonoid from extract are isovitexin-7-O-glucoside (54.17%) and isoorientin-7-O-glueoside (33.36%)**.**

Zeng *et al.* (2018) mentioned that barley grass extract could be attributed to precence of nutritional component of fiber, vitamins or other phytochemical as beta glucan, phenolic acid and flavonoid. β-glucan is particularly important for human consumption because it lowers cholesterol and blood glucose levels.

Chen *et al.* (2017 and Chen et al. 2018) evaluatedthat the chlorophyll (a, b), beta carotenoids and ascorbic acid contents were (1494, 1435 and 1327 mg/kg for barley leaves, freeze dried barley leaves juice and green magma respectively**.**

Also, **Li *et al.* (2019)** found that a chlorophyll extract supplementation effectively alleviated body weight gain and low-grade inflammation, and improved the glucose tolerance in HFD-fed mice. The chlorophyll extract supplementation reversed HFD-induced gut microbiota dysbiosis and prevention of obesity.

Islam *et al.* (2021) stated that the bioactive phytochemicals in the barley and β-glucan content change according germination time. As the germination period progressed, crude protein, crude fat, and crude ash levels increased, while starch content decreased. β-Glucan content significantly decreased during the germination period. Bioactive compounds, in particular the total phenolic (122.84–322.67 μg/g), total flavonoid (32.20–124.09 μg/g), and γ-aminobutyric acid (GABA) content (176.94–212.64 μg/g), increased as germination progressed. Also, the antioxidative properties mainly (DPPH) and 2,2'-Azinobis3-ethylbenzothiazoline-6-sulfonic acid (ABTS) radical scavenging activity also increased during the germination period.

The major bioactive compounds of these natural sources are especially phenolics and flavonoids, which are responsible for their health benefits. Moreover, the antioxidant properties of phenolic are responsible for the inhibition of oxidation of low-density lipoprotein cholesterol **(Sindhi *et al.*, 2013).**

El Rabey *et al.* (2013) investigated that supplementation of barley and oat for hyperlipidemia and hypercholesterolemia male albino rats enhance lipid profile. Whereas found that hypercholesterolemic rats supplemented with oat bran and barley showed a significant decrease in lipid parameters, significant increase in high density lipoprotein-cholesterol, improved antioxidant enzyme, and improved histopathology of kidney, liver, heart, and testes.

Thatiparthi *et al.* (2019) reported that the rats administered with high fat diet for 60 days showed a significant increase in body weight, altered lipid profile, liver function markers like AST, ALT, ALP. However, administration of barley grass juice for 60 days, profoundly decreased the bodyweight, body mass index, improved lipid profile and liver function markers. Histopathological variations observed in liver and carotid artery of high fat diet group, when treated with barley juice grass showed preserved hepatocytes and reduced atherosclerosis.

Swelim *et al.* (2019) studied the effect of concentered beta glucan or barley beta glucan in male albino rats. They found that the hyperlipidemic rats showed an increase in lipid profile, total lipid, phospholipids, atherogenic indices, liver enzymes, kidney functions and glucose levels while a decrease in HDL-C and albumin compared with the control group. Moreover, histological examination of liver tissue of hyperlipidemic rats showed fatty hepatocytes compared with the control.

Dorsaf *et al.* (2020) studied the protective capacity of barley leaves extract against dieldrin-induced hepatotoxicity and nephrotoxicity in rats. They found that aqueous extract of barley grass has the potential to ameliorate liver and kidney injury induced by dieldrin mainly through its potent antioxidant properties due to its richness in phenolic compounds.

The aim of the present study was to characterize and evaluate the phytochemicals constituent of water and ethanolic extracts of barley leaves at 15 and 20 day old sprout. Also, investigated ability of barley leaves extracts (water and ethanol) to lowering triglycerides, total cholesterol, LDL-C, risk factor and increase HDL-C . Improve liver function, kidney function on experimental rats fed on high fat diet and illustrate the effect of these extracts in protection liver and kidney tissues.

Materials And Methods

Barley grains were obtained from the Institute of Crops Field, Agriculture Research Centre, Giza, Egypt. All chemical reagents were purchased from Sigma-Aldrich (St. Louis, Mo, USA).. Adult male albino rats (60 animals), aged 12 weeks old weighted (212±10 g) were purchased from the Laboratory Animal Department, Food Technology Research, Agricultural Research Center, Ministry of Agriculture, Giza, Egypt.

Sprouting grains:

Briefly, overnight soaked seeds were used for germination and barley grass was collected on day 15^{th} and 20^{th} day, **El-Dreny and El-Hadidy (2018).**

Ethyl alchol sp and water extracts were perpared from the barley green leaves after harvested 15^{th} and 20^{th} day . Then, left over night in refrigerator and pass through cotton cloths to remove a fiber. Its

kept till concentration by rotary and analyzed according to the method described by **Choe *et al.* (2010)**

Extraction of antioxidant compounds were performed by using a fine dried powder**,** total phenolic acid content estimated based on the procedure described by **Batista *et al.* (2011).**However, the total flavonoid content was determined according to the method described by **Zhishen *et al*. (1999)**. Chlorophylls (A and B) and total carotenoids contents were determination by the method of **Lichtenthaler and Wellburn (1983).** On the other hand,the electron donation ability of the obtained ethanol and water extracts were measured by 2,2-diphenyl-1-picrylhdrazyl radical (DPPH) according to the method of **Hatano *et al.* (1988).** But, ABTS radical scavenging activity was measured according to the method described by **Re *et al.* (1999).** The samples were analyzed for β-glucans by HPLC by the method described by **Alaubydi and Abed (2011).**

Biological Expermental design:

Adult male albino rats (60 animals), aged 12 weeks old weighted (212±10 g) were housed in plastic cages and fed Basal diet and the constituents of salt and vitamin mixture were suggested by the corresponding reported of **Reeves *et al*., (1993).** After the adaptation period the rats randomly divided into 10 groups as a following:

Group (1): Rats fed on basal diet.

Group (2): Rats fed on high fat diet (HFD) the basal diet was supplemented Hydrogenated palm oil with(20%) during experimental period.

Group (3): Rats fed on high fat diet (HFD) and (1 ml of water extract of leaves barley on 15th day (50 mg/rat/day) through gastric gavages for 8weeks period. [BLWE15d]

Group (4): Rats fed on high fat diet (HFD) and (2 ml of water extract of leaves barley on 15th day (100 mg/rat/day) through gastric gavages for 8weeks period. [BLWE15d]

Group (5): Rats fed on high fat diet (HFD) and (1 ml of ethanol extract of leaves barley on 15th day (75 mg/rat/day) through gastric gavages for 8weeks period. [BLEE15d]

Group (6): Rats fed on high fat diet (HFD) and (2 ml of ethanol extract of leaves barley on 15th day (150 mg/rat/day) through gastric gavages for 8weeks period. [BLEE15d]

Group (7): Rats fed on high fat diet (HFD) and (1 ml of water extract of leaves barley on 20th day (50 mg/rat/day) through gastric gavages for 8weeks period.[BLWE20d]

Group (8): Rats fed on high fat diet (HFD) and (2 ml of water extract of leaves barley on 20th day (100 mg/rat/day) through gastric gavages for 8weeks period[.BLWE20d]

Group (9): Rats fed on high fat diet (HFD) and (1 ml of [ethanol extract of leaves barley on 20th day (67 mg/rat/day) through gastric gavages for 8weeks period.[BLEE20d].

Group (10): Rats fed on high fat diet (HFD) and (2 ml of ethanol extract of leaves barley on 20th day (134 mg/rat/day) through gastric gavages for 8weeks period. [BLEE20d]

At the end of experimental period the blood samples were collected from eye plexuses into a dry clean centrifuge glass tube without any coagulation to prepare serum. Blood samples were left for 15 min at refrigerator. Then, the tubes were centrifugation for 15 min at 3000 rpm and the clean supernatant serum was kept frozen at in 20°C until for analysis. At end of the experimental period rats were weighed and euthanized under deep anesthesia using ether and collection of tissue specimen were performed for further histological examination.

Biological parameters assay:

Triglycerides (TG) were determined calorimetrically according to the methods of **Fassati and Prencipe (1982).** Total Cholesterol was calorimetrically determined as according to the enzymatic method of **Richmond (1973).** Determination of high density lipoprotein-cholesterol

(HDL-C) was estimated by enzymatic colorimetric method according to the method of **Wieland and Seidel (1983).** While, very low density lipoprotein cholesterol [VLDL-C] was calculated as reported by **Friedewald *et al.* (1972).** On the other hand, low density of lipoprotein cholesterol [LDL-C] was calculated as according to **El-Din and Maha (2012)** and Coronary risk index [CRI or risk factor (RF)] was calculated as according **Adeneye *et al.* (2010).** Alanine transaminase (ALT) and aspartate transaminase (AST) activities were calorimetrically measured according to the method described by **Reitman and Frankel (1957).** Serum protein was determined using the method of **Gornnall *et al.* (1949).** The albumin content was determined using the method of **Doumes *et al*. (1971).** Serum uric acid was determined according the method of **Barham and Trinder (1972)** and Creatinine determination was carried out calorimetrically according to the method described by **Schirmeister *et al.* (1964)**.Urea was determined as carried out by **Fawcett and Scott (1960)**.

Histopathological Examination

Tissue specimens were collected from liver and kidney washed in sterile saline and fixed in10% neutral formalin for histopathological studies. The targetorgans were then dehydrated in gradual ethanol (50–99%),cleared in xylene, and embedded in paraffin. Sections were prepared and then stained with hematoxylin and eosin (H&S)dye for microscopic according to **Drury and Wallington (1986).**

Statistical analysis:

The statistical analysis was carried out using one-way ANOVA using SPSS, ver. 25 **(IBM Corp. Released 2013)**. Data were treated as a complete randomization design according to **Steel *et al.* (1997)**. Multiple comparisons were carried out applying **Duncan test** the significance level was set at < 0.05

Result and Discussion

1- Bioactive components of barley green leave extracts:

The total phenolic compounds content for extracts were determined by Folin and Ciocalteu reagent method as gallic acid equivalent (GAE/100 g) dried extract and the obtained results are tabulated in Table (1). The phenolic compounds content in barley leaves aged 15th day of germinated were found to be 5425.4 and 7237.6 mg GAE/100 g, for both water and ethanol extracts while, in barley leaves aged 20th day of germinated of water and ethanol extracts were 5960.4, 8792 mg GAE/100 g. However, total flavonoids (TF) as quercetine equivalent (QE/100 g) dried extract and the obtained results of both water and ethanol extracts of barley leaves aged 15th day of germinated were found to be 83.82 and 145.2 mg QE/100g of DW, respectively. While, (TF) of water and ethanol extracts barley leaves aged 20th day of germinated were found to be 167.9 and 191.8 mg QE/100g of DW, respectively.

Generally, from these results showed, a high value of total phenolic acids and flavonoids of water and ethanol extracts barley leaves aged 20th day of germinated. These results are in agreement of those reported by **Zhang *et al.* (2013)**.

Antioxidant activity was assayed using the method of DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging activity and ABTS (2,2′-azino-bis-3- ethylbenzothiazoline-6-sulfonic acid) radical scavenging activity and the results are recorded in (Table 1). From the obtained data the antioxidant activity in the germinated barley for both water and ethanol extracts aged15th day showed 55.68 and 67.16% for (DPPH) and were found to be 77.68, 42.21% for ABTS .However barley leaves both water and ethanol extracts aged 20th day of germinated were 65.66 and 68.84% for (DPPH) and for (ABTS) 79.33 and 52.30 %, respectively.

From the abovementioned results showed a high antioxidant activity of barley leaves (water and ethanol) extracts aged 20th day of germinated. These probably due to the biosynthesis of phenolic compounds because germination increases antioxidant activity in barley and may become a suitable method for increasing the antioxidant properties of foods or drinks.

Therefore, The bioactive compounds such as phenolic, flavonoid content, and the in vitro antioxidant properties (DPPH and ABTS radical scavenging activity) of barley leaves were increased during germination. These results are agreement with those reported by **Islam *et al.* (2021)**. On the other hand, **Zhou and Yu. (2004**) reported that good correlations between DPPH radical scavenging activity and ABTS radical cation scavenging activity with total Phenolic compound. Based on the results of total phenolic compounds, the best extracting solvent was ethanol. Also, It was observed that the effect of ethanol on total flavonoid compound was similar to that on total Phenolic compound. The highest total flavonoid compound was obtained with ethanolic extract which in agreement with those reported by **(Do *et al.*, 2014).**

Table 1. Total phenolics, total flavonoids and antiradical activities of barley leaves extracts at different aged germination periods (aged 15th and 20th days).

Group of extracts	Total Phenolics mgGAE/100g	Total flavonoids mg QE/100g	DPPH %	ABTS%
Water 15th day	5425.49±0.03^{d}	83.82±0.03^{d}	55.68±0.11^{d}	77.68±0.35^{b}
Ethanol 15th day	7237.6±0.03^{b}	145.27±0.03^{c}	67.16±0.06^{b}	42.21±0.05^{d}
Water 20th day	5960.47±0.06^{c}	167.92±0.03^{b}	65.66±0.04^{c}	79.33±0.26^{a}
Ethanol 20th day	8792.78±0.06^{a}	191.89±0.03^{a}	68.84±0.21^{a}	52.31±0.41^{c}

a, b & c: There is no significant difference (P>0.05) between any two means, within the same column have the same superscript letter

2- Chlorophyll-A, Chlorophyll-B, total carotenoids and β-glucan contentof barley leaves water and ethanolic extracts:

The Chlorophyll-A, Chlorophyll-B and carotenoids were measured in barley leaves extracts in both water and ethanol at different germination periods (aged 15th and 20th day) and the obtained data are presented in Table (2).

The obtained results showed that chlorophyll-A and chlorophyll-B contents were (0.469, 0.463, 0.635 and 0.718 mg/100 g) and were (0.873, 0.833, 1.173 and 0.986 mg/100 g) for water and ethanol extracts of barley leaves aged 15th and 20th day of germination, respectively. From the abovementioned results, it could be seen that chlorophyll-A and chlorophyll-B contents in barley leaves aged 15th day were found to be lower than that

in extracts of barley leaves aged 20th day of germination.

However, total carotenoids content were found to be (0.064, 0.072, 0.185 and 0.134 mg/100 g) for above extracts, respectively. Total carotenoids were higher in extracts of barley leaves aged 20th day of germination. These result are similar with those obtained by **Chen *et al.* (2017 and Chen *et al.* (2018)**

Determination for β-glucan was measured by HPLC in barley leaves extracts in both water and ethanol at different aged (15th and 20th day) of germination and the obtained data are presented in Table (2) The accomplished results showed that β-glucan content were found to be 9.16, 5.47, 1.89 and 1.2 µg/mL for water and ethanol extracts of barley leaves aged 15th and 20th day of germination, respectively. From these data β-Glucan contents were significantly decreased over the germination period was increased. While, β-glucan contents of ethanol extracts was lower than those of water extracts. From the abovementiod results, it could be seen that β-glucan content in extracts of barley leaves aged 15th day was higher than that in extracts of barley leaves aged 20th day of germination . These results are in agreement with those reported by **Kihara *et al.* (2007), Kim *et al.* (2017)** and **Islam *et al.* (2021).** They found that the β-glucan content of barley decreased whenever increase aged day of germination. Decrement of beta glucan refer to the action of β-glucanases **(Hübner *et al.*, 2010).**

Table (2) Chlorophyll-A, Chlorophyll-B, total-carotenoids and β-glucan content on barley leaves for both water and ethanolic extracts:

Extracts	Chlorophyll A mg/100g	Chlorophyll B mg/100g	Total Carotenoids mg/100g	β-glucan µg/mL
Water 15 days	0.47±0.01^{c}	0.87±0.00^{bc}	0.06±0.00^{d}	9.16
Ethanol 15 days	0.46±0.01^{c}	0.83±0.02^{c}	0.07±0.00^{c}	5.47
Water 20 days	0.64±0.03^{b}	1.17±0.06^{a}	0.19±0.00^{a}	1.89
Ethanol 20 days	0.72±0.02^{a}	0.99±0.06^{b}	0.13±0.00^{b}	1.2

a, b & c: There is no significant difference (P>0.05) between any two means, within the same column have the same superscript letter.

3- Effect of different barley leaves extracts on final weights, body weight gain and organs weights of fed High fat diets rats under :

Body weight gain (BWG) and final weights of experiments rats which treated by barley leaves extracts (both water and ethanol) are illustrated in Table (3). The body weight was weighted; rats fed on high fat diet (HFD) for induced to increase cholesterol, triglycerides in blood and obesity using dehydrogenated oil. In the end of experimental period recorded were significant decreased the (BWG) in all treated groups when compared with the positive control group.

The lower values of BWG was observed in group (5) which treated with ethanol extract of barley leaves aged 15th day of germination, followed by water extract of barley leaves in same aged, then (G7) which treated by water extract of barley leaves aged 20th day of germination and (G10) treated by ethanol extract of barley leaves in same aged which had (132.33, 136.00 and 137.00 g, respectively . However, the increased percentage of the above groups (5), (7) and (10) were found to be 61.55, 62.09 and 62.26%, respectively, when compared with negative control (55.24%).

On the other hand, the highest values of BWG were found to be 72.62, 69.13 and 67.08% for groups (G9), (G6), and (G3).

From the abovementiod resulted, it could be seen that the treated with barley leaves extracts suppressing obesity of all groups under treatments with barley extracts i.e water and ethanol extracts BLWE and BLEE .These observation may be due to good nutritional value and beneficial biological effect of the barley leaves extract .These results are in agreement with those reported **by Li *et al.* (2018), Thatiparthi *et al.* (2019) and Han *et al.(* 2020).**

Also, Table (3) showed the results of organs weight of each liver, Kidney, and heart in rats treated by barley leaves extracts. From the obtained data, the liver weight was significantly increased in positive groups with barley leaves extracts (BLE) when compared to normal rats groups 9.79 and 8.43g, respectively. Generally, all treated group had a significantly decrement of liver weights when compared to the positive group. On contrast, the mean values of kidney weight was decreased significantly in the control positive group, as compared to normal rats group 1.84 and 2.17 g, respectively. While, all treated groups with barley leaves extracts had a significantly increase of kidney weights compared to the positive group. . However, the heart weight of positive control and different experimental treated had the same mean values with negative control. These results are in agreement with those reported by **Han *et al.* (2020).** They found that the addition of barley leaves extracts to the hyperlipidimic diet lead to significant decrease in liver.

Table (3): Final body weight, weight gain and organs weight for rats fed on HFD and treatment.

Groups	Initial weight (g)	Final weight (g)	Weight gain (g)	Increase (%)	Liver (%)	Kidney (%)	Heart (%)
G1	219.67 ±0.33	341.00 ±5.86	121.33 ±6.12	55.24 ±2.85^{d}	8.43 ±0.25^{ab}	2.17 ±0.09^{ab}	1.12 ±0.05^{a}
G 2	216.00 ±0.58	427.33 ±3.71	211.33 ±4.26	97.85 ±2.22^{a}	9.79 ±0.97^{a}	1.84 ±0.10^{b}	1.04 ±0.04^{a}
G 3	215.67 ±1.20	360.33 ±5.17	144.67 ±5.04	67.08 ±2.38^{bc}	8.63 ±0.31^{ab}	2.16 ±0.21^{ab}	1.09 ±0.06^{a}
G 4	216.67 ±0.88	360.33 ±10.11	143.67 ±9.84	66.30 ±4.46^{bc}	8.27 ±0.25^{b}	2.21 ±0.07^{ab}	1.16 ±0.07^{a}
G5	215.00 ±0.58	347.33 ±1.33	132.33 ±1.45	61.55 ±0.75^{cd}	8.98 ±0.37^{ab}	2.39 ±0.09^{a}	1.08 ±0.05^{a}
G6	218.00 ±1.53	368.67 ±1.86	150.67 ±2.60	69.13 ±1.58^{bc}	8.32 ±0.22^{b}	2.32 ±0.12^{a}	1.22 ±0.03^{a}
G7	219.00 ±0.58	355.00 ±5.77	136.00 ±5.20	62.09 ±2.21^{cd}	8.25 ±0.31^{b}	2.39 ±0.13^{a}	1.17 ±0.09^{a}
G8	216.67 ±0.88	361.33 ±6.77	144.67 ±6.84	66.77 ±3.21^{bc}	8.24 ±0.36^{b}	2.26 ±0.13^{a}	1.12 ±0.05^{a}
G9	220.33 ±0.88	380.33 ±0.33	160.00 ±0.58	72.62 ±0.55^{b}	7.83 ±0.14^{b}	2.20 ±0.17^{ab}	1.06 ±0.05^{a}
G10	220.00 ±0.58	357.00 ±8.00	137.00 ±7.51	62.26 ±3.27^{cd}	8.10 ±0.26^{b}	2.09 ±0.06^{ab}	1.02 ±0.2^{a}

a, b & c: There is no significant difference (P>0.05) between any two means, within the same column have the same superscript letter.
G1: Negative control (basal diet) G2: Positive control (HFD).
G3: HFD + (1 ml=50 mg/rat/day BLWE15 d) G4: HFD + (2 ml=100 mg/rat/day) BLWE15 d
G5: HFD + (1 ml=75 mg/rat/day BL E E15 d) G6. HFD + (2 ml=150 mg/rat/day BL E E15 d)
G7: HFD + (1 ml=50 mg/rat/day BL WE 20 d) G8: HFD + (2 ml=100 mg/rat/day BL WE 20 d)
G9: HFD + (1 ml=67 mg/rat/day BL E E20 d) G10: HFD + (2 ml=134 mg/rat/day (BL E E20 d)

4- Effect of different barley leaves extracts on lipid profile levels in rats feed High Fat Diet (HFD) :

The results in Table (4) showed that the effect of different barley extracts on serum triglycerides(TG), total cholesterol (TC), high-density lipoprotein-cholesterol (HDL-C), low-density lipoprotein-cholesterol(LDL-C), very low density lipoprotein cholesterol (VLDL-C) and risk factor(RF) for rats fed on HFD and treatments by barley leaves extracts i.e water extracts (BLWE) and ethanol extracts (BLEE).

The highest values of serum TG, TC, LDL-C, VLDL-C and risk factor were 155±0.58, 156±1.73, 113±1.97, 31±0.12 and 13.07±0.72 mg/dL, respectively and the low value of HDL-C was found to be 12±0.58 mg/dL for rats fed high fat diet (positive control)when compared with negative group and all treatments groups under investigation . On the other hand, the rats in (G3) which fed on HFD with treated by (1 mL) water extract of barley leaves aged 15th day of germinated (50 mg/rat/day) showed decrease for TG, TC, LDL-C, VLDL-C, Risk factor were found to be 99.33±0.88, 98.33±0.88, 60.13±2.36, 19.87±0.18 and 5.48±0.61 mg/dL, respectively when compared with positive control . Meanwhile, rats in (G4) which treated by (2 mL) water extract of barley leaves aged 15th day of germinated had more reduction than rats in (G3). Thus the decreasing values were found to be 58.00±1.53, 72.67±1.45, 31.07±0.73, 11.60±0.31 and 2.42±0.01 mg/dL, respectively for TG, TC, LDL-C, VLDL-C and risk factor. Furthermore, HDL-C in rats in (G3) and (G4) were increased about 18.33±1.76 and 30.00±0.58 mg/dL, respectively compared with positive control.

Concerning, rats in (G5) and (G6) which fed on HFD with treated ethanol extract of barley leaves aged 15th day of germinated were more decreasing than water extract of barley leaves 15th day aged. Whereas, rats in (G5)which fed on HFD with treated by (1 mL) of ethanolic extracted showed decrease for TG, T.C, LDL-C, VLDL-C, risk factor and there values were 73.00±1.53, 84.00±0.58, 38.40±0.31, 14.60±0.31 and 2.71±0.03 mg/dL, respectively compared with positive control .While, the values were found to be 80.00±0.58, 75.67±1.20, 30.33±1.84, 16.00±0.12 and 2.59±0.10, mg/dL respectively (G6) for TG, TC, LDL-C, VLDL-C and risk factor Furthermore, HDL in rats was increase about 31.00±0.58 and 29.33±0.88 mg/dL for (G5) and (G6) compared with positive control . Rats in (G7) which fed on HFD with treated by (1 mL) of water extract showed decrease in TG, TC, LDL-C, VLDl-C, RF and these values were 56.33±1.86, 91.67±1.20, 57.40±1.78, 11.27±0.37 and 3.99±0.12 mg/dL, respectively compared with positive control.

Meanwhile, rats in (G8) treated by (2 mL) water extract had significant decrease and these

values were 57.00±0.58, 87.33±1.20, 48.93±0.96, 11.40±0.12 and 3.24±0.05 mg/dL, respectively for TG, TC, LDL-C, VLDl-C and risk factor. On the other hand, rats of (G9)Which fed on HFD with treated by (1 mL)of ethanol extract showed decrease for TC, TG, LDL-C, VLDL-C, RF and these values were 80.00±0.58, 94.33±2.60, 53.33±2.29, 16.00±0.12 and 3.78±0.09 mg/dL, respectively compared with positive control . Furthermore, the values of HDL-C in rats were found to be 23.00±0.58, 27.00±0.58 and 25.00±0.58 mg/dL for (G7), (G8) and (G9) compared with positive control. Concerning, rats in (G10) showed had the best of improving in lipid profile the decreasing values TG, TC, LDL-C, VLDL-C and risk factor were 61.00±0.58, 70.00±0.58, 26.80±1.27, 12.20±0.12 and 2.26±0.06 mg/dL, respectively compared with positive control . Furthermore, HDL increased 31.00±0.58 compared with positive control .

From the abovementioned results, it could be concluded that the serum TG, TC, LDL-C, VLDL- C and risk factor had a significant reduced in all HFD groups treated with different extracts of barley leaves when compared with positive control (G2). Cholesterol-lowering effects have been attributed to the hexacosyl alcohol and beta-sitosterol fractions of barley leaf extract. Beta-sitosterol is thought to act by inhibiting the intestinal absorption of cholesterol and accelerating its catabolism to bile acid .Furthermore, lipid profile development may be refer to presence of lutonarin, which has been shown to have hypolipidimic effects, hexacosanol, and β-glucan **(Seo *et al.* 2013).** The obtained results are in agreement with those reported by **Swelim *et al.* (2019)**, **Thatiparthi *et al.* (2019) and Dorsaf *et al.* (2020).**

Table (4): Effect of different barley leaves extracts on lipid profile levels rats fedin high fat diet.

Groups	Triglycerides (mg/dL)	Total cholesterol (mg/dL)	HDL-chol. (mg/dL)	LDL-chol. (mg/dL)	VLDL-chol. (mg/dL)	Risk factor
G1	61.67±1.76^{e}	80.00±2.08^{f}	36.33±2.03^{a}	31.33±0.35^{f}	12.33±0.35^{e}	2.21±0.07^{e}
G 2	155.00±0.58^{a}	156.00±1.73^{a}	12.00±0.58^{g}	113.00±1.97^{a}	31.00±0.12^{a}	13.07±0.72^{a}
G 3	99.33±0.88^{b}	98.33±0.88^{b}	18.33±1.76^{f}	60.13±2.36^{b}	19.87±0.18^{b}	5.48±0.61^{b}
G 4	58.00±1.53^{fg}	72.67±1.45^{gh}	30.00±0.58^{b}	31.07±0.73^{f}	11.60±0.31^{f}	2.42±0.01^{e}
G5	73.00±1.53^{d}	84.00±0.58^{e}	31.00±0.58^{b}	38.40±0.31^{e}	14.60±0.31^{d}	2.71±0.03^{de}
G6	80.00±0.58^{c}	75.67±1.20^{g}	29.33±0.88^{b}	30.33±1.84^{f}	16.00±0.12^{c}	2.59±0.10^{de}
G7	56.33±1.86^{g}	91.67±1.20^{c}	23.00±0.58^{e}	57.40±1.78^{b}	11.27±0.37^{f}	3.99±0.12^{c}
G8	57.00±0.58^{g}	87.33±1.20^{d}	27.00±0.58^{cd}	48.93±0.96^{d}	11.40±0.12^{f}	3.24±0.05^{cd}
G9	80.00±0.58^{c}	94.33±2.60^{c}	25.00±0.58^{de}	53.33±2.29^{c}	16.00±0.12^{c}	3.78±0.09^{c}
G10	61.00±0.58^{ef}	70.00±0.58^{h}	31.00±0.58^{b}	26.80±1.27^{g}	12.20±0.12^{e}	2.26±0.06^{e}

a, b & c: There is no significant difference (P>0.05) between any two means, within the same column have the same superscript lett.
G1: Negative control (basal diet) G2: Positive control (HFD).
G3: HFD + (1 ml=50 mg/rat/day BLWE15 d) G4: HFD + (2 ml=100 mg/rat/day) BLWE15 d
G5: HFD + (1 ml=75 mg/rat/day BL E E15 d) G6. HFD + (2 ml=150 mg/rat/day BL E E15 d)
G7: HFD + (1 ml=50 mg/rat/day BL WE 20 d) G8: HFD + (2 ml=100 mg/rat/day BL WE 20 d)
G9: HFD + (1 ml=67 mg/rat/day BL EE 20 d G10: HFD + (2 ml=134 mg/rat/day BL WE 20 d

5- Effect of different barley leaves extracts on Liver function in (HFD) experimental rats:

The effect of different barley leaves extracts on liver function in rats fed (HFD) with treatments with barley leaves extracts were estimated and the obtained results are recorded in Table (5). Generally, both water and ethanol extracts of barley leaves was improved the liver function compared with positive control. The rats in (G4) which fed on HFD with treated by (2 mL) water extract of barley leaves aged 15th day of germination were better than rats in(G3) which treated by (1 mL) of water extract of barley leaves the same aged for ALT and AST. The result indicated that the decreasing for ALT and AST in(G4) were 65.33 and 86.00 U/L while the decreasing in (G3) were found to be 87.67 and 113.00 U/L when compared with positive control .

Concerning for ethanol extract of barley leaves aged 15th day of germination; the results showed the rats in (G5) which treated by (1 mL) of ethanol extract had decreased and these values were 72.00 and 111.00 U/L for ALT and AST lower than rats in (G6) treated by (2 mL) of ethanol extract were 62.33 and 96.67 U/L for ALT and AST when compared with positive control . The same Table (5) explained the result for rats in group fed on HFD with treated by either water or ethanol extract of barley leaves aged 20th day of germination. The extract of barley leaves aged 20th day improve liver function (ALT and AST) more than the same extract of barley leaves aged 15th day of germination .Whereas, water extract of barley leaves aged 20th day (1 mL) decreased and these values were 66.00 and 109.00 U/L for ALT and AST when compared with positive control . While, (2 mL) of water extract

of barley leaves aged 20th day of germination was reduced about 63.33and 121.00U/L for ALT and AST when compared to positive control . While, 1 mL of ethanol extracts of barley leaves caused to decreased in ALT and AST 55.33 and 110.00 U/L, respectively compared to positive control but another dose, (2 mL) of ethanol extract of barley leaves aged 20th day of germination reducing in ALT and AST about 59.33 and 91.67 U/L when compared with positive control.

From the abovementioned results, it could be seen that the both water and ethanol extract of barley leaves extracts were found to be improved in serum ALT and AST of experimental rats .These results are accepted with those reported by **Thatiparthi *et al*. (2019)** and **Han *et al.* (2020).**

On the other hand, the contents of total protein, albumin, globulin and albumin/globulin ratio for rats treatments with (HFD) and different barley leaves extracts were evaluated and the obtained data are presence in Table (5). From these data in this study, it could be seen that the effect of fed on barley leaves extracts on serum total protein, albumin and globulin in HFD experimental rats had a significantly decreased compared with all groups. Serum total protein levels, albumin and globulin were 6.83, 3.83and 3.0 g/dL, respectively when compared with negative control 7.50, 4.0 and 3.5 g/dL, respectively. All rats treated by all extracts of barley leaves both aged 15th and 20th day of germination were found to be improved in serum total protein levels compared to positive control. On the other hand, the effective of treated by both water and ethanol extract of barley leaves aged 15th and 20th day of germination on total albumin in all group change as the same range.

However, globulin of positive control and different experimental treated had the same mean values with negative control. Globulin was not significant in the all groups of rats experimental under investigation. These results are in agreement with those reported by **Swelim *et al*. (2019).**

Table 5. Effect of different barley leaves extracts on liver function for rats diet on high fat.

Groups	ALT (U/L)	AST (U/L)	Total protein g/dL	Albumin g/dL	Globulin g/dL	A/G ratio
G1	64.00^{de}	99.67^{e}	7.50^{a}	4.00^{a}	3.5^{a}	1.14
G2	130.33^{a}	221.33^{a}	6.83^{abcd}	3.83^{ab}	3.0^{a}	1.27
G3	87.67^{b}	113.00^{c}	7.33^{ab}	3.56^{abc}	3.76^{a}	0.94
G4	65.33^{de}	86.00^{h}	7.16^{abc}	3.60^{abc}	3.56^{a}	1.01
G5	72.00^{c}	111.00^{cd}	6.30^{d}	3.13^{c}	3.16^{a}	0.99
G6	62.33^{ef}	96.67^{f}	6.83^{abcd}	3.26^{bc}	3.56^{a}	0.91
G7	66.00^{d}	109.00^{d}	6.63^{bcd}	3.26^{bc}	3.36^{a}	0.97
G8	63.33^{de}	121.00^{b}	6.76^{abcd}	3.66^{abc}	3.10^{a}	1.18
G9	55.33^{g}	110.00^{d}	6.56^{cd}	3.66^{abc}	2.9$_{a}$	1.26
G10	59.33^{f}	91.67^{g}	7.13^{abc}	3.86^{a}	3.26^{a}	1.18

a, b & c: There is no significant difference (P>0.05) between any two means, within the same column have the same superscript letter.
G1: Negative control (basal diet) G2: Positive control (HFD).
G3: HFD + (1 ml=50 mg/rat/day BLWE15 d) G4: HFD + (2 ml=100 mg/rat/day) BLWE15 d
G5: HFD + (1 ml=75 mg/rat/day BL E E15 d) G6. HFD + (2 ml=15 0mg/rat/day BL E E15 d)
G7: HFD + (1 ml=50 mg/rat/day BL WE 20 d) G8: HFD + (2 ml=100 mg/rat/day BL WE 20 d)
G9: HFD + (1 ml=67 mg/rat/day BL E E20 d) G10: HFD + (2 ml=134 mg/rat/day (B E E20 d)

6- Effect of different barley leaves extracts on Kidney function in rats fed (HFD) :

Data presented in Table (6) showed that the effect of feeding experimental rats on HFD without/or with treated by either water or ethanol extract on kidney function. From these data of rats in positive control were found to be a high contents in serum urea, createnine and uric acid and the values were 86.00±0.58, 1.61±0.01and 3.4±0.06 mg/dL, respectively when compared to negative control and the values were 36.17±1.92, 0.66±0.01 and 1.6±0.06 mg/dL, respectively.

The rats in (G3) which fed on HFD with treated by (1 mL) of water extract barley leave aged 15th day had decreased values of urea 35.23±1.18, creatinine 0.72±0.04 compared with positive control and improved the uric acid 1.60±0.06mg/dL compared with positive control. While, the rats of (G4) which treated by (2 mL) water extract of barley leaves aged 15th day had decreased in urea 41.00±4.36, creatinine 0.64±0.01 and uric acid 1.70±0.06 mg/dL compared with control (+) . Rats in (G5) which treated by (1 mL) ethanol had decreased in urea 24.67±0.88, creatinine 0.65±0.01and uric acid 1.67±0.05 mg/dL compared with positive control. Rats in (G6) which treated by (2 mL) ethanol extract of barley leaves aged 15th day had decreased in urea 32.67±2.33, creatinine 0.77±0.01 (52.5%) and uric acid 1.57±0.04 mg/dL compared with positive control.

The rats in (G7) which treated by (1 mL) water extract of barley leaves aged 20th day had decreased in urea 29.03±1.79, creatinine 0.75±0.01 and uric acid decreased 2.06±0.03 mg/dL compared with positive control. While, the rats from (G8) with treated by (2 mL) water extract of barley leave aged 20th day had decreased in urea 36.67±2.03, creatinine 0.73±0.01and uric acid was decreased to 1.90±0.06

mg/dL when compared with positive control. Moreover, rats in (G9) treated by (1 mL) ethanol extract had decreased in urea 33.67±4.98, creatinine 0.70±0.01and uric acid 1.93±0.09 when compared with positive control.

Table 6. Effect of different barley leaves extracts on kidney function in (HFD) rats.

Groups	Urea (mg/dL)	Creatinine (mg/dL)	Uric acid (mg/dL)
G1	36.17±1.92^{bc}	0.66±0.01^{ef}	1.60±0.06^{c}
G2	86.00±0.58^{a}	1.61±0.01^{a}	3.40±0.06^{a}
G3	35.23±1.18^{c}	0.72±0.04^{bcd}	1.60±0.06^{c}
G4	41.00±4.36^{b}	0.64±0.01^{f}	1.70±0.06^{c}
G5	24.67±0.88^{e}	0.65±0.01^{ef}	1.67±0.05^{c}
G6	32.67±2.33^{c}	0.77±0.01^{b}	1.57±0.04^{c}
G7	29.03±1.79^{d}	0.75±0.01^{bc}	2.06±0.03^{b}
G8	36.67±2.03^{bc}	0.73±0.01^{bc}	1.90±0.06^{b}
G9	33.67±4.98^{cd}	0.70±0.01^{cde}	1.93±0.09^{b}
G10	29.67±2.67^{d}	0.67±0.01^{def}	1.70±0.06^{c}

a, b& c: There is no significant difference (P>0.05) between any two means for the same attribute, within the same row have the same
G1: Negative control (basal diet) G2: Positive control (HFD).
G3: HFD + (1 ml=50 mg/rat/day BLWE15 d) G4: HFD + (2 ml=100 mg/rat/day) BLWE15 d
G5: HFD + (1 ml=75 mg/rat/day BL E E15 d) G6. HFD + (2 ml=150 mg/rat/day BL E E15 d)
G7: HFD + (1 ml=50 mg/rat/day BL WE 20 d) G8: HFD + (2 ml=100 mg/rat/day BL WE 20 d)
G9: HFD + (1 ml=67 mg/rat/day BL E E20 d) G10: HFD + (2 ml=134 mg/rat/day (B E E20 d)

The rats in (G10) treated by (2 mL) had decreased in urea 29.67±2.67, creatinine 0.67±0.01 and uric acid 1.70±0.06 mg/dL. From the abovementioned results were found that treated and protected rats with barley leaves extract groups showed a significant decrease in urea, creatinine and uric acid levels when compared to hyperlipidemic group. These results are in agreement with those reported by **Swelim *et al*. (2019) and Han *et al*. (2020).**

7- Histopathology finding:

Microscopically, liver of rats from control group (G1, Negative control) revealed the normal histological structure of hepatic lobules (Fig. 1a). On contrary, liver of rats fed on high fat diet (positive control) showed vacuolar degeneration of hepatocytes, fibroplasia in the portal triad and focal hepatocellular necrosis associated with inflammatory cells infiltration (Fig. 1b).

Meanwhile, Fig. (2) which showed the liver of rats from group (3) which treated by (1 mL = 50 mg/rat/day)water extract aged 15th day of germination revealed Kupffer cells activation (Fig. 2a). However, liver from group (4) which treated by (2 mL= 100 mg/rat/day) water extract aged 15th day of germination showed congestion of central vein and small focal hepatocellular necrosis associated with inflammatory cells infiltration (Fig. 2b).

On the other hand, liver of rats from group (5) treated by (1 mL = 75 mg/rat/day) ethanol extract aged 15th day of germination exhibited no changes except Kupffer cells activation in (Fig. 2c). Moreover, the rats of (G6) which treated by 2 mL = 150 mg/rat /day)of ethanol extract showed no histopathological changes in (Fig. 2d).

Furthermore, liver of rats from (G7) treated by (1 mL = 50 mg/rat/day) water extract of barley aged 20th day of germination revealed no histopathological changes showed in same (Fig. 2e) Also, liver of rats from (G 8) treated by (2 mL = 100 mg/rat/day) water extract of barley aged 20th day of germination described few mononuclear cells in the hepatic sinusoids and Kupffer cells activation (Fig. 2f) On the other hand, examined sections from group (9) treated by (1 mL= 67 mg/rat/day ethanol extract aged 20th day revealed vacuolization of sporadic hepatocytes (Fig. 2g). Meanwhile, liver of rats from group (10) treated by (2 mL = 134 mg/rat/day ethanol extract aged 20th day showed no histopathological changes same (Fig. 2k). From above results it could be seen that the (G6), (G7) and (G10) showed normal histopathological as negative control. Therefore the barely leaves extracts both water and ethanol were found to be protect liver from effect accumulation fat in liver. These results are in agreement with those reported by **Dorsaf *et al*. (2020) and Han *et al*. (2020)**.

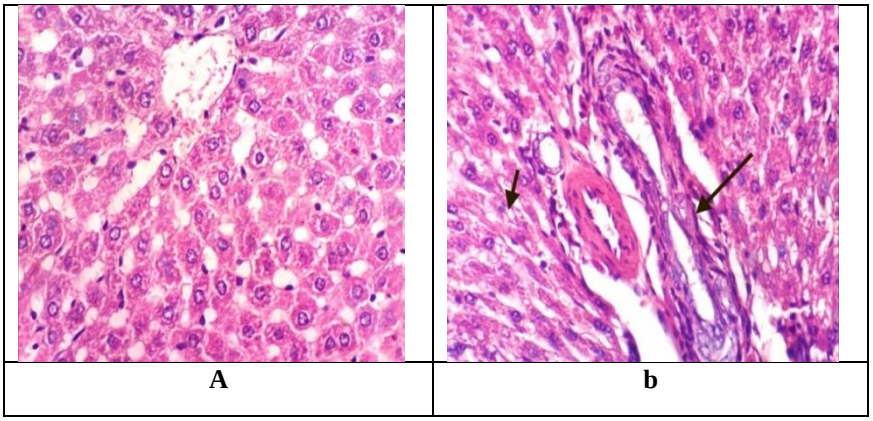

Fig. (1a): Liver of rats from control negative showing the normal histological structure of hepatic lobule; b) liver of rats from positive control showing vacuolar degeneration of hepatocytes and fibroplasia in the portal triad.

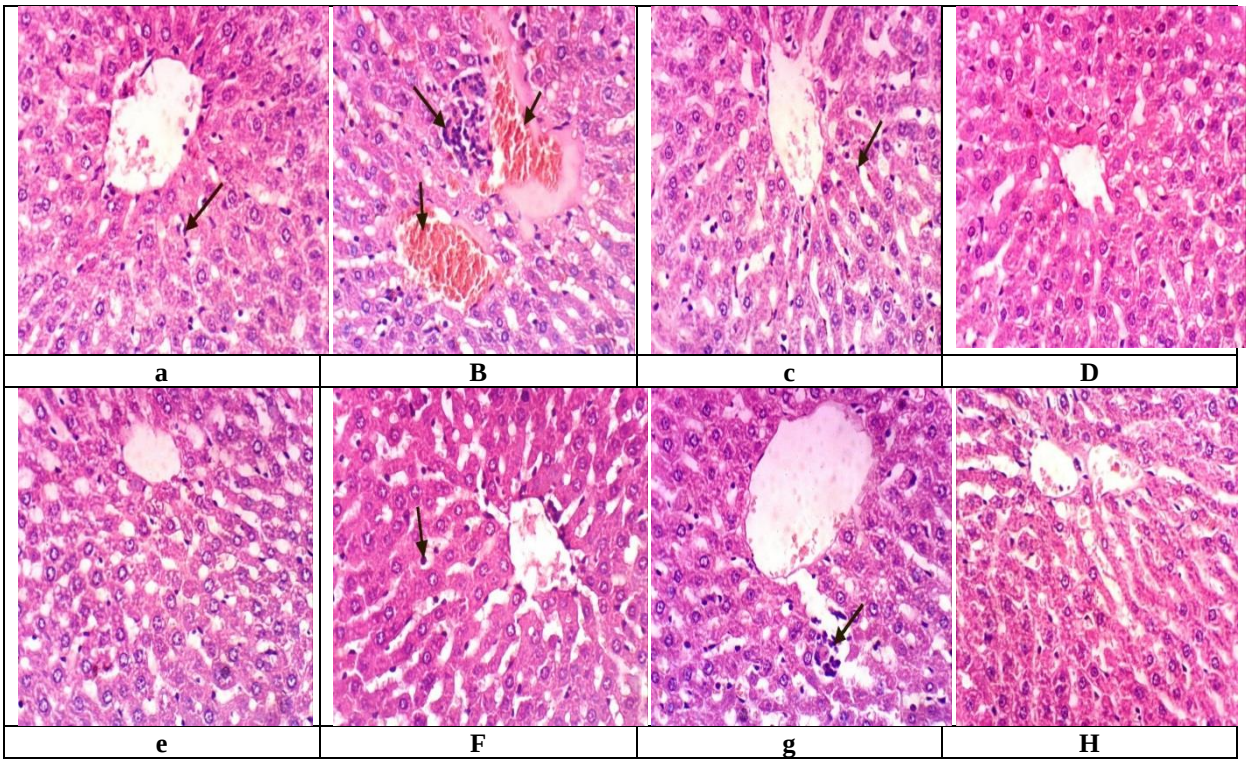

Fig. (2):

Histopathology result of rats Kidney:

Kidneys of rats from control group (G1, Negative control) revealed the normal histological structure of renal parenchyma (Fig 3a). On contrary, kidneys from group (positive control) showed congestion of glomerular tuft, cytoplasmic vacuolization of epithelial lining renal tubules, intertubular inflammatory cells infiltration and congestion of renal blood vessel and atrophy of glomerular tuft (Fig. 3b). However, kidneys of rats from group (3) which treated by (1 mL = 50 mg/rat/day) water extract of barley leaves aged 15th day of germination showed congestion of renal blood vessel (Fig. 3c.). Meanwhile, kidneys of rats from group (4) which treated (2 mL = 100 mg/rat/day) water extract of barley leaves aged 15th day of germination of revealed no histopathological changes (Fig. 3d)

Furthermore, kidneys from group (5) treated by (1 mL = 75 mg/rat/day) ethanol extract of barley leaves aged 15th day of germination revealed cytoplasmic vacuolization of epithelial lining some renal tubules (Fig. 3e). Meanwhile, kidneys of rats from group (6) treated by (2 mL = 150 mg/rat/day) ethanol extract of barley leaves aged 15th day of germination exhibited no histopathological changes (Fig. 3f). On the other hand, kidneys from group (7)treated by (1 mL=50mg /rat/day) water extract of barley leaves aged 20th day of germination revealed mild changes described as congestion of renal blood vessel and glomerular tuft (Fig. 3g). Moreover, no histopathological changes observed in kidneys from group (8) treated by (2 mL = 100 mg/rat/day) water extract of barley leaves aged 20th day of germination (Fig. 3h) .Additionally, kidneys of rats from (G9) and (G10) treated by (1 mL = 67 mg/rat/day, 2 mL = 134

mg/rat/day) ethanol extract of barley leaves aged 20th day of germination revealed no histopathological changes (Figs. 3i and 3j). From the abovementioned results the histopathological finding of groups (G4), (G6), (G8), (G9) and (G10) with treatments barley leaves extracts had protective effect of kidney, against these histological alterations due to their higher content of antioxidant substance and beta-glucan. These results are in agreement with those reported by **El-Aziem *et al*. (2004) and Dorsaf *et al*. (2020).**

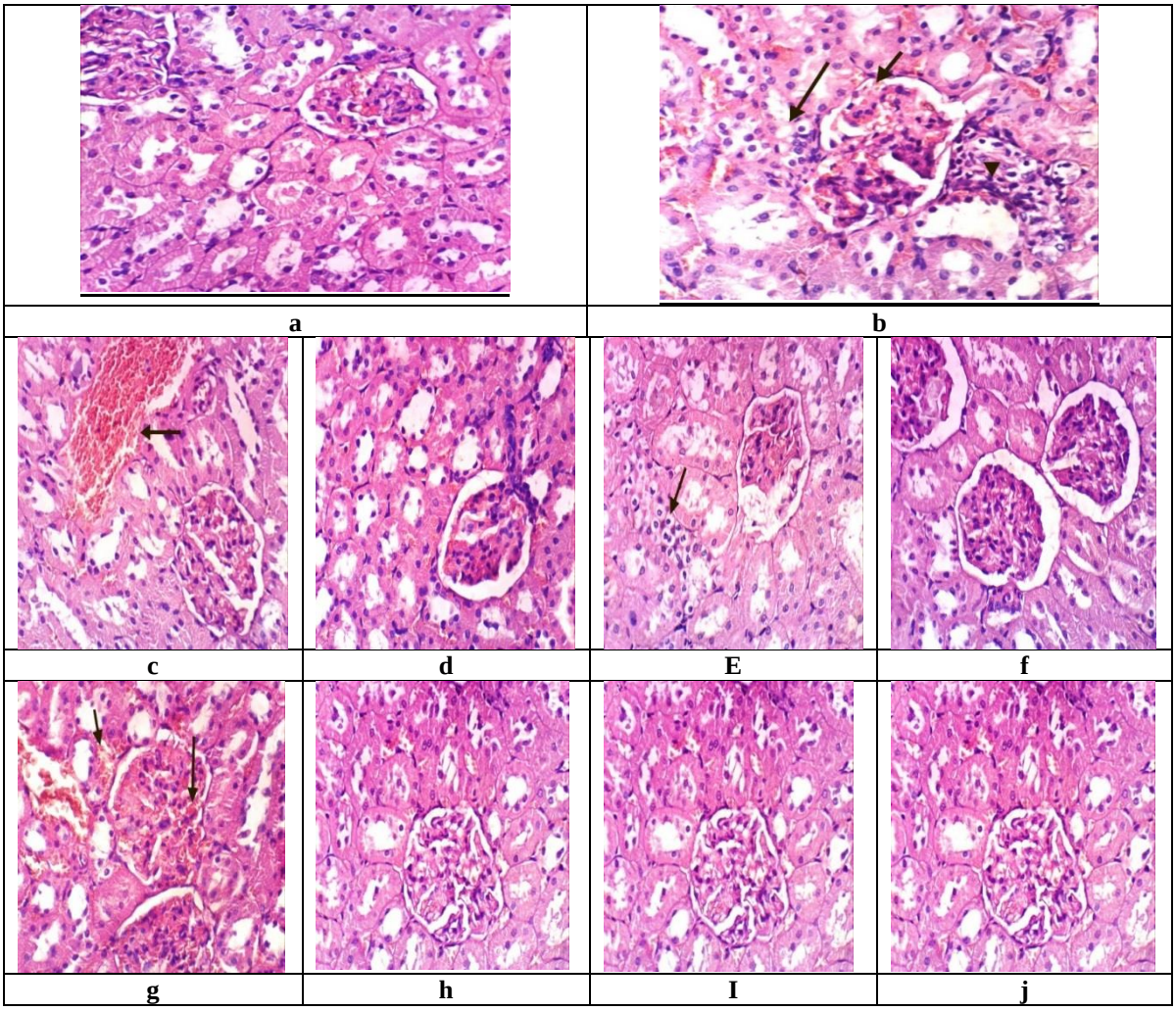

Fig. (3)

Conclusion

Finally, it could be concluded that barley green leaves extracts (ethanol and water) can be used as a lowering triglycerides, cholesterol, LDL-C, VLDL, risk factor and increase HDL-C in hyperlipidemic rats subsequently prevent from heart diseases caused by arteriosclerosis . In addition, play role of suppressing obesity. Moreover, this extracts might be improve liver and kidney function and improved histological alterations of them.

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تاثير المستخلصات المختلفة لاوراق الشعير على بروفيل دهون الدم لجرذان التجارب المغذاه على وجبة مرتفعة الدهون

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تهدف هذه الدراسة الى الاستفادة من المستخلصات المائية والكحولية لاوراق الشعير الغضة ذات القيمة الغذائية العالية وخصائصها كمضادة للاكسدة حيث تم انبات الشعير لفترات 15 و20 يوم وتم تقدير محتوى المركبات الحيوية الكميائية فى كل من المستخلص المائى والايثانولى وكذلك تم اجراء تجربة بيولوجية لتغذية جرذان التجارب بالمستخلصات لاوراق الشعير الغضة سواء المائية او الكحولية بغرض دراسة تاثيرها على مستوى بروفيل دهون الدم لجرذان التجارب تحت الدراسة وكذلك تقدير وظائف الكبد والكلى. كما أجرى الفحص الهستوباثولوجى لانسجة كل من الكبد والكلى لتحديد التاثيرات الايجابية والسلبية لمستخلصات أوراق الشعير حيث كانت الجرعة من المستخلص المائى 50 و 100 ملليجم/ فأر/يوم بينما كانت الجرعات للمستخلص الكحولى 75، 150، 67 و 134 ملليجم/جرد/يوم. والنتائج المتحصل عليها كالتالى .

أوضح التحليل الكميائى لتقدير المحتوي الحيوى للمركبات الفينولية حيث كانت النسب المتحصل عليها 5425,4, 7237,5 ملليجم جاليك اسيد/100جم لكل من المستخلص المائى والكحولى لفترة 15 يوم إنبات بينما كانت لفترة 20 يوم إنبات هى 5960,4, 8792 ملليجم جاليك اسيد/100 جم بينما محتوى المركبات الفلافينولية فكانت هى على التوالى 83,82, 145,2 ملليجم كريستين/100 جم مادة جافة على عمر 15 يوم إنبات بينما كانت 167,9 191,8 ملليجم كريستين/100 جم مادة جافة على عمر 20 يوم إنبات. كما أوضحت النتائج ان محتوى النشاط المضاد للأ كسدة للمستخلصات المائية والكحولية كانت النسب على التوالى(55,68, 67,16% من DPPH بينما كانت 77,68, 42,2 % من (ABTS) وذلك عن عمر إنبات 15 بينما كانت النسب 65,66, 68,84 من (DPPH), 79,33, 52,3 % من (ABTS) عن عمر 20 يوم بينما أظهرت نتائج البيتا جلوكان فى المستخلص المائى والكحولى فكانت القيم 9,16, 5,47, 1,89, 1,2 ميكرو جرام/مللى لكل من المستحلص المائى والكحولى لأوراق الشعير عمر إنبات 15 و20 يوم على التوالى.

بينما نسبة الكلوروفيل أ، ب فى المستخلص المائى لاوراق الشعير عمر 15 و 20 يوم من الانبات 0,469 مجم/100 جم, 0,873 مجم/100 جم، 0,463مجم/100 جم، 0,833 مجم/100 جم على التوالى والكاروتينات الكلية كانت 0,064 مجم/100 جم ، 0,072 مجم/100 جم على التوالى.

كما أظهرت نتائج التحليل لدم الجرذان المغذاه على مستوى عالى من الدهون ان محتواها من الجليسريدات الثلاثية (الدهون الثلاثية) والكوليسترول الكلى ومستوى الكولستيرول الضار (الليبوبروتين المنخفض والمنخفض جدا) والعامل المؤثر كانت القيم هى على التوالى 155, 156, 113, 31 ملليجم/ديسيلتر و 13,7 بينما كانت قيم الليبوبروتين مرتفع الكثافة فكانت قيمته 12 ملليجم/ ديسيلتر وذلك عند مقارنتها بالمجموعة الضابطة حيث كانت القيم على التوالى 61,67 دهون ثلاثية, 80,0 ملليجم/ديسيلتر للكولستيرول الكلى والليبوبروتين المنخفض الكثافة كولستيرول فكان 31,33ملليجم/ديسيلتر بينما الليبوبروتين المنخفض جدا فكان 12.33 ملليجم/ديسيلتربينما العامل المؤثر فكان 2,21. بينما النتائج أوضحت أن المعاملة بمستخلصات أوراق الشعير الغضة سواء المائية أو الكحولية على سيرم الدم حدوث انخفاض معنوى فى كل المجاميع المعالجة بالمستخلصات المختلفة بالجرعات المختلفة فى مستوي دهون الدم لجرذان التجارب تحت الدراسة ودلك بالمقارنة بالمجموعة الممرضة. كما أوضحت النتائج ان المجموعات التى تم تغذيتها على وجبات من مستخلاصات أوراق الشعير سواء المائية أو الكحولية أدت إلى حدوث إنخفاض معنوى فى نشاط إنزيمات الكبد وذلك عند مقارنتها مع المجموعة الضابطة (الكنترول الموجب). أظهرت ان المجموعة المغذاه على مستوى عالى من الدهون ان محتوى تقدير كل من اليوريا والكرياتنين وحامض اليوريك فى سيرم دم لجردان التجارب للمجاميع تحت الدراسة حيث كانت 86ملليجم/ديسيلتر، 1,61, 3,4 ملليجم/ديسيلتر وذلك عند مقارنتها مع المجموعة الضابطة (الكنترول السالب) حيث كانت القيم 36,17, 0,66, 1,6 ملليجم/ديسيلتر. كما أوضحت النتائج ان المجموعات المعالجة بالمستخلصات لأوراق الشعير أدت الى إنخفاض معنوى فى وظائف الكلى عند المقارنة مع المجموعة الممرضة .

أظهر الفحص الهستوباثولوجى لانسجة الكبد وخلايا الكلى ان التغذية بالجرعات المحتلفة بالمستخلصات المائية او الكحولية لأورق الشعير أدت الى حماية انسجة الكبد وتحسين معنوى للكلى من الالتهابات وحمايتها من ترسيب الدهون بالكبد وذلك بالمقارنة بالمجموعة العالية الدهون. واخيرا يمكن القول ان مستخلصات أوراق الشعير سواء المائية او الكحولية لهما تاثير فعال فى تحسين مستوى دهون الدم وكدلك انسجة الكبد والكلى لجرذان التجارب تحت الدراسة ويرجع ذلك لأحتواء هده المستخلصات على المركبات الفينولية والفلا فينودات والبيتا جلوكان وكدلك قيمتها الغدائية وخواصها كمضادة الاكسدة.