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EFFECT OF ADDITION OF FREEZE DRIED FROM YOUNG GREEN BARLEY LEAVES ON HYPERCHOLESTEROLEMIC RATS BY

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ABSTRACT

The present study was performed to investigate the effect of the freeze-dried powder of young green barley leaves added to diets as hypocholesterolemic agents. For this purpose an experiment was carried out by using 24 rats which were divided into four groups. The control group (6 rats) was fed on basal diet and the second group (6 rats) was fed on hypercholesterolemic diet. The other two groups were fed on hypercholesterolemic diet with powder of young green barley at different concentrations of 10 and 20%. The results indicated that all groups which were fed on diet containing powder of young green barley had significant increment in body weight gain, food consumption and feed conversion compared with rats fed basal and hypercholesterolemic diets.

Total cholesterol, triglyceride, HDL and LDL cholesterol were determined. It was found that the rats fed on diets containing powder of young green barley at different levels of 10 and 20% had the highest significant decrease in total cholesterol (112.89, 116.11%), triglyceride (106.1, 107.12%) when compared with the hypercholesterolemic diets rats, respectively.

The activities of alanine transaminase (ALT) and aspartate transaminase (AST) enzymes of liver and kidney functions were estimated. From the obtained results, it could be recommended that the addition of powder from young green barley leaves might improve the liver and kidney functions in hypercholesterolemic dites rats.

On the other hand, the histopathological picture indicated that the addition of freeze dried powder of young green barley leaves to the rats containing a high cholesterol had slightly effect on the microscopical lesions induced by feeding on high cholesterol diet. While, the histopathological examination of the kidneys of rats fed on high cholesterol with or without addition of powder from young green barley leaves at different levels (10 and 20%) revealed nearly similar microscopic changes.

INTRODUCTION

Hypercholesterolemia is an established major risk factor for coronary artery disease. Lifestyle modification is the preferable treatment for most types of hyperlipidemia (National Cholesterol Education Program, 1993).

Barley is one of the earliest cultivated cereal grains in the world. It is gaining interest for food use due to its desirable nutritional and functional characteristics. β-glucan content has become one of the main parameters for the evaluation of barley, which increase the value of barley, since it appears to reduce serum cholesterol (Baurdon *et al.*, 1999).

Barley contains non-starch polysaccharides which forms viscous solutions in the gut that delay transit and modifies nutrient digestion and absorption, thus the small intestinal reabsorption of bile acids is reduced, leading to increase fecal steroid excretion and full in plasma cholesterol levels (Newman *et al.*, 1989 and Kahlon *et al.*, 1993).

A novel antioxidant from young green barley leaves was isolated by ethanol extract from freeze-dried. The fraction exhibiting strongest antioxidative activity, the active component was identified as 2"(3")-O-glycosylisovitexin by GC. Its antioxidative activity was almost equivalent to that of alpha-tocopherol in a lipid peroxidation system at 100 mμg/1.5 mg ethyl linoleate (Osawa *et al.*, 1992).

Young green barley leaves extract (GBLE) is widely used in Japan and other countries as nutritional supplement. It is contain a high level of superoxide dismutase, a potent antioxidant also can play a role in cancer prevention or treatment. GBLE is considered rich in chlorophyll which suggested that this component may have a beneficial effect on chronic pancreatitis (Yokono, 1993).

Young green barley leaves are known to possess potent pharmacological properties, including antioxidative, antiinflammatory, antimutagenic and antiallergic activities. In particular, a flavonoid,2"-O-glycosylisovitexin (2"-O-GIV) isolated from an ethanol extract of young green barley leaves, possesses a strong inhibitory effect toward lipid peroxidation. 2"-O-GIV inhibited acetaldehyde formation from lipoprotein (LDL) by76% at a level of 1 μmol/50μg, whereas ferulic acid inhibited it by 66% at the same level. In the blood plasma system, 2"-O-GlVand probucol inhibited acetaldehyde formation by 89% and 94%, respectively, at a level of 3 μmol. 2"-O-GIV and vitamin C [ascorbic acid] inhibited malondialdehyde formation by 54% and 32%, respectively, at a level of 0.1 μmol (Hartland, 1994).

Jackson *et al.* (1994) have demonstrated that hypercholesterolemic rats fed diets containing malted barley showed reduction in their plasma levels of total and low density lipoproteins (LDL) cholesterol.

Melntosh *et al.* (1995) reported that hypercholesterolemic rats fed whole barley grain show reduction in serum cholesterol, LDL cholesterol and triglycerides but HDL cholesterol increased.

Wang *et al.* (1997) reported that the presence of tocotrienols found in barley which have the potential to inhibit cholesterol and bile acid synthesis, possibly by the inhibition of hydroxymethyl-Glutaryl-Coenzyme A (HMG-CoA) reductase and 7 α-hydroxylase.

Abd-Elkader *et al.* (2000) found that all groups, which were fed barley products had significant increase in food consumption and body weight gain when compared to the positive control group. Also, plasma total cholesterol, triglycerides and low density lipoproteins (LDL) cholesterol levels were significantly decreased and high density lipoproteins (HDL) cholesterol was significantly increased.

Delaney *et al.* (2003) reported that the diets containing β-glucan fraction from rice bran, oat bran and barley were significantly reduced the development of antiatherogenic in hypercholesterolemic syrian golden hamsters.

Wilson *et al.* (2004) found that decrease in plasma total cholesterol and LDL-cholesterol concentrations were occurred in the hamsters which fed reduced and high MW β-glucans diets. Liver total cholesterol, free cholesterol and cholesterol ester concentrations did not differ.

MATERIALS AND METHODS

Materials:

1. Barley (Giza 126 variety) was obtained from Barley Research Department, Agriculture Research Center, Giza, Egypt. Barley cereals were grown at Agricultural Chemistry Dept., Fac. of Agric., Moshtohor, then young green barley leaves were harvested after 21 day. Freeze-dried young green barley leaves were prepared in a freeze-dryer. Then were subsequently grounded to 2 mm mesh size sieve to form a fine and uniform powder.

Total cholesterol kit, HDL-cholesterol kit, LDL-cholesterol kit, triglycerides kit, transaminase kits, total proteins kit, albumin kit, uric acid kit, urea kit and creatinine kit were obtained from Biodiagnostics Co., Cairo, Egypt. All chemicals used in this study were analytical grade.

2. Biological experiment:

2.1. Animals and experimental design:

Twenty four male albino rats weighting about 60-72 g for each one were obtained from Helwan station for experimental animals, Helwan, Cairo, Egypt. The rats were fed on basal diet for week to adaptation in the experimental animal cages. Then the rats were divided into 4 groups (6 rats each). The first group was fed on the basal diet consisted of 70% corn starch, 10% casein, 10% corn oil, 5% cellulose, 4% salt mixture and 1% vitamin mixture. The second group (6 rats) was fed on the hypercholesterolemic diet consisted of 69% corn starch, 10% casein, 10% corn oil, 5% cellulose, 4% salt mixture, 1% cholesterol and 1% vitamin mixture according to Shinnick *et al.* (1990). The other two groups of rats were fed on hypercholesterolemic diet with powder of young green barley leaves at levels of 10 and 20%, respectively, for 8 weeks. The salt and vitamin mixtures used were prepared according to the methods of Hegsted *et al.* (1941). Each rat was weighed every week, food intake was also daily recorded and food efficiency was determined. At the end of experiment, rats were fasted for 12 h and the blood samples were collected from the eye of the rats with heparinized capillary tubes

then centrifuged at 3000 rpm for 20 min to obtain the serum. The liver was excised washed with ice-cold isotonic saline and weighed. Serum and liver samples were stored at -20°C until used for the assay of the biochemical parameters.

2.2. Determination of biological parameters:

Serum total cholesterol (Allain *et al.*, 1974) and total triglycerides (Fossati and Prencipe, 1982) were estimated by standard methods. Serum HDL-cholesterol was determined by the method of Lopes-Virella *et al.* (1977), but LDL-cholesterol was determined according to Steinberg (1981)

Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activities were measured colorimetrically according to the method described by Reitman and Frankel (1957). Urea in the serum was determined according to Fawcett and Socit (1960) and creatinine was estimated according to the method described by Bartles *et al.* (1972).

Uric acid in the serum was determined according to the method described by Haisman and Muller (1977). Blood haemoglobin was estimated according to Van-Kampen and Zijlstra (1967) method.

Total proteins in serum was determined according to the method described by Doumas (1975). Serum albumin was measured according to Doumas *et al.* (1971). But serum globulin was calculated by subtracting the amount of albumin from total protein.

3 Statistical analysis:

Statistical analysis of the obtained data was done following procedure outlined by Gomez and Gomez (1984). The treatment means were compared using the least significant difference test (LSD) at the 5% level of probability as outline by Waller and Duncan (1969) using the SAS institute program (SAS, 1996).

4. Histopathology:

The livers of the rats which fed on different diets were separated, and specimens were immediately fixed in 10% formaline, then treated with conventional grades of ethyl alcohol and xylol, embedded in paraffin and sectioned at 4-6 μ thickness. The sections were stained with Haematoxylin and Eosin (Hand E) stain for studying the histopathological changes (Drury and Wallington, 1986).

RESULTS AND DISCUSSION

Effect of the freeze-dried powder of young green barley leaves on body weight gain, food intake and feed conversion ratio in rats after 8 weeks:

Table (1) shows body weight gain (g), food intake (g) and feed conversion ratio for experimental rats groups after a period of 8 weeks. Mean values of these results exhibited significant effect ($P < 0.05$) under experimental diets of rats. At the end of experimental period, body weight gain of rats fed on

the diet containing powder from barly leaves was significantly higher ($P < 0.05$) than that of corresponding rats fed basal diet and hypercholesterolemic diets. Body weight gain of rats increased from 81.09±1.5 g for control group to 113.25±1.99, 124.13±0.77 and 133.39±1.00 g for rats fed hypercholesterol and powder of young green barley leaves (at different levels of 10% and 20%), respectively. Also, data presented in Table (1) showed the average feed conversion ratio for experimental groups of rats. From the abovementioned results it can be observed that rats fed diet containing powder from young green barley at different concentrations had greater feed efficiency than those of the rats fed basal diet and hypercholesterolemic diets. These results are in agreement with those described by Abd-Elkader *et al.* (2000).

Table (1): Effect of the freeze-dried powder of young green barley leaves on body weight gain, food intake and feed conversion ratio of rats after 8 weeks.

Groups	Initial weight (g)	Final weight (g)	Body weight gain (g) [A]	Food intake (g) [B]	Feed conversion ratio [A/B]
G1	69.22±0.79	150.31±0.91	81.09±1.15	549.36±60.16	0.15
G2	63.89±0.97	177.14±1.18	113.25±1.99	713.44±10.64	0.16
G3	65.25±1.27	189.38±1.07	124.13±0.77	547.12±10.64	0.23
G4	64.65±0.76	198.03±0.54	133.39±1.00	639.52±7.28	0.21
LSD	2.84	2.79	3.84	26.32	

G1: Control group.
G2: High cholesterol group
G3: Powder of young green barley leaves (10%).
G4: Powder of young green barley leaves (20%).

Effect of freeze-dried powder of young green barley leaves on weight of rat organs:

The weights of liver, kidney, heart, lungs, spleen and testis expressed as percent of body weight for the different experimental diets groups using different levels of the powder from young green barley leaves. These results are recorded in Table (2). It could be found that the relative liver weight was significantly increased with rats fed diets at different levels (10 and 20%) of the powder from barley (4.75±0.31, 5.71±0.56) than with the control diet (3.30±0.32) and high cholesterol diet (2.38±0.09).

Data in the same table also revealed that the weights of kidney, heart, lungs, spleen and testis were significantly increased with two groups of rats fed diet containing the powder of barley leaves than that of rats fed basal diet (control group). From these results, it could be concluded that the increase of all organ weights in comparison to control and high cholesterol experiment rats under the effect of different diets may be due to increase in body weight of rats fed diets containing the powder at the above-mentioned different levels from barley leaves (Abd-Elkader *et al.*, 2000).

Table (2): Effect of powder from young green barley leaves on weight of rat organs.

Groups	Final weight (g)	Liver	Kidney	Heart	Lungs	Spleen	Testis
G1	150.31±0.91	3.30±0.32	1.15±0.09	0.39±0.04	0.73±0.06	0.40±0.04	1.33±0.19
G2	177.14±1.18	2.38±0.09	1.14±0.11	0.34±0.01	0.51±0.03	0.39±0.03	1.38±0.13
G3	189.38±1.07	4.75±0.31	1.55±0.08	0.68±0.07	0.94±0.08	0.73±0.13	3.26±0.33
G4	198.03±0.54	5.71±0.56	1.98±0.10	0.73±0.06	1.36±0.07	0.86±0.04	3.66±0.31
LSD	2.79	1.05	0.29	0.15	0.18	0.21	0.74

G1: Control group.
G2: High cholesterol group
G3: Powder of young green barley leaves (10%).
G4: Powder of young green barley leaves (20%).

Effect of different experimental diets on cholesterol types and triglycerides of rats:

The effect of the powder of young green barley leaves and hypercholesterolemic diets on serum total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides of rats were studied and illustrated in Table (3).

The obtained results are presented in Table (3) showed that serum total cholesterol of rats fed on basal diet (G1) and high cholesterol (G2) were 118.20±3.81 and 250.05±2.00 mg/100ml serum, respectively. While rats fed diet containing the powder from young green barley (G3 and G4) had the least mean values of total cholesterol i.e. 116.62±2.44 and 112.81±2.59 mg/100ml serum under different levels (10 and 20%), respectively. From the above-mentioned results, it can be seen that the rats fed diet containing barley powder at the above different levels (G3 and G4) were non significantly decrease of compared with rats fed basal diet [control (G1)]. On the other hand, the total cholesterol concentrations in two groups (G3 and G4) were highly significantly lower when compared with rats fed diet high cholesterol (G2). Serum total cholesterol concentrations were lower in the rats fed barley powder (-53% and -55%) at 10 and 20%, respectively, compared with rats fed the hypercholesterolemic diet. While, high density lipoprotein (HDL) cholesterol concentrations significantly increased with rats fed diet containing barley powder at two levels (10%, G3 and 20%, G4) comparing with others groups (G1 and G2).

On the other hand, low density lipoprotein (LDL) cholesterol concentrations were lower in groups fed barley powder (53.48±2.53, 49.53±2.49 mg/100 ml serum) compared with hypercholesterolemic diet (160.54±1.29 mg/100 ml serum). The data presented in Table (3) showed that serum triglycerides of rats fed on basal diet was 143.06±1.54 mg/100 ml serum but rats fed on high cholesterol was found to be higher 293.81±2.53 mg/100 ml serum. These mean values were decreased to 142.17±3.95 and 140.57±0.51 mg/100 ml serum by feeding with barley at different concentrations (10 and 20%), respectively.

Table (3): Effect of hypercholesterolemic diet supplemented with powder of young green barley leaves on total cholesterol, HDL-cholesterol and triglycerides by feeding rats after 8 weeks.

Parameters	G1	G2	G3	G4	LSD
Total cholesterol (g/100 ml)	118.20 ±3.81	250.05 ±2.00	116.62 ±2.44	112.81 ±2.59	8.69
Relative %	100.00%	211.55%	98.66%	95.44%	
HDL-Cholesterol (g/100 ml)	32.43 ±1.19	33.73 ±0.30	35.36 ±0.66	34.51 ±0.89	2.57
Relative %	100.00%	94.76%	109.03%	106.41%	
LDL-cholesterol (g/100 ml)	60.93 ±1.20	160.54 ±1.29	53.48 ±2.53	49.53 ±2.49	6.17
Relative %	100.00%	263.48%	87.77%	81.29%	
Triglycerides (mg/100 ml)	143.06 ±1.54	293.81 ±2.53	142.17 ±3.95	140.57 ±0.51	7.73
Relative %	100.00%	205.38%	99.38%	98.26%	
Risk ratio (%)	3.66 ±0.19	8.14 ±0.04	3.30 ±0.11	3.28 ±0.13	0.40

From the above-mentioned results, it can be concluded that the total cholesterol and triglycerides of rats fed barley powder were non significantly lower ($P<0.05$) compared with rats fed basal diet and significantly higher compared with rats fed the hypercholesterolemic diet, but there were slightly differences in LDL- and HDL-cholesterol compared with rats fed the hypercholesterolemic diet. These results are in agreement with those reported by Osawa *et al.* (1992), Hartland (1994), Wang *et al.* (1997), Arimoto *et al.* (2000), and Wilson *et al.* (2004).

Effect of powder from young green barley leaves on liver and kidney functions of rats:

Determination of transaminase enzymes activity, Alanine transaminase (ALT) and Aspartate transaminase (AST) released into the blood by the damaged liver is on of the most useful indicators of liver functions. Since the increase in these enzymes activities means that the liver becomes abnormal case.

The mean values of plasma transaminase activities of ALT and AST were presented in Table (4). Mean values of ALT of rats fed powder from young green barley at different concentrations (10 and 20%) had a similar values (34.33±2.96, 34.00±1.00 U/ml, respectively) with rats fed basal diet (36.67±2.03 U/ml) while, hypercholesterolemic diet was 50.67±4.26 U/ml. It could be seen that the rats fed on the powder from barley exhibited a significant decrease among rats fed high cholesterol and basal diet. On the other hand, the values mean of AST in rats fed the powder from barley at 10 and 20% were non-significantly different (36.33±2.03 and 37.33±1.33 U/ml, respectively) with rats fed basal diet (35.00±1.00 U/ml), while significantly higher with among rats fed hypercholesterolmic (HCD) diet (73.67±6.89 U/ml). These results are in agreement with those reported by Delaney *et al.* (2003).

Table (4): Effect of powder from young green barley leaves on liver and kidney functions of rats after 8 weeks

Parameters	G1	G2	G3	G4	LSD
ALT (U/ml)	36.67 ±2.03	50.67 ±4.26	34.33 ±2.96	34.00 ±1.00	8.80
AST (U/ml)	35.00 ±1.00	73.67 ±6.89	36.33 ±2.03	37.33 ±1.33	11.47
Urea (mg/100 ml)	26.51 ±0.22	65.67 ±1.45	50.67 ±2.60	40.33 ±2.91	6.49
Creatinine (mg/100 ml)	0.49 ±0.01	1.60 ±0.12	1.23 ±0.09	0.79 ±0.02	0.23
Uric acid (mg/100 ml)	4.13 ±0.06	3.57 ±0.16	3.71 ±0.33	3.57 ±0.22	0.67

Data of serum urea, creatinine and uric acid of different experimental diets after 8 weeks are illustrated in Table (4). Mean of values of urea were 50.67±2.60 and 40.33±2.91 mg/100 ml serum for rats fed the powder barley at 10 and 20%, respectively. These values were higher than that of rats fed basal diet 26.51±0.22 mg/100 ml serum, but these values were lower compared with rats fed high cholesterol 65.67±1.45 mg/100 ml serum. While, the values of creatinine for rats fed the barley powder were found to be 1.23±0.09, 0.79±0.02 mg/100 ml serum, the obtained values were lower than that of rats fed hypercholesterol diet (1.60±0.12 mg/100 ml serum) and higher than those rats fed basal diet (0.49±0.01 mg/ml serum). But uric acid values were significantly lower of rats fed the barley powder when compared with rats fed basal diet and similar to that fed with high cholesterol diet.

These results are in the same trend with that reported by Jackson *et al.* (1994) and Delaney *et al.* (2003).

Effect of different experimental diets on total proteins, albumin, globulin and hemoglobin of rats:

Total proteins, albumin, globulin and hemoglobin of rats serum fed on tested diets are tabulated in Table (5). Results show that the mean of values of total proteins were 6.79±0.24, 6.34±0.04 mg/100 ml serum in rats fed the powder barley at concentrations of 10% and 20%, respectively. These values were similar with rats fed high cholesterol diet (6.42±0.20 mg/100 ml serum) and higher than that rats fed basal diet (5.82±0.06 mg/100 ml serum). But the serum albumin of rats fed different experimental diet non significantly increased when compared with control group.

On the other hand, the mean values of globulin in rats fed the powder barley at different levels (10 and 20%) and high cholesterol were non-significantly higher with rats fed basal diet. Data concerning albumin/globulin (A/G) ratio in rats serum after feeding of rats on different diets showed a significant decrease when compared with control group. While, the mean values of hemoglobin in rats fed the powder from barley were non significant with rats fed basal diet and high cholesterol. These results are in agreement with those reported by Jackson *et al.* (1994) and Wilson *et al.* (2004).

Table (5): Effect of different experimental diets on total proteins, albumin, globulin and hemoglobin in rats after 8 weeks.

Parameters	G1	G2	G3	G4	LSD
Total protein (g/100 ml serum)	5.82 ±0.06	6.42 ±0.20	6.79 ±0.24	6.34 ±0.04	0.50
Albumin (g/100 ml serum)	3.83 ±0.04	3.70 ±0.17	3.28 ±0.16	3.58 ±0.14	0.43
Globulin (g/100 ml serum)	2.47 ±0.39	2.73 ±0.11	2.71 ±0.17	2.77 ±0.13	0.71
A/G ratio (%)	1.61 ±0.21	1.36 ±0.09	1.51 ±0.11	1.30 ±0.11	0.42
Hemoglobin (mg/100 ml serum)	13.68 ±0.10	13.87 ±0.04	13.75 ±0.03	13.85 ±0.03	0.17

Histopathological findings:

Liver:

Control group:

The histopathological examination of the liver of rats fed basal diet (control group) revealed nearly histologic hepatic tissues, where normal hepatocytes were arranged in cords around central vein. Moreover, small bile ducts lined by cuboidal epithelium with portal vessels were observed in the portal area (Fig. 1).

High cholesterol group:

The microscopic examination of the liver rats fed on high cholesterol revealed vacuolation of the most hepatocytes. Multiple areas of lymphocytic cellular aggregation among the hepatic parenchyma. Thrombosis of the portal vessels with Lymphocytic cellular infilteration of the portal areas were also detected (Fig. 2).

Hypercholesterolemic diet with powder of young green barley leaves groups:

The histopathological examination of the liver rats diet on high cholesterol with powder from young green barley leaves at different concentrations (10 & 20%) were illustrated in the following figures. Addition of powder from young green barley leaves with concentrations of 10 and 20% was associated with enhancement of the microscopic picture of the liver where vacuolation of the cytoplasm with few hepatocytes was noticed in liver of rat fed on 10% barley (Fig. 3). While, no vacuolation of the hepatocytes was detected in the liver of rat fed on 20% barley. However, lymphocytic cellular infilteration of the portal area was recorded in liver of rats fed on 10% or 20% barley (Fig. 4).

Kidneys:

Control groups:

The microscopic examination of the kidneys of rats fed on basal diet revealed nearly normal histological structure of the renal tissues. The renal tubules were lined by simple cuboidal epithelium with round nuclei and

eosinophilic cytoplasm. The glomeruli were formed from gromerular tufts and Bowman's capsule with clear Bowman's space (Fig. 5).

Hypercholesterol diet with powder of young green barley leaves groups:

On the other hand, addition of powder from barley to the rats containing high cholesterol had little effect on the microscopical lesions induced by feeding on high cholesterol diet where, the histopathological examination of the kidneys of rats fed on high cholesterol with or without addition of powder from young green barley leaves at different levels (10 and 20%) revealed nearly similar microscopic changes. However, the severity of these changes was more in the kidneys of rats fed on high cholesterol diet alone. These changes were reported by cloudy swelling of the lining epithelium of renal tubules (Fig. 6). Moreover, hyaline casts within the lumen of the some renal tubules were also seen (Fig. 7).

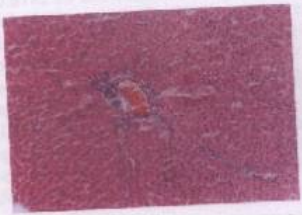

Fig. (1): Liver of rat fed on basal diet showing normal histologic structure of hepatic parench-yma. H & E stain X 400

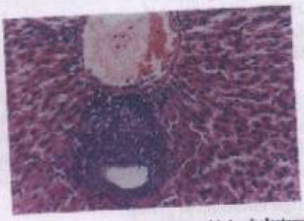

Fig. (2): Liver of rat fed on high cholesterol diet showing thrombosis of portal vessel with lymphocytic cellular infiltration of the portal area and vacuolation of the cytoplasm of hepatocytes. H & E stain X 400

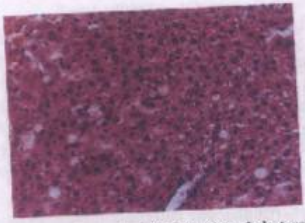

Fig. (3): Liver of rat fed on high cholesterol diet with 10% powder of young green barley leaves showing vacuolation of few hepatocytes. H & E stain X 400

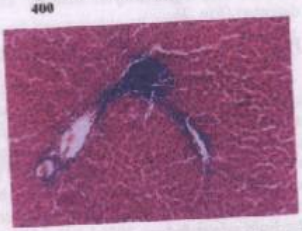

Fig. (4): Liver of rat fed on high cholesterol diet and 20% powder of young green barley leaves showing no vacuolation of hepatocytes with lymphocytic cellular infilteration of the portal area. H & E stain X 400

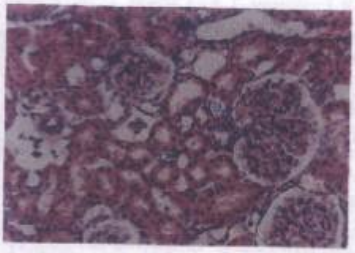

Fig. (5): Kidney of rat fed on basal diet showing normal histological structure of renal tubules (T) and glomeruli (G). H & E stain X 400

Fig. (6): Kidney of rat fed on high cholesterol diet showing cloudy swelling of renal tubules. H & E stain X 400

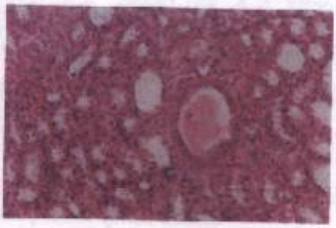

Fig. (7): Kidney of rat fed on high cholesterol diet with powder of young green barley leaves showing eosinophilic cast inside the lumen of renal tubules. H & E stain X 400.

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تأثير إضافة أوراق الشعير الغضة المجففة على الفئران مرتفعة مستوى الكوليستيرول

فرحات فودة على فودة
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أجريت هذه الدراسة لمعرفة تأثير استخدام تركيزات مختلفة من بودرة أوراق الشعير الغضة المجففة كعامل خافض لمستوى الكوليستيرول ومستوى دهون الدم وكذلك وظائف الكبد والكلى فى فئران التجارب التى تغذت على وجبة مرتفعة فى محتوى الكوليستيرول وذلك لمدة ٨ أسابيع. وقد أجريت هذه الدراسة على ٢٤ فأر تم تقسيمها إلى أربعة مجاميع الأولى غذيت على عليقة المستوى العالى من الكوليستيرول والثانية على مستوى مرتفع من الكوليستيرول وباقى المجموعات على العليقة الأساسية مضافاً إليها تركيزات مختلفة من المسحوق الناتج من أوراق الشعير بتركيزات ١٠، ٢٠%. وفى نهاية التجربة تم تقدير كل من وزن الفئران وكمية الطعام المأخوذ وكفاءة الغذاء.

أوضحت النتائج حدوث زيادة معنوية فى وزن الفئران واستهلاك الطعام لمجموعة الفئران التى غذيت على مسحوق أوراق الشعير مقارنة بالمجموعة التى غذيت على مستوى مرتفع من الكوليستيرول وكذلك المجموعة الأساسية. وكذلك تم أخذ عينات من الدم لتقدير الكوليستيرول الكلى والجليسيريدات الثلاثية وكوليستيرول البروتينات الدهنية منخفضة الكثافة (LDLc) وعاليه الكثافة (HDLc) والنسبة بينهما حيث أظهرت نتائج التحليل انخفاض معنوى فى الكوليستيرول الكلى والجليسيريدات

الثلاثية واللبيوبروتينات المنخفضة الكثافة بينما يحدث إرتفاع معنوى فى اللبيوبروتينات المرتفعة الكثافة فى المجموعات التى أحتوت فى غذائها على مسحوق أوراق الشعير الغضة بالمقارنة بالمجموعة مرتفعة الكوليستيرول ويزداد الانخفاض بزيادة فترة التغذية باستخدام مسحوق الشعير وهذا يقلل من التعرض للأزمات القلبية وتبعا لذلك تؤدى هذه التغذية إلى تحسين مستوى دهون الدم وانخفاض مستوى الكوليستيرول. كما أوضحت النتائج لتحليل وظائف إنزيمات الكبد والكلى لمجموعات الفئران التى تم تغذيتها على مسحوق أوراق الشعير تحت التركيزات المختلفة إلى تحسين هذه الوظائف مقارنة بالمجموعة العالية بالكوليستيرول وقد أوضح ذلك الفحص الهستوباثولوجى لأنسجة الكبد والكلى. وبذلك فأنه يمكن التوصية باستخدام مسحوق عصير أوراق الشعير الغضة كعامل خافض للكوليستيرول ومستوى دهون الدم.