

Influence of Using Fresh Wheat Grass Juice and its Blends on Hypercholesterolemic Rats

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ABSTRACT

Biological evaluation of fresh wheat grass juice and its blends were performed using 60 male albino rats. Rats were adapted for 10 days and divided into 10 groups in each group 6 rats, feeding for 6 weeks was carried out to identify the effect of fresh wheat grass juice and its blends on high cholesterol test rats. From results it could be noticed that the lowest weight increase for rats and feed consumed was found in the first group, and these results showed significant differences between them and the other groups. The infected group rats (G2) that fed on a diet containing high percentage of fat and 1% cholesterol had the highest level of total cholesterol and low-density lipoprotein LDL (146 and 83.0 mg/dl), respectively. The group (G9) and (G10) which fed on high fat diets and 1% cholesterol with 5 ml dose(G9) and 10ml dose(G10) of fresh wheatgrass juice with banana and guava / kg bw / day by mouth had a decrease of total cholesterol (79.65 and 78.00 mg/dl), LDL (33.80 and 32.0 mg/dl), total lipids (285.90 and 285.30 mg/dl) and triglyceride (86.00 and 85.70 mg/dl) in (G9) and (G10) respectively, and led to an increase in the value of high density lipoprotein (HDL) (27.13 and 27.90 mg/dl), respectively. Also the use of fresh wheat grass juice and its blends in (G9 and G10) improved liver and kidney functions as compared with the other groups.

INTRODUCTION

Wheat Grass refers to the young grass of the common wheat plant, *Triticum aestivum* that is freshly juiced or dried into powder for animal and human consumption. Both provide chlorophyll, amino acids, minerals, vitamins, and enzymes. Wheat grass is a humble weed that is a powerhouse of nutrients and vitamins for the human body. In the form of fresh juice, it has high concentrations of chlorophyll, active enzymes, vitamins and other nutrients. Although the wonder benefits of wheat grass are being discovered only now in India, they have been known in the west for years. Wheat grass juice has chlorophyll that neutralizes infections, heals wounds, overcomes inflammations and gets rid of parasitic infections. The three most important effects of wheat grass on the human body are: blood purification, liver detoxification and colon cleaning. This is because of wheat grass juice is the richest source of vitamins A, B, C, E and K, calcium, potassium, iron, magnesium, sodium, sulphur and contain 17 forms of amino acids (Bodla, 2011).

Cardiovascular diseases is the most common cause of death worldwide and the most well-established and understood risk factors that are anomalies in plasma fatty proteins and deformation in fat metabolism (Kothari, *et al.* 2011). Hyperlipidemia is secondary metabolism, the disorder associated with high-level diabetes is high in triglycerides (TG), cholesterol and low-density lipoproteins (LDL), which are the main risk factors of the development of premature cardiovascular disease such as atherosclerosis, hypertension and coronary artery disease, heart disease etc. (Sikarwar and Patil, 2012). It can also cause intermittent limp and gangrene and can be compromised feasibility of parties (Gopa, *et al.* 2012). Fresh wheat grass (*Triticum aestivum* Linn.) Juice showed the effect of fat reduction as well as increase in HDLs on normal rats. (Kothari, *et al.* 2008) and Padalia, *et al.* 2010). It is used as healthy improved adjuvants in many diseases including coronary artery disease in India and folk medicine (Kothari, *et al.* 2008). However, to our knowledge, experimental study on the fight against atherosclerosis characteristics of wheatgrass juice in hyperlipidaemic the condition is not in our country previously. Thus, the current study is designed to monitor the potential heart protection effect of wheat (*T. aestivum*) juice by increasing HDLs on dyslipidemic empirically induced rats. So the purpose of the study is to obtain the best stage of germination of wheat grains to

obtain wheat grass, also estimate the sensory properties and acceptability of fresh wheat grass juice with some fruit and vegetable juices. Wheat grass juice and its blends were evaluated organoleptically chemically, and biologically, to modulate the level of cholesterol in blood, and improve the liver and kidney function.

MATERIALS AND METHODS

Materials

Animals

Male Albino rats, weighing about 100-125 grams were obtained from The Research Institute of Ophthalmology, Giza, Egypt.

Chemicals

All diagnostic kits were purchased from Bio-Diagnostic, Cairo- Egypt.

Methods

1. Biological assessment

Sixty Male Albino rats, weighing about 100-125 grams were used in this study. The animals were housed individually in well aerated cages with screen bottoms and fed on basal diet as described in A.O.A.C (2000) for 10 days as an adjustment period (adaptation period) as shown in Table (a). The salt mixture and the vitamin combination were prepared as described in A.O.A.C (1995 and 2000), respectively as listed in Table (b and c respectively). Temperature and humidity were maintained at 25°C and 60%, respectively. Diets were offered to the rats in a special non-scattering feeding cup to avoid loss of food and contamination. Tap water was provided to rats by mean of glass tubes projecting through were cages from inverted bottles supported to one side of the cage.

Table a. Composition of the control and high fat diet (g/100g diet)

Ingredient	C.D* g/100g diet	H.F.D** g/100g diet
Casein	15.0	15.00
Corn oil	10.0	8.00
Cellulose	5.0	5.00
Salt mix	4.0	4.00
Vit. Mix	1.0	1.00
Starch	65.0	50.62
Beef tallow	-	15.00
Cholesterol	-	1.00
Cholin bitartarate	-	0.20
Cholic acid	-	0.18

*C.D means control diet according to A.O.A.C (2000).

**H.F.D means high fat diet according to Tebib, *et al.* (1997).

***Casein contained 90%protein.

Table b. Composition of salt mixture* (g/kg mixture)

Ingredient	Amount (g)
KH ₂ PO ₄	327.50
CaCO ₃	304.50
NaCl	170.00
MgSO ₄ .H ₂ O	103.50
CaHPO ₄ .H ₂ O	60.00
Fe(C ₆ H ₅ O ₇).6H ₂ O	28.00
MnSO ₄	5.12
KI	0.81
CuSO ₄ .5H ₂ O	0.31
ZnCL ₂	0.25

*The salt mixture was prepared as described in A.O.A.C (1995)

Table c. Composition of vitamin mixture*

Ingredient	mg/100 g ration
Vitamin A ¹ (dry stabilized)	2000 (IU)
Vitamin D ² (dry stabilized)	200 (IU)
Vitamin E ³ (dry stabilized)	10 (IU)
Menadione	0.5 mg
Choline	200 mg
p-Aminobenzoic acid	10 mg
Inositol	10 mg
Niacin	4.0 mg
Ca-D-pantothenate	4.0 mg
Riboflavin	0.8 mg
Thiamine-HCl	0.5 mg
Pyridoxine-HCl	0.5 mg
Folic acid	0.2 mg
Biotin	0.04 mg
Vitamin B ₁₂	0.003 mg
Glucose to make	1000

*The vitamin mixture was prepared as described in A.O.A.C (2000)

¹ 1 mg Vit. A= 3333 IU

² 1 mg Vit. D= 25000IU

³ 1 mg Vit. E= 1.5 IU

2. Experimental design

The rats were randomly divided into 10 groups, in each group (6 rats). The feed intake was recorded daily and the weight of rats was recorded individually every week. The animals were fed with basal diet, high fat diet, and fresh wheat grass juice and its blends oral dose for 6 weeks as follows:-

Group No.1

Normal group fed with basal diet (negative control).

Group No.2

Control group fed on high fat diet containing 1% cholesterol (positive control).

Group No.3

The rats were fed on high fat diet (HFD) containing 1% cholesterol and 5ml/ Kg fresh wheat grass juice oral (dose)

Group No.4

The rats were fed on high fat diet containing 1% cholesterol and 10ml /Kg fresh wheat grass juice oral (dose).

Group No.5

The rats were fed on high fat diet containing 1% cholesterol and 5ml/Kg fresh wheat grass juice with banana oral (dose).

Group No.6

The rats were fed on high fat diet containing 1% cholesterol and 10ml/Kg fresh wheat grass juice with banana oral (dose).

Group No.7

The rats were fed on high fat diet containing 1% cholesterol and 5ml /Kg fresh wheat grass juice with guava oral (dose).

Group No.8

The rats were fed on high fat diet containing 1% cholesterol and 10ml/ Kg fresh wheat grass juice with guava oral (dose).

Group No.9

The rats were fed on high fat diet containing 1% cholesterol and 5ml/ Kg fresh wheat grass juice with banana and guava oral (dose).

Group No.10

The rats were fed on high fat diet containing 1% cholesterol and 10ml/ Kg fresh wheat grass juice with banana and guava oral (dose).

3. Blood sampling

Blood samples were taken from all rats groups that were tested at the beginning and end of the experiment. Blood samples were collected from the eye molecules by fin-fin tubes according to the method described by Shermer (1967). The sample was collected in a clean, dry, centrifugal glass tube without any coagulation to prepare a serological sample. The blood was left for 15 minutes at room temperature (25°C), then the tubes were centrifuged for 10 minutes at 3000 rpm. The clean serum was kept frozen at -20°C to determine total cholesterol, HDL, LDL, triglycerides, total lipids, liver enzymes (ALT and AST), ALP and renal functions (urea, uric acid, creatinine) in the serum of rats.

4. Serum assay

1. Determination of serum total cholesterol :

The total cholesterol was determined according to the method of Richmond (1973) and Allain, *et al.* (1974) as follows.

$$\text{Cholesterol Concentration} = \frac{A_{\text{Sample}}}{A_{\text{Standard}}} \times \text{Standard Conc.}$$

2. Determination of HDL-Cholesterol :

Determination of HDL- Cholesterol was carried out according to the method of Burstein, *et al.* (1970) and Lopez – Virella, *et al.* (1977) as follows.

$$\text{HDL - cholesterol in sample (mg/dL)} = \frac{A_{\text{Sample}}}{A_{\text{Standard}}} \times 55$$

3. Determination of serum triglycerides :

Serum triglycerides were determined according to the method of Fassati and Prencepe (1982) as follows.

$$\text{Triglycerides Concentration (mg/dL)} = \frac{A_{\text{Sample}}}{A_{\text{Standard}}} \times \text{Standard Conc.}$$

4. Determination of LDL – Cholesterol :

LDL – Cholesterol was determined according to the method of Wieland and Seidel (1983) as follows.

$$\text{LDL-c (mg/dL)} = \text{Total cholesterol- (VLDL-c + HDL-c).}$$

$$VLDL-c \text{ (mg/dL)} = \frac{\text{triglyceride}}{5}$$

5. Determination of serum total lipids :

Serum total lipids were determined according to the method of Zollner and Kirsch (1962) as follows.

$$\text{Total lipids Concentration (mg/dL)} = \frac{A_{\text{Sample}}}{A_{\text{Standard}}} \times 1000$$

6. Determination of aspartate and alanine aminotransferase GOT and GPT activities:

Colorimetric Determination of GOT and GPT activity was carried out according to the method described by Reitman and Frankel (1957).

7. Determination of alkaline phosphatase (ALP) :

Alkaline phosphatase was determined according to the method described by Belfield and Goldberg (1971) as follows.

$$\text{Enzyme activity (IU / L)} = \frac{A_{\text{sample}}}{A_{\text{standard}}} \times 100$$

8. Determination of uric acid in serum of rats:

The uric acid in serum of rats was determined as enzymatic colorimetric method according to Barham and Trinder (1972) as follows..

$$\text{Uric acid in serum} = \frac{A_{\text{Sample}}}{A_{\text{Standard}}} \times \text{Standard Concentration}$$

9. Determination of urea in serum of rats

Urea in serum of rats was determined as Urease-Berthelot method according to Fawcett and Soctt (1960).

Calculation

$$\text{Urea concentration} = \frac{A_{\text{Sample}}}{A_{\text{Standard}}} \times \text{Standard Conc.}$$

10. Determination of creatinine in serum of rats

The creatinine in serum of rats was determined as Colorimetric Kinetic method according to Bartles, *et al.* (1972) and Larsen (1972) as follows.

$$A_2 - A_1 = \Delta A_{\text{Sample}} \text{ or } \Delta A_{\text{Standard}}$$

$$\text{Creatinine in serum (mg/dL)} = \frac{\Delta A_{\text{Sample}}}{\Delta A_{\text{Standard}}} \times 2$$

5. Statistical analysis:

Obtained data were analyzed statistically by less significant differences (L.S.D) in 5% of the probability measures according to Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

1. Influence of fresh wheat grass juice and its blends in hypercholesterolemic rats.

The feed intake of different tested groups of rats was recorded daily, also, the body weight gain of corresponded groups was calculated, results are given in Table (1) and illustrated in Figs (1) and Fig (2).

From data presented in Table (1) and Fig (2), show significance among some tested groups. However it could be noticed that the group of rats fed with high fat diet and cholesterol positive control (G2) had a significantly different with the other groups of rats fed with high fat diet and cholesterol plus orally fresh wheat grass juice and its blends. The positive control (G2) had the highest amount of feed intake (19.95 g/rat/day). The lowest values were 16.9g and 17.3g /day, respectively in negative control group (G1) and group (G3).

Body weight gain showed significant difference between (G1) negative control and positive control group (G2) which recorded (48 g/rat and 90.4 g/rat), respectively. There are significant difference in body weight gain between positive control group (G2) and all groups. While, the highest value in body weight gain was 90.4 g/rat in group (G2). Also final body weight showed a significant difference between group (G1) negative control and all other groups. The positive control group (G2) had the highest value in final body weight (235 g).

Table 1. Effect of fresh wheat grass juice and its blends on body weight gain and feed intake of rats.

Groups	Body weight(g)		Body weight Gain	Feed intake g/rat/day
	Initial	Final		
G1 Basal diet (negative control).	125 a±2	185 f±1	48 g±1.0	16.9 g±9.98
G2 High fat diet (positive control).	123.4 abc±0.39	235 a±2	90.4 a±0.19	19.95 a±5.0
Kg / G3: high fat diet +1% cholesterol+5ml fresh wheat grass juice oral (dose).	124 ab±1	208 bc±1	67.74 c±3.8	17.3 fg±0.29
Kg /G4: high fat diet +1% cholesterol+10ml fresh wheat grass juice oral (dose).	124 ab±3	206 c ±3	66.12 d±0.12	17.5 efg±0.5
Kg /G5: high fat diet +1% cholesterol+5ml fresh wheat grass beverage with banana oral (dose).	121.6 cd±0.2	200 de±0.5	64.47 e±0.39	17.6 ef±0.2
Kg /G6: high fat diet +1% cholesterol+10ml fresh wheat grass juice with banana oral (dose).	122.5 bc±0.5	198 e±2	61.63 f±2.2	17.9 def±9.97
Kg /G7: high fat diet +1% cholesterol+5ml fresh wheat grass juice with guava oral (dose).	120 d±1	201 de±1	67.5c±1	18.1 cde±9.98
Kg / G8: high fat diet +1% cholesterol+10ml fresh wheat grass juice with guava oral (dose).	124 ab±1	200 de±3	61.29f±0.1	18.3 bcd±1
Kg / G9: high fat diet +1% cholesterol+5ml fresh wheat grass juice with banana and guava oral (dose).	123.5 abc±1.0	202 d±2	63.56 e±2.2	18.6 bc±0.3
Kg /G10: high fat diet +1% cholesterol+10ml fresh wheat grass juice with banana and guava oral (dose).	124.6 ab±0.8	211 b±1	69.34b±1	18.8 b±0.19
L.S.D(P≥0.05)	2.25	3.15	0.96	0.66

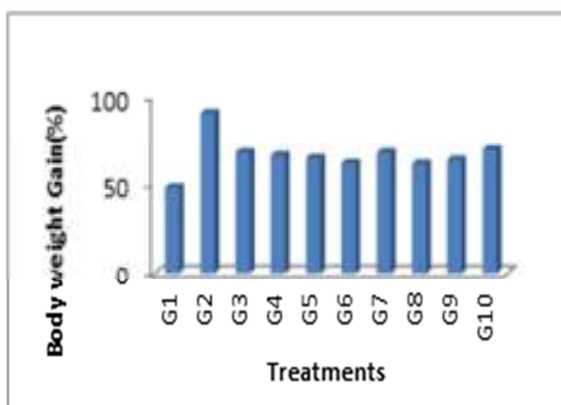


Fig. 1. Effect of fresh wheat grass juice and its blends for diet on body weight gain on rats

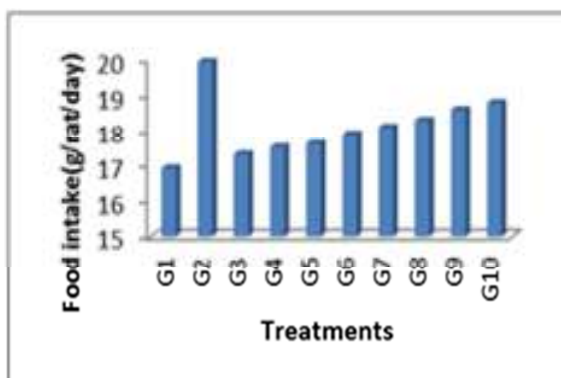


Fig. 2. Effect of fresh wheat grass juice and its blends for diet on feed intake on rats.

- G1: Basal diet (negative control).
- G2: High fat diet (positive control).
- G3: Kg fresh wheat grass juice oral (dose)/ high fat diet +1% cholesterol+5ml
- G4: Kg fresh wheat grass juice oral (dose)/ high fat diet +1% cholesterol+10ml
- G5: Kg fresh wheat grass juice with banana oral (dose). / high fat diet +1% cholesterol+5ml
- G6: Kg fresh wheat grass juice with banana oral (dose). / high fat diet +1% cholesterol+10ml
- G7: Kg fresh wheat grass juice with guava oral (dose). / high fat diet +1% cholesterol+5ml
- G8: Kg fresh wheat grass juice e with guava oral (dose). / high fat diet +1% cholesterol+10ml
- G9: Kg fresh wheat grass juice with banana and guava oral (dose). / high fat diet +1% cholesterol+5ml
- G10: Kg fresh wheat grass juice with banana and guava oral (dose). / high fat diet +1% cholesterol+10ml

2. Effect of fresh wheat grass juice and its blends on T.cholesterol, LDL, HDL, Total lipids and Triglyceride of serum

The effects of fresh wheat grass juice and its blends on the serum lipoprotein cholesterol (Total cholesterol, LDL and HDL as mg/dl), triglycerides and total lipids of hypercholesterolemic rats were studied, and the results are shown in Table (2).

Results in Table (2) and Fig (3) revealed that the total cholesterol level of rats fed with high fat diet plus 1% cholesterol in positive control group (G2) had high level (146 mg/dl) which was statistically difference with the other tested rats group. The lowest value of total cholesterol was (68.2 mg/dl) in negative control group

(G1) which fed a basal diet. It could be also noticed that significant differences were recorded among all tested rats groups except group G3 and group G4 which recorded 91.90 and 90.50 mg/dl respectively.

In this concept, oral administration groups of rats which fed with high fat diet plus 1% cholesterol and fresh wheat grass juice with banana and guava oral dose 5 ml/kg (G9) and group (G10) led to decrease the total cholesterol level of rats (79.65 mg/dl and 78.00 mg/dl, respectively). It could be also noticed that no significant difference was recorded between rat groups (G9 and G10). These results agreed well with those reported by Kothari, et al. (2011) who ascertained that administered fresh wheat grass juice at the dose of 5 mL/kg and 10 mL/kg and the standard drug atorvastatin 0.02% W/V in 2% gum acacia suspension at the dose of 1 mg/kg led to significant decrease in total cholesterol as compared with hypercholesterolemic rats.

Results in Table (2) and Fig (4) showed that the rats group fed with high fat diet plus 1 % cholesterol (positive control G2) recorded the highest level of LDL (83 mg/dl) that was in significant differences with the other rats tested groups. The other rats groups fed with high fat diet plus 1% cholesterol and fresh wheat grass beverage with banana and guava oral dose 5 ml/kg (G9) and group (G10) of rats which fed with high fat diet plus 1% cholesterol and fresh wheat grass beverage with banana and guava oral dose 10 ml/kg, had the lowest levels of LDL that recorded 33.80 and 32 mg/dl, respectively. In this concept, Kothari, et al. (2011) ascertained that the oral fresh grass beverage of wheat grass had a dose dependent significant hypolipidemic activity on diet-induced raised levels of TC, TG, LDL- c and VLDL-c as compared to the control. Lipid levels at the dose of 10 mL /kg were comparable with that of standard drug atorvastatin. These changes in lipid levels after grass beverage treatment may be attributed to bioactive compounds that were demonstrated after phytochemical screening of fresh wheat grass beverage.

Results in Table (2) and Fig (5) also show the HDL levels of different rats tested groups. It could be noticed from the results that, the highest levels of HDL were found to be well in all the tested groups except the rats group which fed with high fat diet plus 1 % cholesterol positive control (G2).Flier and Underhill (1989) revealed that lipoprotein lipase was a key enzyme in HDL-cholesterol metabolism involved in the relationship of precursor product between LDL and HDL-cholesterol. Thus, the low concentration observed of HDL in rats group fed with high fat diet plus 1% cholesterol may depend on elevated hepatic lipase activity.

Concerning the serum total lipids and triglycerides levels of different rats tested groups, results in Table (2) and Figs (6),Fig (7) illustrated that, rats group given high fat diet plus 1% cholesterol positive control group (G2) recorded the highest total lipids and triglycerides levels (580.5 and 245 mg/dl, respectively). Meanwhile, significant decrements were observed in the serum of rats given different tested diets compared with (G2). In this connection, Kothari, et al. (2011) coincided with that the results of present study clearly show that oral fresh grass beverage of *Triticum aestivum* leads to a decrease in the values of lipids and triglycerides.

Table 2. Effect of fresh wheat grass juice and its blends on the serum (T. cholesterol, LDL, HDL, total lipids and triglyceride)

Groups	T. cholesterol (mg/dL)	LDL (mg/dL)	HDL (mg/dL)	Total lipids (mg/dL)	Triglyceride (mg/dL)
G1 Basal diet (negative control).	68.2 g±0.19	28.0 i±2	28.8 a±0.19	254 h±2	58 h±2
G2 High fat diet (positive control).	146 a±3.0	83.0 a±0.2	10.9 g±2	580.5 a±0.5	245 a±2
Kg /G3 high fat diet +1% cholesterol+5ml fresh wheat grass juice oral (dose).	91.90 b±0.75	47.2 b±1	22.18 f±0.5	299.50 b±1	97.98 b±0.09
Kg /G4 high fat diet +1% cholesterol+10ml fresh wheat grass juice oral (dose).	90.50 b±1.0	46.9 b±2	22.90 f±0.5	298.0 c±0.5	97.20 bc±1
Kg /G5 high fat diet +1% cholesterol+5ml fresh wheat grass juice with banana oral (dose).	87.0 c±0.20	42.84 cd±3	25.19 e±0.5	295.0 d±0.5	95.0 cd±0.5
Kg /G6 high fat diet +1% cholesterol+10ml fresh wheat grass juice with banana oral (dose).	85.33 cd±0.33	41.50 de±0.5	25.50 de±1.0	293.72 e±0.19	94.35 d±0.5
Kg /G7 high fat diet +1% cholesterol+5ml fresh wheat grass juice with guava oral (dose).	83.80 de±0.25	37.59 ef±2	25.90 cd±0.2	292.30 f±1	91.00 e±1
Kg /G8 high fat diet +1% cholesterol+10ml fresh wheat grass juice with guava oral (dose).	82.64 e±0.5	36.40 fg±1.5	26.18 bc±0.1	291.25 f±0.5	90.45 ef±2
Kg / G9 high fat diet +1% cholesterol+5ml fresh wheat grass juice with banana and guava oral(dose).	79.65 f±2.1	33.80 gh±1	27.13 b±0.29	285.90 g±1	86.00 fg±1
Kg /G10 high fat diet +1% cholesterol+10ml fresh wheat grass juice with banana and guava oral(dose).	78.00 f±1.1	32 h±2	27.90 b±0.19	285.3 h±1	85.70 g±0.5
LSD _(P<0.05)	1.77	2.93	0.75	1.61	2.13
The normal values of the item					
Normal range	60-80	25-40	20-30	250-300	55-100

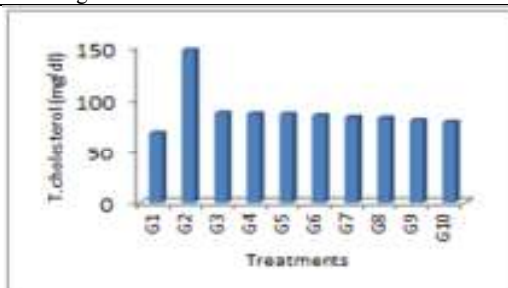


Fig. 3. Effect of fresh wheat grass juice and its blends on the serum (T. cholesterol)

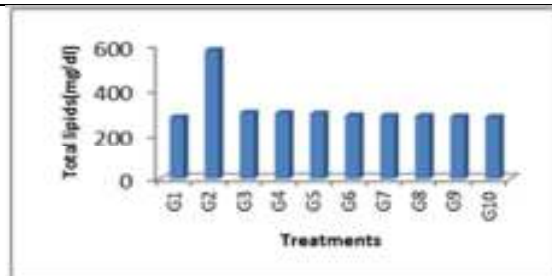


Fig. 6. Effect of fresh wheat grass juice and its blends on the serum (Total lipids)

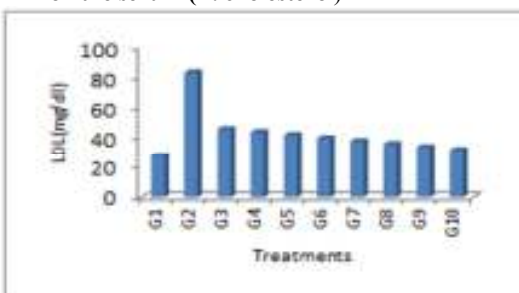


Fig. 4. Effect of fresh wheat grass juice and its blends on the serum (LDL)

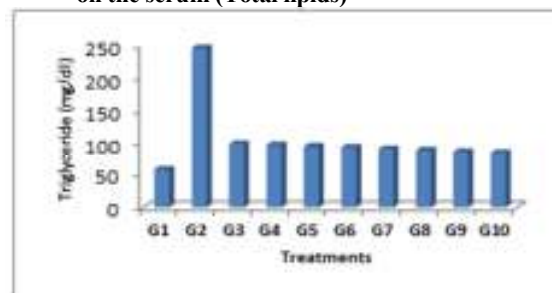


Fig. 7. Effect of fresh wheat grass juice and its blends on the serum (Triglyceride)

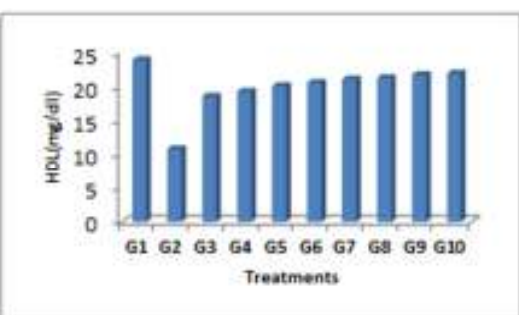


Fig. 5. Effect of fresh wheat grass juice and its blends on the serum (HDL)

- G1: Basal diet (negative control).
- G2: High fat diet (positive control).
- G3: Kg fresh wheat grass juice oral (dose)/ high fat diet +1% cholesterol+5ml
- G4: Kg fresh wheat grass juice oral (dose)/ high fat diet +1% cholesterol+10ml
- G5: Kg fresh wheat grass juice with banana oral (dose). / high fat diet +1% cholesterol+5ml
- G6: Kg fresh wheat grass juice with banana oral (dose). / high fat diet +1% cholesterol+10ml
- G7: Kg fresh wheat grass juice with guava oral (dose). / high fat diet +1% cholesterol+5ml
- G8: Kg fresh wheat grass juice with guava oral (dose). / high fat diet +1% cholesterol+10ml
- G9: Kg fresh wheat grass juice with banana and guava oral (dose). / high fat diet +1% cholesterol+5ml
- G10: Kg fresh wheat grass juice with banana and guava oral (dose). / high fat diet +1% cholesterol+10ml

3. Effect of fresh wheat grass juice and its blends on liver function enzymes (AST, ALT and ALP) of hypercholesterolemic rats.

The activities of serum levels of AST (aspartate aminotransferase), ALT (alanine aminotransferase) and ALP (alkaline phosphatase) as indication of liver functions of different tested rats group are shown in Table (3) and Figs (8) & (9).

It could be noticed that, the rats group fed with high fat diet plus 1% cholesterol positive control group (G2) had the highest values of AST and ALT which indicated the

inhibitory action on the activity of those liver enzymes. The highest values of AST and ALT for this rats group indicated the harmful effect on the liver function enzymes. In this connection, higher plasma activities of these enzymes have been found in response to oxidative stress (Shimizu, *et al.* 1989). In addition, the rats group fed with high fat diet plus 1% cholesterol and fresh wheat grass beverage oral dose 5 ml/kg (G3) recorded low values of AST and ALT that was in significant difference with the group (G2). Moreover, G3 had non-significant difference with G4.

Table 3. Effect of fresh wheat grass juice and its blends on liver function enzymes (AST, ALT and ALP) of hypercholesterolemic rats.

Groups	AST*/GOT (U/L)	ALT*/GPT (U/L)	Alkaline phosphatase (ALP) (IU/L)
G1 Basal diet (negative control).	30.0 f±0.5	23.5 g±0.1	74 h±0.5
G2 High fat diet (positive control).	57.16 a±0.2	35 a±1	102.2 a±0.2
Kg /G3 high fat diet +1% cholesterol+5ml fresh wheat grass juice oral (dose).	43.80 b±0.2	30.2 b±0.19	83.69 b±0.29
Kg / G4 high fat diet +1% cholesterol+10ml fresh wheat grass juice oral (dose).	43.02 b±1	29.60 c±0.5	82.0 bc±0.5
Kg / G5 high fat diet +1% cholesterol+5ml fresh wheat grass juice with banana oral (dose).	41.90c±0.5	28.45 cd±0.02	81.35 cd±1.5
Kg / G6 high fat diet +1% cholesterol+10ml fresh wheat grass juice with banana oral (dose).	40.24 cd±0.2	28.01 de±0.2	80.56 d±0.5
Kg / G7 high fat diet +1% cholesterol+5ml fresh wheat grass juice with guava oral (dose).	38.6 d±1.2	27.40 e±0.3	79.0 e±1.19
Kg /G8 high fat diet +1% cholesterol+10ml fresh wheat grass juice with guava oral (dose).	37.91 e±0.5	26.2 f±0.19	78.42 ef±0.19
Kg / G9 high fat diet +1% cholesterol+5ml fresh wheat grass juice with banana and guava oral(dose).	37.00 ef±1	24.6 fg±0.99	76.40 fg±0.4
Kg /G10 high fat diet +1% cholesterol+10ml fresh wheat grass juice with banana and guava oral(dose).	36.70 f±0.5	24 g±1.5	75.38 g±0.3
LSD _(P<0.05)	0.94	1.17	1.18

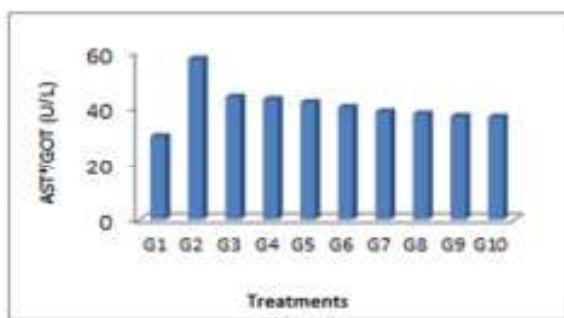


Fig. 8. Effect of fresh wheat grass juice and its blends on the serum (AST)

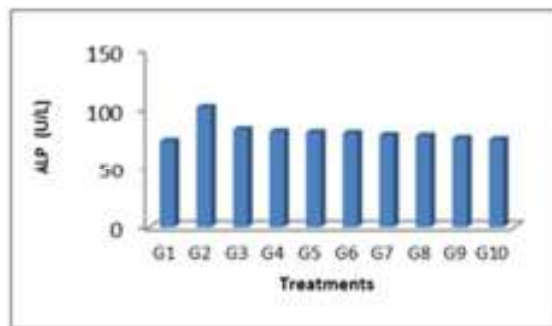


Fig. 10. Effect of fresh wheat grass juice and its blends on the serum (ALP)

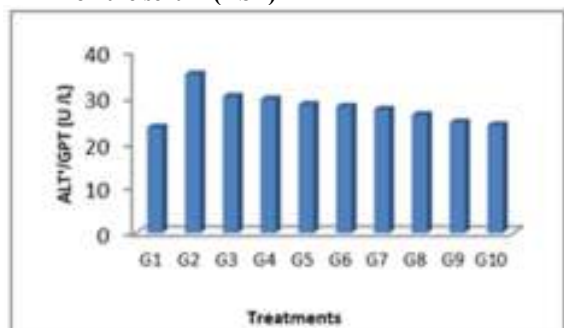


Fig. 9. Effect of fresh wheat grass juice and its blends on the serum (ALT)

- G1: Basal diet (negative control).
- G2: High fat diet (positive control).
- G3: Kg fresh wheat grass juice oral (dose)/ high fat diet +1% cholesterol+5ml
- G4: Kg fresh wheat grass juice oral (dose)/ high fat diet +1% cholesterol+10ml
- G5: Kg fresh wheat grass juice with banana oral (dose). / high fat diet +1% cholesterol+5ml
- G6: Kg fresh wheat grass juice with banana oral (dose). / high fat diet +1% cholesterol+10ml
- G7: Kg fresh wheat grass juice with guava oral (dose). / high fat diet +1% cholesterol+5ml
- G8: Kg fresh wheat grass juice with guava oral (dose). / high fat diet +1% cholesterol+10ml
- G9: Kg fresh wheat grass juice with banana and guava oral (dose). / high fat diet +1% cholesterol+5ml
- G10: Kg fresh wheat grass juice with banana and guava oral (dose). /high fat diet +1% cholesterol+10ml

Results in Table (3) and Figs (8) & (9) showed also that rats group fed with high fat diet plus 1% cholesterol and fresh wheat grass juice with banana and guava oral dose 5 ml/kg (G9) and group (G10) of rats that fed with high fat diet plus 1% cholesterol and fresh wheat grass juice with banana and guava oral dose 10 ml/kg had the lowest level of AST and ALT which had significant difference with the other tested rats groups. This could be as an indication for the improvement in the liver functions as a result for intake of fresh wheat grass juice. Regarding the ALP values, results in Table (3) and Fig (10) reflected the enhancement of liver functions as ALP, in group (9) which was fed with high fat diet plus 1% cholesterol and fresh wheat grass juice with banana and guava oral dose 5 ml/kg and group (G10) of rats that fed with high fat diet plus 1% cholesterol and fresh wheat grass juice with banana and guava oral dose 10 ml/kg.

4. Effect of fresh wheat grass juice and its blends on kidney functions (urea, uric acid and creatinine) of hypercholesterolemic rats.

The serum levels of urea, uric acid and creatinine as indications of kidney functions of different tested rats groups are presented in Table (4) and Figs (11, 12 and 13). It could be noticed there were significant increments in the serum levels of urea and uric acid of rats group (positive control G2) which was fed on high fat diet plus 1% cholesterol (80 and 24 mg/dl, respectively) and rats group fed on high fat diet plus 1% cholesterol and fresh wheat grass juice oral dose 5 ml/kg (G3) (43.0 and 8.20 mg/dl, respectively) as compared with other rats groups.

Results in Table (4) also show the improvement of serum urea, uric acid and creatinine that obtained by feeding with high fat diet plus 1% cholesterol fresh wheat grass juice with banana and guava oral dose 5 ml/kg (G9) and rats group (G10) fed with high fat diet plus 1% cholesterol and fresh wheat grass juice with banana and guava oral dose 10 ml/kg, also there were no significant differences recorded among rats groups G3, G4 in serum levels of urea, uric acid and creatinine.

Table 4. Effect of fresh wheat grass juice and its blends on kidney functions (urea, uric acid and creatinine) of hypercholesterolemic rats.

Groups	Urea (mg/dL)	Uric acid (mg/dL)	Creatinine (mg/dL)
G1 Basal diet (negative control).	30 i±0.5	3.50 g±0.5	0.72 d±0.1
G2 High fat diet (positive control).	80 a±1	24 a±1	0.95 a±0.49
Kg /G3 high fat diet +1% cholesterol+5ml fresh wheat grass juice oral (dose).	43.0 b±0.5	8.20 b±0.1	0.84 b±0.29
Kg / G4 high fat diet +1% cholesterol+10ml fresh wheat grass juice oral (dose).	42.40 bc±1	7.59 bc±0.2	0.82 b±0.03
Kg / G5 high fat diet +1% cholesterol+5ml fresh wheat grass juice with banana oral (dose).	39.90 cd±0.2	6.20 c±0.5	0.81 b±0.2
Kg / G6 high fat diet +1% cholesterol+10ml fresh wheat grass juice with banana oral (dose).	39.0 de±0.5	5.60 cd±0.1	0.81 b±0.19
Kg / G7 high fat diet +1% cholesterol+5ml fresh wheat grass juice with guava oral (dose).	38.4 ef±1	5.23 de±0.5	0.79 bc±0.1
Kg /G8 high fat diet +1% cholesterol+10ml fresh wheat grass juice with guava oral (dose).	37.5 fg±0.3	4.70 ef±0.19	0.78 cd±0.1
Kg / G9 high fat diet +1% cholesterol+5ml fresh wheat grass juice with banana and guava oral(dose).	35.0 g±0.1	4.00 fg±0.39	0.74 d±0.3
Kg /G10 high fat diet +1% cholesterol+10ml fresh wheat grass juice with banana and guava oral(dose).	34.6 h±0.39	3.6 g±0.2	0.73 d±0.5
L.S.D(P≥0.05)	1.08	0.77	4.32

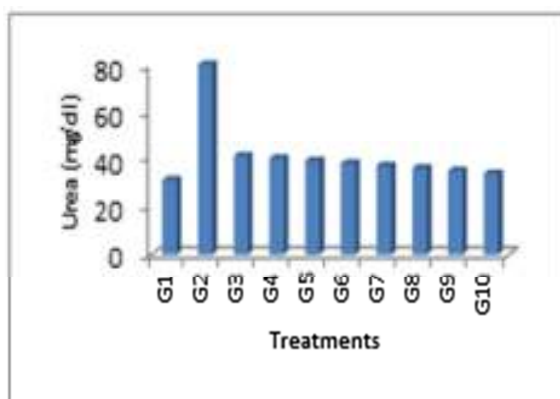


Fig . 11. Effect of fresh wheat grass juice and its blends on the serum Urea

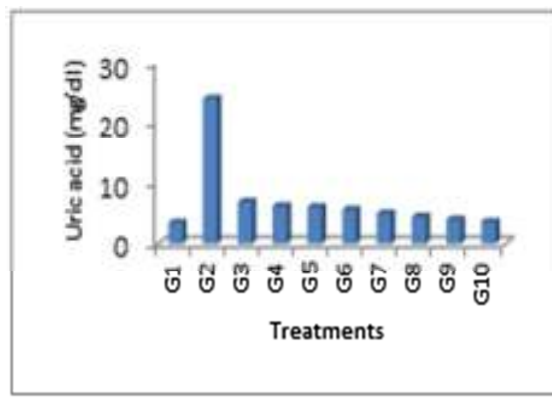


Fig . 12. Effect of fresh wheat grass juice and its blends on the serum Uric acid.

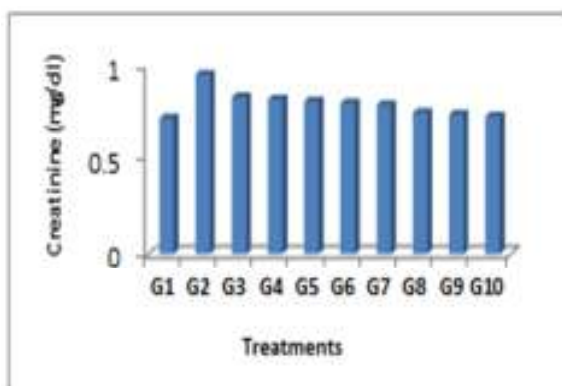


Fig . 13. Effect of fresh wheat grass juice and its blends on the serum Creatinine..

- G1: Basal diet (negative control).
- G2: High fat diet (positive control).
- G3:Kg fresh wheat grass juice oral (dose)/ high fat diet +1% cholesterol+5ml
- G4:Kg fresh wheat grass juice oral (dose)/ high fat diet +1% cholesterol+10ml
- G5:Kg fresh wheat grass juice with banana oral (dose). / high fat diet +1% cholesterol+5ml
- G6:Kg fresh wheat grass juice with banana oral (dose). / high fat diet +1% cholesterol+10ml
- G7:Kg fresh wheat grass juice with guava oral (dose). / high fat diet +1% cholesterol+5ml
- G8:Kg fresh wheat grass juice with guava oral (dose). / high fat diet +1% cholesterol+10ml
- G9:Kg fresh wheat grass juice with banana and guava oral (dose). /high fat diet +1% cholesterol+5ml
- G10:Kg fresh wheat grass juice with banana and guava oral (dose). /high fat diet +1% cholesterol+10ml

CONCLUSION

From the study, it could be concluded that groups (G9 and G10), (G9) which fed on high fat plus 1% cholesterol and fresh wheat grass juice with banana and guava with a dose of 5 ml/kg body weight (G9) and (G10) fed on high fat plus 1% cholesterol and fresh wheat grass juice with banana and guava with a dose of 10ml/ kg body weight. Gave the best results in terms of weight gain, intake of feed intake, reduction of cholesterol, low-density lipoprotein, total fat and triglycerides and led to an increase in the value of high-density lipoprotein HDL. As well as improving liver and kidney functions as compared to the other groups.

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تأثير استخدام عصير عشبة القمح الطازج و مخالطة على الفئران المصابة بالكوليسترول.
جيهان على عوض غنيم^١، مسعد عبد العزيز أبو رية^١، عزة كمال الدين عبد الحميد^٢ و نشوى مصطفى الريس^٢
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تم إجراء تقييم بيولوجي لعصير عشبة القمح الطازج ومخالطة باستخدام ٦٠ فأراً ذكر من النوع الألبينو، بإجراء عملية أفلمة للفئران ١٠ أيام ثم تم تقسيم الفئران لعشرة مجموعات في كل مجموعة ٦ فئران و إستمرت التغذية لمدة ٦ أسابيع للتعرف علي تأثير عصير عشبة القمح الطازج و مخالطة على فئران التجارب المصابة بارتفاع الكوليسترول من النتائج كان أقل زيادة في الوزن للفئران و الغذاء المستهلك في المجموعة الأولى، بينما أظهرت النتائج وجود إختلافات معنوية بينها وبين باقي المجاميع. و سجلت مجموعة الفئران (G2) الكنترول المصاب التي غذيت على عليقة محتوية على نسبة مرتفعة من الدهون و١% الكوليستيرول أعلى معدل من الكوليستيرول الكلى و الليبوبروتين منخفض الكثافة (LDL) (١٤٦, ٠, ٨٣, ٠ مجم/ديسيلتر على التوالي) ، بينما مجموعة الفئران (G9) ، مجموعة الفئران (G10) و التي تغذت على عليقة مرتفعة الدهون و١% كوليستيرول مع إعطائها جرعة ٥ مل (G9) ، ١٠ مل (G10) من عصير عشبة القمح الطازج مع الموز والجوافة/ كجم من وزن الجسم يوميا عن طريق الفم أدت إلى خفض كلا من نسبة الكوليستيرول الكلى (٧٩, ٦٥ ، ٧٨, ٠ مجم/ديسيلتر) و نسبة الليبوبروتين منخفض الكثافة (LDL) (٣٣, ٨٠ ، ٣٢, ٠ مجم/ديسيلتر) و نسبة الدهون الكلية (٢٨٥, ٩٠ ، ٢٨٥, ٣٠ مجم/ديسيلتر) و نسبة الجليسيريدات (٨٦, ٠ ، ٨٥, ٧٠ مجم/ديسيلتر) في كل من المجموعة (G9) ، (G10) على التوالي كما أدت إلى رفع قيمة الليبوبروتين المرتفع الكثافة (HDL) (٢٧, ١٣ ، ٢٧, ٩٠ مجم/ديسيلتر) على التوالي أيضا أدى إستخدام عصير عشبة القمح الطازج و مخالطة مجموعة (G9) ، (G10) إلى تحسين وظائف الكبد و الكلى بالمقارنة بالمجاميع الأخرى.