Introduction:

Since cholesterol is insoluble in water, it is transported in the blood plasma within protein particles (lipoproteins). Lipoproteins are classified by their density: very low-density lipoprotein (VLDL), intermediate density lipoprotein (IDL), low-density lipoprotein (LDL), and high-density lipoprotein (HDL) **(Biggerstaffand and Wooten, 2004)**. All the lipoproteins carry cholesterol, but elevated levels of the lipoproteins other than HDL (termed non-or good cholesterol), particularly LDL-C are associated with an increased risk of atherosclerosis and coronary heart disease **(Carmena *et al.,* 2004).** In contrast, higher levels of HDL cholesterol are protective**.** Elevated levels of non-HDL cholesterol and LDL in the blood may be a consequence of diet, obesity, inherited (genetic) diseases (such as LDL receptor mutations in familial hypercholesterolemia), or the presence of other diseases such as diabetes and an underactive thyroid **(Durrington, 2003) and (Kontush and Chapman, 2006).**

Cholesterol is a waxy steroid metabolite found in the cell membranes and transported in the blood plasma of all animals. It is an essential structural component of mammalian cell membranes, where it is required to establish proper membrane permeability and fluidity. In addition. Cholesterol is an important component for the manufacture of bile acids, steroid hormones, and several fat-soluble vitamins. Cholesterol is the principal sterol synthesized by animals, but small quantities are synthesized in other eukaryotes, such as plants and fungi. It is almost completely absent among prokaryotes, and also bacteria **(Leah, 2009).**

Diets rich in fruits and vegetables are gaining increased importance because of their significant role in reducing the risk of certain types of cancer, cardiovascular diseases and other chronic diseases. Fruits and vegetables contain many antioxidant compounds including phenolic compounds, carotenoids, anthocyanins and tocopherols **(Naczk and Shahidi, 2006).**

Like other fruits, apricot has a beneficial effect on human health and constitutes a rich source of minerals including potassium, iron, zinc, magnesium, manganese and selenium. Iron is a trace element and it has an important role as a core ion in hemoglobin, while zinc is reported as a coenzyme for over 200 enzymes involved in body immunity systems **(Manzoor *et al.*, 2012).**

Mango is one of the most important tropical fruits worldwide in terms of production and consumer acceptance**.** It is a rich source of antioxidants**,** including ascorbic acid**,** carotenoids**,** and phenolic compounds **(Berardini *et al.*, 2004)** and **(Berardini *et al.*, 2005).**

Plums are one of the most important stone fruits crops of the world. Plums also include several familiar stone fruits apricot,cherry and peach. There are more than 2000 varieties of plums, among which relatively few are of commercial importance (**Somogai, 2005)**.

Materials and methods:

Materials

Plant materials: Fruits (Apricot, Mango and Plum) were purchased from the local market of Shibin El- Kom, washed, peeled and the peels dehydrated in sun, then milled to soft powder and kept in dusky Stoppard glass bottles.

Rats: Male albino rats weighing 150-160 g each were purchased from Medical Insects Research Institute, Cairo, Egypt.

Cholesterol

Cholesterol and basal diet constituents were obtained from El-Gomhoria Company for Trade of Drugs, Chemicals and Medical Equipments, Cairo, Egypt.

Methods

Basal diet: The basal diet was prepared of the following: Protein (10%), corn oil (10%), vitamin mixture (1%), mineral mixture (4%), choline chloride (0.2%), methionine (0.3%), cellulose (5%), and the remained is corn starch (69.5%) according to **Campbell (1963)**. While the salt mixture was formulated according to **Hegested *et al.*, (1941).** Cholesterol containing diet was prepared by adding 1% cholesterol to the basal diet for 3 weeks to induce hypercholesterolemia.

Experimental Design:

Fifty male albino rats were housed in healthy condition (21-23ºC) and fed on basal diet for one week before starting the experiment for acclimatization , after this, rats were divided into two main groups, the first main group (5 rats) fed on basal diet as a negative control (ve-) and the other main group (45 rats) was fed on 1% cholesterol+ 0.02 salts for 3 weeks to induce hypercholesterolemia, then classified into nine sub groups as follow:

Group (2): Positive control group (untreated group)

Group (3): Treated with 5% milled Apricot Peels (AP).

Group (4): Treated with 7% milled Apricot Peels (AP).

Group (5): Treated with 5% milled Mango Peels (MP).

Group (6): Treated with 7% milled Mango Peels (MP).
Group (7): Treated with 5% milled Plum Peels (PP).

Group (8): Treated with 7% milled Plum Peels (PP).

Group (9): Treated with 5% milled equalized Mixture of all powders.

Group (10): Treated with 7% milled equalized Mixture of all powders.

At the end of the experimental (4 weeks), rats were fasted for 12-h then sacrificed. Blood samples were collected from the portal vein into dry clean centrifuge tubes for serum separation. Blood samples centrifuged for 10 minutes at 3000 rpm to separate the serum according to **Schermer (1967).** Internal organs separated wiped, the weighted. Also, BWG, FI and FER needed**.**

<u>At the end of the literature the following tests were performed:</u>

Cholesterol, TG, H.D.L-c, L.D.L-c and V.L.D.L-c were determined according to **Allen (1974)**, **Fossati and Prencipe (1982)** and **Lee and Nieman (1996)** respectively**.** Low-density lipoprotein cholesterol and very low-density lipoprotein cholesterol were calculated: VLDL = TG/5, LDL = TC (VLDL+HDL).

Glutamic oxaloacetic transaminase (GOT), glutamic pyruvic transaminase (GPT), alkaline phosphatase (ALP), urea, creatinine, uric acid and total protein according to **Yound (1975), Tietz (1976), Belfield and Goldberg (1971), Doumas *et al.,* (1973), Chary and Sharma (2004),**

Spencer and Price (1977) and Weismann *et al.,* (1950) respectively.

Results and Discussion:

1-Total Cholesterol (TC) mg\dl.

Data of table (1) illustrate the mean value of serum (TC) (mg\dl) of hypercholesterolemic rats fed on different diets. It could be observed that the mean value of (TC) of control (+) group was higher than control (-) group, being 150 ± 1 and 99 ± 0.2 respectively, showing significant difference with percent of decrease -34% of control (-) group as compared to control (+) group .All hypercholesterolemic rats fed on different diets revealed significant decreases in mean values as compared to control (+) group . The values were 121±0.4 , 122±2 , 126±1 , 125±2 , 133±0.7 , 125±0.8 , 126±1 and 124±1 for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of decreases were -19.3 , -18.67 , -16 , 16.67 , -11.3 , -16.67 , -16 and -17.3 % for groups 3,4,5,6,7,8,9 and 10 respectively. Groups (3, 4), (5, 9) and (6, 8) revealed no significant differences between them. Numerically, the better serum (TC) was showed for group (3), being hypercholesterolemic rats fed on (Apricot peels 5%) when compared to control (+) group. **Kirtchevesky (1997)** reported that apricot oil (AO) reduced total cholesterol levels in animals and human. And this may be explained by two mechanisms including: Inhibition of cholesterol absorption and hepatic cholesterol esterase **(Vanston *et al.*, 2002)**. This result agree with **De jong *et al.*, (2003) and Ostlund *et al.*, (2003)**. They found that A.O reduced TC and this may be due to its contents from plant sterols with decreased incorporation of dietary cholesterol into micelles and this lead to decreased cholesterol absorption. Also, this result in the same line with **Mohamed *et al.*, (2011)**. They reported that apricot reduced plasma cholesterol concentration in rats fed on high fat diet.

<u>Table (1)</u>: Fasting serum Total Cholesterol TC (mg\dl) for negative control (1), positive control (2), and all treated groups as affected by the powder of some fruit peels

Variables	*G (1)* Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Total cholesterol (mg/dl)	99 [f] ± 0.2	150[a] ± 1	121[e] ± 0.4	122 [e] ± 2	126 [c] ± 1	125 [cd] ± 2	133 [b] ± 0.7	125[cd] ± 0.8	126 [c] ± 1	124 [d] ± 1
%change of positive control	-34	—	-19.3	-18.67	-16	-16.67	-11.3	-16.67	-16	-17.3
L.S.D ($p \leq 0.05$)	1.01									

Means in the same row with different litters are significantly ($p \leq 0.05$) different.

<u>2-Triglycerides (TG) mg\dl.</u>

Data of table (2) illustrate the mean value of serum (TG) (mg\dl) of hypercholesterolemic rats fed on different diets. It could be observed that the mean value of (TG) of control (+) group was higher than control (-) group, being 252 ± 1 and 140 ± 2 respectively, showing significant difference with percent of decrease -44.44% of control (-) group as compared to control (+) group .All hypercholesterolemic rats fed on different diets revealed significant decreases in mean values as compared to control (+) group . The values were 146±2 , 201±1 , 159±2 , 190±1 , 207±2 , 190±3 , 202±2 and 175±2 mg/dl for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of decreases were -42.06 , -20.24 , -36.9 , -24.6 , -17.86 , -24.6 , -19.84 and -30.56% for groups 3,4,5,6,7,8,9 and 10 respectively. Groups (4, 9) and (6, 8) revealed no significant decreases between them. The better serum (TG) was showed for group (3) hypercholesterolemic which was of rats fed on (Apricot peels 5%) when compared to control (-) group. This result agree with **Kurushimaa *et al*., (1995)** who reported that apricot containing high amounts of linoleic and olic acids reduced serum triglycerides in animals. Also, **Landriera *et al*., (2010)** found that apricot contains a good amount of Vit.E, and this had a strong that of effect on triglycerides metabolism in intestine. This result was also in agreement with **Mohamed *et al*., (2011)** who found that feeding rats with induced with hypercholesterolemia on apricot and pumpkin oils significantly decreased serum triglycerides.

Table (2): Fasting serum Triglycerides TG (mg\dl) for negative control (1), positive control (2), and all treated groups as affected by the powder of some fruits peels

Variables	G (1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Triglycerides (mg/dl)	140 [h] ± 2	252 [a] ± 1	146 [g] ± 2	201 [c] ± 1	159 [f] ± 2	190 [d] ± 1	207 [b] ± 2	190 [d] ± 3	202 [c] ± 2	175 [e] ± 2
%change of positive control	-44.44	—	-42.06	-20.24	-36.9	-24.6	-17.86	-24.6	-19.84	-30.56
L.S.D ($p \leq 0.05$)	1.08									

Means in the same row with different litters are significantly ($P \leq 0.05$) different.

3- High Density Lipoprotein (HDL) mg\dl.

Data of table (3) illustrate the mean value of serum (HDL) (mg\dl) of hypercholesterolemic rats fed on different diets. It could be observed that the mean value of (HDL) of control (+) group was lower than control (-) group, being 37 ± 2

and 58 ± 1 respectively, showing significant difference with percent of increase +56.76%of control (-) group as compared to control (+) group .All hypercholesterolemic rats fed on different diets revealed significant increases in mean values as compared to control (+) group . The values were 58±1 , 47±0.5 , 57±1 , 47.7±2 , 50±1 , 47±1.6 , 50±0.5 and 49±1 for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of increases were +56.76, +27.03, +54,05, +28.92, +35.14, +27.03, +35.14 and +32.45 % for groups 3,4,5,6,7,8,9 and 10 respectively. Group (3) revealed no significant decreases with control (-). Groups (4, 8) and (7, 9) revealed no significant decreases between them. The better serum (HDL) was showed for groups (3) being hypercholesterolemic rats fed on (Apricot peels 5%) when compared to control (+) group and similar to that. This result is in the same line with **Mohamed *et al*., (2011)** who found that apricot increased HDL in rats fed on high fat diet.

Table (3): Fasting serum High Density Lipoprotein HDL (mg\dl) for negative control (1), positive control (2), and all treated groups as affected by the powder of some plants peels

Variables	*G (1)* Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
HDL (mg/dl)	58 [a] ± 1	37.6 [f] ± 2	58 [a] ± 1	47 [e] ± 0.5	57 [b] ± 1	47.7 [e] ± 2	50 [c] ± 1	47 [e] ± 1.6	50 [c] ± 0.5	49 [d] ± 1
% change of positive control	+56.76	—	+56.76	+27.03	+54.05	+28.92	+35.14	+27.03	+35.14	+32.43
L.S.D (p≤0.05)	0.92									

Means in the same row with different litters are significantly (P ≤ 0.05) different.

4- Low Density Lipoprotein (LDL) mg\dl.

Data of table (4) illustrate the mean value of serum (LDL) (mg\dl) of hypercholesterolemic rats fed on different diets. It could be observed that the mean value of (LDL) of control (+) group was higher than control (-) group, being 62.6 ± 2 and 13 ± 2 respectively, showing significant difference with percent of decrease -79.23%of control (-) group as compared to control (+) group .All hypercholesterolemic rats fed on different diets revealed significant decreases in mean values as compared to control (+) group . The values were 33.8±1 , 34.8±2.2 , 37.2±2 , 39.3±1 , 41.6±1 , 40±2 , 36±1 and 40±1 for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of decreases were -46.01, -44.41, 40.58, -37.22, -33.55, -36.1, -42.49 and -36.10 % for groups 3,4,5,6,7,8,9 and 10 respectively. Groups (6, 8, 10) revealed no significant decreases between them. The better serum (LDL) was showed for groups (3) hypercholesterolemic rats fed on (Apricot peels 5%) when compared to control (+) group. **Kurushimaa *et al.*, (1995)** reported that the suppression of hepatic LDL receptor activity was prevented by linoleic acid. **Mohamed *et al.*, (2011)** found that A.O containing a high amount of linoleic and olic acid, so it had a good effect to reduce serum LDL.

Table (4): Fasting serum Low Density Lipoprotein LDL (mg\dl) for negative control (1), positive control (2), and all treated groups as affected by the powder of some plants peels

Variables	G (1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
LDL (mg/dl)	13 [g] ± 2	62.6 [a] ± 2	33.8 [b] ± 1	34.8 [e] ± 2.2	37.2 [d] ± 2	39.3 [c] ± 1	41.6 [b] ± 1	40 [c] ± 2	36 [f] ± 1	40 [c] ± 1
% change of positive control	-79.23	—	-46.01	-44.41	-40.58	-37.22	-33.55	-36.10	-42.49	-36.10
L.S.D ($p \leq 0.05$)	0.94									

Means in the same row with different litters are significantly ($P \leq 0.05$) different.

5- Very Low Density Lipoprotein (VLDL) mg\dl.

Data of table (5) illustrate the mean value of serum (VLDL) (mg\dl) of hypercholesterolemic rats fed on different diets. It could be observed that the mean value of (VLDL) of control (+) group was higher than control (-) group, being 50.4 ± 1 and 28 ± 2 respectively, showing significant difference with percent of decrease -44.44% of control (-) group as compared to control (+) group .All hypercholesterolemic rats fed on different diets revealed significant decreases in mean values as compared to control (+) group . The values were 29.2 ± 1 , 40.2 ± 2 , 31.8 ± 1 , 38 ±2 , 41.4 ± 1 , 38 ± 2 , 40.4 ± 1 and 35 ± 2 for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of decreases were -42.06 , -20,24 , 36.9 , -24.6 , -17.86 , -24.6 , -19.84 and -30.56% for groups 3,4,5,6,7,8,9 and 10 respectively. Groups (4, 9) and (6, 8) revealed no significant decreases between them. The better serum (VLDL) was shown for groups (3) hypercholesterolemic rats fed on (Apricot peels 5%) when compared to control (-) group. This result in agreement with **Mohamed *et al.*, (2011)** who found that A.O decreased serum VLDL in rats fed on high fat diet.

Table (5): Fasting serum Very Low Density Lipoprotein VLDL (mg\dl) for negative control (1), positive control (2), and all treated groups as affected by the powder of some plants peels

Variables	G (1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
VLDL (mg/dl)	28 h ± 2	50.4 a ± 1	29.2 g ± 1	40.2 c ± 2	31.8 f ± 1	38 d ± 2	41.4 b ± 1	38 d ± 2	40.4 c ± 1	35 e ± 2
% change of positive control	-44.44	—	-42.06	-20.24	-36.9	-24.6	-17.86	-24.6	-19.84	-30.56
L.S.D ($p \leq 0.05$)	0.90									

Means in the same row with different litters are significantly ($P \leq 0.05$) different.

6 - Body weight gain (BWG).

Table (6) show the mean value of body weight gain of hypercholesterolemic rats fed on various diets. It could be noticed that the mean value of BWG of control (+) group was higher than control (-) group, being 0.93 ±0.16 and 0.05 ± 0.02 respectively, showing significant difference with percent of decrease -94.62 of control (-) group as compared to control (+) group. Hypercholesterolemic rats fed on various diets showed mostly significant decreases in mean values as compared to control (+) group. The values were 0.61 ± 0.07 , 0.87 ± 0.11 , 0.24 ± 0.11 , 0.89 ± 0.04 , 0.34 ± 0.18 , 0.18 ± 0.13 , 0.57 ± 0.16 and 0.14 ± 0.11 for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of decreases were -34.41, -6.45, -74.19, -4.3, -63.44, -80.65, -38.71 and -84.95 for groups 3,4,5,6,7,8,9 and 10 respectively. Groups 4 and 6 showed no significant decreases between them and control (- or +) groups. Also, groups (3 and 9), (5 and 8) showed no significant decreases between them. The lowest BWG was recorded for group (10) hypercholesterolemic rats fed on mixture of (apricot, mango and plum) peels 7% when compared to control (-) group.

Table (6): Body weight gain (B.W.G) of negative control (1), positive control (2), and all treated groups as affected by some fruits peels

Variables	*G (1)* Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
B٠W.G (g)	0.05^{e} ± 0.02	0.93^{a} ± 0.16	0.61^{b} ± 0.07	0.87^{a} ± 0.11	0.24^{d} ± 0.11	0.89^{a} ± 0.04	0.34^{c} ± 0.18	0.18^{d} ± 0.13	0.57^{b} ± 0.16	0.14^{de} ± 0.11
% change of positive control	-94.62	—	-34.41	-6.45	-74.19	-4.3	-63.44	-80.65	-38.71	-84.95
L.S.D ($p \leq 0.05$)	0.1									

Means in the same row with different litters are significantly ($P \leq 0.05$) different.

7- Feed Intake (FI):

Table (7) show the mean value of feed intake of hypercholesterolemic rats fed on various diets. It could be noticed that the mean value of FI of control (+) group was higher than control (-) group, being 19.83 ± 0.83 and 11.71 ± 0.81 respectively, showing significant difference with percent of decrease -40.95 for control (-) group as compared to control (+) group. All hypercholesterolemic rats fed on various diets showed significant decreases in mean values as compared to control (+)

group. The values were 12.43 ± 0.61 , 17.95 ± 0.68 , 17.48 ± 1.16 , 17.06 ± 0.64 , 17.68 ± 0.64 , 13.39 ± 0.71 , 19.41 ± 0.43 and 19.20 ± 0.41 for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of decreases were -37.32, -9.48, -11.85, -13.97, -10.84, -32.48, -2.12 and -3.18 for groups 3,4,5,6,7,8,9 and 10 respectively. The best FI seems to recorded for group (3) hypercholesterolemic rats fed on (Apricot peels 5%) when compared to control (+) group.

<u>Table (7)</u>: Feed Intake FI (g\day) of negative control (1), positive control (2), and all treated groups as affected by some fruits peels

Variables	G (1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
F.I(g\day)	11.71^{g} ± 0.81	19.83^{a} ± 0.83	12.43^{f} ± 0.61	17.95^{c} ± 0.68	17.48^{cd} ± 1.16	17.06^{d} ± 0.64	17.68^{c} ± 0.64	13.39^{e} ± 0.71	19.41^{ab} ± 0.43	19.20^{b} ± 0.41
% change of positive control	-40.95	—	-37.32	-9.48	-11.85	-13.97	-10.84	-32.48	-2.12	-3.18
L.S.D ($p \leq 0.05$)	0.44									

Means in the same row with different litters are significantly ($P \leq 0.05$) different.

8- Feed Efficiency Ratio (FER)

Table (8) show the mean value of Feed efficiency ratio of hypercholesterolemic rats fed on various diets. It could be noticed that the mean value of FER of control (+) group was higher than control (-) group, being 0.05 ± 0.01 and 0.004 ± 0.001 respectively, showing significant difference with percent of decrease 92 for control (-) group as compared to control (+) group. All hypercholesterolemic rats fed on various diets showed variable FER levels. The values were 0.05 ± 0.006 , 0.05 ± 0.006 , 0.01 ± 0.006 , 0.05 ± 0.006 , 0.02 ± 0.01 , 0.01 ± 0.008 , 0.03 ± 0.006 and 0.007 ± 0.004 for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of decreases were 0, 0, -80, 0, -60, -80, -40 and -86 for groups 3,4,5,6,7,8,9 and 10 respectively. Groups 3, 4 and 6 showed no significant decreases between them. Also, the levels of groups (5 and 8) were of no significant between them. The highest FER was recorded for groups (3, 4 and 6).

Table (8): Feed efficiency ratio (F.E.R) of negative control (1), positive control (2), and all treated groups as affected by some fruits peels

Variables	G (1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
F.E.R	0.004^{e} ± 0.001	0.05^{a} ± 0.01	0.05^{ab} ± 0.006	0.05^{ab} ± 0.006	0.01^{de} ± 0.006	0.05^{ab} ± 0.006	0.02^{cd} ± 0.01	0.01^{de} ± 0.008	0.03^{c} ± 0.006	0.007^{e} ± 0.004
%change of positive control	92	—	0	0	-80	0	-60	-80	-40	-86
L.S.D (p ≤ 0.05)	0.008									

Means in the same row with different litters are significantly (P ≤ 0.05) different.

9- Weight of the internal organs:

Table (9) show the mean values of liver, heart, kidneys, lungs and spleen weight (g) of hypercholesterolemic rats fed on various diets. It could be noticed that the mean values of control (+) group were higher than that of the control (-) group. All hypercholesterolemic rats fed on various diets showed significant decreases in mean values as compared to control (+) group. The best internal organs weights recorded for group (10) being that of the mixture diet. This indicated that intimation alleviated due to experimental diet.

Table (9): Weight of internal organs (g) for negative control (1), positive control (2), and all treated groups as affected by some fruits peels

Variables	G(1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G(10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Liver(g)	5.80^{f} ± 0.10	9.00^{a} ± 0.95	8.23^{b} ± 0.40	7.03^{cde} ± 0.21	6.33^{ef} ± 0.32	7.50^{bcd} ± 0.56	6.77^{de} ± 0.23	7.67^{bc} ± 0.38	6.63^{e} ± 1.10	6.30^{ef} ± 0.36

%change ofpositive control	-35.56	—	-8.56	-21.89	-29.67	-16.67	-24.78	-14.78	-26.33	-30.00
L.S.D ($p \leq 0.05$)	0.61									
Heart(g)	0.5^{d} ± 0.1	0.8^{a} ± 0.1	0.67^{abc} ± 0.06	0.6^{cd} ± 0.2	0.77^{ab} ± 0.15	0.7^{abc} ± 0.1	0.57^{cd} ± 0.12	0.7^{abc} ± 0.2	0.63^{bcd} ± 0.15	0.56^{cd} ± 0.2
%change of positive control	-37.5	—	-16.25	-25	-3.75	-12.5	-28.75	-12.5	-21.25	-30
L.S.D ($p \leq 0.05$)	0.1									

Means in the same row with different litters are significantly ($p \leq 0.05$) different.

10-Urea, Creatinine and Uric acid (mg/dl):

Data of table (10) illustrate the mean values of serum urea, serum creatinine and uric acid (mg/dl) of hypercholesterolemic rats fed on various diets. It could be noticed that the mean values kidneys function parameters of control (+) group was higher than control (-) group, being. All hypercholesterolemic rats fed on different diets revealed significant decreases in mean values of kidney function parameters as compared to control (+) group. The best group, was recorded for group (10), being for rats fed on mixture diet.

Table (10): Fasting serum Urea, creatinine and uric acid (mg\dl) for negative control (1), positive control (2), and all treated groups as affected by the powder of some plants peels

Variables	G (1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G (10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Urea (mg/dl)	29^{e} ± 1	50.3^{a} ± 7.77	35^{bcd} ± 6	36^{bc} ± 2	40^{b} ± 4	41^{b} ± 5	38^{b} ± 6	38^{b} ± 7	29.67^{de} ± 1.15	29.3^{cde} ± 2.08
%change of positive control	-42.35	—	-30.42	-28.43	-20.48	-18.49	-24.45	-24.45	-41.01	-41.75
L.S.D ($p \leq 0.05$)	4.44									
Creatinine (mg/dl)	0.93^{d} ± 0.01	1.11^{a} ± 0.06	0.95^{d} ± 0.03	1^{bc} ± 0.03	1.03^{b} ± 0.06	0.96^{cd} ± 0.04	0.97^{cd} ± 0.03	0.96^{cd} ± 0.04	1^{bc} ± 0.03	0.95^{cd} ± 0.07
%change of positive control	-16.22	—	-14.41	-9.91	-7.21	-13.51	-12.61	-13.51	-9.91	-14.41
L.S.D ($p \leq 0.05$)	0.03									
Uric Acid (mg/dl)	0.49^{e} ± 0.24	1.21^{a} ± 0.20	0.91^{bcd} ± 0.32	0.73^{d} ± 0.06	0.79^{cd} ± 0.08	0.76^{d} ± 0.17	0.89^{bcd} ± 0.16	0.81^{cd} ± 0.28	0.99^{bc} ± 0.20	0.72^{d} ± 0.12

%change of positive control	-59.50	—	-24.79	-39.67	-34.71	-37.19	-26.45	-33.06	-18.18	-40.50
L.S.D ($p \leq 0.05$)	0.15									

Means in the same row with different litters are significantly ($P \leq 0.05$) different.

11-GOT, GPT and ALP (u\l):

Data of table (11). Illustrate the mean value of serum GOT,GPT and ALP (u\l) of hypercholesterolemic rats fed on various diets. It could be noticed that the mean values of GOT of control (+) groups were higher than control (-) group. The best treatment was recorded for group (10) mixture diet on 7 % level. This was parallel to the changes of kidney function parameter and internal organs weights (table 9, 10). This result in agreement with **Oboh and Olumese (2010)** who said that recorded significant increases in the serum GOT activities in rabbits fed on high fat diet compared with the control group, fed a standard diet. Increases in serum activities of these enzymes are usually indicative of possible liver damage. Also **(Mohamed *et al.*, 2011)** who found that apricot decreased GOT in rats fed on high fat diet.

Table (11): Fasting serum GOT, GPT and ALP (u\l) for negative control (1), positive control (2), and all treated groups as affected by the powder of some fruits peels

Variables	G (1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G(10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
GOT(u/l)	130^{cd} ± 4.36	187.3^{a} ± 9.50	169^{b} ± 7	181.3^{ab} ± 2.52	172.7^{b} ± 7.02	146.3^{c} ± 19.50	150^{c} ± 20	143^{c} ± 8.89	145.3^{c} ± 4.51	140.3^{c} ± 2.52
%change of positive control	-30.59	—	-9.77	-3.20	-7.79	-21.89	-19.91	-23.65	-22.42	-25.09
L.S.D ($p \leq 0.05$)	11.1									
GPT(u/l)	45.3^{bcd} ± 2.52	71.3^{a} ± 3.06	56^{bc} ± 1	60.3^{b} ± 1.53	61.3^{b} ± 7.50	61.7^{b} ± 10.42	62.3^{b} ± 3.06	51.7^{c} ± 7.02	55^{bc} ± 1	50.3^{bc} ± 3.51
%change of positive control	-36.47	—	-21.46	-15.43	-14.03	-13.46	-12.62	-27.49	-22.86	-29.43
L.S.D ($p \leq 0.05$)	5.80									

ALP (u/l)	165[d] ± 2	347.67[a] ± 39.37	209.3[c] ± 6.51	237.3[bc] ± 39.37	225.3[c] ± 16.50	277.67[b] ± 11.37	235[bc] ± 54.06	277[b] ± 12	225.3[c] ± 42.50	189[cd] ± 39
%change of positive control	-52.54	—	-39.79	-31.75	-35.2	-20.14	-32.41	-20.33	-35.2	-45.64
L.S.D ($p \leq 0.05$)	34.11									

Means in the same row with different litters are significantly ($p \leq 0.05$) different.

12-TP (u\l):

Data of table (12). Illustrate the mean value of serum TP (g\dl) of hypercholesterolemic rats fed on various diets. It could be noticed that the mean value of TP (u\l) of control (+) group was less than control (-) group, being 4.39 ± 0.81 and 6.55±0.2 respectively, indicating significant difference with percent of decrease -49.20 % of control (-) group when compared to control (+) group. All hypercholesterolemic rats fed on different diets revealed significant increases in mean values as compared to control (+) group. The values were 6.7±0.37 , 7.3±0.15 , 6.8±0.11 , 7.08±0.12 , 6.82±0.32 , 7.16±0.03 , 6.95±0.33 and 7.73±0.26 (g/dl) for AP (5%,7%) , MP (5%,7%) , PP (5%,7%) and Mixture (5%,7%) respectively. The percent of increases were +52.62 , +66.29 , +54.90 , +61.28 , +55.35 , +63.10 , +58.31, and +76.08% for groups 3,4,5,6,7,8,9 and 10 respectively. The best treatment was recorded for group 10 (mixture diet 7%) when compared to control (- or +) groups of (TP).

Table (12): Fasting serum TP (g\dl) for negative control (1), positive control (2), and all treated groups as affected by the powder of some plants peels

Variables	G(1) Negative control	G (2) Positive control	Apricot Peels (AP)		Mango Peels (MP)		Plum Peels (PP)		Mixture	
			G (3) 5%	G (4) 7%	G (5) 5%	G (6) 7%	G (7) 5%	G (8) 7%	G (9) 5%	G(10) 7%
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
TP (g/dl)	6.55[bc] ± 0.2	4.39[d] ± 0.81	6.7[b] ± 0.37	7.3[b] ± 0.15	6.8[b] ± 0.11	7.08[b] ± 0.12	6.82[b] ± 0.32	7.16[b] ± 0.03	6.95[b] ± 0.33	7.73[a] ± 0.26
%change of positive control	+49.20	—	+52.62	+66.29	+54.90	+61.28	+55.35	+63.10	+58.31	+76.08
L.S.D ($p \leq 0.05$)	0.39									

Means in the same row with different litters are significantly ($p \leq 0.05$) different.

Conclusion:

The selected fruits peels in the present study were effective in protecting rats against hypercholesterolemia. These results supported the hypothesis that tested fruits peels contain several important compounds such as fibers, minerals, polyphenols, flavonoids and carotenoids, which are able to inhibit hypercholesterolemic process along with improvement the liver and renal function, liver function, lipids profile and the biological parameters. Therefore, data recommended the selected fruits peel by a moderate amount to be possibly included in our daily diets.

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