Chemical and remedial effects of purslane (*portulaca oleracea)* plant

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Abstract: *Portulaca oleracea* referred to the common purslane considered one of the important unknown plants in Egypt. This study was carried out to investigate the biological, histopathological and anticancer effect of previous plant. Chemical composition (total acidity, protein, crude fiber, ash content, minerals, phenolic and flavonoids compounds were determined in aqueous extract of fresh plant and dried powder of *portulaca oleracea.* Infested rats by toxic hepatitis were feeding orally with aqueous extract compared with silymarin drug which led to prevent the increase of the serum hepatic enzyme level (ALP, AST and ALP), uric acid, nitric oxide, lipid profile and liver MDA. Antioxidant status in liver GSH were declined in rats treated with Ccl4 alone, increased after feeding orally. The histopathological examination of liver also showed that aqueous extract of *portulaca oleracea* reduced the incidence of liver lesions signs of hepatic toxicity and substantiates its use in various liver disorders as hepato protection. The results of anti-cancer activity showed the highest HEPG2 dead cell percentage by plant dried powder (0.547 liver cell of HEPG2) at concentration of 12.50 µg/ml. Increasing the concentration to 100 µg/ml the resulted in more higher percentage of HEPG2 dead cell (0.668) and the cytotoxic effect was determined with the Ic50 values of 17 µg/ml in HEPG2 cell line.
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Key word *Portulacaoleracea* plant, Uric acid, nitric oxide, Lipid profile, Liver MDA and antioxidant status

1. Introduction

Portulaca oleracea is a member of the purslane, Family "*portulacaceae* **(Hyam and pankhurst, 1995)**, the genus *Portulaca* contains about 40 topical and warms climate species. It is characterized by its taller upright growth habit and larger leaves and seeds **(Gorske et al., 1979 and Gledhill 1985)**. **Aberoumand (2009)** reported that the leaves and stems of *portulaca oleracea* contained ashes (22.66%), crude protein (23.47%), Lipid (5.26%) and Fibers (40.67%). The stems and leaves also have high energy values 303.9 Kcal/100g dry weight. Mineral contents (mg/100gm DM) were K (14.71), Na (7.17), Ca (18.71), Fe (0.48) and Zn (3.02). **Skulski (2010)**reported that *portulaca oleracea* has freshly leaves and a slightly sour taste, it is high in iron and has appreciable amount of Omega - 3 - fatty acids which are more commonly found in seed. So that *portulaca oleracea* is used extensively in Chinese medicine as an herb which clears heat toxin and antibiotic and antifungal effect increases uterine contraction and prevention and treatment of dysentery. *Portulaca oleracea* was found as effective as sulfa drugs, over 90% effective in acute cases and 60% in chronic cases. **Choi et al., (1997)**, **Lim and Suh., (2000)**, **Islam *et al.*, (2000) and seo*et al.*, 2003)** reported that *portulaca oleracea* was traditionally used in sore nipples, tonsilits, astringent, cardiotonic, colic, dermatitis, diarrhea, dysentery, dysurea, dyspepsia, eczema, heamaturia, hyperglyceamia and pruritis. Antimicrobial and anticancer effects were also reported. **Lim (2007)** reported that total phenolic compounds of *portulaca oleracea* ranged from 127±13 to478± 45mg GAE/100g fresh weight of plant **Oyedeji and bolarinwa, (2013)** showed that treatment of rats for 50 days with aqueous extract of *portulaca oleracea* and methanolic extract of *portulaca oleracea* (75mg/kg methanolic extract of *portulaca oleracea*) caused acellular and fused seminiferous tubules with papillary configuration and showing marked dense fibrosis of the stroma with leydig cells hyperplasia. **Chen *et al,* (2010)** reported that water soluble polysaccharides isolated from *portulaca oleracea* possesses mild cytotoxic activity against cervical cancer head cell. The sulphated form of these polysaccharides inhances the antitumor activity. The present study was performed to find out the possibility of taking the benefit of *portuiaca oleracea* as follows: studying 1): the chemical and nutritional properties of *portulaca oleracea* dried powder and fresh aqueous extract.2): the role of fresh aqueous

extract in prevention of liver damage induced By Ccl4 in adult male Sprague- dawley rats. 3): the effect of *portulaca oleracea* dried powder as anti-tumor activity against HEPG 2 cell (liver cell)

2. Materials and Methods

- Materials

Portulaca oleracea plant (purslane) was obtained from a farm of Quisna city Minufiya Governorate during 2011 season.

- Preparation of samples

a- Fresh plant aqueous extract.

The fresh *portulaca oleracea* plant was immediately washed thoroughly with tap water,then blended with water (2kg of plant: 1 liter water) in warring blender and filtered from tuff fibers. packed in polyethylene pouches.then stored till analysis.

b – Drying of *Portulaca oleracea* plant.

Portulaca oleracea plant was dried in a hot air oven at 60℃, then grinded, packed in polyethylene pouches and stored at ambient temperature for analysis.

- Chemical analysis:

Moisture, protein, ash ,fiber ,total acidity and mineral content were determined according to the methods of **A.O.A.C (2007).**PH value was measured by using Beckman PH meter. Total and reducing sugars were determined using method of **Somogi (1952)** and **Nelson,(1974)** ,total phenols were determined according to the method of **Danial and George,(1979).** total flavonoids were determined according to **Zhisen et al.,(1999),** fractionation of poly phenolic compounds were determined by HPLC according to the method of **Goupy *et al.*, (1999),** fractionation of flavonoids were determined by HPLC according to method of **Matilla et al., (2000).** Carotenoids were determined according to **Wettestein (1957).**

- Biological evaluation:

Adult albino male (Sprague- Dawley 60 rats). Weighted in a range of 120 to 150g were obtained from the breeding colony at the animal house of the National organization for drug control and research.The rats were fed basal diet**(A.O.A.C.2007)** and water were given ad. Libitum.

- Experimental design:

After adapation period (one week)the rats randomly divided into six groups (ten rats for every group)as follows:

Group (1): served as control and received saline (0.2 ml/rat) by oral administration via epigastric tube.

Group (2): An animal model of hepatotoxicity obtained by carbon tetrachloride injection 0.5 ml/100g intra peritoneally (i.p) twice weekly followed by liver enzymes checking to confirm the damage liver.

Group (3): Received oral administration of 750 ml/kg of *portulaca oleracea* aqueous extract daily for 28 days.

Group (4): Silymarin 50 mg/kg administrated orally daily for 28 days.

Group (5): *Portulaca oleracea* aqueous extract (750ml/kg) orally daily for 2 weeks then concomitant administration of CcL4 0.5 ml/100g intra peritoneally, twice weekly with *portulaca oleracea* in the next 2 weeks.

Group (6): Silymarin 50 mg/kg orally for 2 weeks ,then concomitant administration of CcL4 0.5ml/100g intra peritoneally twice weekly with silymarin in the next 2 weeks.

It is worth mentioning that aqueous extract of the fresh *portulaca oleracea* herbs was administrated to rats orally by nasogastric tube in a dose of 750mg/kg **(Samuel *et al.*, 2011).**

Meanwhile,Tetrachloromethan (Ccl4,99%) from across organics dissolved in sunflower oil 25%. Dose in rat 0.5 ml/100g injected intraperitoneally **(Xu *et al.*, 2005).** On the other hand,Silymarin (Unipharma) was used as the standard drug-purified powder was dissolved in water with the aid of tween 80. Silymarin was orally administered to rats in a dose of 50 mg/kg body weight **(Al shawsh *et al.*, 2011).**

- Serum analysis:

At the end of the experimential period (4weeks), the animals were left for 12hour, and then sacrified blood sample were collected from retro-orbital plexus. The blood standed for 30 min for collecting and centrifuged at 500 rpm for 15 min to separate serum and stored at – 18^{o}C until analysis. Alanine aminotransferase (ALT), aspartate aminotransferase (AST) were determined in serum according to **Reitman and Frankel, (1957)**. Alkaline phosphatase (ALP) was determined according to **Thomas (1978).** Uric acid was measured using an enzymatic method of **Trivedi *et al.*, (1978).** Total cholesterol (TC) was determined according to **Young (1990)**. Low density lipoprotein cholesterol (LDL) was measured by the method of **Bergmenyer (1985)**, triglycerides was determined according to the method of **Fossati and Principe, (1989).** Malondialdehyde (MDA) measured according to **Ohkawed *et al.*, (1979).** Nitric oxide (NO) was measured according to the method of **Montgomery and Dymock, (1961**) glutathione reduced (GSH) was determined according to **Beutler *et al., (*1963).**

Tissue homogenate preparation:

Pieces of liver were weighted and homogenized immediately in 5-10ml ice-cold medium containing

buffer (50 mm potassium phosphate PH 7.5 containing 2mM EDTA) per gram tissue, using tissue homogenizer, the homogenate was centrifuged at 4.000 rpm for 15 min at 4°c. The supernatant was removed and stored at –80°c for the various biochemical determinations(GSH-MDA)according to **Montgomery and Dymock,(1961).**

- Histopathological studies:

Liver of all groups were kept in formalin for histopathological studies

- Statistical analysis

The data were statistically analysed using computer based fitting program (prism Graphpad) (San Diego, CA, USA). **Gabriel (1978)** comparison between more than two groups was carried out using the one-way analysis of variance (ANOVA) on SPSS for windows version 10.0.The following statistical methods were used for analysis of results as described by **Armitage and Berry,(1994)** Tukey–kramer's multiple comparison tests Significance was determined at $p<0.01$.

Measurement of potential cytotoxicity was tested using the method of **Skehan and Storeng, (1990).**

3. Results and discussion

Portulaca oleracea is a plant in Egypt and need to study, so its chemical composition was analysed to find the properties of this plant.The aqueous extract showed that total acidity was 0.13%, and pH value was 4.9. Reducing and total sugars were 1.72 and 1.85% respectively. The crude protein, ash and crude fibers were3.8, 0.82 and 0.40% respectively. It was found that antioxidant consisted of the following components, total phenol (2.94 mg /100g), flavonoids (5.41 mg/100g) chlorophyll A (150.0 mg/100g), chlorophyll B (119.2 mg /100g), total chlorophyll (269.2 mg/100 g) and total carotenoids (40.40 mg/100g) (as shown in Table 1). The aqueous extract of *portulaca oleracea* was rich in iron (123.6 mg /100g) and magnesium (515.92 mg /100g) as compared by the adult requirement of iron and magnesium (12-15 and 270-400 mg/100g). From table (2) it was found that phenolic compound fractionated to catechein, chlorogenic, salcylic and pyrogalol while flavonoids were fractionated to rosmarinic, rutin, quercitrin; these results are in agreement to the results obtained by **Naciye (2012)**.

Chemical composition of purslane (*portulaca oleracea)* powder revealed that moisture content, total acidity, T.S.S, reducing and total sugars and crude fibers were 5.14, 0.68, 3.06, 3.16, 3.72 and 17.99% D.W respectively. The plant material was characterized with high protein and ash which amounted in 18.58% and 16.50% D.W.,respectively.

Table (1) Chemical composition of aqueous extract of purslane(*Portulaca oleracea)* plant (on wet weight basis)

Components	Aqueous extract ofpurslane (*Portulaca oleracea*)
Total acidity%	0.13
pH value	4.9
Total soluble solids(T.S.S)	4.7
Reducing sugars %	1.72
Total sugars %	1.85
Protein %	3.80
Ash %	0.82
Fiber %	0.40
Total phenolic compound*	2.94
Total flavonoids**	5.41
***Chlorophyll A**	150.0
***Chlorophyll B**	119.20
***Total chlorophyll**	269.2
***Total carotenoids**	40.40

Minerals	Aqueous extract of *Portulaca oleracea*	****Recommended daily requirements (adult)
***Calcium**	500.9	1200
***Sodium**	322.37	1600
***Potassium**	442.6	1650 – 1875
***Magnesium**	515.92	270 – 400
***Iron**	123.6	12 – 15
***Zinc**	3.03	12 – 15
***Manganese**	1.25	350

* mg/100g; ** As gallic acid

*** As quercitin

**** Daily requirement of adult (**Food and Nutrition Board, 1989)**

Table (2) Fractionation of purslane(*Portulaca oleracea)* aqueous extract poly phenols and flavonoids components by HPLC (Mg/100g wet weight)

Poly phenol fraction																
Aqueous extract	Pyrogalol	Protocatchui	Chlorogenic	Catechol	Caffien	Vanillic	Gallic	Ferulic	Elagic	Salcylic	Benzoic	Coumaric	Cinnamic	Caffeic	Catechein	**Total fraction**
	0.425	0.071	0.763	0.049	0.071	0.146	0.04	0.071	-	0.662	-	-	0.01	0.154	0.862	**2.939**

Flavonoids fractions									
Aqueous extract	Rosmarinic	Rutin	Quercitrin	Kampferol	Apignen	Hesperetin	Quercitin	Norenginin	**Total fraction**
Mg/100 g	4.847	0.242	0.232	-	-	0.010	0.074	-	**5.405**

The antioxidant contents (total phenols, total flavonoids, chlorophylls and carotenoids) in dried powder of *portulaca oleracea* showed a higher amounts table (3). It was clear that total phenols and total flavonoids amounted in 354.23 and 95.94 mg /100g (on dry weight basis) respectively. Chlorophyll A, B, total Chlorophyll and total carotenoids were 32.24, 21.63, 53.87 and 110.97 mg/1009 respectively.

The mineral contents of dried powder(mg/100g) of *portulaca oleracea* was very high in calcium (1178), potassium (4191.52), magnesium (942.5) and iron (155.94) (table 3).

Fractionation of phenolic and flavonoids compounds showed fifteen phenolic compounds and eight flavonoids (Table 4). Elagic resulted in maximum concentration of phenolic (59.45 mg /100g) followed by salicylic (46.75), chlorogenic (17.82) and catechein (16.21) mg/100g D.W. The other phenolic compounds were found in low concentration(less than10mg), on the other hand rosmarinic (76.63 mg/ 100g D.W.) was the maximum flavonoids in dried powder of *portulaca oleracea* plant, which followed by quercitrin (8.56), rutin, (6.55), quercitin (3.72) and apignen (3.70) mg / 100g D.w.

From the aforementioned data, it could be concluded that portulaca oleracea are characterized by highest amount of protein, ash, phenyls, flavonoids and carotenoids. This rich source of antioxidants, reflects its benefit as remedial materials.

Table (3) Chemical composition of dried powder of purslane(*portulaca oleracea)* (on dry weight basis)

Components	**Dried powder ofpurslane (*portulaca oleracea)***	
Moisture	5.14	
Total acidity	0.68	
pH value	5.7	
Total soluble solids(T.S.S)	30.6	
Reducing sugars %	3.16	
Total sugars %	3.72	
Protein%	18.58	
Ash %	16.50	
Fiber %	17.99	
*Total phenolic compound**	354.23	
*Total flavonoids***	95.94	
*Chlorophyll A	32.24	
*Chlorophyll B	21.63	
*Total Chlorophyll	53.87	
*Total carotenoids	110.97	
Minerals	Dried powder of *portulaca oleracea*	****Recommended daily requirements(adult)
*Calcium (ca)	1178	1200
*Sodium (Na)	649.93	1600
*Potassium(K)	4191.52	1650 – 1875
*Magnesium (Mg)	942.50	270 – 400
*Iron(Fe)	155.94	12 – 15
*Zinc (Zn)	1.90	12 – 15
*Manganese (Mn)	4.06	350

*mg /100g **As gallic acid ***As quercitin ***Daily requirement of adult (Food and Nutrition Board, 1989)

Table (4)Fractionation of poly phenols and flavonoids components of dried powder of purslane(portulaca oleracea) by HPLC (Mg/100gDM)

Poly phenol fraction																
Sample	Pyrogalol	Protocatchui	Chlorogenic	Catechol	Caffien	Vanillic	Gallic	Ferulic	Elagic	Salcylic	Benzoic	Coumaric	Cinnamic	Caffeic	Catechein	**Total fraction**
Dried powder of *portulaca oleracea*	-	4.82	17.82	4.13	3.51	7.48	5.09	5.36	59.43	46.75	-	2.07	0.30	5.49	16.21	**178.38**

Flavonoids fractions									
Sample	Rosmarinic	Rutin	Quercitrin	Kampferol	Apignen	Hesperetin	Quercitin	Narenginin	**Total frac.tion**
Dried powder of *portulaca oleracea*	76.63	6.55	8.56	-	3.70	0.55	3.72	-	**95.94**

Biological evaluation

The role of *portulaca oleracea* aqueous extract in prevention of liver damage induced by CcL4 in adult male Sprague. Dawely rats was studied and compared to silymarin.

Effect of aqueous extract of purslane(*portulaca oleracea) on liver function enzymes(u/l)*

Table(5) shows that ALT,AST and ALP as liver function amounted in 34±2.35,40±3.1 and24±205µ/l for control. Injection with Ccl4 resulted in highest significant increase for the above mentioned enzymes being 3.65,3.48,1.5 times as that of control. Administration of purslane aqueous extract or silymarin either with Ccl4 or without resulted in highly significant decrease compared with positive control (injected with Ccl4). Meanwhile, presence of Ccl4 with the extract or silymarin resulted in significant increase compared with negative control. The data revealed that the presence of Ccl4 delay the effect of either purslane extract or silymarin as a remedial material and this may be due to the antagonism between these materials.The obtained data were in line with those of **Venukumar and Latha, (2002)** whom mentioned that the raise in the activities of ALT, AST and ALP in rats' serum was a sign of hepatocellular damage of liver similar to acute viral hepatitis. On the other hand, **Ahmida (2010** reported that the hepato protective effective effect of *portulaca oleracea* was due to the phytochemical present in it, included omega-3-fatty acids, B-carotene, flavonoids and alkaloids.

Effect of aqueous extract of purslane (*portulaca oleracea) on serum lipid profile*

Serum lipids showed cholesterol,triglycerides and low density lipoprotein cholesterol (LDL) amounted in 59±5.14,34±3.41 and 32±2.16mg/dl for control.Injection with Ccl4 resulted in increase of these parameters by about 1.8,4.41 and 2.6 times as compared to the non injected group.A highly significant decrease was found due to treatment with purslane or silymarin except that of triglyceride which showed a non significant differences due to purslane treatment.The obtained results were confirmed by **Movahedian *et al.*, (2007)** whom mentioned that addition of *portulaca oleracea* leaf extract to the cholesterol-enriched diet in rabbits improved the resultant hypercholesterolemia.

Effect of aqueous extract of purslane (*portulaca oleracea) on antioxidant activity of injurious liver.*

Table (7) revealed that the injurious liver due to Ccl4 injection characterized with lowest amount of GSH (10.73mg/g) and highest increase in MDA(45±1.47nmol/g),uric acid (34.8±2.54mg/dl) and nitric oxide(61.5±6.58nmol/l. These amounts were about 0.6,1.3.1.9 and 2.8 times as that of control, significant increase regarding GSH was found compared with control (either treated or non-treated with Ccl4) due to purslane extract or silymarin.Meanwhile a significant decrease

concerning uric acid or nitric oxide was found due to treatments compared with the control.On the other hand, MDA showed non-significant differences compared with control (untreated)except that of purslane +Ccl4 and this reflect role of portulaca oleracea as antioxidant materials. In this respect, **Naeem and Sohail,(2013)** reported that phytochemical constituents isolated from *portulaca oleracea* including steroids, vitamins, minerals, fatty acids, alkaloids and saponins played an important role in its antioxidant activity and hepatoprotective effects. **Hao *et al.*, (2009)** mentioned that *portulaca oleracea* can be used as medicinal plant where it is used for anti-aging thereby increasing the level of SOD and decreasing the level of MDA in the brains of mice treated with D-galactosamine. **Shirwaikar *et al.*, (2003)** reported that decreased levels of uric acid in the *portulaca oleracea* treated animals, may be due to its antioxidant potential. From the above mentioned data,it could be concluded that purslane aqueous extract improved the liver function injured with Ccl4 as compared to silymarin due to its content of phytochemicals.

Table (6): Effect of aqueous extract of purslane (*portulaca oleracea)* on liver function enzyme(µ/l)

	Control	CcL_4	Purslane	Silymarin	Purslane+CcL4+	Sylimarin+Ccl_4
	G_1	G_2	G_3	G_4	G_5	G_6
ALT(lU/L)	34±2.35	124±14***	28±1.34 ooo	30±2.07 ooo	49.38±1.35 ooo	51±2.64 ooo
AST(lU/L)	40±3.1	139±6.88***	30±1.67	36±1.73	56.5±3.18	63±3.79* o
ALP(lU/L)	24±2.05	37±2.93**	19±2.4 ooo	18±1.15 ooo	33±2.60	36±1.34**

All values are shown means and SE. *** significant p<0.01 as compared to control group
ooo Significant p<0.01 as compared to CcL_4 group

Table (6): Effect of aqueous extract of purslane(*portulaca oleracea* on lipid profile/L(mg/dL)

	Control	CcL_4	Purslane	Silymarin	Purslane+CcL4	Sylimarin+Ccl_4
	G_1	G_2	G_3	G_4	G_5	G_6
Cholesterol	59±5.14	105±8.27***	60±5.98 ooo	63.5±4.8 ooo	78±3.32 o	83.50±6.54
Triglycerides	34±3.41	150±8.58***	34.5±2.34 ooo	36±2.69 ooo	74.5±6.1*** ooo	94±4.89*** ooo
LDL-cholest	32±2.16	83±2.93***	31±1.12 ooo	35±2.55 ooo	56.5±4.52*** ooo	61±3.13*** ooo

All values are shown means and SE. ***significant p<0.01 as compared to control group
ooo Significant p<0.01 as compared to CcL4 group

Table (7): Effect of aqueous extract of purslane(*portulaca oleracea)* on liver antioxidants

	Control	CcL_4	Purslane	Silymarin	Purslane+CcL	Sylimarin+C
	G_1	G_2	G_3	G_4	G_5	G_6
GSH mg/g	19.5±1.24	10.73±0.52*	32.30±2.88** oo	31.4±2.53** ooo	25.30±1.59 ooo	22.28±2.17 oo
MDA nmol/g	34±2.65	45±1.47*	28.5±2.02	29±2.59	35.31±1.44 o	39.4±1.92
Uric A.mg/dl	18±0.70	34.8±2.54***	17.80±0.86 ooo	18.1±1.13 ooo	27.43±1.60*	29±2.77**
Nitric O.nmol/l	22±3.63	61.5±6.58***	22.0±3.03 ooo	17.3±3.51 ooo	51±5.5**	55.63±7.78**

All values are shown means and SE. *** significant p<0.01 as compared to control group
ooo Significant p<0.01 as compared to CcL_4 group

Histopathological results:

Microscopically, liver sections of control, untreated rat revealed the normal histological structure of hepatic lobule from central vein and normal hepatocytes (Fig. 11). Meanwhile, examined sections from CcL4 intoxicated rat showed cytoplasmic vacuolization of hepatocytes, marked apoptosis of hepatocytes (Figs. 12, 13, 14 & 15), oval cells hyperplasia (Fig. 13), fibroblasts proliferation in portal triads (Fig. 12) associated with portal fibrosis and mononuclear cells infiltration (Fig. 15). However, liver of rats treated with either silymarin alone or *portulaca oleraceas aqueous extract* alone revealed no histopathological changes (Figs. 16 & 17). Microscopically, liver of rat intoxicated with CcL4 and treated with silymarin revealed improvement in the histopathological picture, as examined sections from this group revealed cytoplasmic vacuolization of hepatocytes (Fig. 18), fatty change of hepatocytes and apoptosis of other hepatocytes (Fig. 19). Moreover, liver of CcL4 intoxicated rat treated with *portulaca oleracea* aqueous extract showed marked improvement in the signs of hepatic toxicity. Examined sections revealed vacuolar degeneration of focal hepatocytes

with apoptosis of hepatocytes (Figs. 20 & 21). In the present, the histopathological changes observed in liver section of Ccl_4-intoxicated rats are in harmony with earlier investigators who found centilobular necrosis, ballooning degeneration, inflammatory infiltration of lymphocytes and hydropic degeneration with a clear cytoplasm and vacuolization **(Demirdag *et al.*, 2004)** in rats injected with Ccl_4..

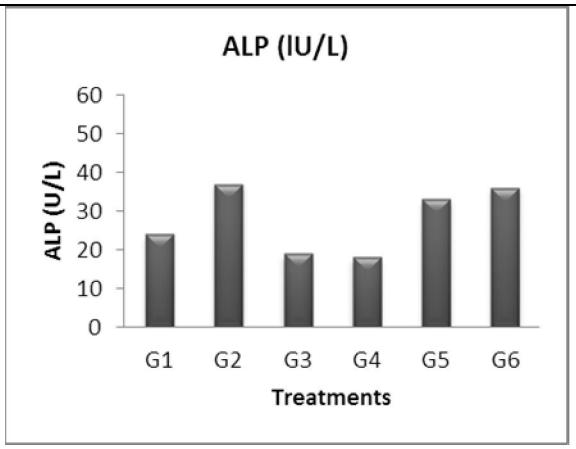

Fig (1): Effect of aqueous extract of purslane(*portulaca oleracea)* on alkaline phosphatase (ALK)

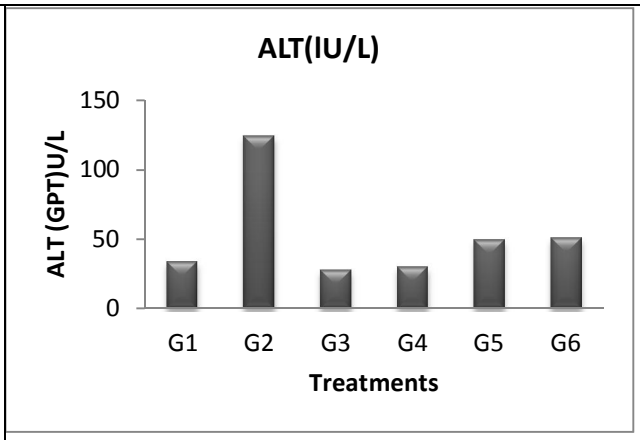

Fig (2): Effect of aqueous extract o purslane(f *portulaca oleracea)* on alanine aminotransferase (ALT)

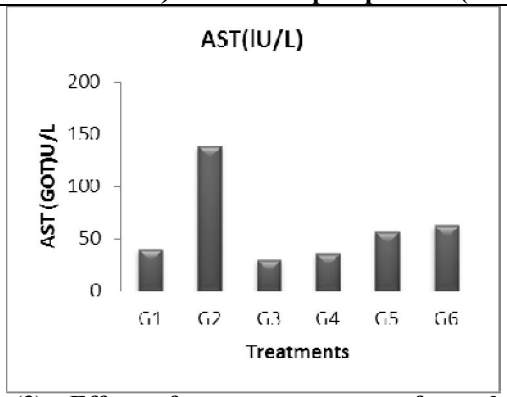

Fig (3): Effect of aqueous extract of purslane(*portulaca oleracea)* on Aspartate aminotransferase (AST)

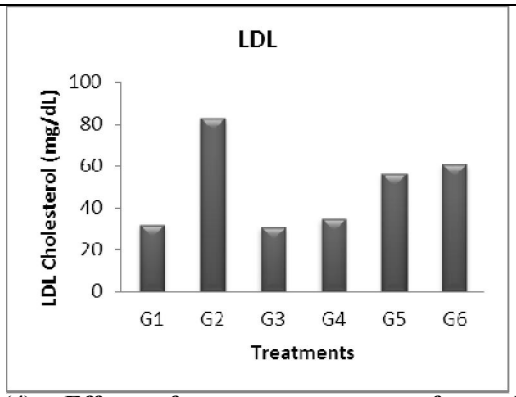

Fig (4): Effect of aqueous extract of purslane(*portulaca oleracea)* on low-density lipoprotein cholesterol (LDL)

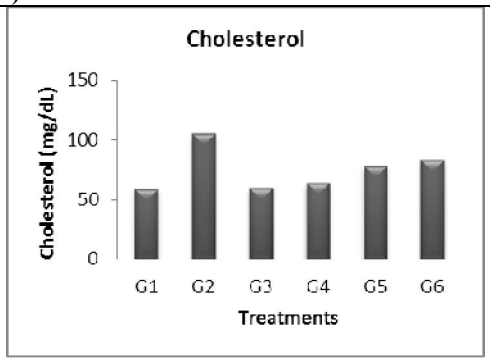

Fig (5): Effect of aqueous extract of purslane(*portulaca oleracea)* on total cholesterol (TC)

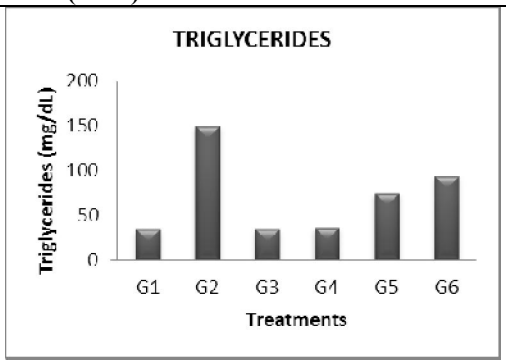

Fig (6): Effect of aqueous extract ofpurslane(*portulaca oleracea)* on triglycerides (Tg)

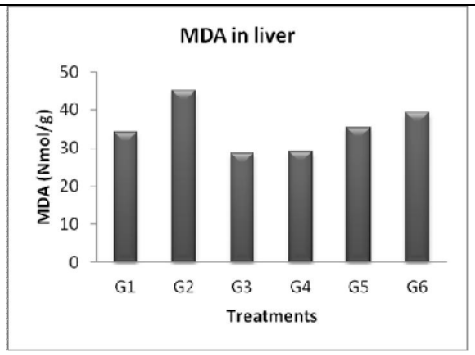

Fig (7): Effect of aqueous extract of purslane (*portulaca oleracea)* on malondialdhyde (MDA)

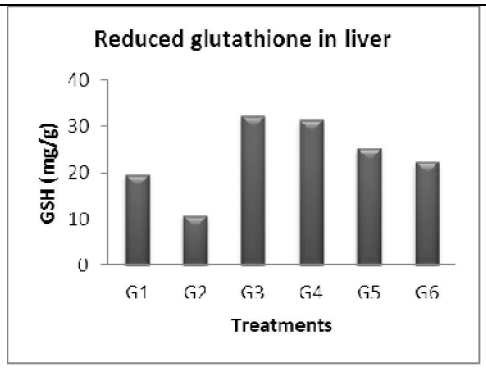

Fig (8): Effect of aqueous extract of purslane (*portulaca olerace)a* on reduced glutathione in liver (GSH)

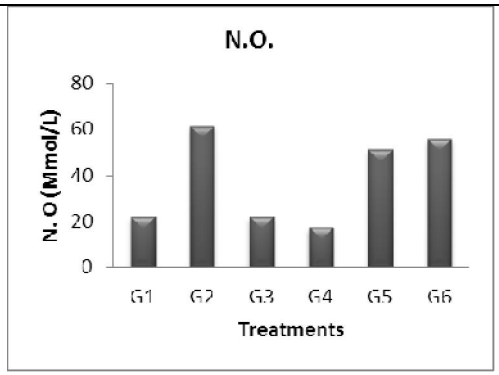

Fig (9): Effect of aqueous extract of purslane (*portulaca oleracea)* on nitric oxide (NO)

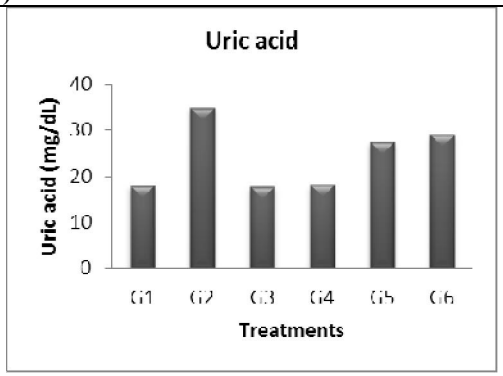

Fig (10): Effect of aqueous extract of purslane (*portulaca oleracea)* on uric acid.

The liver sections of the rats treated with silymarin & extract of *Portulaca oleracea* aqueous extract followed by Ccl4 intoxication showed a sign of improvement. The efficacy of any hepatoprotective drug is dependent on its capacity of either reducing the harmful effect or restoring the normal hepatic physiology that has been disturbed by a hepatotoxin. The silymarin group and the test group decreased Ccl 4 induced elevated enzyme levels, indicating the protection of structural integrity of hepatocytic cell membrane or regeneration of damaged liver cells **(Anusha *et al.,* 2011).** The *portulaca oleracea* extracts (ethanolic and aqueous) may exert antioxidant activities and protect the tissues from lipid peroxidation. The protective effects due to treatment with *portulaca oleracea* extracts strongly indicated the possibility of the extracts being able to prevent and/or mitigate any leakages of marker enzymes into circulation, condition the hepatocytes to accelerate regeneration of parenchymal cells, and preserve the integrity of the plasma membranes and hence restore these enzymes levels **(Al-Howiriny *et al.,* 2004).** Moreover, *portulaca oleracea* extracts have a membrane stabilizing effect **(Asai & Miyazawa, 2001)**. Additionally, there is growing evidence that the hepato-protective effect of extracts takes place directly at the level of hepatocytes by lowering intracellular levels of cholesterol and cytotoxic bile acids **(Wohaieb & Godin, 1987)**.

Anticancer experiment of dried powder of purslane (*portulaca oleracea).*

The effect of dried powder of *portulaca oleracea* on human hepatoma (HEPG2) cells, experiments conducted using cultured HEPG2. Result in table (8) and fig (22) showed that the concentration of dried powder of *portulaca oleracea* 12.5µg/ml recorded the highest percentage of HEPG2 dead cell (live cell of HEPG2 0.571).

By increasing concentration of dried powder of *portulaca oleracea* to 100 µg /ml recorded high percentage of HEPG2 dead cell 0.688 (live cell of HEPG2 was 0.332). The highest HEPG2 dead cell percentage recorded by dried powder of *portulaca oleracea* may be related to the presence of one or more phenolic compounds such as chlorogenic, elagic salcylic, ferulic, caffeic and catechin and one or more flavonoids compounds especially rosmarinic acid, rutin,quercitrin, quercitin and apignen. Also *portulaca oleracea* is known to be very rich source of

omega -3- fatty acid and beta-Carotene a known antioxidant that prevent cancer radical **(Chae *et al.*,2009).** Fig (22) appeared that dried powder of *portulaca oleracea* showed cytotoxic effects with the IC50 values of 17µg/ml in HEPG2 cell line. **Dursun *et al*., (2004)** revealed that the bioactive compound and health effects of *portulaca oleracea* grown in turkey were alkaloids, Beta-carotene, Beta-sitosterol, caffeic acid, catechol, chlorophyll, coumarin, DHA, EPA, ferulic acid, flavonoids, saponin and tannin acts as analgesic, antiaggregant, antiarhritic, antiartheriosclerotic, anticancer (breast, colon, fore stomach, liver, skin) activities.

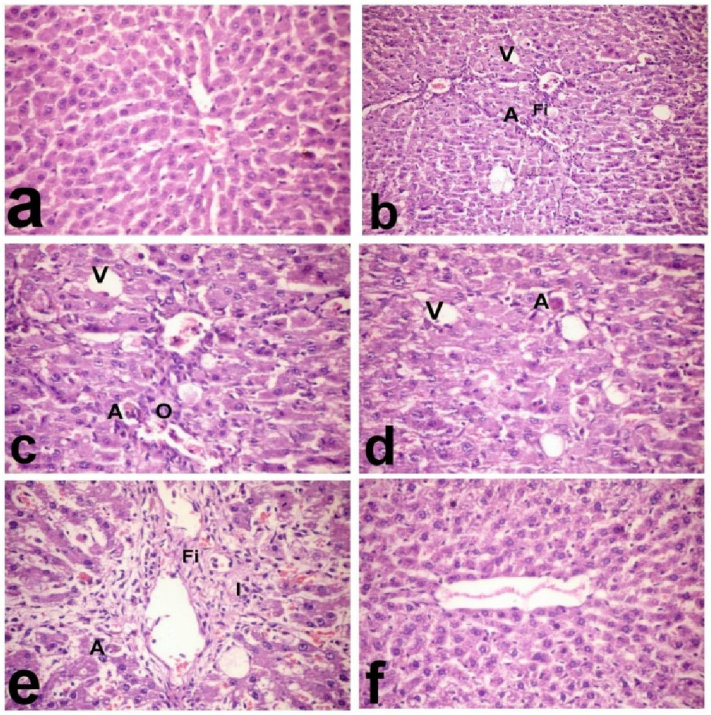

Plate (1):
Fig. 11 (a): liver of control, untreated rat showing the normal histological structure of hepatic lobule from central vein and normal hepatocytes (H & E X 400).
Fig.12 (b): liver of CcL4 intoxicated rat showing cytoplasmic vacuolization of hepatocytes, marked apoptosis of hepatocytes and fibroblasts proliferation in portal triads (H & E X 200).
Fig.13 (c): liver of CcL4 intoxicated rat showing cytoplasmic vacuolization of hepatocytes, marked apoptosis of hepatocytes and oval cells hyperplasia (H & E X 400).
Fig. 14 (d): liver of CcL4 intoxicated rat showing cytoplasmic vacuolization of hepatocytes and marked apoptosis of hepatocytes (H & E X 400).
Fig.15 (e): liver of CcL4 intoxicated rat showing portal fibrosis with mononuclear cells infiltration and apoptosis of hepatocytes (H & E X 400)
Fig. 16(f): liver of rat treated with silymarin showing no histopathological changes (H & E X 400).

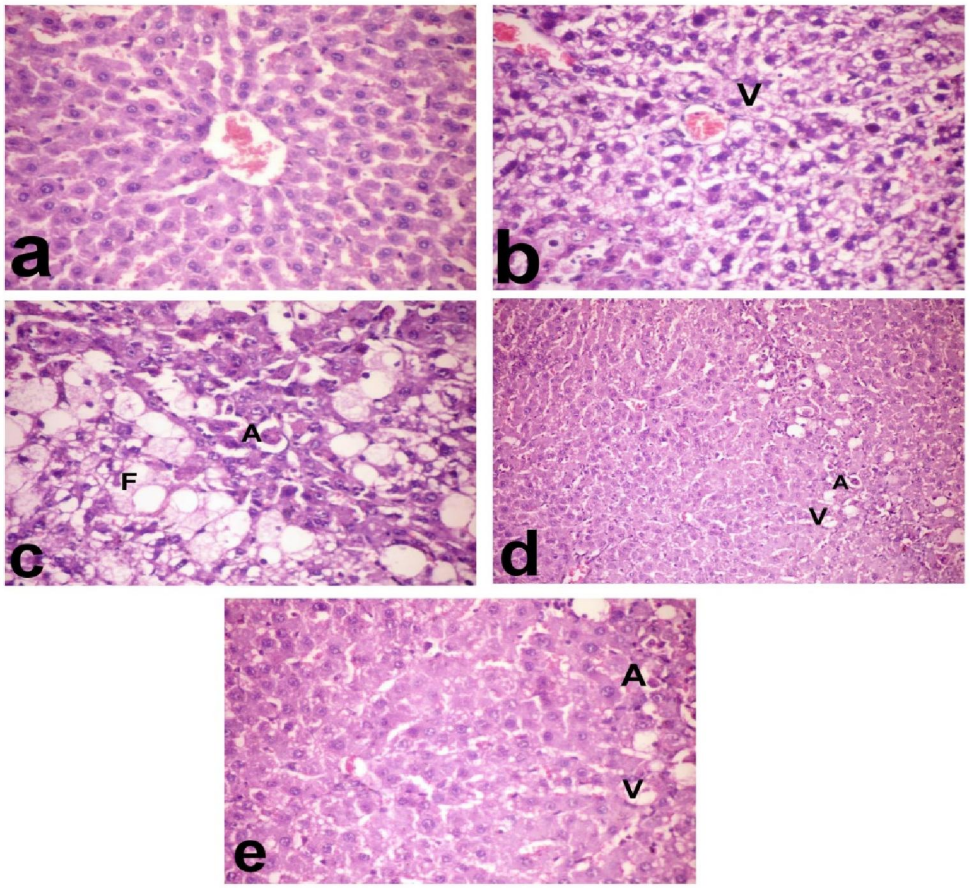

Plate (2):
Fig.17 (a): liver of rat treated with *portulaca* showing no histopathological changes (H & E X 400).
Fig.18 (b): liver of CcL4 intoxicated rat treated with silymarin showing cytoplasmic vacuolization of hepatocytes (H & E X 400)
Fig.19 (c): liver of CcL4 intoxicated rat treated with silymarin showing fatty change of hepatocytes and apoptosis of other hepatocytes (H & E X 400).
Fig.20 (d): liver of CcL4 intoxicated rat treated with *portulaca* showing vacuolar degeneration of focal hepatocytes with apoptosis of hepatocytes (H & E X 200).
Fig.21 (e): liver of CcL4 intoxicated rat treated with *portulaca* showing vacuolar degeneration of focal hepatocytes with apoptosis of hepatocytes (H & E X 400).

Table (8): Effect of dried whole plant of purslane (*Portulaca oleracea)* on HEPG2 cell liver.

CONG. µ g/ml	HEPG2*
0.000	1.000
12.500	0.547
25.000	0.409
50.000	0.336
100.000	0.332

*Liver cell of HEPG2

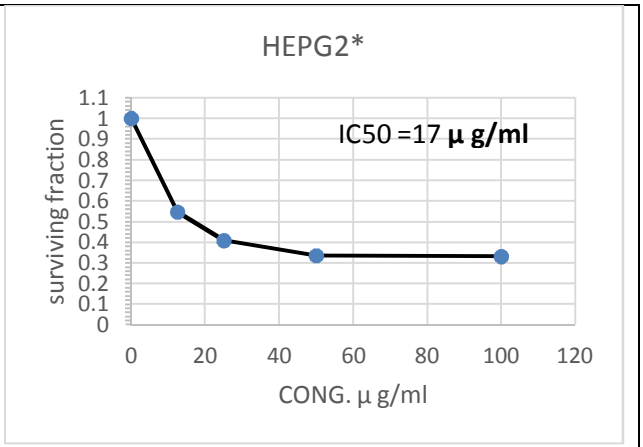

Fig. (22): Effect of dried powder whole plant of purslane (*Portulaca oleracea)* on HEPG2 cell liver.

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