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Potential Effect of Samwa (Cleome Droserifolia) Plant on Hepatointoxication Rats

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Abstract: *The present study aims to investigate the potential effect of different concentrations of 2.5, 5 ,7.5 and 10% Samwa as powder on Hepatointoxication complications in rats. thirty-six male albino rats, weighing 150±10 g, were used and divided into two main groups. The first group, 6 rats, was kept as a negative (-ve) control group fed on the basal diet while the second one, 30 rats, was injected by Carbon tetrachloride (Ccl4) to induce Hepatointoxication and divided into five equal sub groups. The second group was still fed on the basal diet and kept as positive (+ve) control group and the rest four groups were fed on the basal diet containing 2.5, 5, 7.5 and 10% of Samwa powder. Serum liver function (ALT, AST, ALP). kidney function (urea, creatinine, uric acid), Albumin, Total protein and histopathological changes of liver was examined the obtained results concluding that the feeding with the tested plant improved the kidney functions, liver functions specially the high concentrate of these studied plant used. All of these effects could be principally attributed to the strong antioxidant activities of these plant parts as the result of their high bioactive compounds content. These findings provide a basis for the use of Samwa plant for the treatment of complications caused by Hepatointoxication.*
KeyWords: *Hepatointoxication, liver functions, kidney functions, Samwa, and Histopathological organs.*

1. Introduction

Chronic liver disease is the world's 11th major cause of mortality and 14th leading cause of illness, with an increasing global incidence. Chronic liver injury from viral hepatitis, alcoholic liver disease, nonalcoholic fatty liver disease (NAFLD), or autoimmune liver diseases causes hepatic fibrosis, which is the most frequent pathophysiological process that leads to cirrhosis [1].

Liver fibrosis is a fibrous scar formation caused by an excessive buildup of extracellular matrix (ECM) proteins such as collagen and fibronectin, a critical stage in tissue repair [2]. During liver injury, hepatic stellate cells (HSCs) become activated and increase the release of inflammatory mediators and the production of ECM proteins; combined, these changes launch the wound-healing process

Minor and transitory tissue damage causes a temporary increase in the accumulation of ECM proteins, which contributes to tissue repair [1,3,4]. The liver is responsible for numerous key metabolic tasks, including nutrition digestion and delivery. Infections such as hepatitis B and C, as well as genetic abnormalities, can cause liver disease. Other liver illnesses may be caused by autoimmune reactions or medication toxicity. Obesity in the United States has increased the incidence of nonalcoholic fatty liver disease. Many liver illnesses increase an individual's risk of acquiring liver cancer. [5,6,7,8].

The only current treatment for end-stage liver disease is a liver transplant, and there are only so many livers available from deceased donors. Thus, NIDDK-supported liver research focuses on detecting liver illness early, conserving liver function in persons with liver disease, and discovering new treatment options, such as transplants using liver tissue from living donors. [5,6,7,8].

Samwa (Cleome droserifolia; Family: Cleomaceae) are found throughout the Middle East, including Egypt, Libya, Palestine, Syria, and other arid and semi-arid locations. It is one of the most widely used therapeutic herbs in South Sinai, Egypt. Samwa is used medicinally by Bedouins in South Sinai to treat stomachaches, skin allergies, and open wounds. It also has anticancer and hepatoprotective qualities. The aqueous and chloroformic extracts have been employed as hepatoprotectants, antidiabetic, and antibacterial agents. Furthermore, the ethanolic extract contains antihistaminic,

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relaxing, and tranquilizing properties [9]. Several authors have documented Samwa's biological roles, including antioxidant, antiparasitic, anticarcinogenic, and antibacterial properties. These biological benefits are due to the wide range of natural bioactive substances in Samwa, including terpenes, flavonoids, glucosinolates, anthocyanin alkaloids, and polyphenols [9].passed through an 80-mesh sieve was retained for packing in polyethylene pages and stored at 4 ^{0}C until use.

2. Material and Experimental Techniques.

Materials

Samwa was obtained from the local markets in 2024 from Sharqia Governorate.

Experimental animals

A total of 36 adult normal male albino rats Sprague Dawley strain weighing 150±10 g were obtained from Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt.

The chemical kits

Carbon tetrachloride (CCL4) was obtained from El-gomhoria Company for Med-Preparations, chemicals, and Medical Equipments, Cairo-Egypt as 10%liquid solution. It was dispensed in white plastic bottles each containing one litre as atoxic chemical material for liver poisoning according to [10]. At the same time it was mixed with 10% paraffin oil which was obtained from the pharmacy for dilution during the induction.

Methods

Preparations of Samwa powders

Samwa was washed and dried in a hot air oven (Horizontal Forced Air Drier, Proctor and Schwartz Inc., Philadelphia, PA) at 75 ^{0}C until arriving by the moisture in the final product to about 8%. The dried Samwa was ground into a fine powder in high mixer speed (Moulinex Egypt, ElAraby Co., Benha, Egypt). The material that passed through an 80-mesh sieve was retained for packing in polyethylene pages and stored at 4 ^{0}C until use.

Induction of Hepatointoxication

Hepatopathy was induced in thirty normal healthy rats injected with 0.2 mg\kg body weight by Carbon Tetrachloride for two weeks to induce liver-impaired [11]. After two weeks liver function (LF) was analyzed using a specific kit (AlGomhoryia Company for Trading Drugs, Chemicals and Medical Instruments, Cairo, Egypt) by a drop of blood obtained from the tail vein all rats had high liver enzymes and included in the study.

Experimental design

All biological experiments performed complied with the rulings of the Institute of Laboratory Animal Resources, Commission on Life Sciences, and National Research Council [12].Rats (n=36 rats), were housed individually in wire cages in a room maintained at 25 ± 2 0C and kept under normal healthy conditions. All rats were fed on a basal diet for one week before starting the experiment for acclimatization. After one week period, the rats were divided into two main groups, the first group (Group 1, 6 rats) still fed on basal/standard diet (SD) and the other main group (30 rats) was used for Hepatopathy induction for two weeks and classified into five subgroups as follow: group (2), fed on standard diet only as a positive control (rats with Hepatopathy); group (3), fed on SD containing 2.5 % (w/w) SPP; group (4), fed on SD containing 5 % (w/w) SPP; group (5), fed on SD containing 7.5 % (w/w) SPP; group (6), fed on SD containing 10 % (w/w) SPP. During the experimental period, the body weight and food intake were estimated weekly and the general behavior of rats was observed.

Relative organs weight

The organs of rats (liver) were carefully removed, washed in saline solution, dried between 2 filter papers, and immediately weighed and kept in buffered formalin solution (10%) for histopathological examination. The relative organ weight was calculated as follows:

$$\text{Relative organs weight } \% = \frac{\text{Organ weight (g)}}{\text{Total body weight (g)}} \times 100$$

Blood sampling

At the end of experiment period, 28 days, blood samples were collected after 12 hours fasting using the abdominal aorta and rats were scarified under ether anesthetized. Blood samples were received into glass centrifuge tubes, containing oxalate solution (1.34 %) as anticoagulant. After centrifugation at 3000 rpm for 10 min., plasma was with drown and used for the analysis of vitamins. The erythrocyte residue was washed with three successive portions of sodium chloride solution (0.9 %) and then haemolysed with deionised water for 30 min. Haemolysate was then centrifuged at 30,000 rpm for 30 min. and the supernatant fractions was transferred to a clean test tube and analyzed of antioxidant enzymes [13]. Liver organ was removed and used for GSH and MDA determination.

Biochemical analysis
Liver functions

Determination of serum alanine aminotransferase (ALT), serum asparatate aminotransferase (AST), serum alkaline phosphatase (ALP) [14,15,16].

Kidney functions

Serum urea and serum creatinin were determined by enzymatic method according to [17,18,19].

Total protein

Protein was estimated by Biuret which is a peptide bond of protein that reacts with the alkaline copper solution to give a violet coloration as described by [20, 21]. The violet color absorbs light at 530 nm by using spectrophotometer 20.

Albumin

Serum Albumin was determined as g/dl [22,23,24].

Histopathological investigation

Small specimens of the organ (liver) were taken from each experimental group, fixed in neutral buffered formalin, dehydrated in ascending concentrations of ethanol (70, 80, 90%), cleared in xylene, and embedded in paraffin. Sections of (4-6) µm thickness were prepared and stained with Hematoxylin and Eosin [25].

Statistical analysis

The data were analyzed using a completely randomized factorial design when a significant main effect was detected; the means were separated with the student-Newman-Keuls Test. Differences between treatments of ($P \leq 0.05$) were considered significant using spssProgram. Biological results were analyzed by One Way ANOVA [26].

3.Results and Discussion

The data presented in Table (1) illustrate the mean Liver weight (PW) of hepatic rats given smwa their combinations. Notably, the mean liver weight (PW) in grams of the positive control group exceeded that of the negative control group, measuring 4.73 and 2.88 respectively. Among the hepatic rats consuming various diets, a significant decrease in mean values was observed compared to the positive control group, which displayed values of (4.49, 4.23, 3.40, and 3.82) for Samwa 2.5%, Samwa 5%, Samwa 7.5%, and Samwa10% respectively. Rats fed a mixture of the tested plant parts displayed the most notable reduction in organ weight compared to the negative control group. These results align with those observed by [27]. regarding the feeding of certain plants to hepatic.

Table (1): Effect of feeding hepatic rats with Samwa on relative **Liver** weight (g/100 g. B.Wt.).

Organs weight (g/100 g. B.Wt.)	
Groups	**Liver**

	Mean ±SD
Group 1 (negative control)	2.88±0.05[f]
Group 2 (positive control)	4.73±0.07[a]
Group3 2.5 % Samwa	4.49±0.15[b]
Group 4 5 % Samwa	4.23±0.20[c]
Group 5 7.5 % Samwa	3.40±0.13[e]
Group 6 10 % Samwa	3.82±0.02[d]

Values are expressed as mean ± SD. Values in the same column have the different superscript letters are significantly different at p≤0.05.

Data obtained in Tables (2) show the effect of smwa on liver functions (ALT, AST and ALP) of hepatic rats. As shown the mean value of ALT of positive control group was higher than negative control group, being 68.30±2.20 and 21.10±1.28, respectively, showing significant difference between them. All hepatic rats fed on smwa revealed significant decreases in mean values as compared to positive control group. The values were 60.30±2.76, 52.70±4.40, 41.50±3.37 and 28.30±3.51 for smwa 2.50%, smwa 5 %, smwa 7.5%, and smwa (10%), respectively. Rats fed on groups 3, 4, 5 and 6 showed significant differences between them. Numerically group 5 and 6 (7.5 and 10% mixture) was the best treatment considering the ALT activity showed significant differences, in comparison with negative control group. The same behavior was observed for AST and ALP.

Table (2): Effect of smwa on liver functions (Mean ± SD) of hepatic rats

Groups	**Parameters**		
	ALT(U/L)	AST(U/L)	ALP(U/L)
	Mean ±SD	Mean ±SD	Mean ±SD
Group 1 (negative control)	21.10±1.28[f]	21.10±1.44[e]	65.90±1.80[e]
Group 2 (positive control)	68.30±2.20[a]	69.5±2.20[a]	85.90±2.03[a]
Group 3 2.5% Smwa	60.30±2.76[b]	65.90±2.24[a]	84.10±3.22[a]
Group 4 5% Smwa	52.70±4.40[c]	56.90±1.92[b]	79.81±2.24[b]
Group 5 7.5%Smwa	41.50±3.37[d]	50.90±5.50[c]	74.90±2.34[c]
Group 6 10%Smwa	28.30±3.51[e]	38.50±2.30[d]	69.90±1.38[d]

Values are expressed as mean ± SD. Values in the same column have different superscript letters are significantly different at p≤0.05.

These results suggest the effects of Cleome Droserifolia-rich extract in hepatic cadmium toxicity in mice. They discovered that Cd caused liver damage, inflammation, and apoptosis by depleting antioxidants. They validated the beneficial benefits of oleuropein from olive leaf extract (16 mg/kg b.w.), which significantly reverses all Cd toxicity aspects. As a result of its strong modulation of apoptosis and inflammation, Cleome Droserifolia may have an important role in the pharmacotherapy of various hepatic cellular and molecular dysfunctions, such as cancer. Furthermore, [28, 29]. Cleome Droserifolia extracts protect rats from high-fat diet-induced lipid metabolic disruption and liver injury. Both extracts, particularly the hydroxytyrosol-rich extract, were highly effective in protecting against body weight increase by inhibiting white adipose tissue formation. Furthermore, these extracts could provide protectionagainst the lipid metabolism disturbance and degenerative changes in hepatic cells caused by the HFD, not only by increasing the antioxidant system activity in the cells, but also by inhibiting the expression of proteins involved in inflammation and liver damage.

Data obtained in Tables (3) show the effect of smwa on kidney functions (on serum urea, creatinine, and uric acid) of hepatic rats. As shown the mean value of urea of positive control group was higher than negative control group, being 18.0±1.38 and 35.40±1.87 mg/dl, respectively, indicating significant difference between them. All hepatic rats fed on different diets revealed significant decreases in mean values as compared to positive control group. The values were 32.60±2.84a, 29.80±1.28, 26.20±2.57c and 21.20±2.83d for smwa 2.50%, smwa 5 %, smwa 7.5% and smwa 10 %

respectively. Rats fed on groups 3, 4, 5 and 6 showed significant differences between them. The best treatment was recorded for groups 5 and 6 (7.5 and 10 % smwa) as compared to negative control group. The same behavior was observed for uric acid and creatinine. These results agree with [30]**.** who suggests low cadmium exposure causes cell injury, possibly through inducing ROS production and treatment with smwa antagonizes the adverse effects of cadmium and decreases cadmium induced ROS generation in renal cells. [31]**.**

Table (3): Effect of smwa on kidney functions (Mean ± SD) on serum urea, creatinine, and uric acid of hepatic rats

Groups	**Parameters**		
	Urea (mg/dl)	Uric acid (mg/dl)	Creatinine (mg/dl)
	Mean ± SD	Mean ± SD	Mean ± SD
Group 1 (negative control)	18.0±1.38^{e}	2.02±0.63^{f}	0.67±0.03^{d}
Group 2 (positive control)	35.40±1.87^{a}	3.70±0.14^{a}	1.00±0.12^{a}
Group 3 2. 5 % smwa	32.60±2.84^{ab}	3.48±0.063^{b}	0.96±0.06^{a}
Group 4 5 % smwa	29.80±1.28^{b}	3.20±0.10^{c}	0.90±0.12^{ab}
Group 5 7.5 % smwa	26.20±2.57^{c}	2.76±0.124^{d}	0.80±0.071^{bc}
Group 6 10% smwa	21.20±2.83^{d}	2.40±0.148^{e}	0.74±0.20^{cd}

Values are expressed as mean ± SD. Values in the same column have the different superscript letters are significantly different at p≤0.05.

smwa, like other aldose reductase inhibitors, has promising therapeutic prospects for the treatment of hepatic complications such as nephropathy and smwa helps dissolve gall and kidney stones. Dry the smwa in the shade and grind it into fine powder. Mix the powder with water and rest it overnight. Drink this mixture daily to dissolve kidney stones.

Data obtained in Tables (4) show the effect of smwa on (**albumin** and total protien) of hepatic rats. As shown the mean value of **albumin** of positive control group was lower than negative control group, being 2.48±0.27 and 5.50±0.26, respectively, showing significant difference between them. All hepatic rats fed on smwa revealed significant increases in mean values as compared to positive control group. The values were 3.66±0.40, 3.46±0.58, 4.38±0.14 and 5.34±0.16 for smwa (2.5%, 5 %, 7.5% and 10%), respectively. Rats fed on groups 3, 4, 5 and 6 showed significant differences between them. Rats fed on groups 5 and 6 was the best treatment (7.5 and 10 % smwa) as compared to negative control group. The same behavior was observed for Total protein.

Table (4): Effect of smwa on serum total protein and serum albumin (Mean ± SD) of hepatic rats

Groups	**Parameters**	
	Albumin (mg/dl)	Total protein (mg/dl)
	Mean ±SD	Mean ±SD
Group 1 (negative control)	5.50±0.26^{a}	7.44±0.30^{a}
Group 2 (positive control)	2.48±0.27^{d}	5.46±0.10^{f}
Group 3 2.5%smwa	3.66±0.40^{c}	5.80±0.29^{e}
Group4 5%smwa	3.46±0.58^{cd}	6.24±0.18^{d}
Group5 7.5%smwa	4.38±0.14^{b}	6.68±0.15^{c}
Group6 10%smwa	5.34±0.16^{a}	7.26±0.17^{b}

Values are expressed as mean ± SD. Values in the same column have the different superscript letters are significantly different at p≤0.05.

Cleome Droserifolia increase total serum proteins, and albumin. In general, the useful effect of Cleome Droserifolia in improving liver functions Due to the presence of both total flavonoids and total phenols, Cleome Droserifolia rich sources of antioxidants. So, it is advice to add Cleome Droserifolia to bakery product and consume it as a routine diet to hepatic disease patients. Also, patients suffering from liver diseases may drink Cleome Droserifolia to enhancing liver functions and increase antioxidant enzymes. antioxidant and hepatoprotective activities in *smwa*, it may be concluded that, methanol extract of *smwa* **(**Cleome Droserifolia) possess significant protection and Chemo-prevention of Hepatotoxicity offered by the antioxidants fraternity of Cleome Droserifolia. **Liver toxicity or bile**: The cleansing virtues in Cleome Droserifolia is very healing for liver toxicity or bile ailments, like jaundice, hepatitis, food poisoning, diarrhoea or vomiting [32,33].

Histopathological investigation

Histopathological examination of Liver:

The impact of a smwa on the histological structure of hepatic rats was assessed.

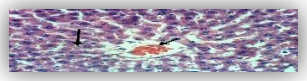

Photo. (1): Liver of rat from group 1-1 showing the normal histological structure of hepatic lobule (H & E X 400).

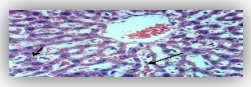

Photo. (2): Liver of rat from group 2-2 showing cytoplasmic vacuolization of hepatocytes with dilatation and congestion of hepatic sinusoids (H & E X 400).

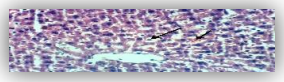

Photo. (3): Liver of rat from group 3-1 showing congestion of hepatic sinusoids and Kupffer cells activation (H & E X 400).

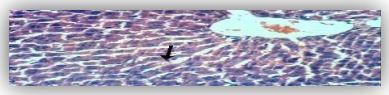

Photo. (4): Liver of rat from group 4-1 showing slight activation of Kupffer cells (H & E X 400).

Photo. (5): Liver of rat from group 5-1 showing congestion of central vein and activation of Kupffer cells (H & E X 400).

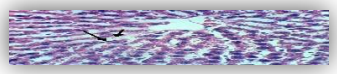

Photo. (6): Liver of rat from group 6-2 showing dilatation of hepatic sinusoids and activation of Kupffer cells (H & E X 400).

4. CONCLUSION

In conclusion, data of the present study has demonstrated the efficiency of the selected plant parts including smwa to partially ameliorate **Hepatointoxication** and its complications in hepatic rats. All of these treated effects could be attributed to the high contents of many bioactive compound categories found in the tested plant parts which exhibited high antioxidant activities. These antioxidant activities affect the organ weight, liver and kidney functions, and blood picture parameters in hepatic rats. These findings provide a basis for the use of the selected plant parts for the prevention and/or treatment of **Hepatointoxication**.

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