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Evaluation of the Renal Protective Effects of Cyperus at Varying Concentrations in a Rat Model of Kidney Disorders

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Cyperus plants are frequently utilized around the globe to cure a range of human ailments, including as stomach and intestinal issues, as well as for their diuretic, digestant, and lactodepurant properties. Cyperus is a very promising genus in the Cyperaceae family that is used for health supplementation. So current study aims to improving kidney health using different concentrations of (Cyperus) plant in kidney disorders rats. The experiment was conducted at an animal house. all rats

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were provided with a standard diet for a duration of one week. Subsequently, the rats were segregated into five groups, each consisting of 6 rats. The first group, serving as the control negative (n=6) and labeled as C-ve, were exclusively fed the basal diet for a duration of 28 days. Thirty rats were administered gentamicin to induce renal problems. The experimental groups were administered different concentrations of Cyperus (5%, 7%, and 15%). The findings indicated that group 5, consisting of rats with renal disorders that were fed with 15% Cyperus powder, had the highest blood glucose levels. Conversely, there were no significant variations seen in HDL levels among group 3 & group 4. While results found that Cyperus significantly reduced in urea and uric acid in kidney disorders rats. The results suggested to use Cyperus powder for kidney disorders rats.

Keywords: Cyperus; kidney disorders; kidney health.

1. INTRODUCTION

Cyperus is a genus of plants. These plants are either annual or perennial, predominantly found in aquatic environments and thriving in stagnant or slow-moving water with a maximum depth of 0.5 meters (20 inches). The species exhibit significant variation in size, ranging from little individuals measuring barely 5 centimeters (2 inches) in height, to others that may to a towering height of 5 meters (16 feet). Some common names for these plants involve papyrus sedges, umbrella-sedges, nutsedges, flatsedges & galingales. The stems exhibit either a circular or triangular cross-section. They have small grass-like leaves at the base as well as a whorl at the top of the blooming stalks, but they are often leafless. Greenish blossoms are wind-pollinated. Clusters grow among the apical leaves. The seed is a small nut. Atala, [1]. The Cyperaceae family consists over 5600 species of monocots that resemble grass, and they are found in temperate and tropical locations all over the world. From a phytochemical perspective, Cyperus is a very promising genus in the Cyperaceae family for health supplementation. A total of approximately 950 species are contained in it, with Cyperus rotundus L. being the species that has been investigated the most in the field of pharmacological trial. Cyperus spp. have long been employed for the treatment of various illnesses, for example gastrointestinal & blood abnormalities, menstrual irregularities, respiratory problems also inflammatory illnesses. The extracts of Cyperus spp. involve a variety of substance that is bioactive, for instance α-pinene, germacrene D, cyperotundone, α-corymbolol, α-cyperone, caryophyllene oxide, mustakone, & zierone. It is possible that these chemicals are responsible for the pharmacological impacts that the extract has. The species Cyperus sp. Zhuang et al. [2] is referred to. Cyperus plants are commonly employed worldwide for the treatment of several human maladies, including stomach and intestinal disorders, as well as for its digestant, diuretic, & lactodepurant properties. Other conditions that can be treated with the extracts from plants comprise bronchitis, blood abnormalities, amenorrhea, diarrhea, menstrual irregularities, dysentery, as well as inflammatory disorders. Extracts from plants are additionally employed as a specialized pharmaceutical ingredient. The trial done by Shresttha et al. in 2018. Despite the vast number of species under the Cyperus genus, the most often recorded ones are yellow nutsedge (*Cyperus esculentus* L.), purple nutsedge (*Cyperus rotundus* L.), in addition to *C. papyrus*. The species of Cyperus that can be discovered in South Asia the most frequently is the *Cyperus rotundus*. The plant is a perennial species that flourishes in soil with abundant moisture & possesses a robust capacity for reproduction via rhizomes in addition tubers. This plant is native to the tropical and subtropical regions of the Old World. Although it can be harmful in cultivated fields, it has been used for medicinal purposes since ancient periods. A round-legged Cyperus In various countries, rhizomes along with tubers are utilized for traditional Oriental medicine, such as China, India, Iran, and Japan, for the treatment of fever, digestive ailments, and menstrual irregularities. Abbey [3]. The presence of several bioactive components is responsible for the plant's numerous medicinal potentials, according to an increasing number of studies. Cypriol, a component of the essential oil of Cyperus scariosus R.Br., is used in a number of different medications and perfumes. Indeed, cypriol is in great demand in the perfume business because of its ambery, balsamic, spicy, warm, and woodsy characteristics. Other Cyperus species, including C. rotundus, C. articulatus L., in addition to Cyperus maculatus Boeckeler, also contain the essential oil. Dikwa et al. [4].

Vertebrates contain two kidneys, which have the appearance of reddish-brown beans. Approximately 12 centimeters (4+/2 inches) in length, they are situated on the right & left sides of the retroperitoneal site in adult persons. The paired renal veins discharge blood that has been supplied by the paired renal arteries. Ureters, which transport urine to the bladder, are connected to each kidney via a ureter.The kidneys eliminate a variety of metabolic waste products through the urine. The nephron is the fundamental unit of the kidney, responsible for its microscopic structure and function. The kidney filters, reabsorbs, secretes, and excretes blood, resulting in the generation of urine. The nitrogenous wastes found in the body consist of urea, which is produced from the breakdown of proteins, and uric acid, which is formed during the metabolism of nucleic acids [5].

2. AIM OF STUDY

To improve kidney health using different concentrations of the Cyperus plant in rats with kidney disorders.

Beneficial effects of *(Cyperus)* plant in improving biochemical & histological changes kidney disorders rats.

3. MATERIALS AND METHODS

3.1 Materials

A- Cyperus Source: harvested as dried material in the local market of Al-Baha City, KSA.

B-Experimental animals: The study utilized a sample of thirty male albino rats from the average weight of the Sprague Dawley strain is 150±10g.

C- Gentamicin (Aminoglycosides Antibiotics): Damaged kidney function can be caused in well male albino types by injecting gentamicin (an aminoglycoside antibiotic) gained from Memphis Co. Form Pharm. Chem. Ind Cairo., A.R.E. at a dosage of ten mg/kg/day for seven days. This leads to nephrotoxicity, which is one of the negative effects of gentamicin.

D- Choline chloride, casein, cellulose & DL Methionine: The substances cellulose, casein, DL methionine powder, as well as powder of choline chloride were acquired from Morgan Co. located in Cairo, Egypt.

E-Chemical kits utilized in this research (TC, ALT, albumin, HDL-c, TG, bilirubin, ALP, AST, creatinine, urea) were bought from Al-Gomhoria Company for Chemical, Medical & Instruments, located in Cairo, Egypt.

3.2 Methods

Analytical methods:

The moisture content was assessed by subjecting the sample to an air oven set at a temperature range of 100 – 102 degrees Celsius for about three hours. The content of total nitrogen was evaluated via the Marco Kjeldahl procedure, & the crude protein content was subsequently computed by multiplying the total nitrogen by a factor of 6.25. The fat content was assessed utilizing the Soxhlet equipment. The extraction process lasted for a duration of sixteen hours, utilizing n-hexane as the solvent for extraction. The content of Ash was determined following charring. The specimens were introduced into a muffle furnace and heated to a temperature of 525 degrees Celsius until a white or light grey residue was achieved, following the procedure outlined by the AOAC [6].

Crude fiber: The estimation of crude fiber**.**

Carbohydrates content: The carbohydrate content was determined utilizing the following formula: % Carbohydrates = 100 - (% ash + % protein + % fat + % moisture + % fiber)**.**

Diets:

Basal diet: The basal diet involves protein (10 percent), cellulose (5 percent), choline chloride (0.2 percent), corn oil (10 percent), and vitamin mixture (one percent) AIN. [7], salt mixture (four percent) [8] also corn starch (up to a full 100%) consistent with Jayasekhar et al., (1997).

Preparation of rats with impaired kidney: Gentamicin, an aminoglycoside antibiotic, can be used to induce impaired kidney function in albino rats by administering it through intraperitoneal injection at a dosage of 100mg/kg/day for a duration of 7 days. This method follows the nephrotoxicity protocol described by Farombi and Ekor [9], where one of the adverse reactions of gentamicin occurs**.**

Design of the Experimental: -

The Science Research Ethics Committee of the Faculty of Home Economics accepted the research protocol #11-SREC-06-2024.

For this experiment, thirty adult male white albino rats of the Sprague Dawley Strain were utilized. The rats were ten weeks old and weighed 140±10g. We used a baseline diet for all of the rats. For seven days in a row in 1993. Following this adaptation period, each of the five groups of rats is given a random assignment, with six rats per group. The groups are then separated as follows**:**

Group (1): As a control group, rats were given a standard diet**.**
Group (2): kidney disorder rats and non-treatment). (Control positive 6 rats).
Group (3): (kidney disorder rats and treatment with *(Cyperus)* powder 5%) (6 rats).
Group (4): (kidney disorder rats and treatment with *(Cyperus)* powder 7%) (6 rats).
Group (5): (kidney disorder rats and treatment with *(Cyperus)* powder 10 %) (6 rats).

At the beginning and end of each week of the experiment, researchers monitored the rats' overall behavior in addition to their weight and food consumption. After the 28-day trial is over, we will weigh the rats individually before killing them and drawing blood samples. After removing serum from specimens of blood by spinning them at 4000 rpm for ten minutes, they were placed in a deep freezer until they were needed. Before histological studies could be performed on the liver, kidney, spleen, or heart, the following procedures were carried out.

Biological evaluation:

This formulae were applied to determine the body weight gain percentage (BWG) & food efficiency ratio (FIR) in order to conduct the biological evaluation of the various diets in accordance with [10]:

$$BWG = \frac{\text{Final weight} - \text{initial weight}}{\text{Initial weight}}$$

$$FER = \frac{\text{Gain in body weight (g)}}{\text{Feed intake (g)}}$$

Organ's weight: Rat internal organs, including the heart, liver, kidney, & spleen, were meticulously taken away rinsed with saline solution, dehydrated using filter sheets & promptly weighed. They were then conserved in a buffered formalin solution (ten percent) for subsequent histological analysis**.**

Blood sampling: Tests of blood were taken from the retroorbital vein as well as the hepatic portal vein at the conclusion of every experiment after a twelve-hour fast. The specimens of blood were carefully placed into sterile, dry centrifuge tubes. After 28 minutes in a 37 degrees Celsius water bath, they coagulated. The tubes were centrifuged at 4000 RPM for 10 minutes after coagulation. Serum was carefully removed & placed in sterile Eppendorf tubes. The samples of serum were then stored at -20 degrees Celsius until analysis, in accordance with the methodology described by Schermer in 1967.

Biochemical Analysis:

Lipids profile:

Determination of serum total cholesterol: Applying the colorimetric approach designated by [11], the serum total cholesterol was measured.

Determination of serum triglycerides: The enzymatic approach was applied for estimating serum triglycerides, utilizing kits as described in the research conducted by [Fossati,1982] [12].

Assessment of high-density lipoprotein (HDL-c): it was measured as indicated by (Grodon and Amer,1977 & Fredewaid 1972).

The VLDL-c determination: it was estimated in mg/dl by [13].

Evaluation of low-density lipoprotein cholesterol (LDL-c): it was determined in mg/dl [13]

The atherogenic index (AI) assessment: equal (VLDL-C+ LDL-c) [14]**.**

Functions of the Liver:

Determination ALT: - performed in accordance with [15],

Determination aminotransferase (AST): it was performed by [16].

Kidney functions:

Determining the urea in serum: Urea was identified by the enzymatic technique in accordance with [17].

Evaluation of serum creatinine: It was identified in line with the method defined by [18].

Assessment of serum uric acid: it was measured calorimetrically with the technique of [19].

Determination of blood glucose: Serum glucose was measured calorimetrically applying the technique of [20].

Histopathological examination:

Following the scarification of the animals at the conclusion of the experimental period, kidney specimens were gained shortly thereafter. As a final step, the specimens were embedded in paraffin wax after being fixed in a neutral formalin solution containing 10% formalin, dried with ethyl alcohol, and cleaned with xylene. Hematoxylin and eosin were used to stain the slices, which varied in thickness from just four to six [21].

3.3 Statistical Analysis

A completely randomized factorial design, as described in SAS (1988), was applied to evaluate the data. After finding a statistically significant main effect, the Student-Newman-Keuls test was used to separate the means. A treatment was considered to have significant differences using the Costat Program if the significance threshold was below 0.05. A one-way analysis of alteration was utilized to analyze the biological information [22].

4. RESULTS AND DISCUSSION

This trail aimed to improve kidney health using different concentrations of (Cyperus) plant in kidney disorders rats.

4.1 Chemical Composition of (Cyperus) Plant Powder

In Table (1), we can see the chemical components of the (Cyperus) plant. From the results presented in Table (1), it could be noticed that the (Cyperus) plant contained 43.88, 19.09, 2.41, 27.60 and 7.02% as carbohydrate, Fiber, fat, protein and ash respectively. From the obtained results, it could be noticed that the (Cyperus) plant contained the highest component was carbohydrates followed by protein and fiber content.This finding similar to that recorded by Kilani et al. [23] reported that chemical constituents of (Cyperus) leaves were investigated on dry weight basis and the results showed that (Cyperus) leaves had the highest content of fiber when compared with wheat flour and lower than wheat flour carbohydrates content which was in range 37.44-45.05% while (Cyperus) leaves had high fat content as compared to wheat flour.

4.2 Biological Results

Data shown in Table (2) demonstration the impact of (Cyperus) plant on glucose (milligram per deciliter), of kidney disorders rats. Data showed the mean value of glucose in serum (milligram per deciliter) of kidney disorders rats fed on Cyperus powder 5%,7% and 15%. the mean value of serum glucose of control (negative) was less than control (positive) group, being 71.2 ± 0.9 and 78.3 ± 0.8, correspondingly, show significant differences, with percent of reduction -9.06. All kidney disorders rats fed on) Cyperus) powder 5%,7% and 15% significantly showed variances when contrasted with control (+) group. The values were 77 ± 1, 75 ± 1 and 73.5 ± 1.2 for Cyperus) powder 5%,7% and 15%, respectively. The percentage of decreases were - 1.66, -4.21 and -6.13 for groups three, four & five, correspondingly. Numerically, Group 5 achieved the highest blood glucose level (kidney disorder rats fed on Cyperus powder 15 %). These findings correlate with Rosello [5], they reported that the increased blood glucose levels were significantly reduced at 0, thirty, sixty, or 120 minutes after glucose administration in the ethanolic extract (250 & 500 milligram per kilogram body weight) as well as conventional glibenclamide (ten milligram per kilogram body weight) groups in contrast to the normal control group.

Table 1. Chemical composition of (Cyperus) plant (on dry weight basis %)

Samples	Chemical composition (%)				
	Protein	**Fat**	**Fiber**	**Ash**	**Total carbohydrate**
(Cyperus) plant	27.60	2.41	19.09	7.02	43.88

DW= Dry weight

Table 2. Influence of diverse levels of (Cyperus) plant on blood glucose in kidney disorder rats

Parameters	Glucose (mg/dl)	%Change of Control Positive group	LSD (P< 0.05)
Groups	Mean±SD		
(Gl)Negative control	71.2^{C} ±0.9	-9.06	
(G2) Positive control	78.3^{a}±0.8		
(G3) Cyperus powder 5%	77^{d} ±1	-1.66	
(G4) Cyperus powder7%	75^{C} ± 1	-4.21	0.27
(G5) Cyperus) powder15%	73.5^{d} ± 1.2	-6.13	

Values denote arithmetic means ± standard deviation of the mean
Means with different letter (a, b, c, d. etc,) in the same column differ significantly at (p<0.05), using ANOVA. test, while those with similar letter are non-significantly different

Table 3. Impact of altered levels of (Cyperus) plant on TC, TG in kidney disorder rats

Parameters	T.C (mg/dl) Mean ±SD	%Change of Control Positive group	LS.D (S0.05)	T.G (mg/dl) Me an+5 D	%Change of Control Positive group	LS.D (<0.05)
(Gl)Negative control	110^{e} ±1	-8.7		94^{d} ±1.00	-5.05	
(G2) Positive control	120.6^{a}± 1.3	-		99^{a} ± 1.00	-	
(G3) Cyperus powder 5%	117.3^{b} ± 1.5	-2.73	0.46	98.7^{b}±1.15	-0.30	0.12
(G4) Cyperus powder7%	115.5^{c} ± 1.2	-4.22		96^{C} ± 1.00	-3.03	
(G5) Cyperus) powder15%	113^{d} ± 1.00	-6.30		94^{d}± 1.00	-5.05	

Values denote arithmetic means ± standard deviation of the mean
Means with different letter (a, b, c, d. etc,) in the same column differ significantly at (p<0.05), using ANOVA. test, while those with similar letter are non-significantly different

Data in Table (3) demonstrate that Serum TC levels in the control (-) group were significantly lower than those in the control (+) group, with a mean drop of -8.7% (110 ± 1 vs. 120.6 ± 1.3). All renopathy rats fed (Cyperus) powder 5%, 7%, and 15% differed substantially from (+) group.The readings for amarnton (Helichrysum stoechas) powder 5%, 7%, and alcohol extract 5% were 117.3± 1.5, 115.5± 1.2, and 113± 1, respectively. Groups 3, 4 and 5 decreased 2.73, -4.22, and -6.30 percent. Group 5 (Cyperus 15%-fed renal disease rats) had serum TC measured.

As for, TG (mg/dl) Table (3) showed that the mean value of plasma TG of control (-) was lesser than control group, being 94 ± 1.00 & 99 ± 1.00, correspondingly, viewing significant variances, with percent of decrease -5. 05. The mean of group 3,4 and 5 values were 98.7± 1.15, 96 ± 1.00 and 94± 1.00. The finest blood TG was verified for group five (kidney disorder rats fed on Cyperus15%).

For of Table (4) showed the mean value of serum HDLc (mg/dl) of kidney disorder rats fed on Cyperus powder 5%,7% and 15%. the mean value of serum HDL of control (-) was higher than control (+) group, being 40 ± 1 & 38 ± 1 respectively, show significant differences, with percent of increase 5.26. The mean values were 37± 1, 38.3 ± 0.8 and 40 ± 1 for Cyperus powder 5%,7% and 15%, respectively. Group 3, and 4 showed no significant variances among them. Group 4, & 5 showed no significant distinctions among them. The percent of decreases were -0.26, 0.78 and 5.26 for groups three, four & five, correspondingly. The better serum HDL was recorded for group five (kidney disorder rats fed on Cyperus15 %).

For LDLc (mg/dl), statistics of Table (4) revealed that There was a significant distinction, with a reduction of 18.47 percent, amongst the control (+) & control (-) groups regarding the mean serum LDL values, which were 51.2 ± 0.9 and 62.8 ± 1.15, accordingly. All renopathy rats fed on Cyperus powder 5%,7% and 15% showed

significantly variations when equated with control (+) group. The values were 60.6± 0.41, 58 ± 1 and 54.2 ± 0.9 for Cyperus powder 5%,7% and 15% correspondingly. The percent of decreases were -3.50, -7.64 and -13.69 for groups three, four & five correspondingly. The best serum LDL was recorded for group five (kidney disorder rats fed on Cyperus15 %).

Also, VLDL, data of Table (4) indicated that the mean value of serum VLDL of control (negative) was lower than control (positive) group, being 18.8 ± 0.2 & 19.8 ± 0.2, respectively, show significant differences, with percent of decrease -5.05. All kidney syndrome rats nourished on Cyperus powder 5%,7% and 15% showed significantly differences when compared with control (+) group. The values were 19.7± 0.2, 19.2± 0.2 and 18.8 ± 0.2 for Cyperus powder 5%,7% and 15% separately. Group 3, and 4 showed nonsignificant distinctions among them. The percent of decrease were -0.50, -3.03 and -5.05 for groups three, four & five, correspondingly. The finest serum LDL was recorded for group five (kidney disorder rats fed on Cyperus15 %). Miller and Max, [24], found that (treatment of Cyperus significantly amplified HDL cholesterol level as well as diminished LDL cholesterol as contrasted with young control rats.

Statistics of Table (5) a demonstrate the mean value of serum AST (U/L) of kidney disorder rats nourished on Cyperus powder 5%,7% and 15%. The mean value of serum AST of control (negative) was lower than control (positive) group, being 56.2 ± 0.9 and 67 ± 1, respectively, show significant differences, with percent of decrease -16.11. All kidney disorder rats fed on Cyperus powder 5%, 7% and 15% showed significantly differences when compared with control (+) group. The values were 64.0 ± 1, 62.0 ± 1 & 60.0 ± 1 for Cyperus powder 5%,7% and 15% respectively. The percent of reduces were -4.47, -7.46 and -10.44 for groups three, four & five correspondingly. Numerically, the best serum AST was recorded for group five (kidney disorder rats fed on Cyperus15 %).

For ALT (u/1), Table (5) demonstrated that the mean value of serum ALT of control (-) was lower than control (+) group, being 27.0 ± 1.0 & 32.0 ± 1.0, correspondingly, show significant differences, with percent of reduce -15.62. All kidney sickness rats nourished on Cyperus powder 5%,7% and 15% showed significantly differences when equated with control (+) group. The values were 30.0 ± 1.0, 29.0 ± 1.0 & 28.0 ± 1.0 for Cyperus powder 5%,7% and alcohol extract5% respectively. Group 3, 4 and 5 showed nonsignificant variations among them. The percent of decreases were -6.25, -9.37 & -12.5 for groups three, four & five correspondingly. The better serum ALT was recorded for group five (kidney disorder rats fed on Cyperus 15 %). Chen and Angus., [25] discovered that animals treated with STZ had a reduction in enzyme activities after receiving Cyperus & glibenclamide. The results supported the idea that the ethanolic extract could refurbish liver function & showed that Cyperus might lower marker enzyme levels.

Kidney function tests (uric acid, urea, also creatinine) in rats with a kidney disease and the effects of Cyperus powder: Table 6 shows the average blood urea concentration (mg/dl) in rats with renal disease that were given5%,7%, or 15% Cyperus powder. It is clear that there was a substantial difference between the two groups, with a percent drop of -80.57, as the mean serum urea values of the control (negative) group and the control (positive) group were 17±1 and 87.5 ±1.2, respectively. When matched to the control group (+), rats with renal disorders that were given Cyperus powder at5%,7%, or 15% showed substantial variations. For 5%, 7%, and 15% Cyperus powder, the related values were 75 ± 1, 73.5 ± 1.2, as well as 72.2 ± 0.9, correspondingly. For groups three, four, and five, the percentage declines were -14.28, -16, and -17.48, respectively. Group five, which consisted of rats with renal disorders and were given Cyperus15%, had the best serum urea results.

For U.A (mg/dl), Table (6) demonstrate that the mean value of serum U.A of control (negative) was decrease than control (+) group, being 2.8± 0.1 & 3.1 ± 0.1, respectively, displaying significant differences, with percent of decrease -9.67. All kidney illness rats fed on Cyperus powder 5%,7% and 15%, showed significantly differences when compared with control (+) group. The values were 2.9 ± 0.1, 2.8 ± 0.l and 2.6 ± 0.1 for Cyperus powder 5%,7% and 15% respectively. Group three & four demonstrated nonsignificant variations among them. The percent of decreases were -6.45, -9.67 and -16.12 for groups three, four & five, respectively. The best serum U.A was recorded for group five (kidney disorder rats fed on Cyperus 15 %).

Table 4. Influence of different levels of Cyperus plant on serum LDL HDL, & VLDL in kidney disorder rats

Parameters	HDL (mg/dl) Mean ±SD	%Chang e of Control Positive group	L.S.D (<0.05)	LDL (mg/dl) Mean ±SD	%Chang e of Control Positive group	L.S.D (<0.05)	VLDL (mg/dl) Mean ±SD	%Chang e of Control Positive group	L.S.D (<0.05)
(Gl)Negative control	40.0 ± 1.0	5.26	1.70	51.2 ^{a}±0.9	-18.47	0.65	18.8 ^{b}±0.2	-5.05	0.363
(G2) Positive control	38.0 ^{a}±1.0	-		62.8 ^{b}±1.15	-		19.8 ^{a}±0.2	-	
(G3) Cyperus powder 5%	37.0 ^{b} ± 1	-0.26		60.6 ^{b}±0.41	-3.50		19.7 ^{b}±0.2	-0.50	
(G4) Cyperus powder7%	38.3 ^{ab}±0.8	0.78		58.0 ^{c} ± 1	-7.64		19.2 ^{b}±0.2	-3.03	
(G5) Cyperus) powder15%	40 ^{a}±1.0	5.26		54.2 ^{a}±0.9	-13.69		18.8 ^{b}±0.2	-5.05	

Values denote arithmetic means ± standard deviation of the mean.

Means with different letter (a, b, c, d. etc,) in the same column differ significantly at (p<0.05), using ANOVA. test, while those with similar letter are non-significantly different

Table 5. Effect of different levels of (Cyperus) plant on liver function in kidney disorder rats

Parameters	AST (UL) Mean ±SD	%Change of Control Positive group	L.S.D (<0.05)	ALT (U/L) Mean ±SD	%Change of Control Positive group	L.S.D (<0.5)
(Gl)Negative control	56.2^{C} ± 0.9	-16.11		27 ^{c} ± 1	-15.62	
(G2) Positive control	67.0^{a} ± 1.0	-		32^{a}±l	-	
(G3) Cyperus powder 5%	64.0 ^{b} ± 1.0	-4.47	0.08	30^{b}±l	-6.25	1.81
(G4) Cyperus powder7%	62.0 ^{b} ± 1.0	-7.46		29 c± 1	-9.37	
(G5) Cyperus) powder15%	60.0^{d} ± 1.0	-10.44		28 ^{c} ± 1	-12.5	

Values denote arithmetic means ± standard deviation of the mean.

Means with different letter (a, b, c, d. etc,) in the same column differ significantly at (p<0.05), using ANOVA. test, while those with similar letter are non-significantly different

Table 6. Influence of diverse levels of (Cyperus) plant on Kidney function (urea, uric acid & creatinine) in kidney disorder rats

parameters	**Urea**	**%Change of Control Positive group**		**U.A**	**%Change of Control Positive group**		**Creatini**	**%Change of Control Positive group**	
Variable Groups	**(mg/dl)** Mean ±SD	**ge of Control Positive group**	**LS.D (<0.05)**	**(mg/dl)** Mean ±SD	**ge of Control** Group	**LS.D (<0.05)**	**(mg/dl)** Mean ±SD		**LS.D (<0.05)**
(Gl)Negative control	17 ^{e}± 1	-80.57		2.8 ^{bc} ±0. 1	-9.67		0.2 ^{d} ±0.1	-93.54	
(G2) Positive control	87.5 ^{a} ± 1.2	-		3.1 ^{a}±0.1	-		3.1 ^{a}±0.1	-	
(G3) Cyperus powder 5%	75 ^{b} ± 1	-14.28	0.252	2.9^{b} ±0. 1	-6.45	0.181	2.6 ^{b} ±0. 1	-16.12	0.181
(G4) Cyperus powder7%	73.5 ^{b} ± 1.2	-16		2.8 ^{ab}±0.1	-9.67		2.4 ^{c}±0.1	-22.58	
(G5) Cyperus) powder15%	72.2 ^{d} ±0.9	-17.48		2.6 ^{a}±0.1	-16.12		2.3 ^{c}±0.1	-25.80	

Values denote arithmetic means ± standard deviation of the mean.

Means with different letter (a, b, c, d. etc,) in the same column differ significantly at (p<0.05), using ANOVA. test, while those with similar letter are non-significantly different.

As for creatinine (mg/dl), Table (6) demonstrate that the mean value of serum creatinine of control (-) was lower than control (+) group, being 0.2± 0.1 and 3.1 ±0.1, respectively, viewing significant differences, with percent of decrease -93.54. All kidney sickness rats fed on Cyperus powder 5%,7% and 15% showed significantly differences when paralleled with control (positive) group. The values were 2.6 ±0.1, 2.4 ± O.land 2.3± 0.1 for Cyperus powder 5%,7% and alcohol extract5% respectively . Group four & five showed nonsignificant variations among them. The percent of decreases were -16.12, -22.58 and -25.80 for groups three, four & five, respectively. The better serum creatinine was recorded for group five (kidney disorder rats fed on Cyperus 15 %). This result agrees with Nazish and Noma., [26] they found that Experimental rats exposed to NaF were studied for the effects of Cyperus esculentus nut extract on the levels of IL-1β and TNF-α in the kidneys and liver. The results are shown as the Mean ± S.E.M., with n = 6 in each group. α denotes a significant deviation from the control, while p< 0.05 indicates a significant deviation from NaF. The analysis was conducted using One-Way ANOVA. Principal: Sodium fluoride; Cyperus esculentus [27-30].

4.3 Histopathological Results

Liver: Microscopically liver of rat from group 1(control negative), untreated rat showed normal histological structure of the hepatic cells (HCs), central vein (CV) and portal area (arrow) (Fig. 1). On the other hand, Liver of rat from group 2 (control positive) showed marked swelling, degeneration (arrow) and necrosis (dotted arrow) of the hepatic cells with few apoptotic cells (Fig. 2). While Liver of rat from group 3(fed 5% Cyperus) showed marked protection of the hepatic parenchymal cells and mild necrobiotic changes (Fig. 3). Microscopic examination of the liver from rats of group 4 showing good protection of the hepatic cells, notice the congestion of the portal vessel (Co) and few proliferated bile ductules (dotted arrow) in the portal area (Fig. 4). Histopathological study of sections from the liver rats of group 5 showed showing very mild necrobiotic changes of the hepatic cells (Fig. 5).

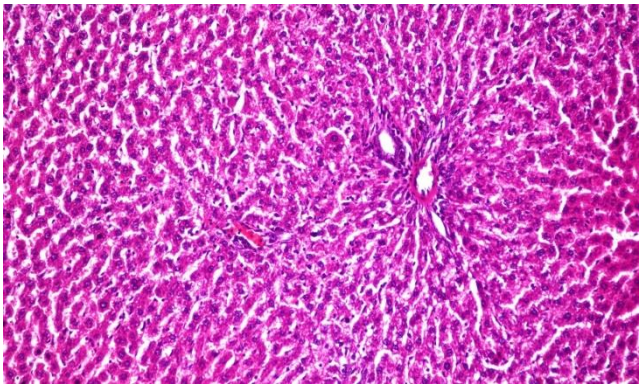

Fig. 1. Liver of control rat showing normal histological structure of the hepatic cells (HCs), central vein (CV) and portal area (arrow). (H&E, X200)

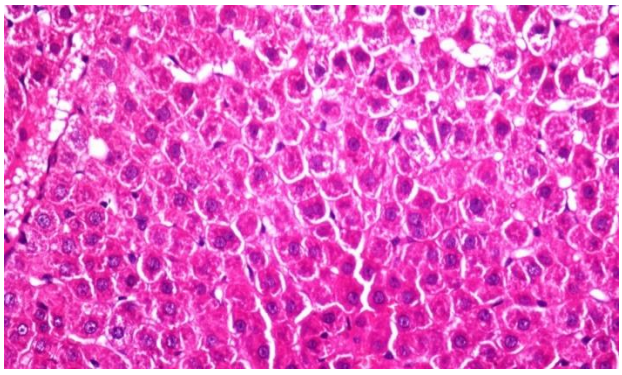

Fig. 2. Liver of control positive rat showing marked swelling, degeneration (arrow) and necrosis (dotted arrow) of the hepatic cells with few apoptotic cells. (H&E, X400)

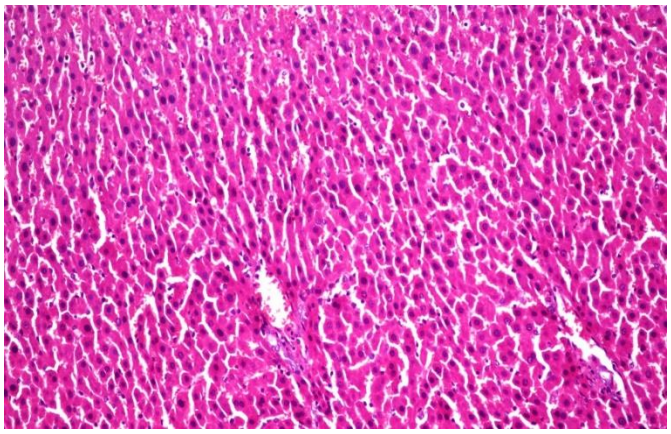

Fig. 3. Liver of control positive rat that treated with (5% Cyperus) showing marked protection of the hepatic parenchymal cells and mild necrobiotic changes. (H&E, X200)

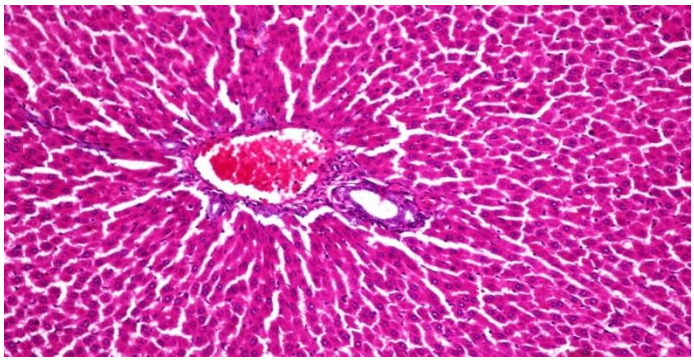

Fig. 4. Liver of control positive rat that treated with (10% Cyperus) showing good protection of the hepatic cells, notice the congestion of the portal vessel (Co) and few proliferated bile ductules (dotted arrow) in the portal area. (H&E, X200)

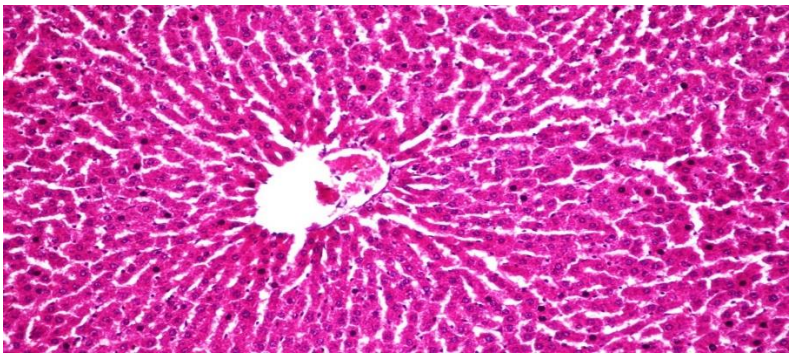

Fig. 5. Liver of control positive rat that treated with (15% Cyperus) showing very mild necrobiotic changes of the hepatic cells. (H&E, X200).

5. RECOMMENDATIONS

1. It is suggested to use different levels of Cyperus powder for kidney disorder patients.
2. Uses different levels of Cyperus powder, may be suggested for lowering LDL and atherogenig index levels and blood glucose.

6. CONCLUSION

The experimental findings of the present study concluded that Cyperus is capable of exhibiting

significant improving activity of kidney. The also showed improvement in glucose levels; biochemical parameters such as SGOT, SGPT, and lipid profile and might be valuable good.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

ETHICAL APPROVAL

The Science Research Ethics Committee of the Faculty of Home Economics accepted the research protocol #11-SREC-06-2024.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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