

دراسه للتأثير المحتمل لبذور (الحلبه والكتان) علي الفشل الكلوي الحاد في الجرذان

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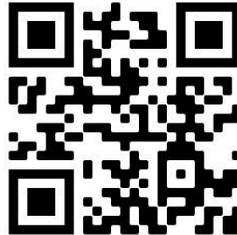
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الملخص العربي

إصابة الكلى الحادة شائعة بشكل متزايد في جميع أنحاء العالم. لذلك أجريت هذه الدراسة للتحقيق في التأثير المحتمل لبذور الحلبة وبذور الكتان على الفشل الكلوي الحاد في الفئران. تم استخدام ستة وثلاثين من ذكور الجرذان البيضاء وزنها 140 ± 10 جم في هذه الدراسة وتم تقسيمها إلى مجموعتين رئيسيتين ، المجموعة الرئيسية الأولى (6 فئران) التي تم الاحتفاظ بها كمجموعة ضابطة سلبية (v -) تلقت نظامًا غذائيًا أساسيًا طوال فترة التجربة (أربعة أسابيع) ، بينما تم حقن المجموعة الرئيسية الثانية (30 جرّدًا) بالجلسرين لاحداثالفشل الكلوي حاد وتم تقسيمهم إلى خمس مجموعات فرعية ، الأولى المجموعة الضابطة الموجبة (v +) ، والثانية والثالثة أعطيت نظام غذائي أساسي مكمل بالحلبة (5%) و (10%) ، على التوالي. المجموعة الرابعة والخامسة أعطوا نظامًا غذائيًا أساسيًا مكملًا ببذور الكتان (5%) و (10%) على التوالي لمدة اربع اسابيع.تم إجراء التركيب الكيميائي وكذلك محتوى المواد الفينولية والفلافونويدات الكلية لكلا النباتين. في نهاية التجربة ، تم حساب البيانات البيولوجية ؛ تم أخذ سيرم الدم لعمل التحاليل الحيوية. بالإضافة إلى ذلك ، تم إجراء الفحص التشريحي للكلى.

أوضحت النتائج أن نسبة وزن الجسم المكتسب ، وكمية الغذاء المتناول ، ونسبة كفاءة الاستفادة من الغذاء، وسوبرأوكسيدديسميوتاز (SOD) ، والجلوتاثيون بيروكسيداز (GPx) ، والكتالاز (CAT) ، انخفضت في المجموعة الضابطة (v +).

بينما ووظائف الكلى (حمض اليوريك واليوريا والكرياتينين) و الوزن النسبي للكلى تزداد في المجموعة الضابطة (v +). أظهرت جميع المجموعات المعالجة بكلا النباتين تحسناً في المتغيرات السابقة مقارنة بالمجموعة الضابطة الموجبة ، خاصة المجموعات المعالجة بجرعات عالية من النباتات.

في الختام ، يمكن الاستفادة من استهلاك الحلبة وبذور الكتان في تحسين وظائف الكلى والحماية من عوامل خطر الإصابة بالفشل الكلوي الحاد في الفئران.

الكلمات المفتاحية:الفشل الكلوي الحاد-الحلبة-الكتان-الهستوباثولوجي-التركيب الكيميائي

Study the potential effect of (fenugreek and flaxseed) seeds on acute renal failure in rats

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ABSTRACT

Acute kidney injury is increasingly common around the world; so the present study was carried out to investigate the potential effect of fenugreek and flaxseed seeds on acute renal failure in rats. Thirty-six male albino rats weighing 140 ± 10 g were used in this study and divided into two main groups, the first main group (6 rats) kept as a negative control group (v -) received a basal diet throughout the experiment period (four weeks), while the second main group (30 rats) were injected by glycerol to induce acute renal failure and divided into five subgroups, the first was the (v +) control group, the second and third given a basal diet supplemented with fenugreek (5%) and (10 %), respectively. The four and five groups were given a basal diet supplemented with flaxseed (5%) and (10%), respectively for four weeks. The chemical composition, total phenolic and total flavonoids contents for both plants were done. At the end of the experiment, biological data were calculated; blood samples were taken to biochemical analysis. In addition, a histopathological examination for the kidney was done. The results revealed that body weight gain %, feed intake ,feed efficiency ratio, ,serum Superoxide Dismutase (SOD), Glutathione Peroxidase (GPx) and Catalase (CAT) decreased in the (v +) control group. Kidney function; uric acid, urea, and creatinine , are increased in the (v +) control group. All treated groups with two plants showed improvement in previous parameters compared with the positive control group, especially treated groups with high doses of plants. In conclusion, the consumption of fenugreek and flaxseed (5 and 10%) could be used for improving

kidney function and protecting from the risk factor of acute renal failure rats.

Keywords: Acute renal failure- fenugreek - flaxseed- Histopathology-chemical composition.

INTRODUCTION

Acute kidney injury (AKI) is a syndrome characterized by a rapid (hours to days) deterioration of kidney function. It is often diagnosed in the context of other acute illnesses and is particularly common in critically ill patients. The clinical consequences of AKI include the accumulation of waste products, electrolytes, and fluid, but also less obvious effects, including reduced immunity and dysfunction of non-renal organs (**Singbartl and Joannidis ,2015**).

Fenugreek (*Trigonella foenum-graceum L.*) is an annual diploid plant of the family *Leguminosae*, which is known under various names around the world. Fenugreek plants have a distinctive and long-lasting spicy aroma (**Bieńkowski et al., 2016**).

Fenugreek, is an annual plant native to India and North Africa; but now, widely cultivated almost all over the world this plant, has been used in herbal medicine for a long time around the world, its leaves and seeds, which are commonly used as leafy vegetables and condiments, and as traditional herbal medicine as Ayurveda treatments of a variety of conditions and is a part of traditional diets (**Jiang et al.,2017**).

Seeds of fenugreek spice have medicinal properties such as hypocholesterolemic , lactation aid, antibacterial, gastric stimulant, for anorexia, antidiabetic agent, galactogogue, hepatoprotective effect and anticancer. These beneficial physiological effects including the antidiabetic and hypocholesterolemic effects of fenugreek are mainly attributable to the intrinsic dietary fiber constituent which have promising nutraceutical valu (**Kumar and Bhandari , 2015**).

Flax (*Linum usitatissimum*), also known as common flax or linseed, is a member of the genus *Linum* in the family *Linaceae*.

(**Quanru and Lihua, 2016**).

Flaxseed is important in the food chain throughout the world because of its physiological advantages in preventing or treatment of diseases as a functional food. Flaxseed has been regarded as a Generally Recognized As Safe (GRAS), source of vitamins, minerals, proteins, and peptides (including bioactive cyclic peptides), lipids (including omega-3 and omega-6 polyunsaturated fatty acids), carbohydrates, lignans, and dietary fiber. Due to its beneficial features for health, it has been applied in specific diets. (Dzuvor *et al.*, 2018).

Flaxseed is found in two types (1) brown and (2) yellow or golden brown and yellow flaxseeds have equal numbers of short-chain ω -3 fatty acids and identical nutritional features (Ebrahimi *et al.*, 2021). Flaxseed, similar to other natural compounds such as curcumin, sesamin and chrysin, contains several components that have anti-inflammatory, antioxidant and antiapoptotic actions. It contains fiber, lignans, polyunsaturated fatty acids and other bioactive compounds which collectively can decrease inflammation, oxidative stress and improve hemodynamic status. For example, the consumption of flaxseed was found to have cardioprotective effects via lowering the blood pressure, the circulating lipids and by exerting antiplatelet and antiatherosclerotic actions (Al Za'abi *et al.*, 2021)

This work was carried out to study the potential effect of some seeds (flaxseed and fenugreek) on acute renal failure in experimental rats caused by glycerol.

MATERIALS AND METHODS

Materials:

Plant materials: Flaxseeds (brown) and fenugreek were purchased from The Local Company for Herbs and Medicinal Plants, Cairo Governorate, Egypt.

Experimental animals: A total of 36 adult male albino rats (Sprague-Dawley strain) weighing 140 ± 10 g. were obtained from the animal colony, Helwan farm, Vaccine and Immunity Organization, Ministry of Health, Cairo Governorate, Egypt.

Chemicals: Glycerol was used to induce acute renal failure. It was obtained from El-Faroniah Company for Pharmaceutical and Chemical industries Tanta, El-Gharbia, Egypt. It was injected once intramuscularly with glycerol (10ml/kg BW, 50%v/v in sterile saline) to induce acute renal failure.

Methods:

Plant sample preparation: Fenugreek seed and flaxseeds(brown) used in the experiment were homogenized in the blender, and then stored at room temperature in closed glass bottles in the dark until used.

Chemical analysis of plant samples: The studied seeds were chemically analyzed in order to identify their poly-phenolic compound profiles according to AOAC (2010).

Experimental design: Animals were kept in clean wire cages under hygienic conditions. Feed was introduced to the rats in special food containers to avoid scattering. Similarly, fresh water was provided *ad-libitum* and checked daily. Adaptation will be continued for one week. The rats fed on a basal diet (B. D.) according to Jerome *et al.*, (2002) and divided into two main groups as follows:

The first main group: (6 rats) fed on basal diet for 4 weeks as a negative control group.

The second main group: (30 rats) injected intramuscularly with glycerol in 0.9% saline at 10 ml/kg body weight to induce acute renal failure (Karam *et al.*, 1995) and divided into equal (5) subgroups (each 6 rats) as follows:

Subgroup (1): Fed on a basal diet and kept as a positive group.

Subgroup (2) : Fed on a basal diet containing fenugreek seed (5%) for 4 weeks .

Subgroup (3): Fed on fed on basal diet containing fenugreek seed (10%) for 4 weeks .

Subgroup (4): Fed on fed on basal diet containing flaxseed (5%) for 4 weeks.

Subgroup (5): Fed on fed on basal diet containing flaxseed (10%) for 4 weeks.

Fenugreek and flaxseed powders added on account of corn starch in diet .

Biological evaluation:

Body weight and feed consumption were measured twice a week and the total feed intake of the experimental period (6 weeks) was calculated according to (**Chapman *et al.*, 1959**). The feed efficiency ratio was calculated according to (**Hosoya ,1980**).

Kidney functions parameters:

Serum creatinine, serum urea and serum uric acid were determined according to **Murray and Kaplan,(1984)** and **Fossati *et al.*,(1980)**, respectively.

Determination of the activity of liver enzymes:

Serum aspartate and alanine aminotransferase: AST(SGOT) and ALT(SGPT) were determined in the serum as described by **Reitm and Franke (1957)**.

Serum proteins:

Total protein, albumin and globulin were determined as described by method of **Weichselbaum (1946)**,**Bartholomev and Delany (1966)** and **Coles (1974)** respectively.

Antioxidant enzymes

Glutathione peroxidase (GPx), (SuperOxide Dismutase (SOD), Catalase (CAT), were determined according to the methods of **Paglia and Valentine, (1967)**, **Nishikimi *et al.*, (1972)**and **Aebi (1984)** respectively.

Determination of malondialdehyde (MDA):

Malondialdehyde(MDA) was determined by the method of **Okhawa *et al.*,(1979)**.

Determination of electrolyte:

Serum sodium and potassium:

Serum sodium and potassium were measured according to the colorimetric method described by **Henry (1974)**.

Histopathological examination:

After the sacrifice of rats, the kidney was removed and immersed in 10% buffered neutral formalin solution. The fixed specimens were then trimmed, washed and dehydrated in ascending grades of alcohol. After that, they will be cleared in xylol, embedded in paraffin, cut in sections of 4-6 microns thickness and stained with hematoxylin and eosin (Carleton *et al.*, 1980).

Statistical analysis

Statistical analysis was carried out using one way analysis of variance (ANOVA) test followed by Duncan test through the program of statistical packages for the social science (SPSS) version 16. Results were expressed as mean \pm SD. The differences among means at $p \leq 0.05$ are considered to signify according to **Snedecor and Cochran (1989)**.

RESULTS:

Table (1): shows the total phenolic and total flavonoid contents in flaxseed and fenugreek, The amount of total phenolics in flaxseed and fenugreek were 0.31 and 0.37 % respectively . While, the amount of total flavonoids in flaxseed and fenugreek were (17.57 and 82.9 mg/100g respectively).

Table (2): shows the averages (g) of carbohydrate, protein, fat, moisture , fibers and ash per 100g. flaxseed and fenugreek. The results of chemical compositions for flaxseed powder revealed that the highest average recorded by carbohydrate(39.3) followed by fat(37.37), fibers(9.15), moisture(2.85), ash(2.06) and protein (8.88) respectively. While, the results of chemical compositions for fenugreek powder revealed that the highest average recorded by carbohydrate(55.23) followed by fat(12.32) , fibers(8.98) , moisture (4.01), ash(2.38) and protein(14.25) respectively

Table (3): shows the effect of fenugreek, (5% and 10%), and flaxseed (5% and 10 %) on feed intake (FI), body weight gain (BWG %) and

feed efficiency ratio (FER) in acute renal failure rats. The results showed that previously mentioned parameters recorded an increase in a negative control group as compared to the positive control group. All the treated groups with fenugreek and flaxseed (5 %, 10 %) showed a significant decrease as compared to the negative control group.

Table (4): shows the effect of fenugreek (5% and 10%) and flaxseed (5% and 10%) on relative kidney weight in acute renal failure rats. Relative kidney weight value showed a significant increase in the positive control group as compared to the negative control group . All treated groups indicated significant decrease as compared to the positive control group. The best result was found in the treated group with (flaxseeds10%) and close to the normal group.

Table (5): shows the effect of fenugreek (5% and 10%) and flaxseed (5% and 10%) on kidney function;(uric acid, urea, and creatinine). The results showed the increase of plasma creatinine, urea, and uric acid in the positive control group which were significantly higher compared to the normal control group. fenugreek(10 %)and flaxseed(10 %) groups had significantly decreased the plasma levels of uric acid, urea and creatinine. The best results of plasma creatinine levels were found in treated groups of fenugreek(10 %).

Table (6): shows the effect of fenugreek (5% and 10%) and flaxseed (5% and 10%) on serum electrolytes sodium and Potassium. It shows that decrease in the positive control group compared to the normal control group. Both fenugreek and flaxseed groups (10 %) had a significant increase of electrolytes; sodium and potassium in plasma.

Table (7): shows the effect of fenugreek (5% and 10%) and flaxseed (5% and 10%) on Total Protein, Albumin and Globulin .It showed the increase of Total Protein, Albumin and Globulin in the negative control group which were significantly higher compared to the positive control group. Fenugreek(10 %)and flaxseed(10 %)groups had significantly increased total Protein, Albumin and Globulin. The best results were recorded by treated groups of fenugreek(10 %).

Table (8): shows the effect of fenugreek (5% and 10%) and flaxseed (5% and 10%) on serum antioxidant enzymes in acute renal failure rats. The mean value of SOD, GPx and CAT value showed significant decrease in the positive control group as compared to the negative control group. All treated groups indicated a significant increase as compared to the positive control group. The best result was found in the treated groups with fenugreek (10%), and flaxseed (10%).

Table (1): Total phenolic and total flavonoid contents in flaxseed and fenugreek

Sample	Total phenols(%)	Flvonoids (mg/100g)
Flaxseed	.31±.01	17.57±.021
Fenugreek	.37±.021	82.9

Table (2): The averages of carbohydrate, protein, fat, moisture, fibers and ash (g/100g) in flaxseed and fenugreek .

Sample	carbohydrate	Protein	Fat	Moisture	Fibers	Ash
Flaxseed	39.3±0.21	8.88±.01	37.37±.021	2.58±.021	9.15±.021	2.06±.02
Fenugreek	55.23±0.021	14.25±.01	12.32±.015	4.01±.01	8.98±.01	2.38±.01

Table (3): Effect of fenugreek and flaxseed on feed intake(FI) , body weight gain(BWG%) and feed efficiency ratio(FER) of experimental rats (n= 6 rats)

Parameters Groups	FI(g)/day	BWG(%)	FER
Control – ve	22.78±.65 ^a	42.08±8.83 ^a	.015±.004 ^a
Control + ve	21.00±.63 ^d	17.50±3.31 ^d	.006±.001 ^e
Fenugreek 5%	21.90±.06 ^c	19.10±4.17 ^d	.006±.002 ^d
Fenugreek10%	22.20±.10 ^b	26.99±5.66 ^{bc}	.009±.002 ^c
Flaxseed5%	22.27±.33 ^b	23.44±3.64 ^{cd}	.009±.001 ^{cd}
Flaxseed10%	22.53±.20 ^{ab}	31.77±4.15 ^b	.012±.003 ^b
LSD	.48	6.26	.003

Means in the same column with completely different letters are significantly different at $p \leq 0.05$.

Table (4): Effect of fenugreek and flaxseed on relative organ weight of experimental rats (n= 6 rats)

Parameters Groups	Kidney (g/100g.B.Wt.)
Control – ve	.715±.069 ^a
Control + ve	.725±.021 ^a
Fenugreek 5%	.698±.062 ^a
Fenugreek10%	.688±.141 ^a
Flaxseed5%	.681±.063 ^a
Flaxseed10%	.705±.048 ^a
LSD	.091

Means in the same column with completely different letters are significantly different at $p \leq 0.05$.

Table (5): Effect of fenugreek and flaxseed on creatinine ,urea and uric acid of experimental rats

Parameters Groups	Creatinine (mg/dl)	Urea(mg/dl)	Uric acid (mg/dl)
Control – ve	.52±.08 ^d	14.33±3.82 ^d	1.65±.18 ^e
Control + ve	1.59±.30 ^a	67.00±13.43 ^a	3.48±.24 ^a
Fenugreek 5%	1.03±.16 ^b	45.83±7.47 ^b	2.43±.19 ^c
Fenugreek10%	.70±.11 ^{cd}	23.00±5.44 ^{cd}	1.89±.24 ^{de}
Flaxseed5%	1.10±.10 ^b	53.50±12.85 ^b	2.79±.30 ^b
Flaxseed10%	.80±.12 ^c	25.50±6.09 ^c	2.02±.24 ^d
LSD	.19	10.57	.28

(n= 6 rats)

Means in the same column with completely different letters are significantly different at $p \leq 0.05$.

Table (6): Effect of fenugreek and flaxseed on Sodium (Na⁺) and potassium (K⁺) of experimental rats (n= 6 rats)

Parameters Groups	Na (mg/dl)	K (mg/dl)
Control – ve	154.38±1.21 ^a	5.93±.13 ^a
Control + ve	142.07±2.17 ^e	4.93±0.21 ^e
Fenugreek 5%	148.67±2.16 ^c	5.39±0.10 ^c
Fenugreek10%	152.71±1.44 ^{ab}	5.76±0.12 ^b
Flaxseed5%	145.40±1.41 ^d	5.15±0.12 ^d
Flaxseed10%	150.73±2.11 ^{bc}	5.71±0.19 ^b
LSD	2.12	.18

Means in the same column with completely different letters are significantly different at $p \leq 0.05$.

Table (7): Effect of fenugreek and flaxseed on serum proteins (TP) , ALb and GLob of experimental rats (n= 6 rats)

Parameters Groups	Total Protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)
Control – ve	7.66±.24 ^a	4.42±.24 ^a	2.77±.10 ^a
Control + ve	5.71±.48 ^e	3.08±.19 ^d	1.43±.20 ^d
Fenugreek 5%	6.55±.28 ^c	3.77±.16 ^c	2.20±.15 ^b
Fenugreek10%	7.37±.16 ^a	4.32±.18 ^a	2.67±.17 ^a
Flaxseed5%	6.17±.25 ^d	3.60±.18 ^c	1.91±.19 ^c
Flaxseed10%	7.00±.22 ^b	4.06±.17 ^b	2.59±.15 ^a
LSD	.34	.22	.19

Means in the same column with completely different letters are significantly different at $p \leq 0.05$.

Table (8): Effect of fenugreek and flaxseed on SOD , GPX and CAT of experimental rats (n= 6 rats)

Parameters Groups	SOD(U/L)	GP _x (ng/ml)	CAT(U/gt)
Control – ve	302.47±12.01 ^a	70.17±4.18 ^a	10.70±.85 ^a
Control + ve	136.27±16.96 ^d	32.27±2.07 ^f	3.53±.54 ^f
Fenugreek 5%	190.23±32.62 ^c	46.97±4.09 ^d	6.60±.41 ^d
Fenugreek10%	271.67±22.46 ^b	64.00±5.06 ^b	9.50±.54 ^b
Flaxseed5%	157.17±25.41 ^d	41.00±3.96 ^e	5.10±.50 ^e
Flaxseed10%	262.43±18.77 ^b	58.63±2.83 ^c	8.50±.68 ^c
LSD	26.36	4.51	.71

Means in the same column with completely different letters are significantly different at $p \leq 0.05$.

Histopathological results:

Microscopically, renal sections showed normal glomeruli (G) and tubules (T) in the control –ve group(**Photo 1**). Meanwhile, Renal sections from control +ve group showed prominent pathological alterations including: diffuse tubular dilation with tubular epithelium degeneration (black arrows) and necrosis (arrow heads)(**Photo 2**). Renal sections from the group received 5% flaxseed showed diffused tubular dilation with cast formation (arrowheads) and mild epithelial hydropic degeneration (black arrows) (**Photo3**). Renal sections from the group that received 5 % fenugreek showed diffused tubular dilation (black arrows) (**Photo 4**). Renal sections from the group that received 10% flaxseed showed mild tubular dilation with cast formation (arrowheads)(**Photo 5**). Renal sections from group received 10% fenugreek showed retained normal histological picture (**Photo 6**). Low magnification X: 100 bar 100 and high magnification X: 400 bar 50.

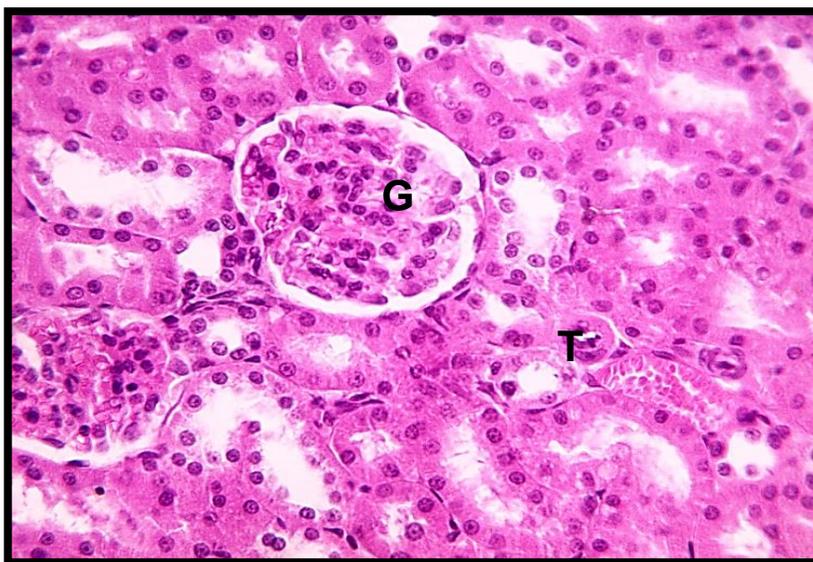


Photo (1) :Renal sections from control –ve group showed normal glomeruli (G) and tubules (T) in control group. Low magnification X: 100 and high magnification X: 400

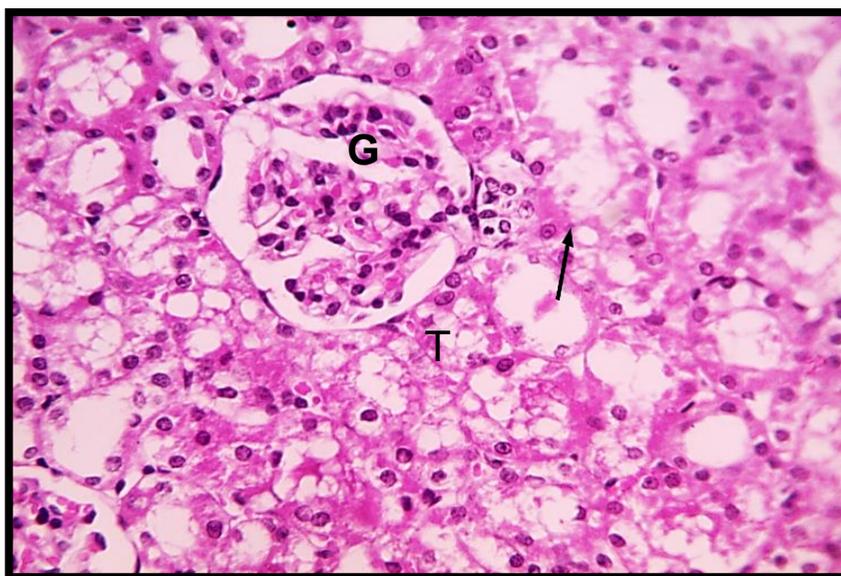


Photo (2) : Renal sections from control +ve group showed prominent pathological alterations including: diffuse tubular dilation with tubular epithelium degeneration (black arrows) and necrosis (arrowheads) . Low magnification X: 100 and high magnification X: 400

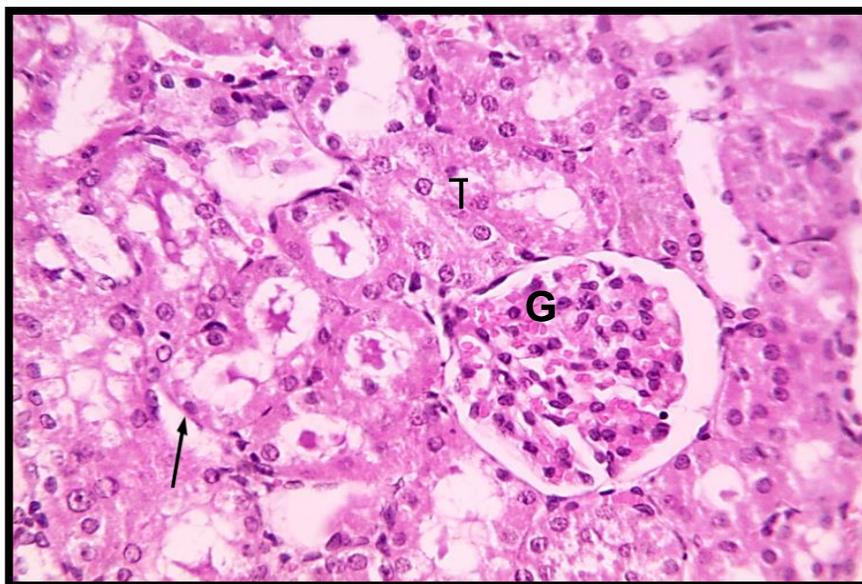


Photo (3): Renal sections from group received 5% flaxseed showed diffuse tubular dilation with cast formation (arrowheads) and mild epithelial hydropic degeneration (black arrows) . Low magnification X: 100 and high magnification X: 400

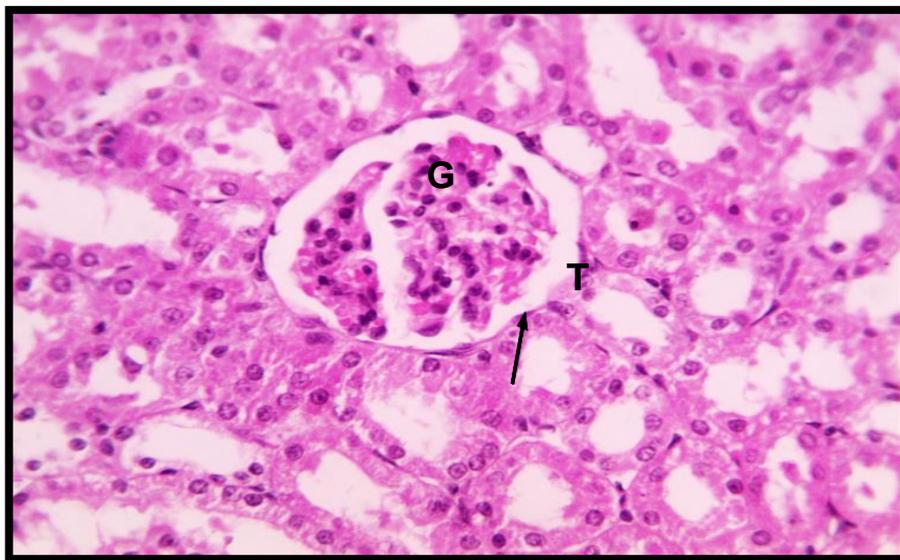
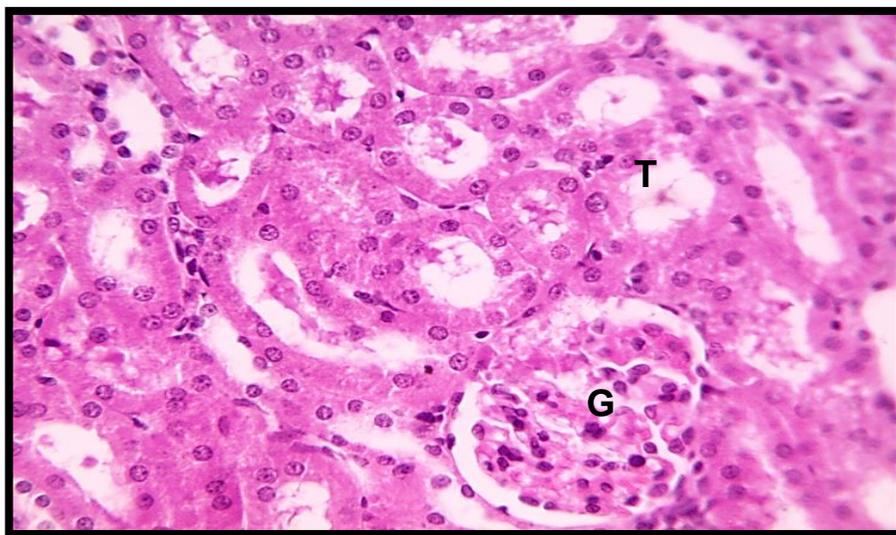


Photo (4): Renal sections from group received 5 % fenugreek showed diffused tubular dilation (black arrows) . Low magnification X: 100 and high magnification X: 400



Photo(5):Renal sections from group received 10% flaxseed showed mild tubular dilation with cast formation (arrowheads) . Low magnification X: 100 and high magnification X: 400

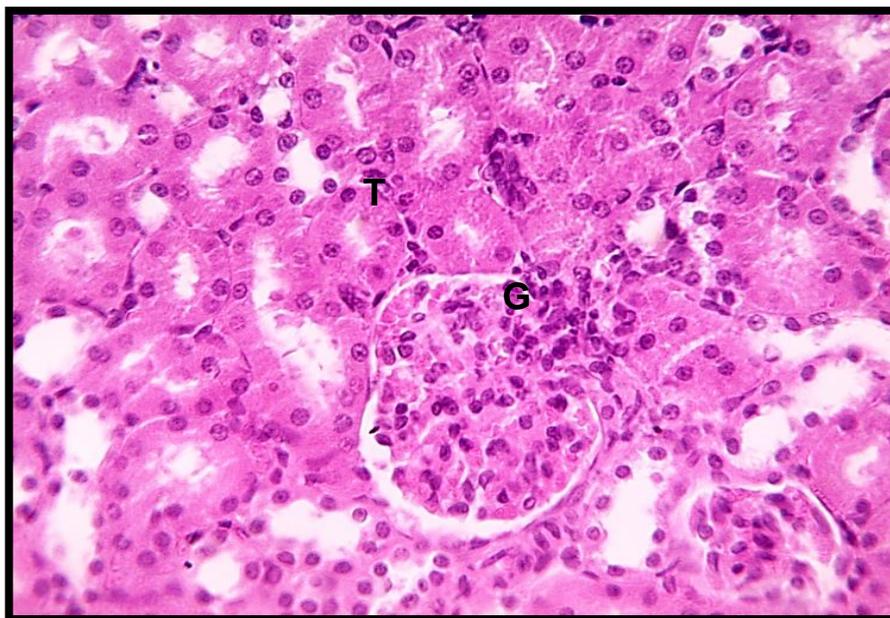


Photo (6): Renal sections from group received 10% fenugreek showed retained normal histological picture. . Low magnification X: 100 and high magnification X: 400

DISCUSSTION:

In the last decades, much work has been done to improve our understanding of acute kidney injury (AKI) as well to standardize its diagnostic criteria (**Matuszkiewicz -Rowińska and Małyszko, 2020**). Different parts of vegetables, cereal crops, oilseeds and herbs have been reported to be potential sources of natural antioxidants (**Fahim et al., 2019**). Flavonoids have antihypertensive, anti-diabetic, and anti-inflammatory effects, among other therapeutic activities. Many of them also exert renoprotective actions that may be of interest in diseases such as glomerulonephritis, diabetic nephropathy, and chemically-induced kidney insufficiency. They affect several renal factors that promote diuresis and natriuresis, which may contribute to their well-known antihypertensive effect. Flavonoids prevent or attenuate the renal injury associated with arterial

hypertension, both by decreasing blood pressure and by acting directly on the renal parenchyma(**Vargas et al. ,2018**).

In this study, The amount of total phenolics in flaxseed and fenugreek were (0.31 and 0.37 % respectively) . While, the amount of total flavonoids in flaxseed and fenugreek were (17.57and 82.9 mg/100g respectively).Our result agrees with **Al Za'abi et al., (2021)**who reported that flaxseed contains three different types of phenolic compounds–phenolic acids, flavonoids and lignans. Some of these compounds shown to possess antioxidant, hypolipidemic and hypoglycemic effects. Also, these result agrees with **Ukpaka and Neo, (2021) and Amer and Awwad, (2021)**who reported that the health benefits of the flaxseed are correlated with presence of activities of α -linolenic acid, lignin's, protein, phenolic acid and flavonoids.

In this study, The results of chemical compositions for flaxseed powder revealed that the highest average was recorded by carbohydrate (39.3) followed by fat (37.37),fibers(9.15),moisture(2.85),ash(2.06) and protein (1.42) respectively. While, the results of chemical compositions for fenugreek powder revealed that the highest average was recorded by carbohydrate(55.23) followed by fat(12.32) , fibers(8.98) ,moisture (4.01), ash (2.38) and protein(14,25) respectively. These results agree with **Hanaa et al.,(2017)**who showed that the flaxseed is rich in fat, protein and dietary fiber. Chemical analysis of flaxseed averaged 30 to 40% oil, 20 to 25% protein, 20 to 28% total dietary fiber, 4 to 8% moisture and 3 to 4% ash. Flaxseed is emerging as one of the key sources of photochemical. These phytochemicals (phenolic acids, flavonoids and lignins) are antioxidants and affect growth and viability. Flaxseed is an essential source of high quality protein and soluble fiber and has considerable potential as a source of phenolic compounds. Also, our results agree with **Ebrahimi et al. (2021)**who suggested that Flaxseed has multiple compounds with bioactive plant materials such as oil, protein, lignans, dietary fibers, vitamins (A, C, F, and E), and minerals(P, Mg, K, Na, Fe, Cu, Mn, and Zn) . Also these results agree with **Żuk-Gołaszewska and Wierzbowska ,(2017)**Who suggested that Fenugreek seeds are also a rich source of protein, lipid, saponins, flavonoids, choline, carotene, essential oils

and other functional elements. Also, **Navarro del Hierro et al. (2020)** who suggested that fenugreek includes saponins, phenolic compounds, phytosterols, carotenoids, alkaloids, tocopherols, and are also rich in essential fatty acids, amino acids, minerals and some vitamins, among many other constituents. Our result agrees with **Yasothei, (2021)** who reported that the composition (%) of fenugreek seed were crude fiber (7.54). Fenugreek seeds rich in bioactive antioxidant substances are also used extensively as an important ingredient in daily food preparations and herbal formulations.

In this study, the obtained findings, showed a significant decrease in feed intake (FI), body weight gain (BWG) and Feed efficiency ratio (FER) in the positive control group as compared to the negative control group. All treated groups with fenugreek and flaxseed recorded significant increase in (FI), BWG% and (FER) as compared to control positive group. Our result agrees with **Ali et al., (2019)** who showed that feed intake (FI), body weight gain % (BWG) and feed efficiency ratio (FER) of injected rats by glycerol decrease of (+ve) control group when compared to (-ve) control group. Also, these result agrees with **Bahnasy et al., (2020)** who suggested that rats received a diet supplemented with fenugreek seeds (5%), showed no significant difference ($P < 0.05$) in FI when compared with (+ve) control group. Rats that received diet supplemented with fenugreek seeds (5%) showed no significant difference ($P < 0.05$) in BWG when compared with the (+ve) control group. Rats that received diet supplemented with fenugreek (5%) showed no significant in FER when compared with the (+ve) control group. The probable mechanism may be that fenugreek flushes out the carbohydrates from the body before they enter the blood stream resulting in weight loss. Also, fenugreek seeds contain a high proportion (40 %) of soluble fiber. This fiber forms a gelatinous structure (similar to guar gum) which may have effects on slowing the digestion and absorption of food from the intestine and creates a sense of fullness in the abdomen, thus suppressing appetite and promoting weight loss **according to Geetha et al., (2011)**.

Our result agrees with **Aly-Aldin et al., (2015)** who showed that the Body weight gain of rats fed flaxseed oil diets was significantly ($P \leq 0.05$) lower than negative control rats. No significant ($P > 0.05$)

difference in feed intake and feed efficiency ratio among rats fed flaxseed oil, negative control rats. This effect may be responsible for the beneficial action of flaxseed oil on body weight gain.

Results obtained in present study showed that there was a significant increase in the relative kidney weight in the positive control group as compared to the negative control group. This result agrees with **Yin et al., (2019)** who suggested that glycerol injection increased the kidney relative weight in the positive control group as compared to the negative control group. Also, this study agrees with **Al-Brakati et al., (2021)** who reported that glycerol treatment significantly increases relative kidney weight. Also, this result agrees with **Bahnasy et al., (2020)** who suggested that rats who received diets supplemented with fenugreek seeds (5%), showed a significant decrease ($P < 0.05$) in relative kidney weight when compared with (+ve) control group. It may be due to the chemical composition of fenugreek seed (FS) which has been thoroughly studied and its medicinal properties are associated with its phytochemicals such as galactomannans, phenolic compounds, alkaloids, proteins, vitamins (A precursors B1, C and nicotinic acid) and volatile oils according to **Acharya et al., (2008)**. While **Ragheb et al., (2019)** noticed that the (+ve) control group showed a significant increase $P < 0.05$ than the (-ve) control group. All treated groups with flaxseed showed no significant difference $P < 0.05$ in kidney weight/body weight % as compared to the (+ve) control group. Flaxseed might be ascribed to its constituents who incorporate omega-3 and phytoestrogenic lignans which seem to assume a significant job in free radical searching according to **Bhatia (2007)**.

In present study, the results showed the increase of plasma creatinine, urea, and uric acid in the positive control group which is significantly higher compared to the normal control group. fenugreek (10 %) and flaxseed (10 %) groups had significantly decreased the plasma levels of uric acid, urea and creatinine. The best results of plasma creatinine levels were found in treated groups of fenugreek (10 %). This result agree with **Mousleh et al., (2018)** showed that serum urea and creatinine levels were increased ($P < 0.001$) in glycerol-injected rats. Also, **Yin et al., (2019)** reported that glycerol injection increased creatinine and urea in the positive control group compared to the normal control group. Also, **Amin and**

Mohamed(2019) suggested that rats treated with fenugreek had significantly decreased the plasma levels of uric acid, and creatinine. Also, **Sayed et al.,(2012)**reported that rats treated with fenugreek was found to significantly reduce the high levels of urea and creatinine. Also, **Eidi et al., (2007)** showed the treatment of fenugreek extract significantly decreased urea, uric acid, and creatinine. It may be due to the antioxidative properties of polyphenols and bioflavonoids, saponin, vitamins, selenium, etc. present in fenugreek. Fenugreek includes three main components as follows: diosgenin (the most important saponin of this plant), 4-hydroxy isoleucine (4-OH-Ile), and galactomannans exhibit powerful effects on kidneys' functional status according to **Fuller and Stephens, (2015)and Kumar, and Bhandari, (2015)**. Also, **Aly-Aldin et al.,(2015)**reported that rats treated with flaxseed oil had significantly decreased the plasma levels of uric acid, urea and creatinine. These results were supported by **EL-Sahar and Abed EL- Rahman ,(2014)** who reported that flaxseed oil improved kidney functions in rats. The possible mechanism of the studied flaxseed oil as a renal protective factor may be attributed to its antioxidant effect. The antioxidants occurring in food play many functions to block and reduce the oxidation processes which led to the prevention of oxidative stress. Many types of antioxidant factors extracted from herbal sources were extensively studied due to their antioxidative properties according to **Yoo et al.,(2008), Sharma et al.,(2016)**.

In present study , the results showed that both fenugreek and flaxseed groups (10 %) had significant increase of electrolytes; sodium and potassium in plasma. This result agrees with **Ali et al.,(2019)** who showed that glycerol injection caused significant decrease in plasma sodium and Potassium of the positive control group compared to the normal control group. Our result agree with **Sayed et al.,(2012)** who suggested that rats treated with fenugreek was found to significantly reduce the high levels of sodium and potassium. .Also, Our result agree with **Farrah et al., (2018)** who showed that treatment with flaxseed oils caused significant increase sodium and potassium. It may be due to flaxseed oil improved integrity of renal proximal convoluted tubules and its brush border membrane which is responsible for reabsorption of important ions and that may be altered due to toxic insult according to **Rizwan et**

al.,(2014). This study showed the increase of total protein, Albumin and globulin in the negative control group which is significantly higher compared to the positive control group. Fenugreek(10 %)and flaxseed(10 %)groups had significantly increased of Total Protein, Albumin and Globulin. The best results were recorded by treated groups of fenugreek(10 %).

Ali et al.,(2019) showed that glycerol injection led to significant decrease in plasma total protein, albumin, and globulin of the positive control group compared to the normal control group. Also, **Bahnasy et al.**,(2020) showed that rats received diets supplemented with fenugreek seeds (5%), showed significant increase ($P<0.05$) in total protein, albumin and globulin when compared with (+ve) control group. Also, **Amin and Mohamed (2019)** suggested that rats treated with fenugreek had significantly increase in albumin. **Farrah et al.**, (2018) suggested that flaxseed oil treatment showed a significant increase in serum albumin level .This improvement could be returned to the relieving effects of flaxseed oil on hepatic architecture which is important for metabolism and excretion of toxic materials according to **Farag et al.**, (2007) .

In present study, the mean value of SOD , GPx and CAT value showed a significant decrease in the positive control group as compared to the negative control group. All treated groups indicated a significant increase as compared to the positive control group. The best result was found in the treated groups with fenugreek (10%), and flaxseed (10%). This result agrees with **Al-Brakat et al.**, (2021) reported that Glycerol-injected rats displayed declines in reduced glutathione level, and superoxide dismutase, catalase, glutathione peroxidase, and glutathione reductase activities. These result agrees with **Mukthamba and Srinivasan (2017)** who suggested that Dietary interventions with fenugreek generally countered the increase in the activities of catalase, superoxidisedismutase, glutathione reductase and glutathione-S-transferase in these rats .it may be due to have observed the cardioprotective effect of intragastrically administered fenugreek (250 mg/kg body mass for 15 days) or trigonelline isolated from fenugreek seed, as evident from significantly decreased levels of TBARS and enhanced activities of antioxidant enzymes and antioxidant molecule glutathione in myocardial infarcted rats according to **Panda et**

al.,(2013), **Murugesan et al.**,(2011).Also, **Kumar and Bhandari (2013)** showed that rats treated with of fenugreek(0.5 and 1 g/kg b.w., orally) caused a significant ($P < 0.05$ and $P < 0.01$) increase in the SOD and CAT levels as compared to positive control group. Also, **Al Za'abi et al.**, (2021) suggested flaxseed has been shown to play a protective role against oxidative stress, which is evident by the increase in antioxidants enzymes such as CAT, SOD and glutathione peroxidase. Also, **Makni, et al.**, (2010) flaxseed has been shown to play a protective role against oxidative stress, which is evident by the increase in antioxidants enzymes such as CAT, SOD and glutathione peroxidase. It may be due to oxidative stress can cause tissue damage by generating the reactive oxygen species and leading to chronic inflammation. Oxidative stress also increases DNA oxidation, lipid peroxidation and the depletion of antioxidant enzymes, promoting further tissue injury and ischemia. Possibly through the upregulation of the genes expressing these enzymes. The increase in these enzyme activities might have led to a reduction in the direct oxidative and peroxidative. It is also possible that flaxseed down regulated the genes expressing these markers according to **Wadley et al.**, (2013),**Mittal et al.**, (2014)and **Lee et al.**, (2008).

Histopathological results agree with **Al-Basher, et al.**, (2019) who showed that glycerol injection resulted in histopathological changes such as renal tubular injury due to rat's tubular myoglobin deposition. Glycerol-injected rats showed a significant increase in the kidney relative weight .Also, **Belaïd-Nouira et al.**, (2013) who reported that treatment with fenugreek seeds supplementation showed a partial improvement of the kidney histological aspect at two levels by restoration of the cuboidal form of the different tubules epithelium, retrieval of Bowman's spaces and decrease of the pyknotic cells. Also, **Abdel-Moneim, et al.**, (2011) who reported that Flaxseed oil could improve to some extent, the altered kidney histopathology but the renal tubular epithelium was still vacuolated and some glomeruli were shrunken.

Conclusion

In conclusion, this study evaluated the potential effect of (fenugreek and flaxseed) seeds on acute renal failure in rats.

Fenugreek and flaxseed have contained an amount of phenolic compounds and flavonoids, which may play an important role as natural antioxidants. The consumption of fenugreek and flaxseed could be used for improving, kidney function and protecting from the risk factor of acute renal failure in experimental rats.

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