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Protective effect of Beet Roots and Leaves on Kidney Disorder inGentamicin-Induced Rats

Sherief S.Ragab, Emad M. El-Kholie and NeamaA. Abdel Rhman

Nutrition and Food Science Dept., Faculty of Home Economics, Menoufia Univ., Egypt

Abstract

The protective effect of different concentrations 5 and 10 % (*Beta vulgaris*, L.)as powder on gentamicin-induced nephrotoxicity and to elucidate the potential mechanism male rats was investigation. Thirty six male albino rats weighing 150±10 g were used, and divided into 6 equal groups, first one was kept as a negative (-ve) control group, while the other 5 groups wereinjected by gentamicin once day for 10 days. The obtained results concluded that the body weight gain and feed intake of all nephrotoxic rats fed on various diets showed non-significant increases in mean values as compared to positive control group.The best treatment of urea, uric acid and creatinine was recorded for rats fed on 10% beet root as compared to negative control group. The lowest liver enzymes (ALP, ALT and AST)recorded for group fed on 10% beet rootsaspowder as compared to negative control group.All nephrotoxic rats fed on different diets revealed significant decreases in total cholesterol and triglyceride with the mean values as compared to positive control group. All nephrotoxic rats fed on different diets revealed significant decrease in HDL-c, LDL-c and VLDL-c with the mean values as compared to positive control group.As conclusion, the rats fed with beat root and leaves as powder improving the kidney functions, liver functions and lipid profile.

Key Words: Beat root and leaves, Nephrotoxicity, Kidney functions, Liver functions.

Introduction

The kidney plays a vital role in the maintenance of normal blood volume/pressure and the regulation of acid -base balance. Approximately one - fourth of the cardiac out is filtered through the kidney. The kidneys also play a great role in urine excretion as they are the path way for removal of the waste products of absorption and metabolism. Which include ammonia, urea, creatinine, phospgorus, water, sodium and potassium, the kidney produces erythropoietin hormone, deficiency of this hormone results in profound anemia. A decrease in kidney functions greatly affects metabolism and nutritional status **(Miller and Klahr, 2005)**.

In Egypt, the estimated prevalence of end - stage renal disease (ESRD) increases from 225 per million population in 199 to 375vper million in 2007 as reported by **(Afify&Karim, 1999 and Afify, 2003).**

Besides the colour pigments the juice or extract consists of sugars, salts and/or proteins naturally occurring in red beets. The solution may be concentrated and some products may be refined in order to remove most of the sugars, salts and proteins. Food grade acids (e.g., citric, lactic, L-ascorbic) may be added as pH controlling agents and stabilizers and carriers (e.g., maltodextrin) may be added as aids for manufacturing dry powders **(Jecfa, 2002).**

Beetroot is known to be a powerful antioxidant. In ancient times, beetroot was believed to help enhance human sex hormones and as an aphrodisiac. The juice of beetroot is also consumed as a natural remedy for sexual weakness and to expel kidney and bladder stones. In recent years, beetroot has gained popularity to be a natural food to boost the energy in athletes **(Ali, 2003)**.

El Gamal*et al*., (2014) found that BVEE has a renal protective potential. The nephron protective effect of BVEE against GM-induced renal toxicity may be ascribed to its antioxidant, anti-apoptosis, and anti-inflammatory properties. These finding substantiate the use of beetroot extract in Arab traditional medicine for the treatment of renal disorders.

Recent studies have also postulated that renal inflammation, which is characterized by infiltration of inflammatory cells such as monocytes / macrophages and subsequent release of pro-inflammatory cytokines and activation of NF-κB in response to oxidative stress, is involved in this process. Furthermore, induced apoptosis / necrosis of renal tubular epithelial cells **(Ali, 2001)**.

Chawla*et al*., (2016) reported that beet root is one of the oldest vegetable known to mankind. In this review article, we made humble

attempt to give a brief knowledge about the nutritional value, health benefits, phyto-chemical composition, pharmacological actions and medicinal properties of beet root. It serves as an economical package of health care.

Beet is a fortune of nutrients, minerals, vitamins and amino acids, which make it a sound dietary supplement. Beet juice is an excellent therapy to excrete out kidney and bladder stones. Several parts of beet root has numerous medicinal properties such as anti-oxidant, anti-inflammatory, anti-hyperglycemic, anti-hypertensive, anti-cancer, anti-microbial, hepatoprotective and diuretic. Beet root is not only helpful in hair growth, shine of the hair, but also beneficial for skin. Beet root provides energy to the body and boosts up immune system. It is used as natural food color in dairy and meat products. Overall, it is a versatile super food, which has numerous uses like medicinal uses, cosmetic uses as well as cuisine uses. It highlights beet root utilization and its potential as value-added products in human food systems; and demonstrates the potential of the beet root as a medicinal food **(Chawla*et al*., 2016)**.

This work was conducted to study the effect of different concentrations of beet roote and leaves as powderon biological and biochemical changes of diabetic rats.

Material & Methods

Materials

Beetroot (*Beta vulgaris, L.*) vegetable plant was obtained from local market in 2016 from Sharqia Governorate.

Gentamicin (Aminoglycoside antibiotics)

Impaired kidney can be induced in normal healthy male albino rats by intra-peritoneal injection of gentamicin (aminoglycosides antibiotics) obtained from Memphis Co. form Pharm. Chem.Ind., Cairo., A.R.E.at 10 mg/kg/day for 10 days in which the nephrotoxicity, one of the adverse reaction of gentamicin takes place.

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

Chemical kits used for determination the (TC, TG, HDL-c, ALT, AST, ALP, bilirubin, urea, creatinin, albumin) were obtained from Al-Gomhoriafor Drug, Chemicals, Medicals, Instruments Company, Cairo, Egypt.

Methods

Preparations of beet root and leave

To prepare the dried beet root vegetables was obtained from local market,root and leaves were washed thoroughly under running tap water, shade dried, and ground to a fine powder using an air mill (Molunix, Al-Araby, company, Egypt).

Experimental design:

Thirty-six adult male white albino rats, Sprague Dawley Strain, 10 weeks age, weighing (150±10g) were used in this experiment. All rats were fed on basal diet prepared according to **American Institute of Nutrition (AIN) (1993)** for 7 consecutive days. After this adaptation period, rats are divided into 6 groups, each group which consists of 6 rats as follows:

Group (1): Rats will feed on basal diet as a control negative.

Group(2):injected intraperitoneally with (aminoglycosides antibiotics) Garamycin (10 mg/kg) every 24 hr. for 10 days to induce Nephrotoxicity, one of the adverse reaction takes place **(Douma*s et al.*, 1971)**as a positive control group.

Group (3): 6 rats: Treated with 5% beet rootof diet.

Group (4): 6 rats: Treated with 10% beet rootof diet.

Group (5): 6 rats: Treated with 5% beet root leavesof diet.

Group (6): 6 rats: Treated with 10% beet root leavesof diet.

During the experimental period, the body weight and food intake were estimated weekly and the general behavior of rats was observed.

The experiment will take 28 days, at the end of the experimental period each rat weight separately then, rats are slaughtered and collect blood samples. Blood samples were centrifuged at (4000 rpm) for ten minute to separate blood serum, then kept in deep freezer till using extracting the liver, spleenand kidney.

Blood sampling

After fasting for 12 hours, blood samples in initial times were obtained from retro orbital vein, while it obtained from hepatic portal vein at the end of each experiments. Two kind of blood samples were taken. The first parts of blood samples were collected into a dry clean centrifuge glass tubes and left to clot in water bath (37°C) for 30 minutes, then centrifuged for 10 minutes at 4000 rpm to separate the serum, which were carefully aspirated and transferred into clean cuvette tube and stored frozen in deep freezer till analysis.

Body weight gain(BWG), feed intake (FI), and feed efficiency ratio (FER)

During the experimental period (28 days) the net food intake was daily recorded, while body weight was weekly recorded. The net food intake and gained body weight were used for the calculation of feed efficiency ratios (FER) as follow:

$$\text{FER \%} = \frac{\text{Body weight gain (g)}}{\text{Food intake (g)}} \times 100$$

Biochemical Analysis:

Lipids profile:

Serum total cholesterol was determined according to the colorimetric method described by **Thomas (1992)**.

2.3.1.3. Determination of serum triglycerides

Serum triglycerides was determined by enzymatic method using kits according to the **Young (1975) and Fossati (1982)**.

2.3.1.4. Determination of high density lipoprotein (HDL-c):

HDL-c was determined according to the method described by**Fredewaid (1972) and Grodon and Amer (1977)**.

2.3.1.5. Calculation of very low density lipoproteincholesterol (VLDL-c):

VLDL-c was calculated in mg/dl according to **Lee and Nieman (1996)** using the following formula: **VLDL-c (mg/dl) = Triglycerides / 5**

Calculation of low density lipoprotein cholesterol (LDL-c)

LDL-c was calculated in mg/dl according to **Lee and Nieman(1996)** as follows:

LDL-c (mg/dl) = Total cholesterol – HDL-c – VLDL-c

Determination of total lipids

Determination of total lipids in serum was colorimetrically determined according to **Schmitt and Drevon (1964)**.

Liver functions

Determination of serum alanine aminotransferase (ALT), serum asparatate aminotransferase (AST), serum alkaline phosphatase (ALP) were carried out according to the method of **ClinicaChimicaActa(1980)**, **Hafkenscheid 1979 and Moss 1982**),respectively.

Kidney functions

Determination of serum urea

Serum urea and serum creatinin were determined by enzymatic method according to **Patton and Crouch (1977)** and **Henry (1974)**.

Determination of blood glucose

Enzymatic determination of plasma glucose was carried out calorimetrically according to the method of **Tinder (1969).**

Statistical analysis

The data were analyzed using a completely randomized factorial design **(SAS 1988)** 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.

Results and discussion

Data presented in Table (1) show the mean value of body weight gain (BWG), feed intake (FI) and feed efficiency ratio (FER) of nephrotoxic rats fed on beet root and leaves as powder. It is clear to notice that the mean value of body weight gain (BWG)gof positive control group was lower than negative control group, being 0.821±0.003and1.095±0.002 g/28 day, respectively. All nephrotoxic rats fed on various diets showed non-significant increases in mean values as compared to positive control group,which recorded0.943±0.004, 1.04±0.006, 0.904±0.005and 0.857±0.001g/28 day for 5%& 10% beet root and 5%& 10 % beet leaves), respectively. Nephrotoxic rats fed on 10% beet root showed the highest increase of body weight gain as compared to negative control group.

Table (1) also illustrated that the mean value of **(**FI**)** of positive control group was lower than negative control group, being 8.27±0.03and22.5±0.08 g/day, respectively, showing significant differences between them. All nephrotoxic rats fed on various diets showed significant increase in mean values as compared to positive control group .The values were 12.28±0.06, 15.38±0.05, 11.26±0.04, and 9.51±0.02 g/ day for (beet root5%, beet root10%, beet root leaves 5%, beet root leaves 10%) respectively . The best (FI) was recorded for group (4) fed on 10% beet root when compared with negative control group.

On the other hand, the mean value of (FER) for positive control group was lower than negative control group, being 0.036±0.001and0.902±0.003 g/day, respectively, showing non-significant difference between them. All nephrotoxic rats fed on various diets showed non-significant increases in mean values as compared to positive control group. The values were

(0.058±0.001, 0.099±0.002, 0.052±0.002 and0.040±0.01 g/ day, respectively for groups (3, 4, 5 and 6), respectively. Numerically, the best (FER) was recorded for group fed on 10% beet root as compared to negative control group. These results are in agreement with**Chawla*et al.*, (2016)**, who reported thatthe treated groups showed significant increase in body weight gain (P≤0.05), feed intake (P≤0.05) and FER (P≤0.05) when compared with positive control group. Also, **El Gamal*et al.*, (2014)**reported that the treated groups with beet root showed significant increase in BWG, FI, and FER.

Data given in Table (2) show the effect of beet root and leavesas powder on kidney functions on serum urea, creatinine, and uric acid of nephrotoxic rats. As shown the mean value of urea of positive control group was higher than negative control group, being 36.40±2.07and 19.0±1.58mg/dl, respectively, with non-significant difference between them. All nephrotoxic rats fed on different diets revealed non-significant decreases in mean values as compared to positive control group. The values were 27.20±2.77, 22.20±3.03, 30.80±1.48 and33.60±3.04 mg/dl for beet root as powder and beet root leaves as powder, respectively. The best treatment was recorded for group (4) which fed on 10% beet root as compared to negative control group.

Regarding the mean value of serum uric acid of positive control group was higher than negative control group, being 3.80±0.15and2.12±0.83 mg/dl, respectively, with significant difference between them. All nephrotoxic rats fed on beet root powder and beet root leaves powder revealed significant decreases in mean values of uric acid when compared with positive control group. The values were 2.86±0.114, 2.50±0.158, 3.30±0.20 and3.58±0.083 mg/dl, respectively for the treatment groups respectively. The best treatment was observed for group (4) which fed on 10% beet rootas compared to negative control group.

On the other hand, the mean value of creatinine of positive control group was higher than negative control group, being1.01±0.13and0.68±0.04mg/dl, respectively, showing significant difference between them. All nephrotoxic rats fed on different diets revealed significant decreases in mean values of serum creatinine when compared with positive control group. The values were 0.81±0.081, 0.75±0.10, 0.91±0.03 and0.97±0.07mg/dl for groups 3, 4, 5 and 6, respectively. Rats fed on groups (3, 4, 5 and 6) showed significant differences between them. The best treatment was recorded for group (4) which fed on 10% beet root as compared to negative control group. These

results agree with **El Gamal*et al*., (2014)** whosuggests that beet root ethanolic extract (BVEE)has a renal protective potential. The nephroprotective effect ofBVEE against GM-induced renal toxicity may be ascribed to its antioxidant, antiapoptosis, and anti-inflammatory properties.These finding substantiate the use of beetroot extractin Arab traditional medicine for the treatment of renaldisorders. Also, theyreported thatconsumption of beet root and beet root powder showed a significant decrease the value of creatinine ($P \leq 0.05$), urea ($P \leq 0.05$) and uric acid ($P \leq 0.05$) in all treated groups compared with positive control group.

Data obtained in Table (3 and 4) show theeffect of beet root as powder and beet root leaves powderon liver functions (ALT, AST,ALP, total protein and albumin) of nephrotoxic rats. As shown, the mean value of ALT of positive control group was higher than negative control group, being 69.40±2.40and22.20±1.48Ul, respectively, with significant difference between them. All nephrotoxic rats fed on beet root and leaves revealed significant decreases in mean values as compared to positive control group. The values were 42.60±3.57, 29.40±3.71, 53.80±4.60 and61.40±2.96Ul for nephrotoxic rats groups, respectively. Rats fed on groups 3, 4, 5and 6) showed significant differences between them. Numerically, group (4) which fed on 10% beet root powder recorded the best treatment considering the ALT activity showed with differences, in comparison with negative control group.

As for AST, the mean value of positive control group was higher than negative control group, being 70.6±2.40 and 22.20±1.64Ul,respectively, with significant differences between them. All treatment groups fed on different diets revealed significant differences in mean values as compared to positive control group. The values were 52.00±5.70, 39.60±2.50, 58.00±2.12and 67.00±2.44Ul, for beet root powder and beet root leaves powder, respectively. Rats on groups 2 and 6 showed non –significant differences between them. The best treatment recorded for group 10% beet root as compared to negative control group.

RegardingALP,the mean value of positive control group was higher than negative control group, being 87.00±2.23 and 67.00±2.00Ul, respectively, with significant differences between them. All treatment groups fed on different diets revealed significant differences in mean values as compared to positive control group. The values were 76.00±2.54, 71.00±1.58, 81.00±2.44 and 85.20±3.42Ul for beet root powder and beet root leaves powder, respectively. Rats fed on groups (2 and 6) showed non –significant differences between them. The best treatment group wasrecorded for 10%

beet root powder as compared to negative control group. These results are in agreement with**Agarwal *et al.*, (2006),** who reported that ALT, AST and ALP with beet root powder significantly decreased aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP). Also,**Kujawska *et al.*, (2009)** found that the restoration of the activity of the majority of antioxidant enzymes in the liverrecorded for beet root.**Rabeh (2015)**, reported that the improvement in liver functions due to the presence of both total flavonoids and total phenols, beet root powder and the beetroot waste represent rich sources of antioxidants. So, it is advice to add beet root powder and the waste (pulp) of beet root to bakery product and consume it as a routine diet to hepatic disease patients. Also, patients suffering from liver diseases may drink beet root juice to enhancing liver functions and increase antioxidant enzymes**.**

On the other hand, the mean value of albumin of positive control group was lower than negative control group, being 2.78±0.28 and 5.20±0.27Ul, respectively. All nephrotoxic rats fed on different diets except group 4 showed significant differences when compared with positive control group. The values were 4.08±0.13, 5.04±0.15, 3.36±0.30 and 3.16±0.48Ul for treatment groups 3, 4, 5 and 6, respectively. Rats fed on group 4 which fed on 10% beet root showed non-significant differences as compared to negative control group. The best treatment was recorded for group 4 fed on 10% beet root when compared with negative control group.
Regarding total protein, the mean values of positive control group were lower than negative control group being, 5.16±0.20 and 7.14±0.20mg/dl, respectively. All treatment groups showed significant increase in the mean value of total protein when compared with positive control group, respectivelywhich recorded6.38±0.14, 6.86±0.16, 5.94±0.16 and 5.50±0.27mg/dl, for groups3, 4, 5 and 6, respectively. Groups 3, 4,5 and 6 showed significant differences between them. Nephrotoxic rats fed on 10% beet root showed the highest increasing of serum total protein as compared to negative control group. These results are in agreement with**(Rabeh 2015)**who reported that beet root increase total serum proteins, and albumin. In general, the useful effect of beet root in improving liver functions Due to the presence of both total flavonoids and total phenols, beet root, juice and the beetroot waste represent rich sources of antioxidants. So, it is advice to add beet root powder and the waste (pulp) of beet root to bakery product and consume it as a routine diet to hepatic disease patients. Also, patients suffering from liver diseases may drink beet root juice to enhancing liver functions and increase antioxidant enzymes**.** Also,**Maximas*et al.*, (2015)**,

whoreported that methanol extract of beet root, possess significant protection and chemo-prevention of hepatotoxicity offered by the antioxidants fraternity of beetroot.

Liver toxicity or bile: The cleansing virtues in beets juice is very healing for liver toxicity or bile ailments, like jaundice, hepatitis, food poisoning, diarrhoea or vomiting (**Kumar, 2015**).

Recent studies have also postulated that renal inflammation, which is characterizby infiltration of inflammatory cells such as monocytes/macrophages and subsequent release of pro-inflammatory cytokines and activation of NF-κB in response to oxidative stress, is involved in this process. Furthermore, induced apoptosis/necrosis of renal tubular epithelial cells **(Ali, 2001)**.

In recent years there has been a growing interest in the biological activity of red beetroot **(Beta vulgaris rubra)** and its potential utility as a health promoting and disease preventing functional food. As a source of nitrate, beetroot ingestion provides a natural means of increasing *in vivo* nitric oxide (NO) availability and has emerged as a potential strategy to prevent and manage pathologies associated with diminished NO bioavailability, notably hypertension and endothelial function. Beetroot is also being considered as a promising therapeutic treatment in a range of clinical pathologies associated with oxidative stress and inflammation. Its constituents, most notably the betalain pigments, display potent antioxidant, anti-inflammatory and chemo-preventive activity *in vitro* and *in vivo* (**Clifford *et al.*, 2015)**.

Data presented in Table (5 and 6) illustrate the effect of beet root and beet root leaves powderon serum total cholesterol (T.C), serum triglycerides (T.G), serum high density lipoprotein cholesterol (HDL-c), serum low density lipoprotein cholesterol (LDL-c) and serum very low density lipoprotein cholesterol (VLDL-c) of nephrotoxic rats. It is clear to mention that the mean value of total cholesterol (T.C) of positive control group was higher than negative control group, being 237.60±16.63and 119.80±2.94 mg/dl, respectively, with significant difference between them. All nephrotoxic rats fed on different diets revealed significant decreases in mean values as compared to positive control group. The values were 154.40±5.85, 138.40±4.15, 178.80±3.70 and 195.40±4.92 for beet root and beet root leaves powder, respectively. The best serum (T.C) level was showed for group (4) which fed on 10% beet rootwhen compared with negative control group.

Forserum triglycerides (T.G),the mean value of positive control group was higher than negative control group, being 210.20^{a}±4.60 and 103.80^{e}±4.65, respectively. All treatment groups showed significant differences when compared with positive control group,with the mean values 123.00±5.24, 117.60±2.07, 140.20±4.60 and 173.00±13.22 mg/dlfor beet root and beet root leaves powder, respectively. Groups3 and 4 showed non-significant differences between them. The best serum (T.G) level was showed for group (3 and4) which fed on 10% beet root and 5% beet root when compared with negative control group.

Regarding serum HDL-c, the mean value of positive control group was lower than negative control group, being 28.00±2.12 and 41.00±2.23 mg/dl, respectively, with significant differences between them. All nephrotoxic rats fed on different diets revealed significant increase in mean values as compared to positive control group. The values were 33.80±3.34, 37.4±2.40, 33.20±1.92, and 31.80±3.83 mg/dl for beet root and beet root leaves powder, respectively. Rats fed on groups (3, 5 and 6) showed non-significant differences between them. The best serum HDL-c was observed for group (4) fed on 10% beet root when compared with negative control group.

On the other hand, the mean value of serum LDL-cof positive control group was higher than negative control group, being 140.16±3.35and 44.24±4.51 mg/dl, respectively, with significant difference between them. All nephrotoxic rats fed on different diets revealed significant decrease in mean values as compared to positive control group. The values were 64.60±2.28, 56.68±3.87, 79.02±3.39 and 106.60±12.17 for beet root and beet root leaves powder. Rats fed on 10% beet root recorded the best serum (LDL-c).

Regarding serum VLDL-c, the mean value of positive control group was higher than negative control group, being 42.04±0.92and 20.76±0.93, mg/dl, respectively, with significant difference between them. All nephrotoxic rats fed on different diets showed significant decreases in mean values of VLDL-c as compared to positive control group. The values were 24.60±1.04, 23.52±0.41, 28.04±0.92 and 34.60±2.64 mg/dl for beet root and beet root leaves powder, respectively. The best treatment was recorded for rats fed on 10%beet root as compared to positive control group.

These results are in agreement with**Agarwal *et al.*,(2006)**,who reported that a significant ($P\leq0.05$) increase was found in serum total cholesterol, triglycerides and LDL and VLDL concentrations with a significant ($P\leq0.05$) decrease in serum HDL concentration in cadmium treated rats. Beet root flavonoids caused a significant ($P\leq0.05$) decrease in

total cholesterol, triglycerides, LDL and VLDL while HDL concentration significantly (P≤0.05) increased.

Hee Lee et al,. (2009) reported thatthe supplementation of 8% freeze-dried red beetleaf in a high fat and high cholesterol diet was associated withthe reduced lipid peroxidation, improved antioxidant status, anddecreased oxidative damage to DNA in the blood and tissues.In addition, red beet leaf could control body weight by reducingfat pads in C57BL/6J mice. These beneficial effects might becontributed by antioxidant components, other various micronutrientsand fibers contained in the red beet leaf. Therefore, our resultsdemonstrated that a regular intake of red beet leaf is a betterway to improve oxidative damage and possibly contributes toreduced risk of developing chronic diseases**.**

Lowers cholesterol: Beetroot contains soluble fibre, which has also been shown to have cholesterol lowering capabilities (**Kumar, 2015**).

Antioxidants: Its carotenoids and flavanoids can help reduce the oxidation of LDL cholesterol which could lead to damaged artery walls and ultimately heart attacks and strokes(**Kumar, 2015**).

Hagander*et al.*, (1989):FounedthatHigh blood pressureAlong with high blood sugar levels and high cholesterol, high blood pressure is a known risk factor for heart disease that may be improved with diet and lifestyle changes . Hyperlipidemia (high cholesterol) Eating a diet rich in fiber has been shown to help improve cholesterol levels and reduce the risk of heart disease. Beet pulp and pectin have been used as dietary fiber in humans. However, it is unclear if beet has cholesterol-lowering effects. Research results are mixed**.**

Table (1): Effect of Beet root and leaves as powder on body weight gain (BWG), feed intake (FI) and feed efficiency ratio (FER)of nephrotoxic rats

Groups	Parameters		
	BWG (g/28day)	**FI (g/day)**	**FER (g/day)**
	Mean±SD	**Mean±SD**	**Mean±SD**
Group 1 (negative control)	1.095 ± 0.002^{a}	22.5 ± 0.08^{a}	0.902 ± 0.003^{a}
Group 2 (positive control)	0.821 ± 0.003^{f}	8.27 ± 0.03^{f}	0.036 ± 0.001^{f}
Group 3 ٥% beet root	0.943 ± 0.004^{c}	12.28 ± 0.06^{c}	0.058 ± 0.001^{c}
Group 4 10% beet root	1.04 ± 0.006^{b}	15.38 ± 0.05^{b}	0.099 ± 0.002^{b}
Group 5 5%beetroot leaves	0.904 ± 0.005^{d}	11.26 ± 0.04^{d}	0.052 ± 0.002^{d}
Group 6 10%beetroot leaves	0.857 ± 0.001^{e}	9.51 ± 0.02^{e}	0.040 ± 0.01^{e}

- Values are expressed as mean ± SD.
- Significant at $p\leq0.05$ using one way ANOVA test.
- Values which have different letters differ significantly, while those with have, similar or partially are non-significant.

Table (2): Effect of beet rootsand leaves powder on kidney functions (on serum urea, creatinine and uric acid) of nephrotoxic rats:

Groups	Parameters		
	Urea (mg/dl)	Uric acid (mg/dl)	Creatinine (mg/dl)
	Mean ± SD	Mean ± SD	Mean ± SD
Group 1(negative control)	19.0±1.58^{e}	2.12±0.83^{f}	0.68±0.04^{d}
Group 2(positive control)	36.40±2.07^{a}	3.80±0.15^{a}	1.01±0.13^{a}
Group 35 %beet root	27.20±2.77^{c}	2.86±0.114^{d}	0.81±0.081^{bc}
Group 410 %beet root	22.20±3.03^{d}	2.50±0.158^{e}	0.75±0.10^{cd}
Group 55 %leave beet root	30.80±1.48^{b}	3.30±0.20^{c}	0.91±0.03^{ab}
Group 610%leavebeet root	33.60±3.04^{ab}	3.58±0.083^{b}	0.97±0.07^{a}

- Values are expressed as mean ± SD.
- Significant at p≤0.05 using one way ANOVA test.
- Values which have different letters differ significantly, while those with have, similar or partially are non-significant.

Table (3): Effect of beet roots and leaves powder on liver functions (ALT, ASTand ALPof nephrotoxic rats

Groups	Parameters		
	ALT(U/L)	AST(U/L)	ALP(U/L)
	Mean ±SD	Mean ±SD	Mean ±SD
Group 1(negative control)	22.20±1.48^{f}	22.20±1.64^{e}	67.00±2.00^{e}
Group 2(positive control)	69.40±2.40^{a}	70.6±2.40^{a}	87.00±2.23^{a}
Group 35%beet root	42.60±3.57^{d}	52.00±5.70^{c}	76.00±2.54^{c}
Group 410%beet root	29.40±3.71^{e}	39.60±2.50^{d}	71.00±1.58^{d}
Group 55%beetroot leaves	53.80±4.60^{c}	58.00±2.12^{b}	81.00±2.44^{b}
Group 610%beetrootleaves	61.40±2.96^{b}	67.00±2.44^{a}	85.20±3.42^{a}

- Values are expressed as mean ± SD.
- Significant at p≤0.05 using one way ANOVA test.
- Values which have different letters differ significantly, while those with have, similar or partially are non- significant.

Table (4): Effect of beet rootsand leaves powder on serum total protein serum albumin of nephrotoxicrats

Groups	Parameters	
	Albumin(mg/dl)	Total protein (mg/dl)
	Mean ±SD	Mean ±SD
Group 1(negative control)	5.20±0.27[a]	7.14±0.20[a]
Group 2(positive control)	2.78±0.28[d]	5.16±0.20[f]
Group 35%beet root	4.08±0.13[b]	6.38±0.14[c]
Group4 10%beet root	5.04±0.15[a]	6.86±0.16[b]
Group5 5%beetroot leaves	3.36±0.30[c]	5.94±0.16[d]
Group6 10%beetroot leaves	3.16±0.48[cd]	5.50±0.27[e]

- Values are expressed as mean ± SD.
- Significant at p≤0.05 using one way ANOVA test.
- Values which have different letters differ significantly, while those with have, similar or partially are non-significant.

Table (5): Effect of beet rootsand leaves powder on serum triglyceride (T.G) andserum total cholesterol (T.C) of nephrotoxic rats

Groups	Parameters	
	Total cholesterol (mg/dl)	Triglycerides (mg/dl)
	Mean ±SD	Mean ±SD
Group 1(negative control)	119.80±2.94[f]	103.80±4.65[e]
Group 2(positive control)	237.60±16.63[a]	210.20±4.60[a]
Group 35%beet root	154.40±5.85[d]	123.00±5.24[d]
Group4 10%beet root	138.40±4.15[e]	117.60±2.07[d]
Group5 5%beetroot leaves	178.80±3.70[c]	140.20±4.60[c]
Group6 10%beetroot leaves	195.40±4.92[b]	173.00±13.22[b]

- Values are expressed as mean ± SD.
- Significant at p≤0.05 using one way ANOVA test.
- Values which have different letters differ significantly, while those with have, similar orpartially are non-significant.

Table (6): Effect of beet root and leaves powder on serum (HDL-c), serum(LDL-c) and serum (VLDL-c), of nephrotoxic rats

Groups	Parameters		
	HDL-c (mg/dl)	LDL-c (mg/dl)	VLDL-c (mg/dl)
	Mean ± SD	Mean ± SD	Mean ± SD
Group 1(negative control)	41.00±2.23[a]	44.24±4.51[f]	20.76±0.93[e]
Group 2(positive control)	28.00±2.12[d]	140.16±3.35[a]	42.04±0.92[a]
Group 35%beet root	33.80±3.34[c]	64.60±2.28[d]	24.60±1.04[d]
Group4 10%beet root	37.4±2.40[b]	56.68±3.87[e]	23.52±0.41[d]
Group5 5%beetrootleaves	33.20±1.92[c]	79.02±3.39[c]	28.04±0.92[c]
Group6 10%beetroot leaves	31.80±3.83[c]	106.60±12.17[b]	34.60±2.64[b]

- Values are expressed as mean ± SD.
- Significant at $p \leq 0.05$ using one way ANOVA test.
- Values which have different letters differ significantly, while those with have, similar or partially are non-significant.

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التأثير الحافظ لجذور وأوراق البنجر فى الفئران المصابة بخلل فى الكبد بواسطة الجنتاميسين

شريف صبرى رجب ـ عماد محمد الخولى ـ نعمة عادل عبد الرحمن
قسم التغذية وعلوم الأطعمة ـ كلية الأقتصاد المنزلى ـ جامعة المنوفية ـ مصر

الملخص العربى

تم فى هذا البحث دراسه التأثير الوقائى لجذور البنجر واوراقه فى صوره مسحوق بتركيز ٥% ، ١٠% على الكلى المصابه فى ذكور الفئران المعالجه بالجنتاميسين باستخدم ٣٦ فأر في هذه الدراسة يتراوح وزن كل منها ١٥٠±١٠ جرام وتم تقسيمها إلى٦ مجموعات متساويه ، كل مجموعة تحتوي على ٦ الفئران. تركت المجموعه الاولى كمجموعه ضابطه سالبه ، اما المجموعات الخمس الأخرى فتم حقنها بواسطه الجنتامسين يوميا لمده ١٠ أيام . وفى نهايه التجربه تم قياس أنزيمات الكبد فى الدم والالبيومين والبروتين الكلى ، وظائف الكلى، الكوليسترول الكلى، الدهون الثلاثيه . كانت أهم النتائج المتحصل عليها أن الزيادة في وزن الجسم والغذاء المتناول من كل مجاميع الفئران أظهرت زيادة غير كبيرة في القيم المتوسطة بالمقارنة مع مجموعة الظابطة الموجبة .وسجلت أفضل نتيجة من اليوريا وحمض اليوريك والكرياتينين عن الفئران التي تغذت على تركيز ١٠% من جذور وأوراق البنجربالمقارنة مع المجموعة الظابطة السالبة. أقل قيم فى انزيمات الكبد المختلفة (ALP، ALT, AST) سجلت مع مجموعة الفئران التى تغذت على جذور البنجر بتركيز ١٠٪ جذور البنجر على شكل مسحوق بالمقارنة مع مجموعة الظابطة السالبة. واظهرت الدراسة أن الفئران التى تغذت على وجبات مختلفة من البنجر حدث لها انخفاض كبير في نسبة الكولسترول الكلي والدهون الثلاثية بالمقارنة مع مجموعة الظابطة الموجبة. كذلك حدث انخفاض كبير فىHDL-C ، LDL-Cو VLDL-c للفئران التى تغذت على وجبات مختلفة من البنجر بالمقارنة مع مجموعة الظابطة الموجبة. خلاصة القول أن تغذية الفئران على جذور وأوراق البنجر أدى إلى تحسين وظائف الكلى والكبد وانخفاض دهون الدم.

الكلماتالمفتاحيه : البنجر ، أوراق البنجر ، أمراض الكلى .