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Introduction:

In chronic kidney disease CKD, the kidneys are damaged and/or cannot filter blood normally. CKD increases the risk for many adverse health outcomes, including cardiovascular disease, end-stage renal disease (ESRD), and mortality. However, CKD is usually asymptomatic until its most advanced state.

CKD has been defined as decreased kidney function and/or kidney damage persistent for at

Least 3 months. Kidney dysfunction is indicated by a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m2, while kidney damage most frequently is manifested as increased urinary albumin excretion. (**CDC,2010 and National Kidney Foundation, 2002**).

National Kidney Foundation recommends plant-based diets, such as the Dietary approaches to stop hypertension (DASH) diet, which are high in fiber; are low in saturated fat and processed meats; contain sources of potassium, phosphorus, magnesium, and calcium; and have low levels of sodium. The health benefits of such diets include preventing heart disease and hypertension as well as delaying the progression of kidney disease. The Mediterranean diet is similar to the DASH diet, and it is also associated with a lower risk of mortality from cardiovascular disease (**Clegg and Gallant, 2019**).

Higher dietary fiber intake was associated with better renal function and lower inflammation. Higher fiber intake was also associated with better survival, especially in individuals with manifest CKD **(Hong Xu, 2018).**

Barley contains insoluble fiber which helps the regulation of bowl function and also may help decreasing the risk for cancers; in addition, barley contains antioxidants that reduce the rate of oxidative damage by scavenging free radicals. Soluble fiber, such as β-glucan, may be beneficial in regulating sugar, insulin, and cholesterol responses to foods. Barley inhibits hydrogen peroxide (H2O2) by provoking oxidative damage to DNA and apoptosis (**Pins, J. J., and Kaur ,2006 , Keenan *et al*, 2007 and Abozalam *et al*, 2016**).

Oat is known with its high β-glucans content which is soluble dietary fiber, B complex vitamins, protein, fat and minerals, Cereal β-glukan usage, increase the functional quality of foods. It reduces the blood glucose, cholesterol and triglyceride level. It also protect humans against colon cancer .In addition, oat is a source of antioxidants, such as tocols and various phenolic compounds. Oat antioxidants have been reported to inhibit low-density lipoprotein oxidation and promote scavenging of reactive oxygen species (**Othman *et al*, 2011, El Rabey *et al*, 2013 and Giram *et al*, 2017**).

The popularity of bakery products has contributed to increased demand for ready-to-eat, convenience food products, such as bread, biscuits, snacks and other pastry products **(David, 2006).**

The present study was carried out to evaluate the effect of barley and oat flour on the physicochemical and sensory properties of the snacks and to investigate the biological role of the snacks fortified with barley and oat flour on kidney and liver functions**.**

Materials and methods:

Materials:

Wheat variety (*Triticum sativum*) cultivar, barley (*Hordeum vulgare*) grains Giza 123, (B)and oat (*Avena sativa*) grains were obtained from Field Crops Institute, Agricultural Research Center, Giza, Egypt; and wheat grain was milled for 72% extraction using Buhler laboratory pneumatic flour mill. All Kits of Biochemical analyses: AST, ALP, bilirubin, albumin, cholesterol, triglyceride, HDL, LDL, urea, creatinne and urea were purchased from Biomeieux, Laboratory of Reagents and Products (France).

Methods

Preparation of snacks:

The flour blends were prepared according to the ratio presented in Table (1). Different blends were mixed at the rate of 100g blended flour with 1.5 g active dry yeast, sodium chloride (1.5 g), sugar (10g), and vanilla (1g). The dough was left to ferment for 1 hr for 30ºC at 85% relative humidity.

The dough was divided to pieces each weighted 20gm. The pieces were arranged on trays and were left to ferment for a further 30 min at the same temperature and relative humidity. The pieces of fermented dough and left again for 15 min at the same temperature and relative humidity then were baked at 230 ºC for 10 min. Snacks were allowed to cool on racks for about 1 hr before evaluation.

Table (1): The flour blends wheat, barley and oat flour for snacks making.

Sample	Blends (%)		
	wheat flour (WF)	barley flour (BF)	Oat flour(OF)
C	100	0	0
T1	50	0	50
T2	50	50	0

Chemical analysis:

Total solids, fat, total protein (TN) , Carbohydrate, crude fiber ,ash , calcium, phosphorus, manganese, potassium and sodium contents were determined according to **AOAC (2007).**

Sensory Properties

Snack samples were evaluated for color (20), flavor (20), taste (20), crispiness (20), appearance (20) and overall acceptability (100) according to the method described in **AACC (2000).**

Experimental conditions:

Male Wistar Albino rats (aged 7-8 weeks) weighing 150-240 g was purchased from the Animal House Colony, National Research Center, Giza, Egypt. All animals were maintained on a standard diet only and housed in a room free from any source of chemical contamination.

Preparation of the Basal Diet:

The basal diet for rats was prepared using AIN-93 according to **Reeves *et al.* (1993).** the basal diet consists of the following: Protein (Casein) 20%; Sucrose 10%;Corn Oil 4%; Choline Chloride 0.2%; Vitamin mixture 1%; Salt mixture 3.5%; Fibers (Cellulose) 5% and the remainder is Corn Starch up to 100%.

Experimental procedure:

Forty rats were randomized into 5 equal groups each of 8 animals. Group 1 was injected intraperitoneally with sterile normal saline (0.2 ml) and keep as normal (negative) control. Group 2 was daily injected with GM in a dose of 100 mg/kg b.wt during the last 8 days of experiment to induce nephrotoxicity and kept as a nephrotoxic (positive) control. Groups 3, 4 and 5 were fed a basal diet injected with GM +whet snacks, oat snacks and barley snacks at a rate of 20% for each, respectively. At the end of the experimental period, all rats were fasted overnight then sacrificed. Blood samples were immediately collected from the retro orbital plexus with capillary tubes under mild ether anesthesia, into clean dried centrifuge tubes. The tubes were then centrifuged at 3000 rpm for 15 minutes. Clear serum samples were carefully separated using Pasteur pipettes, and frozen at - 20°C until biochemical analysis (**Margoni *et al*., 2011**).

Biochemical analysis:

Following 24 hours from the end of eight-day experimental period, blood samples were taken and sera were obtained. Biochemical parameters (Urea, creatinine, Albumin, ALP, ALT, AST, Cholesterol, TG, HDL and LDL) were assessed with an automatic analyzer (Roche Modular P800).

Statistical analysis:-

The obtained results were evaluated statistically using analysis of variance as reported by **McClave & Benson (1991).** In addition the other reported values were expressed as mean ±SD and ±SE, two – tailed Student’s t test was used to compare between different groups. . P value less than 0.05 was considered statistically significant. SPSS (Chicago, IL, USA) software window Version 16 was used.

Results and Discussion:

Chemical Composition of Raw materials and Snacks:

Table (1) summarizes the average of moisture, protein, fat, crude fiber and ash contents of the Snacks treatments. The protein, fat, fiber and ash levels of OF were higher than BFand WF; however the moisture content of WF was higher than BF and OF. Total carbohydrate content of BF was higher than WF and OF. Data presented in Table (2) show the chemical composition of snacks from WF and (50% OF: 50% WF) and (50% BF: 50% WF). Oat–WF snacks (50:50) were characterized with higher moisture, protein, and fiber content, and lower carbohydrate content than other treatments. The increase in protein, fat, fibers and ash of oat flour supplemented snacks can be attributed to the high content of those ingredients in OF. Such findings were also obtained by **Pastuszka *et al.* (2012) and El Shebini, *et al*, (2014),** who studied chemical, rheological and sensory properties of wheat-oat flour composite snacks.

Table (2): Chemical Composition of Raw Materials and Snacks.

Samples	Moisture %	Protein %	Fat %	Ash %	Fiber %	Carbohydrates%
WF	11.41±0.45^{A}	12.49±0.84^{B}	1.4±0.15^{C}	0.51±0.11^{C}	0.88±0.09^{C}	74.19±3.25^{AB}
OF	8.1±0.36^{B}	16.0±0.95^{A}	5.0±0.35^{A}	1.5±0.25^{A}	5.4±1.12^{A}	69.40±2.88^{B}
BF	7.29±0.48^{C}	12.32±0.85^{B}	1.54±0.18^{B}	1.22±0.30^{B}	1.53±0.95^{B}	77.63±3.75^{A}
Snacks treatments						
C	5.24±0.65^{B}	12.42±1.22^{B}	6.86±0.85^{C}	0.78±0.74^{B}	0.94±0.25^{C}	74.88±3.80^{A}
T1	6.78±1.20^{A}	14.52±1.45^{A}	9.36±1.03^{A}	1.84±0.95^{A}	3.20±0.87^{A}	67.50±3.62^{B}
T2	6.32±1.35^{A}	12.24±1.35^{B}	8.76±0.95^{B}	1.90±0.98^{A}	2.68±0.76^{B}	70.78±3.82^{AB}

The same letters in the column means significant differences
WF= Wheat flour (72% ext.) . O = Oat flour. B = barley flour
C: Snacks manufacture with wheat flour (72% ext.)
T1: Snacks manufacture with wheat and oat flour (50/50 w/w)
T2: Snacks manufacture with wheat and barley flour (50/50 w/w)

Minerals content of raw materials and snacks:

Table (3) shows the average of calcium, phosphor and potassium contents of the snacks treatments. Whereas wheat flour contained the lowest amount of calcium and phosphor. OF were higher in phosphor and potassium contents than BF and WF; however BF had the highest of calcium.

Data presented in Table (3) show the Minerals content of snacks from WF and (50% OF: 50% WF) and (50% BF: 50% WF) . Oat–WF snacks (50:50) were characterized with higher phosphor and potassium content than other treatments._While BF–WF snacks (50:50) were characterized with higher calcium content than other treatments_The increase in phosphor and potassium content of oat flour supplemented snacks can be attributed to the high content of those ingredients in OF. Such findings were also obtained by **Sangwan *et al*., (2014).**

Table (3): Minerals content of raw materials and snacks.

Samples (mg/100g)	Calcium (Ca)	Phosphor (P)	Potassium (K)
WF	22.13±0.85^{C}	72.40±1.82^{C}	67.38±1.72^{B}
OF	53.84±1.12^{B}	107.92±4.20^{A}	428±11.4^{A}
BF	282±9.14^{A}	98.18±3.95^{B}	65.78±0.84^{B}
Snacks treatments			
C	16.48±0.42^{C}	58.34±2.18^{C}	52.45±2.02^{C}
T1	37.24±0.38^{B}	94.25±4.16^{A}	214.50±8.13^{A}
T2	128.35±6.20^{A}	82.54±3.32^{B}	65.20±2.14^{B}

The same letters in the column means significant differences
WF= Wheat flour (72% ext.). OF = Oat flour. BF = barley flour
C: Snacks manufacture with wheat flour (72% ext.).
T1: Snacks manufacture with wheat and oat flour (50/50 w/w).
T2: Snacks manufacture with wheat and barley flour (50/50 w/w).

Sensory Attributes:

Data presented in Table 4 show the sensory evaluation of snacks as a function of replaced WF with OF and BF. Regarding color, flavor and crispiness, it could be noticed that no significant differences between snacks from WF (control) and snacks from mixtures of WF with OF (T1). Significant differences were observed when wheat flour was replaced with BF in snacks for taste, appearance and overall acceptability. As the replacement level increased the color, flavor crispiness, general appearance and overall acceptability score increased. WF (control) had the highest scores for sensory attributes flowed by snacks from mixtures of WF with OF (T1). The results obtained are agree with **El Shebini, *et***

***al*, (2014),**who found that replaced wheat flour with OF in snacks cased enhancement in taste, appearance and overall acceptability .

Table (4) Sensory evaluation of snacks produced from WF, OF and BF.

Snacks treatments	Overall acceptability (100)	Appearance (20)	Crispness (20)	Taste (20)	Flavor (20)	Color (20
C	90.20±0.22^{B}	16.40±0.12^{A}	17.90±0.62^{B}	19.2±0.85^{A}	18.8±0.745^{B}	17.9±0.82^{B}
T1	91.40±0.30^{A}	16.20±0.08^{A}	18.30±0.84^{A}	19.6±0.80^{A}	19.2±0.75^{A}	18.1±0.82^{A}
T2	87.80±0.20^{C}	15.60±0.06^{B}	17.80±0.80^{B}	18.2±0.82^{B}	18.9±0.80^{B}	17.3±0.82^{BC}

The same letters in the column means significant differences

Effect of snacks produced from WF, OF and BF on kidney and liver functions of rats:

The effect of snacks produced from WF, OF and BF on serum urea nitrogen, and creatinine in gentamicin-nephrotoxic rats are presented in table (5).The nephrotoxicity rats Group (2) positive control(C+ve) were increased in serum levels of urea nitrogen, and creatinine when compared with Group (1) control negative (C-ve). Oral intake of snacks produced from WF, OF and BF in nephrotoxic rats were induced decreased in high serum levels of urea nitrogen, and creatinine when compared with Group (2) positive control(C+ve**).**

Abozalam *et al*, (2016) recorded that doxorubicin conjugated with green tea and barley increased renohepatoprotection activity and may decrease systemic toxicity of doxorubicin when administered in high dose. Also, **El Shebini *et al*, (2014),** found that OF could be useful for preparation of snacks, which reduced serum urea nitrogen and creatinine, when compared with positive group rats. Celery is rich in B-Complex vitamins, adding to its stress reducing and sedative qualities. It is rich in vitamins A and C, and is indicated in arthritis and kidney problems.

The same table (5) showed that the nephrotoxicity rats Group (2) positive control(C+ve) were increased in ALT, AST and ALP when compared with Group (1) control negative (C-ve). Oral intake of snacks produced from WF, OF and BF in nephrotoxic rats were induced decreased in ALT, AST and ALP when compared with Group (2) positive control(C+ve**)**. Such findings were also obtained by **Abozalam *et al*, (2016),** who stated that combination of barley, green tea and doxorubicin for 4 weeks after induction of hepatorenal toxicity significantly decreased serum AST and ALT compared to control positive group. Also, **Arshadi *et al*, (2014),** found that OF could be useful for preparation of snacks, which reduced ALT, AST and ALP when compared with positive group rats.

Table 5. Effect of snacks produced from WF, OF and BF on kidney and liver functions of rats

Groups	AST (U LG[1])	ALT (U LG[1])	ALP (U LG[1])	Albumin (mg dLG[1])	Urea (mg dLG[1])	Creatinine (mg dLG[1])
Group 1	31.40±0.82[B]	29.80±1.40[C]	105.72±6.15[C]	4.36±0.20[B]	43.20±1.2[D]	0.62±0.02[C]
Group 2	38.62±0.94[A]	37.40±1.62[A]	146.50±6.80[A]	3.24±0.14[D]	56.32±1.7[A]	0.74±0.01[A]
Group 3	32.60±0.84[C]	31.18±1.02[B]	116.42±6.20[B]	3.86±0.12[C]	50.24±1.4[B]	0.70±0.04[B]
Group 4	29.34±0.75[D]	28.64±0.98[D]	96.36±5.42[D]	4.82±0.26[A]	43.60±1.02[D]	0.52±0.03[E]
Group 5	30.12±0.87[B]	29.72±1.04[C]	102.28±6.20[C]	4.20±0.28[BC]	45.28±1.3[C]	0.58±0.04[D]

The same letters in the column means significant differences

Group1: Control negative rats fed on basil diet.

Group2: Control positive rats fed on basil diet and treated with gentamicin (100 mg/kg/day.).

Group3: Rats fed on basil diet treated with gentamicin and 20% wheat flour snacks.

Group4: Rats fed on basil diet treated with gentamicin and 20% oat snacks.

Group5: Rats fed on basil diet treated with gentamicin and 20% barley snacks.

Effect of snacks produced from WF, OF, and BF on lipid profile in rats:

The effect of snacks produced from WF, OF and BF on total cholesterol and triglyceride in gentamicin-injected rats are presented in

Table (6) .The results revealed that the total cholesterol was significantly increased in nephrotoxic rats Group (2) positive control(C+ve) compared to Group (1) control negative (C-ve). Oral intake of snacks produced from WF, OF, and BF in nephrotoxic rats were significantly (P<0.05) reduced serum total cholesterol, triglycerides, LDL but increased HDL when compared to Group (2) positive control(C+ve). the results obtained are agree with **Arshadi *et al*, (2014),** who stated that barley and oat cause reduction of blood fats, serum total cholesterol, LDL , triglycerides and cholesterol. So the simultaneous use of these extracts is recommended. Also, barley extract has more useful effect than oat extract in reduction of blood lipid parameters.thes may be due to a high content of oat and barley from dietary fiber and phenolic compounds, which inhibit low-density lipoprotein oxidation and promote scavenging of reactive oxygen species (**El Rabey *et al*, 2013** and **Abozalam *et al*, 2016).**

Table 6: Effect of snacks produced from WF, OF and BF on lipid profile in rats

Groups	**Cholesterol (mg dLG^{1})**	**TG (mg dLG^{1})**	**HDL (mg dLG^{1})**	**LDL (mg dLG^{1})**
Group1	88.20±7.22^{C}	134.60±3.34^{B}	31.34±3.83^{C}	28.14±0.40^{B}
Group2	93.42±8.54^{A}	150.32±4.20^{A}	24.80±3.62^{D}	38.62±0.52^{A}
Group3	86.14±9.42^{B}	136.48±3.12^{B}	30.60±3.44^{C}	28.40±0.43^{B}
Group4	80.12±7.06^{E}	114.30±2.82^{D}	38.62±4.12^{A}	20.12±0.54^{C}
Group5	82.24±7.84^{D}	122.50±2.94^{C}	35.25±4.32^{B}	22.50±0.45^{C}

The same letters in the column means significant differences

Group1: Control negative rats fed on basil diet.

Group2: Control positive rats fed on basil diet and treated with gentamicin (100 mg/kg/day.).

Group3: Rats fed on basil diet treated with gentamicin and 20% wheat flour snacks.

Group4: Rats fed on basil diet treated with gentamicin and 20% oat snacks.

Group5: Rats fed on basil diet treated with gentamicin and 20% barley snacks.

Conclusion:

Barley and oat flour can be used in snacks manufacture at concentration of 50 and 50 respectively which enhanced chemical composition and sensory properties of snacks. Barley and oat flour could be attributed to inhibition of lipid peroxidation and enhancement of kidney and liver functions.

Abstract:

The aim of this study to investigate the effect of replacement of wheat flour with barley and oat flour on the physicochemical and sensory properties of the snacks and the effect of this product on some biochemical parameters of kidney and liver in nephrotoxicity induced by GM in rats were investigated. Snacks recipes were prepared; using 100% wheat flour, 50% replacement levels of wheat flour (WF) by oat flour (OF) and 50% replacement levels of wheat flour (WF) by barley flour (BF). The results showed that the snacks produced from replacement levels of wheat flour (WF) by 50% of barley and oat flour gave the highest scores of sensory properties than the control. Snacks containing 50% oat and 50% barley flour were used to feed rats with gentamicin-induced nephrotoxicity: The rats used in the study were randomly divided into 5 groups. Each group had 8 rats :(group 1) fed on basil diet and served as control , (group 2) fed on basil diet with injected with GM, (group 3) , rats fed on basil diet treated with gentamicin with 20 % wheat flour snacks, (group 4) rats fed on basil diet treated with gentamicin with 20 % snacks containing 50 % oat flour (OF), and (group 5) rats fed on basil diet treated with gentamicin with 20 % snacks containing 50 % barley flour (BF). Blood samples were taken after 24 hours from the end of experiment which lasted eight days. The results showed that the introduction of snacks containing oats and barley into the meal of rats treated with gentamicin for 6 weeks induced significant ($P < 0.05$) decreases in serum urea nitrogen, creatinine, ALT, AST, ALP, serum total cholesterol and triglycerides when compared with GM- intoxicated rats. The nephroprotective mechanisms of barley and oat could be attributed to inhibition of lipid peroxidation and enhancement of kidney and liver functions. These results affirm the traditional use of these materials in folk medicine for the prevention of kidney diseases.

Key words: Oat, barley, Snacks, gentamicin, nephrotoxicity, kidney diseases

References:

AACC, (2000). Approved Methods of the AACC. 8th ed., American Association of Cereal Chemists, INC. St., Paul, 2000, Minnesota, USA.

Abozalam, S.B.A., Salama, A.A.A., Arbid, M.M.S., Ain Shoka, A.A., and Abd El-Latif, H.A.(2016). Effect of Barley, Green Tea and Doxorubicin against N-dimethylnitrosamine Induced Hepatorenal Toxicity in Rats. Current Science International,5(4): 386-399.

AOAC (2007). Association of Official Analytical Chemists-Official method of Analysis, 18th Ed., Benjamin Franklin Station Washington DC, USA.

Arshadi ,A.,Talebi, E.,Tahery, E., and Kargar jahromy, H.(2014). Effect of barley and oats on high-density lipoprotein cholesterol and triglycerides in rats. Pars Journal of Medical Sciences, 12, (2): 29-35.

CDC. National Chronic Kidney Disease Fact Sheet 2010. 2010. Available at: www.cdc.gov/diabetes/pubs/pdf/kidney_Factsheet.pdf. Accessed November 12 2010.

Clegg, D.J., and Gallant, K.M.H (2019). Plant-Based Diets in CKD. Clin. J. Am .Soc. Nephrol, 14: 141–143.

David MO (2006). Nigeria, No 1 market for U.S. Wheat; Potential for other grains and feeds, USAID Foreign Agric. Serv. Bull., pp. 1-2.

El Rabey, H.A., Al-Seeni, M.N., and Amer, H.M. (2013). Efficiency of Barley Bran and Oat Bran in Ameliorating Blood Lipid Profile and the Adverse Histological Changes in Hypercholesterolemic Male Rats. BioMed Research International.1-10.

El Shebini, S.M., Ahmed, M.S., Hussein, Maha, I.A., Moaty, Nihad, H. Ahmed, Laila, M., Hanna, and Salwa, T. Tapozada.(2014). Chemical, Rheological and Sensory Properties of Wheat-Oat Flour Composite Snacks and Its Healthy Beneficial Effect. International Journal Of Food And Nutritional Sciences,3 (6) :34-43.

Giram, S. J., Agrawal, R. S., and Shere, D. M. (2017). Organoleptic and Nutritional Evaluation of Cookies Supplemented with Oat and Finger Millet. Int. J. Pure App. Biosci., 5 (5): 360-365.

Hong Xu ,(2018). Diet, Lifestyle and Chronic Kidney Disease. (Ph.D.). Public defense at the lecture hall Atrium, Nobels väg 12B, Solna campus, Karolinska Institutet, Stockholm, Sweden, Monday, October 15th 2018.

Keenan, J. M., Goulson, M., Shamliyan, T., Knutson, N., Kolberg, L., and Curry, L. (2007). "The effects of concentrated barley β-glucan on blood lipids in a population of hypercholesterolaemic men and women," British Journal of Nutrition, vol. 97, no. 6, pp.1162–1168.

Levent, H., and Bilgiçli,N.(2012). Evaluation of Physical, Chemical and Sensory Properties of Turkish Flat Breads (Bazlama and Yufka) Supplemented with Lupin, Buckwheat and Oat Flours. International Journal of Food Science and Nutrition Engineering, 2(5): 89-95.

Margoni, A., Perrea, D. N. , Vlachos, I., Prokopaki, G., Pantopoulou, A., Fotis, L., Kostaki, M. and Papavassiliou, A. (2011). Serum leptin, adiponectin and tumor necrosis factor-α in hyperlipidemic rats with/without concomitant diabetes mellitus, The Feinstein Institute for Medical Research., 17(1-2): 36-40.

McClave, J.T., Benson, P. G.(1991). Statistical for business and economics. Max Well Macmillan International editions. Dellen Publishing Co. USA. 1991:272-295.

National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. American Journal of Kidney Diseases. 2002 Feb; 39(2 Suppl1):S1-266. PMID 11904577.

Othman, R. A., Moghadasian, M.H., and Jones, P. J. H. (2011). "Cholesterol- lowering effects of oat β-glucan," Nutrition Reviews, vol. 69, no. 6, pp. 299–309.

Pins, J. J., and Kaur, H.(2006). "A review of the effects of barley β-glucan on cardiovascular and diabetic risk," Cereal FoodsWorld, vol. 51, no. 1, pp. 8–11.

Pastuszka, D., Gambuś, H., Ziobro, R., Mickowska, B., Buksa, K., and Sabat, R.(2012). Quality and nutritional value of wheat bread with a preparation of oat proteins. Journal of Microbiology, Biotechnology and Food Sciences, 1,: 980-987.

Sangwan ,S. Singh ,R .and Tomar,K(2014). Nutritional and functional properties of oats: An update. Journal of Innovative Biology. Vol. 1, Issue 1, P. 003-014.

تأثير الوجبات الخفيفة المصنعة بدقيق الشعير والشوفان علي وظائف الكبد والكلي في الفئران المعاملة بالجينتاميسين

هدفت هذه الدراسة إلى معرفة تأثير استبدال دقيق القمح بدقيق الشعير ودقيق الشوفان على الخصائص الفيزيائية والكيميائية والحسية للوجبات الخفيفة (سناكس) وتأثير هذا المنتج على بعض المتغيرات البيوكيميائية للكلى والكبد في الفئران المصابة بالتسمم الكلوي المستحث بالجينتاميسين. تم تحضير الوجبات الخفيفة باستخدام دقيق القمح ١٠٠٪ ، و ٥٠٪ من مستويات استبدال دقيق القمح بدقيق الشوفان و ٥٠٪ من مستويات استبدال دقيق القمح بدقيق الشعير . أظهرت النتائج أن الوجبات الخفيفة المنتجة من مستويات إحلال دقيق القمح بنسبة ٥٠٪ من دقيق الشعير والشوفان أعطت أعلى درجات في الخواص الحسية . لذا تم استخدام هذا المنتج المحتوي علي ٥٠% من دقيق الشوفان و٥٠% دقيق الشعير في تغذية الفئران المصابة بالتسمم الكلوي المستحث بالجينتاميسين ،حيث تم تقسيم الفئران المستخدمة في الدراسة بشكل عشوائي إلى ٥ مجموعات كل مجموعة كانت تحتوي على ٨ فئران: (المجموعة ١) تم تغذيها على الوجبة القياسية واستخدمت للمقارنة ، (المجموعة ٢) تم تغذيها على الوجبة القياسية مع حقنها بالجينتاميسين، (المجموعة ٣) تم تغذيها على الوجبة القياسية وحقنها بالجينتاميسين مع ٢٠٪ وجبات خفيفة من دقيق القمح فقط، (المجموعة ٤) تم تغذيها على الوجبة القياسية وحقنها بالجينتاميسين مع ٢٠٪ وجبات خفيفة تحتوي على٥٠٪ دقيق الشوفان و (المجموعة٥) تم تغذيها على الوجبة القياسية وحقنها بالجينتاميسين مع ٢٠٪وجبات خفيفة تحتوي على ٥٠٪ دقيق شعير ،تم أخذ عينات الدم بعد ٢٤ ساعة من انتهاء التجربة . أظهرت النتائج أن ادخال لوجبات الخفيفية المحتوية علي الشوفان والشعير في وجبة الفئران المعاملة بالجينتاميسين لمدة٦ أسابيع أدت إلى انخفاض معنوي ($P < 0.05$) في قيم نيتروجين اليوريا في الدم ، والكرياتينين ، و ALT، AST ، و ALP ، والكوليسترول الكلي في الدم ، والدهون الثلاثية عند مقارنتها مع الفئران المعاملة بالجينتاميسين. يمكن أن تعزى آليات الحماية في الشعير والشوفان إلى تثبيط بيروكسيد الدهون وتعزيز وظائف الكلى والكبد. وتؤكد هذه النتائج على الاستخدام التقليدي لهذه المواد في الطب الشعبي للوقاية من أمراض الكلى.