



Faculty of Home Economics

Journal of Home Economics
Print ISSN: 2735-5934, Online ISSN: 2735-590X
Menoufia University, Shibin El Kom, Egypt
<https://mkas.journals.ekb.eg>



Nutrition and Food Sciences

Studying the Bioactive Compounds Content, Antioxidant Activities in Barley and their Relationship with Diabetes in Rats

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Abstract

Diabetes is portrayed as the state in which insulin's homeostasis of sugar and lipid digestion is erroneously controlled. This study plans to research bioactive mixture content, cancer prevention agent exercises in grain, and their relationship with diabetes in rats. Thirty male pale-skinned rodents weighing 140 ± 10 g were partitioned into six gatherings. The principal bunch, five rats, was kept as a negative (-ve) control bunch that benefited from the basal eating routine, while the other five gatherings were infused with alloxan to initiate diabetes. The subsequent gathering was as yet benefited from the basal eating regimen and kept as a positive (+ve) control bunch. The other four gatherings helped from a basal eating routine containing 5, 10, 15, and 20% (w/w) grain powder. Creature's treatment with alloxan caused a huge ($P \leq 0.05$) expansion in the serum glucose focus contrasted with the ordinary control. Supplementation of rats' diet with 5, 10, 15, and 20% (w/w) grain powder prompts a decline in those qualities. Additionally, liver catalysts (ALP, AST, and ALT) and Kidney capacities (urea, uric corrosive, creatinine, and BUN) in diabetic rodents. The best treatment utilized was 20% of grain powder focus. These impacts are chiefly credited to grain powder's solid cell reinforcement exercises due to their high bioactive mixtures. We could consider that grain powder has a strong cancer prevention agent impact on the therapy of diabetes difficulties in rodents. Likewise, all tried centralizations of grain powder in this study caused improvement in the confusion brought about by diabetes.

Key words: *Barley powder, antioxidant effect, Biochemical analysis*

Introduction

Diabetes mellitus (DM) is a gathering of metabolic issues depicted as ongoing hyperglycemic condition coming about because of flaw in insulin discharge, insulin activity or both. These outcomes fundamentally in raised fasting and postprandial blood

glucose levels. On the off chance that this disparity homeostasis doesn't get back to business as usual and proceeds for a defer timeframe, it prompts hyperglycemia that at the appointed time transforms into a bunch of indications called DM WHO [1-4]. DM is broadly dispersed all around the world including Egypt, and almost one of each 10 man is diabetic. In 2006, as per the World Health Organization, somewhere around 171 million individuals overall experience the ill effects of diabetes ADA[5].The frequency is expanding quickly and it is assessed that constantly 2030, this number will presumably twofold [5].Thusly, the human populace overall seems, by all accounts, to be amidst a pandemic of diabetes. Reports from the World Health Organization (WHO) exhibit that DM is one of the significant enemies within recent memory, with individuals in Southeast Asia and Western Pacific just as Middle East being most at hazards [2].

Grain has persevered as a significant cereal harvest through numerous hundreds of years and it is the world's fourth significant cereal yield after wheat, maize and rice. The region committed to grain make in Ethiopia throughout the course of recent years has moved. It was around 0.8 million hectares in the last part of the 1970s, and rose to more than 1 million hectare in the last part of the 1980s Martin et al., [6]. It have different class of phenolic compounds, for example, benzoic, cinnamic corrosive subsidiaries, proanthocyanidins, quinines, flavanols, chalcones, flavones, flavanones, and amino phenolic compounds. They can be found in a free, esterified or in an insoluble bound structure and they are quantitatively disseminated between various tissues of the grains [7].

Grain was observed that steady utilization of all grains diminish the danger of type II diabetes by 31%, show that entire grains broaden exceptional advantages in propelling solid blood glucose control [8]. In spite of the fact that, there are gigantic investigations clarifies the treatment of DM by synthetic mixtures however such treatment still an issue a preliminary to open another road in diabetes forestall and treatment through utilizing the normal plant sources i.e., grain. Likewise, the bioactive mixtures fixings and cancer prevention agent action of grain will be the extent of this review.

Material and Methods

Materials and chemicals

Grain (*Hordeum vulgare* L.) was gotten from nearby market in Shebin El-kom, Menoufia Governorate, Egypt. Ordered affirmation of grain grains was done by Agricultural Plant Department, Faculty of Agriculture, Menoufia University, Shebin El-Kom, Egypt. Casein was acquired from Morgan Chemical Co., Cairo, Egypt. Alloxan, scientific packs, the pre-owned nutrients and salts combination for rodents basal eating routine readiness, and any remaining synthetics and solvents in logical grade were bought from El-Ghomhorya Company for Trading Drugs, Chemicals and Medical Suppliers, Cairo Egypt.

Rats

Male pale skinned person rodents (Sprague-Dawley white) weighing 140±10g were acquired from the Research Institute of Ophthalmology Medical Analysis Department, Giza, Egypt.

Methods

Preparations of barley powder

The grain grains were washed by regular water then, at that point, dried at 500C in a vacuum broiler (Gold Star, Egypt), then, at that point, processed (Molineux Egypt, Al-Araby Co., Egypt) and celebrated in plastic sack in 40C. The grain wheat has been isolated the powder. This plant were chosen to concentrate on its healthful and cancer prevention agent impacts against hyperglycemia.

Chemical composition analysis of barley

Grain tests were examined for general substance structure including dampness, protein (T.N. × 6.25, miniature - kjeldahl technique utilizing self-loader mechanical assembly, Velp organization, Italy), fat (Soxhlet mi-programmed device Velp Company, Italy, petrol ether dissolvable), debris, fiber and dietary fiber substance were resolved utilizing the strategies portrayed in the AOAC[9]. Sugars determined by contrasts: Carbohydrates (%) = 100 - (% dampness + % protein + % fat + % Ash + % fiber). All out energy (Kcal/100 g) was determined by Insel et al., [10], utilizing the accompanying condition: Total energy esteem (Kcal/100 g) = 4 (Protein % + carbs %) + 9 (Fat %).

Determination of bioactive compounds in BA

Total phenolics and flavonoids

Complete phenolics in grain were resolved utilizing Folin-Ciocalteu reagent as per Singleton and Rossi [11], while the all out flavonoids substance in Barley extricates were assessed utilizing colorimetric examine portrayed by Zhisen et al., [12].

Antioxidant activity

Cancer prevention agent action (AA) of grain samples and principles (α-tocopherol and) not entirely settled by the BCB measure following an adjustment of the system portrayed by Marco [13].

Biological experiments

Ethical approval

Natural trials for this study were morally endorsed by the Scientific Research Ethics Committee (Animal Care and Use), Faculty of Home Economics, Menoufia University, Shebin El-Kom, Egypt.

Induction of diabetes

Diabetes was actuated in thirty typical sound rodents by infusion into functionally with newly arranged alloxan monohydrate in saline at a portion level of 150 mg/kg body weight [14]. Following infusion creatures were gotten 5% glucose arrangement over

night to conquer drug actuated hypoglycemia [15-16]. Following five days blood glucose was dissected by a drop of blood was gotten from tail vein and exposed to a portion of haemogluco test. All rodents with fasting glucose > 126 mg/dl were viewed as diabetics and remembered for the test.

Experimental design

The examination was done in the Faculty of Home Economics, Menoufia University, Shebin El-Kom. All rodents were housed in hardened steel confines at ordinary environmental temperature ($25 \pm 5^{\circ}\text{C}$). Thirty grown-up male white pale skinned person rodents, Sprague Dawley Strain, 10 weeks age, gauging ($140 \pm 10\text{g}$) were utilized in this analysis. All rodents were benefited from basal eating routine arranged by AIN [17], for 7 successive days. After this variation period, rodents are separated into 6 gatherings, each gathering which comprises of 5 rodents as follows: Group (1), rodents will benefit from basal eating regimen as a control negative; Group (2), diabetic rodents feed on basal eating routine as a positive benchmark group; Group (3), Diabetic rodents were benefited from the grain as powder by 5% of the heaviness of the eating routine; Group (4), Diabetic rodents were benefited from the grain as powder by 10% of the heaviness of the eating routine; Group (5), Diabetic rodents were benefited from the grain as powder by 15 % of the heaviness of the eating routine; and Group (6), diabetic rodents were benefited from the grain as powder by 20% of the heaviness of the eating regimen.

Blood sampling

Blood tests were gathered toward the finish of the trial from the orbital plexus through heparinized slender glass tubes as indicated by the strategy for Schermer [18], Blood was gathered, either on EDTA for hematological examinations, or in glass rotator cylinders to isolate the serum. Following 10 minutes of centrifugation of the blood at 5000 rpm, supernatant serum was quickly isolated for biochemical investigation

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

Nutritional assessment of the various eating regimens were completed by assurance of body weight gain % (BWG), food effectiveness proportion (FER) as indicated by Chapman et al., [19], utilizing the accompanying equations: $\text{BWG}\% = (\text{Final weight} - \text{Initial weight})/\text{Initial weight} \times 100$ and $\text{FER} = \text{Grams gain in body weight (g/multi day)}/\text{Grams feed admission (g/multi day)}$.

Biochemical analysis

The plasma glucose, fructoseamine and not entirely settled by the strategies for Tinder [20], Scott [21], and Wilson and Miles [22], separately. Superoxide Dismutase (SOD) was examined by the strategy for Sun et al., [23], Catalase movement (CAT) was measured after the technique for Diego [24], Determination of Glutathione Peroxidase (GPX) did by the technique for Zhao et al., [25], Total cancer prevention agent action was assessed by phosphormolybdenum test as per Prieto et al., [26]. Liver capacities like

Aspartate aminotransferase (AST) was completed by the technique for Goldberg [27], Alanine aminotransferase (ALT) was done by the strategy for Yound [28], Serum not entirely set in stone as indicated by Tietz [29]. Kidney capacities, for example, urea was assurance as indicated by the enzymatic technique for Patton and Crouch [30], Serum not entirely set in stone as per the strategy portrayed by Henry [31], Uric still up in the air as per the technique depicted by Schultz [32], BUN is more effectively estimated than urea and is utilized as a list of blood urea level [33], Blood Urea Nitrogen (BUN) = 28/60 × serum Urea in mg/dl.

Statistical analysis

Factual examination was performed by utilizing PC program, measurable bundle for sociology (SPSS Software, Version 6.4 2008), and contrasted and each other utilizing the reasonable tests. Contrasts between medicines of ($P \leq 0.05$) were thought of as huge. Natural outcomes were examined by One Way ANOVA.

Results and Discussion

The general structure, bioactive mixtures and cancer prevention agent movement of grain are displayed in Table 1. The outcomes showed that the dampness, absolute protein, unrefined fat, rough fiber, debris and all out sugars substance were 11.89, 6.01, 0.81, 8.76, 1.28 and 71.25 %, separately. The general synthesis announced was not agreement with that saw by Makeri et al., [34], however somewhat understanding with that evaluated by Ereifej and Haddad [35]. These information mirrored the impact of assortments and geographic conditions on the substance piece of grain. These parts in grain may be significant according to the nourishment perspective. Accordingly, advancement of various food items with grain would improve the dietary nature of the item better than other numerous food sources. Additionally, the all-out dietary fiber, absolute phenolics and flavonoids content in the grain are giving such food high critical as a significant useful food. Moreover, the information showed that there was a positive and critical connection between the past bioactive mixtures as a whole and the cell reinforcement movement displayed by the grain tests. Such information as per the detailed by Liu and Yao [36]. Plant-based food sources by and large are viewed as significant wellsprings of cancer prevention agents in the eating regimen. Cancer prevention agents assist with shielding cells from the potentially harming physiological interaction known as "oxidative pressure" (harm to solid cells or DNA by unpaired electrons known as free revolutionaries). Oxidative pressure is believed to be transferred to the improvement of constant sicknesses including malignant growth, diabetes, coronary illness, heftiness and states of maturing including neurodegenerative infections like Parkinson's and Alzheimer's infection [37-44].

Table 1. Proximate composition of TRP

Component	Content
Proximate chemical composition:	
Water (g/100g)	11.89 ± 1.67
Total protein (g/100g)	6.01 ± 0.56
Crude fat (g/100g)	0.81 ± 0.11
Ash (g/100g)	1.28 ± 0.22
Crude fiber (g/100g)	8.76 ± 0.94
Carbohydrate (g/100g)	71.25 ± 3.09
Total energy (kcal/100g)	316.33± 5.18
Bioactive compounds:	
Dietary fiber	4.17± 0.84
Total phenolics (mg GAE.100g-1)	11.56 ± 1.14
Total flavonoids (mg catechin. 100g-1)	0.94 ± 0.08
Antioxidant activity:	
Antioxidant activity of barley (Ethanol extract, AA, %)	49.21 ± 1.33
Antioxidant activity of standard (α -tocopherol, AA, %)	98.12 ± 0.34
Antioxidant activity of barley (as a % of standard)	50.15 ± 0.71

Each value represents the mean of three replicates \pm SD.

Information state in table (2) the impact of taking care of grain powder on BWG of positive benchmark group was lower than negative benchmark group. Acquired outcomes demonstrated that control (+) has critical diminished from (23.89 \pm 3.23 to 14.06 \pm 1.24) contrasted with control (-) bunch. Other trial gatherings (G3, G4, G5) have non-huge contrasts, which revealed by Eman [45]. A similar table (2) show the impact of taking care of grain powder on (FI) of positive benchmark group was lower than negative benchmark group. Acquired outcomes showed that control (-) have huge diminished from (27.1 \pm 2.85 to 13.5 \pm 1.52) contrasted with control (+) bunch. Other trial gatherings (G3, G4, G5) have non-critical contrasts. Hyperglycemic rodents that benefited from diet contain 20% grain powder recorded the best outcome. It is obvious that because of diabetes mellitus FI diminished as found by Reham [46]. Then again, in table (2) (FER) of negative positive control recorded the most elevated worth when contrasted and positive control with huge distinction ($P \leq 0.05$). The mean qualities were 0.0089% and 0.0102%, separately. If there should be an occurrence of treated rodent gatherings, it clear to make reference to that 20% grain powder recorded the most elevated FER while, the least worth recorded for 5 % grain powder. The mean qualities were 0.0091% and 0.0099%, individually. FER diminished fundamentally when rodents infused with alloxan and decline when it took care of with grain powder revealed by Mona [47].

Table (2): Effect of Barley Powder on Body Weight Gain (BWG), Feed Intake (FI) and Efficiency Ratio (FER) (G/28 day) effect hyperglycemic rats

Groups	Parameters	Body weight gain (%)	Feed intake (g/day)	Feed Efficiency Ratio (%)
G1 C (-)		23.89a ±3.23	27.1a ± 2.85	0.0089d ±0.0019
G2 C (+)		14.06d ± 1.24	13.5e ± 1.52	0.0102a ±0.0014
G3(5% Barley Powder)		15.57cd ±1.31	17.7d ±0.54	0.0099b ±0.0017
G4 (10% Barley Powder)		16.16cd ±0.91	18.8cd ±0.66	0.0095bc ±0.0012
G5 (15% Barley Powder)		18.84c ± 1.51	20.3c ± 1.34	0.0092c ±0.0004
G6 (20% Barley Powder)		21.33b ±0.95	22.5b ±0.67	0.0091c ±0.0006a
LSD		2.095	1.774	0.0011

Each value represent mean of three replicates ± SD. Mean under the same column bearing different superscript letters are significantly different at $p \leq 0.05$.

In the table (3) showed the impact of grain powder on blood glucose of diabetic rodents. The acquired outcomes showed that the higher glucose level recorded for the positive benchmark group, contrasted with negative benchmark group with critical contrasts, The Values were (182.8±5.403 and 85.8±4.549), individually. All hyperglycemic rodents benefited from various eating regimens uncovered huge declines in the mean qualities, when contrasted with the positive benchmark group. These outcomes concur with Amna et al., [48], who proposes that the aftereffects of his review uncovered that by consuming grain based eating routine, showed huge decrease in postprandial serum glucose level when contrasted with consuming non-grain diet and the major dietary part of grain is Beta-glucan which assists with bringing down the blood glucose level. As displayed in the table (3) the mean worth of insulin (mg/dl) of positive benchmark group was lower than the negative benchmark group being (6.58±0.456 and 14.11±0.203 mg/dl) individually, all hyperglycemic rodents benefited from various eating regimens uncovered huge abatements in the mean qualities, when contrasted with the positive benchmark group. these outcomes with insulin concurred with Amna et al., [48], Information state in table (3) show the impact of taking care of Barley powder on fructosamine of positive benchmark group was more than negative benchmark group. Acquired outcomes showed that control (+) has critical expanded from (1.69±0.037 to 2.33±0.092) contrasted with control (-) bunch. Other test gatherings (G3, G4, G5) have non-critical contrasts. Comparative outcomes were found by Mohammed and Gehan [49], who proposed that the serum level of fructosamine marker were viewed as altogether expansion in the untreated diabetic gathering while the boundaries were fundamentally diminished in grain offered diabetic gathering in examination the diabetic. Hyperglycemic rodents that benefited from diet contain 20% grain powder shown the best outcomes. Grain shows powerful hypoglycemic activity in alloxan-prompted diabetic

rodents. Such action might be connected with various bioactive mixtures. These mixtures are known for their properties in rummaging free extremists, hindering lipid oxidation in vitro and further develop glucose reaction and insulin obstruction related with type 2 diabetes [40,50].

Table (3): Effect of barley powder on glucose, insulin and fructsamine of hyperglycemic rats

Groups	Parameters	Glucose (mg/dl)	Insulin (mg/dl)	Fructsamine (mg/dl)
G1 C (-)		85.8f ± 4.549	14.11a± 0.203	1.69e± 0.037
G2 C (+)		182.8a ± 5.403	6.58f± 0.456	2.33a± 0.092
G3(5% Barley powder)		152.8b±5.805	7.29e± 0.337	2.10b ± 0.058
G4(10% Barley powder)		136.6c±5.856	8.55d±0.422	1.93c ± 0.062
G5 (15% Barley powder)		124.8d± 4.147	9.50c±0.513	1.85c± 0.075
G6 (20% Barley powder)		109.6e ±4.159	10.99b±0.659	1.81d ± 0.047
LSD		6.122	0.531	0.087

Each value represent mean of three replicates ± standard deviation. Mean under the same column bearing different superscript letters are significantly different at $p \leq 0.05$.

The impact of grain powder on Catalase Activity (CAT)(%) of diabetic rodents displayed in Table (4) Data showed that (CAT)(%) of the negative benchmark group recorded the higher worth when contrasted and positive benchmark group with huge distinction. While the most elevated worth recorded for bunch (G6) (20% grain powder + basal eating regimen) however the least worth recorded for bunch G3 (5% Barley powder + basal eating routine) with huge distinction, The mean qualities were (40.2±1.643 and 31.6±2.408), separately. This in concurrence with Ereifej and Haddad [35]. who tracked down showed genuinely huge higher movement of CAT in Barley. The impact of grain powder on (GPX) (u/l), of diabetic rodents displayed in Table (4) Data showed that GPX of the negative benchmark group recorded the higher worth when contrasted and positive benchmark group with huge distinction. While, the most noteworthy worth recorded for bunch (G6) (20%, Barley powder + basal eating routine) however the least worth recorded for bunch G3 (5% grain powder + basal eating regimen) with critical distinction, The mean qualities were (953.8±55.03 and 552.0 ±31.07), individually. This in concurrence with Zduńczyk et al., [51], who proposed that the GPx action was viewed as expanding (P<0.05) with Results of an in vitro study were affirmed in changes of GPx exercises the Barley diet expanded the action of GPx. The impact of Barley powder on TAC of hyperglycemic rodents displayed in Table (4). Information showed that TAC of the negative benchmark group recorded the higher worth when contrasted and positive benchmark group with huge distinction. While, the most noteworthy worth recorded for bunch (G6, 20% grain powder + basal eating routine) however the least worth recorded

for bunch G3 (5%, grain powder + basal eating regimen) with critical distinction. The mean qualities were (1.24±0.080 and 0.78±0.074), separately. This in concurrence with Soong et al.,[52], who observed that absolute phenolic content was viewed as emphatically connected with complete subterranean insect oxidative limit and contrarily connected with the Respiratory trouble disorder (RDS) of biscuits. The phenolic content was most noteworthy in biscuit prepared with grain flour. The impact of grain powder on SOD of hyperglycemic rodents displayed in Table (4). Information showed that SOD of the negative benchmark group recorded the higher worth when contrasted and positive benchmark group with critical distinction. While, the most elevated worth recorded for bunch (G6) (20% grain powder + basal eating regimen) yet the least worth recorded for bunch G3 (5%, grain powder + basal eating routine) with critical distinction. The mean qualities were (251.3±7.35 and 184.4±5.99), individually. This in concurrence with Acar et al., [53], the dry spell treatment brought about a 418% and 59% increment in SOD movement in safe assortments toward the finish of the twelfth day of exploratory period. For the most part, to forestall free extreme harms (oxidative pressure exercises), the organic entity has created cell reinforcement protections to a great extent founded on cancer prevention agent chemicals ready to rummage ROS. Grasses are answerable for the decrease of O₂⁻ to H₂O₂ and various chemicals will eliminate H₂O₂ including GSH-Px and CAT. Additionally, the GSH decreases the Se and the diminished type of the protein then, at that point, respond with hydrogen peroxide. The proportion of nine GSH/GSSG in ordinary cells are kept high. Along these lines, there should be a system of lessening GSSG back to GSH. This is accomplished by GSH-Rd catalyst which catalyze the response: $GSSG + NADPH + H^+ \rightarrow 2GSH + NADP^+$. GSH-Rd can likewise catalyze decrease of certain blended disulphides, for example, that among GSH and Co-protein A [54]. Many examinations such Cao [55], announced that cancer prevention agent chemicals frameworks are dynamic in liver cells. Diminishing the movement of the cancer prevention agent chemical, brings about expanded ROS creation and mitochondrial brokenness [56]. The chose plant in the current review taking care of is wealthy in bioactive mixtures which displayed cancer prevention agent exercises in various natural frameworks [57]. Such cancer prevention agent properties are significant in bearing of the diabetes advancement through ROS searching cycles in Rbc's. Information of table (5) show ALT action of trial rodents. Clearly hyperglycemic impact on rodent brought of ALT up in serum (from 38.54±3.65 to 85.15±4.53 U/L). In the meantime cell reinforcement impact of grain phenolic intensifies switched this change, prompting abatement of ALT action, given that the most noteworthy impact was found for G6. Such outcomes affirm the synergistic activity of these spice. There is non-huge distinction between G6, G5, G4, G3 and the negative benchmark group. ALT is a liver-explicit protein that exists in the cytosol and, as a sign of liver not entirely settled, and is

a more touchy and explicit measures for liver cell harm [58]. Comparative outcomes were found by Hosseini et al., [59], who recommended that compound ALT had huge abatement in the exploratory gathering getting grain contrasted with the gathering getting cholesterol.

Table (4) Effect of barley powder on Catalase Activity (CAT), Glutathione Peroxidase (GPX), Total Antioxidant Capacity (TAC) and Super Oxide Dismutase (SOD) of hyperglycemic rats

Parameters	CAT (%)	GPX (u/l)	TAC (mmol/ml)	SOD (u/ml)
G1 C (-)	45.2a±2.863	1061.2a±11.12	1.91a±0.053	300.0a±11.97
G2 C (+)	23.2 e±4.086	418.4f±18.29	0.49f±0.066	116.6f±4.54
G3(5% Barley Powder)	31.6d±2.408	552.0e±31.07	0.78e±0.074	184.4e±5.99
G4 (10% Barley Powder)	35.4cd±3.286	640.4d±41.74	0.86d±0.044	200.1d±7.27
G5 (15% Barley Powder leaves)	37.0bc±2.738	793.0c±35.86	1.01c±0.056	226.6c±6.17
G6 (20% Barley Powder)	40.2b± 1.643	953.8b±55.03	1.24b±0.080	251.3b±7.35
LSD	3.982	42.326	0.067	9.781

Each value represent mean of three replicates ±SD. Mean under the same column bearing different superscript letters are significantly different at $p \leq 0.05$.

Aftereffects of table (5) show AST action of test rodents. It should that AST action was raised due to hyperglycemic inebriation (from 202.92±4.03 to 270.16±5.98 U/L) contrasted with control (-). There is non-huge contrast between G5 (grain powder 15%) and G6 (grain powder 20%). It additionally seen that there are non-huge between G3 (grain powder 5%) and G4 (grain powder 10%). These outcomes concurred with Amna et al., [48], who recommended that ALT action in serum while taking care of hyperglycemic rats on arrangement grain brought this action contrasted down with the positive benchmark group. Analysts showed that the methanol concentrate of grain seed because of phenolic compounds is compelling in the treatment of liver issues, and furthermore expands hepatic glutathione levels of the liver, lipid peroxidation of the liver and biochemical boundaries of liver which is viable and has a defensive impact during lipid peroxidation because of the utilization of certain medications Shah et al., [60]. Information of a similar Table (5) show ALP movement of exploratory rodents. It was seen that ALP movement was raised due to hyperglycemic. It should that ALT action was raised (from 138.21±3.41 to 237.11±3.95 (U/L) contrasted with control (-) rodents with huge difference between them. Test abstains from food (G3, G4, G5 and G6) showed critical decrease in ALP action (U/L), thinking about that the most elevated diminished breaking point got for G6 (grain powder 20%), The mean worth was (165.62±2.84). Comparative outcomes found by Maraia [61], who proposed that entire grain diminishes the degrees of S-ALT, AST, LDH and ALP in examination with +ve control bunch. The

impact of plant parts on diminishing the serum liver capacity proteins movement have been accounted for by many examinations [62-63]. Such impacts could be trademark to their undeniable level substance of phytochemicals. Our current information with the others revealed that grain is rich wellspring of various classes of phytochemicals such flavanols, phenolics, B-glycan, phytosterols and so on As a general rule, aminotransferases are regularly intracellular compounds. Hence, the presence of raised degrees of aminotransferase in serum shows harm to cells wealthy in these compounds. For instance, actual injury or an illness interaction can cause cell lysis, coming about arrival of intracellular chemicals into the blood [64]. Two amino transferases were found in plasma are of specific demonstrative worth AST and ALT. AST compound is one of the catalysts tried in the cardiovascular protein series. This compound is found in extremely high fixation inside the heart muscles, skeletal muscle cells, and less significantly in the kidney and pancreas. ALT is found predominately in the liver lesser amounts are found in the kidneys, heart and skeletal muscles [65].

Table (5): Effect of barley powder on liver functions ALT, AST and ALP of hyperglycemic rats

Groups	Parameters	ALT (U/L)	AST (U/L)	ALP (U/L)
G1 C (-)		38.54e ±3.65	202.92f±4.03	138.21f± 3.41
G2 C (+)		85.15a ± 4.53	270.16a ± 5.98	237.11a± 3.95
G3(5% Barley powder)		71.47b±5.01	248.83b ± 3.28	208.20b ±4.63
G4(10% Barley powder)		63.74c ±3.08	240.51c±1.56	189.40c± 6.46
G5 (15% Barley powder)		56.72d ± 3.37	229.36d ± 2.70	177.73d ±5.22
G6 (20% Barley powder)		52.20d ±2.29	221.01e ± 2.94	165.62e ±2.84
LSD		4.88	4.96	6.04

Each value represent mean of three replicates ±SD. Mean under the same column bearing different superscript letters are significantly different at $p \leq 0.05$.

Information introduced in table (6) showed the impact of Barley powder on Kidney capacities (serum creatinine, urea, blood urea nitrogen and uric corrosive) of hyperglycemic rodents. Information show serum creatinine movement of test rodents. It saw that serum creatinine movement was raised (from 0.34 ± 0.041 to 0.70 ± 0.071 mg/dl) due to hyperglycemic. It saw that serum Urea action was raised. Test counts calories (G3, G4, G5, G6) showed critical decrease in serum creatinine movement going from 0.58 ± 0.037 to 0.40 ± 0.023 , thinking about that the most elevated diminished cutoff acquired for G6 (grain powder 20%) and G5 (grain powder 15%) with non-huge contrast between them. Likewise, serum urea movement of exploratory rodents. It was seen that serum urea movement was raised due to hyperglycemic (from 40.52 ± 1.64 to 71.16 ± 2.59 mg/dl). It saw that serum urea movement was raised. Test consumes less calories (G3,

G4, G5, G6) showed critical decrease in serum urea movement going from (58.56±5.75 to 45.29±2.67), thinking about that the most elevated diminished cutoff got for G6 (grain powder 20%) and G5 (grain powder 15%) with non-huge contrast between them. Information in similar table show serum BUN action of test rodents. It was seen that serum BUN movement was raised due to hyperglycemic (from 40.52 ±1.64 to 71.16 ± 2.59 mg/dl). It saw that serum BUN movement was raised. Exploratory weight control plans (G3, G4, G5, G6) showed huge decrease in serum BUN action going from (58.56±5.75 to 45.29±2.67), thinking about that the most elevated diminished cutoff got for G6 (Barley powder 20%) and G5 (grain powder 15%) with non-critical distinction between them. At last, information show that serum uric corrosive action of test rodents. It was seen that serum uric corrosive action was raised due to hyperglycemic (from 1.20±0.057 to 3.04±0.475 mg/dl). It saw that serum Uric corrosive action was raised. Trial eats less carbs (G3, G4, G5, G6) showed critical decrease in serum uric corrosive action going from (2.09±0.106 to 1.38±0.074), thinking about that the most elevated diminished breaking point acquired for G6 (grain powder 20%) and G5 (grain powder 15%) with non-huge distinction between them. These outcomes concurrence with Abulnaja and Haddad [66]. who observed that simultaneous grain wheat supplementation slims down nonessentially diminished and improved these kidney work boundaries because of reduction the creatine kinase-MB to its not unexpected levels. Likewise, Mona [47], found that the serum creatinine and urea of hyperglycemic rodents as affecting by benefiting from grain bread. The impact of plant parts removes on decreasing the serum kidney work boundaries have been accounted for by many investigates [62-63, 67]. For example, announced in these examinations the lessening in serum uric corrosive and creatinine as the consequence of Barley taking care of could be ascribed to their higher substance of phytochemicals such flavanols, phenolic compounds, B-glycan, phytosterols and so on The conceivable method of activity of kidney serum boundaries bringing down level of the grain could be clarified by at least one of the accompanying cycles. Polyphenols found in such plant further developed the kidney weight and serum levels of urea nitrogen, creatinine and creatinine leeway just as expanded the action of superoxide dismutase in the kidney audited in El-Nashar [68]. While, many creators such Badary et al., [69] and Mohamed et al., [70], found that flavanone delivered critical insurance of renal capacity by huge decrease in serum urea and creatinine focuses, diminished polyuria and decrease in body weight reduction, checked decrease in urinary fragmentary sodium discharge just as ensured kidney tissues. At last, Van Hoorn et al., [71], saw that flavonoids brought down plasma creatinine and urea fixation, both demonstrating a superior postoperative kidney work.

Taking everything into account, the current review has shown the power of scarcely to improve hyperglycemia and its complexities in diabetic rodents. The entanglements

remember raised the cancer prevention agent guard framework for cells and work on the liver and kidney capacities. These impacts could be credited to their solid cancer prevention agent movement as the aftereffect of high bioactive mixtures content. These discoveries give a premise to the utilization of grain for the avoidance and early treatment of T2DM.

Table (6): Effect of barley powder on kidney functions (serum creatinine, urea, blood urea nitrogen and uric acid) of hyperglycemic rats

Parameters	Creatinine (mg/dl)	Urea (mg/dl)	BUN (mg/dl)	Uric Acid (mg/dl)
G1 C (-)	0.34e±0.041	40.52e±1.64	188.83e±7.67	1.20e±0.057
G2 C (+)	0.70a±0.071	71.16a±2.59	331.64a±12.08	3.04a±0.475
G3(5%Barley Powder)	0.58b±0.037	58.56b±5.75	272.88b±26.81	2.09b±0.106
G4 (10%Barley Powder)	0.47c±0.049	52.03c±2.08	242.42c±9.68	1.89bc±0.062
G5 (15%Barley Powder leaves)	0.44cd±0.020	51.02c±1.85	237.76c±8.66	1.65cd±0.085
G6 (20%Barley Powder)	0.40d±0.023	45.29d±2.67	213.04d±13.32	1.38de±0.074
LSD	0.058	3.828	17.696	0.287

Each value represent mean of three replicates ±SD. Mean under the same column bearing different superscript letters are significantly different at $p \leq 0.05$.

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دراسة المحتوى من المركبات النشطة حيويًا والأنشطة المضادة للأوكسدة للشعير وعلاقتها بمرض السكر في الفئران

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الملخص العربي

يعرف مرض السكر بأنه حالة عدم توازن أيض الكربوهيدرات والدهون بشكل غير صحيح بواسطة الأنسولين. تهدف الدراسة الحالية في التحقيق من الأنشطة المضادة للأوكسدة في الشعير وعلاقتها بمرض السكر في الفئران. ثلاثون من من ذكور الفئران البيضاء وزنها 10 ± 140 جم، تم استخدامها وتقسيمها إلى 6 مجموعات. المجموعة الأولى عبارة عن 5 فئران، تم وضعها كمجموعة ضابطة سالبة، تغذت على الوجبة الأساسية، بينما المجموع الخمسة الباقية تم حقنها بمادة الألوكسان للحث على الإصابة بمرض السكر. المجموعة الثانية تغذت على الوجبة الأساسية وتم وضعها كمجموعة ضابطة موجبة، والأربعة المجموع تم تغذيتها على الوجبة الأساسية تحتوي على تركيز 5 و10 و15 و20% من مسحوق الشعير. أدت معاملة الفئران الحيوانات بالألوكسان في زيادة معنوية ($P \leq 0.05$) في تركيز الجلوكوز في الدم مقارنة بالمجموعة الضابطة السالبة. بينما المكملات الغذائية 5 و10 و15 و20% من مسحوق الشعير أدى إلى تقليل هذه النسبة وكذلك أنزيمات الكبد (ALP, AST, ALT) ووظائف الكلى (اليوريا وحمض البوليك والكرياتينين ونيروجين اليوريا في الدم) في الفئران المصابة بمرض السكر وكانت أفضل المعاملات استخدام النسبة 20% من مسحوق الشعير. يمكن ان نرجع هذه التأثيرات بشكل أساسي إلى الأنشطة المضادة للأوكسدة القوية لهذا المسحوق نتيجة لمحتواها العالي من المركبات النشطة. يمكن اعتبار التأثيرات المضادة للأوكسدة في مسحوق الشعير قوي للتغذية في علاج مضاعفات مرض السكر في الفئران. وأظهرت كافة التركيزات المستخدمة في هذه الدراسة إلى تحسن في المضاعفات التي يسببها مرض السكر.

الكلمات المفتاحية: مسحوق الشعير، ارتفاع سكر الدم، الأنشطة المضادة للأوكسدة، التحاليل الكيميائية الحيوية.