Biological Study on the Beneficial Effects of Arabic Gum on Biological Parameters of Hyperglycemic Albino Rats

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Abstract: The purpose of the present work was to study the beneficial effects of Arabic Gum used in the diet of Alloxanized diabetic rats by single intraperitoneal injection of Alloxan at a dose 105 mg/kg b. wt on biological parameters. Thirty Adult albino male rats were classified into 5 groups (each involved 6 rats) one of which is control negative (-ve) group, another one was kept as control positive (+ve) and the remaining three rat groups were given Arabic Gum with 5%,10% and 15% respectively. Feeding was continued for 6 weeks. The study showed that the hyperglycemic group of rats fed with 5% had highly significant reducing serum glucose (68.17) compared to control positive (+ve) group. The lowest percentage of Arab Gum seems to be effective in the treatment of diabetic rats in improving BodyWeight Gain, Feed Intake, Feed Efficiency Ratio, Urea, Creatinine, Albumin and Total Protein concentration The recorded improvement of these parameters was highly significant and significant with both 10% &15% Arabic Gum. Arabic Gum corrected the changes in internal organs relative weight. The group of hyperglycemic rats fed with 5% had highly significant in the mean values of serum electrolytes,(Na,K.Ca and Ph), the recorded results were significant in 10% &15% Arabic Gum for these parameters. Sensory evaluation, Farinograph and Extensograph properties of dough of toast bread samples prepared with replacement of wheat flour by 5%, 10% and 15% Arabic Gum respectively showed that the flavor and general acceptability of 5%,10% of Arabic Gum were higher than those of all Arabic Gum toast bread samples. In conclusion, Arabic Gum had beneficial effects in improving the health status of hyperglycemic rats.
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Key words: Arabic Gum, hyperglycemic, diabeties, bakery product

1.Introdction

Diabetes mellitus is a metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The type-1 diabetes is caused by absolute deficiency of resistance to insulin action and an inadequate compensatory insulin-secretory response **(Bunker, 2008).**

Arabic gum (AG) is a branched-chain, complex polysaccharide, either neutral or slightly acidic, found as a mixed calcium, magnesium and potassium salt of a polysaccharidic acid. GA has been shown to have an adverse effect on electrolyte balance and vitamin D in mice, and to cause hypersensitivity in humans. Diabetes mellitus (DM) is a chronic disease that affected human kind throughout the world Recently, less precise records report that at random one of 5 to 10 persons in Egypt is inflicted with DM. **(Ahmed, 2007)**. Hyperglycemia can cause oxidative stress, which, in turn, may result in cellular tissue damage. The harmful influence of diabetes on metabolism of tissues and organs is well known Likewise, uncontrolled hyperglycemia can lead to disturbances in the structure and function of organs **(Gupta *et al.*, 2004)**. Arabic gum (AG) is spontaneously develop insulin deficiency and thus hyperglycemia. In Middle Eastern countries GA is widely used in the treatment of patients with chronic kidney disease and end-stage renal disease **(Al Majed *et al.*, 2002)**. GA was found to increase fecal nitrogen excretion (**Bliss *et al.*, 1996)** to decrease production of free oxygen radicals **(Al Majed *et al.*, 2002)**, and to modestly counteract renal injury following acute gentamicin nephrotoxicity in rats **(Ali *et al.*, 2003)**. In healthy mice, GA treatment has been shown to increase creatinine clearance and renal ADH excretion as well as intestinal and renal excretion of Mg^{2+} and Ca^{2+} **(Nasir *et al.*, 2008).** It has also been shown to lower plasma concentration of $1,25(OH)_2D_3$ as well as urinary P_i and Na^+ excretion **(Nasir *et al.*, 2008)**. A major cause of end-stage renal disease is diabetic nephropathy **(Schernthaner. 2008)**. The present study thus explored the beneficial effects of Arabic Gum on biological parameters of hyperglycemic albino rats.

2.Materials and Methods

Materials:

Arabic Gum The dried exudates (gum) from Acacia Sudan and related species (Acacia Seyal)**.** Alloxan was a pure chemical fine (BDH), obtained from Al Gomhorria company.

Preparation of bread:

Control bread was prepared to the recipe of Food Technology Research Institute Agricultural Research Center, Giza, Egypt. Experiment bread was prepared with replacement of 5, 10 and15% of kg flour by 5, 10 and15% grinded Arabic Gum.

Biological Experiment:

Thirty adult male albino rats of Sprague Dawly strain, average weight 150±15gm were obtained from Institute of Ophthalmology,Giza, Egypt.Rats were housed in individual stainless steel aerated cages for one week before starting the Experiment. This was carried out under hygienic laboratory conditions and fed basal diet for adaptation. Rats were then divided into 5 groups as follows:

Group(1): Control negative (-ve); 6 rats fed on basal diet.

Other 24 rats were injected subcutaneous with a single dose of Alloxan (150 mg/kg body weight to induce hyperglycemia **(Buko *et al.*, 1996).**

Group (2): Control positive(+ve); 6 diabetic rats fed on the basal diet.

Group (3): 6 diabetic rats fed on the basal diet with replacement 5% Arabic Gum.

Group (4): 6 diabetic rats fed on the basal diet with replacement 10% Arabic Gum.

Group (5): 6 diabetic rats fed on the basal diet with replacement 15% Arabic Gum.

Basal diet consisted of protein 10% (as casein), corn oil 10%; mineral 4%, cellulose 5%, starch 69,8%, choline chloride 0.2% and vitamin mixture 1%. Basal diet was prepared according to **Cambell (1963)** minerals and vitamin mixture were added according to **Hegested *et al.* (1941)**.

Body weight (BW) and feed consumption (FC) were calculated as reported by **Chapman *et al.* (1959)**. Feed efficiency ratio calculated as follow,

$$\frac{Mean\ daily\ weight\ gain\ (g)}{Mean\ daily\ FC\ (g)}$$

Internal organs were reported accurately dried from liquids and their weights calculated as percentage (%) of final weight.

Biochemical analysis of serum:-

At the end of the experimental period (6 weeks) rats were fasted overnight, anaesthetized, sacrificed and blood serum collected. The blood was centrifuged to obtain the serum which was stored at -18ºC till analysis **(Asstoor and king, 1954)**

Glucose was determined in the serum according to the colorimetric method by **Wayne (1998)**.

Calcium was determined in the Serum according to **Baginski, (1973),** phosphorus by **Yee, (1968),** sodium and potassium by **Riely, (1966**).

Urea, Creatinine, Total Albumin and Total protein was analyses by **Fawcett and Scott (1960).**

Sensory Evaluation

The organoleptic properties of fresh pan bread produced by using 100% wheat flour (72% ext.) as control sample and pan bread samples which prepared by partial replacement of wheat flour by 5,10 and 15% of Arabic gum were evaluated to select the best substitution level for high quality pan bread. The bread samples were evaluated by ten panelists for their external and internal properties. Sensory Evaluation was done in Food Technology Research Institute Agricultural Research Center, Giza, Egypt **A.O.A.C (1995)** to detect Crust Color, Crust Quality, Volume, Crumb Color, Crumb grain, Textual, Taste. Aroma and total scores or General Acceptability. All characteristics were evaluated from 1- 10 degree (1 represents very poor and 10 represents very good) except, Textual, Taste were evaluated from 1- 20 degree (1 represents very poor and 20 represents very good) and the total scores values were a reflection of all the tested quality attributes and acceptability of the studied pan bread. These values were calculated from 100 as a sum of received sensory score. **(Penfield and Camphell,1990). (Klein, 1984).**

The evaluated of each product was done at 11.30 am in laboratory of the Institute of food Technology Research Giza Egypt. Application of the score sheet is attached in the appendix **(Coultate, 1996).**

Rheological properties of the dough:

Rheological properties of the dough were assessed in Food Technology Research Institute Agricultural Research Center, Giza, Egypt, using Farinograph to determine: Water absorption(%), Arrival time (min), Dough development (min), Dough stability (min) and Degree softening(B.U). Extensograph properties of dough test was used to determine Elasticity Barbender Unit (B.U), Extensibility(mm), proportional Number P.N (B.U.mm) and dough energy (cm) according to **A.A.C.C,(1995)**.

Physical Experiment:

Physical Experiments were assessed in Food Technology Research Institute Agricultural Research Center, Giza, Egypt to determine weight, volume and Specific Volume according to **A.O.A.C, (1995)**

Statistical Analysis

Statistical Analysis of the obtained data was performed by calculating the mean and standard error, while T-test was used to represent the quantities data **(Snedecor, 1969)**.

3.Results :

Table (1) The demonstrated The effect of feeding with Arabic Gum on Blood glucose (mg/dl), which revealed 66.49% seems to be effective in the diabetic groups compared to control negative (-ve) group. Arabic Gum (5%) was significantly ($p < 0.05$) decreased the mean value of serum glucose as

compared to control groups. The lowest effect as anti-diabetic recorded for Arabic Gum 10% and 15% compared to the 5% of Arabic Gum. Glucose level in diabetic rats.The lowest percentage of Arabic Gum (126.33± 4.23).

Table(2) showed the Body weight gain (BWG), feed intake (FI) and feed efficiency ratio (FER) of hyperglycemic rats fed on Arabic Gum. The results recorded the body weight is significantly ($p < 0.05$) improved with controlling the diabetes through Arabic Gum in its lowest percentage (5%) while in 10% and 15% of Arabic Gum the results recorded decreased in BWG,FI and FER treatment as compared with diabetic control group.

Table (3) showed the mean values of relative internal organs weights of Diabetic rats fed on Arabic Gum. The results indicated that the mean values of internal organs weights (% of final body weight) of diabetic rats were affected by feeding on different percentage of Arabic Gum. The lowest percentage of Arabic Gum is significantly ($p < 0.05$) highest effective in decreasing the mean weight values of heart, liver and kidney, however, the mean weight value of the spleens is not effectively deceased.

Table (4): showed the effected the Arabic gum on the serum Electrolytes of Diabetic rat which feed on different of percentage of Arabic gum. The results indicated that the mean values of serum Electrolytes (Na,K,Ca,ph) of diabetic rats were affected by feeding on different percentage of Arabic Gum. The lowest percentage of Arabic Gum (5%) is significantly ($p < 0.05$) highest effective on the diabetic rats.

Table (5) The demonstrated The effect of feeding with Arabic Gum on serum Analysis of liver and kidney function in diabetic rats.The lowest percentage of Arabic Gum seems to be effective in the diabetic groups compared to control negative (-ve) group. Arabic Gum (5%) was significantly to control groups. The highly significantly ($p < 0.05$) effects in Urea, creatinine, Alb and T.P recorded for the 5% of Arabic Gum compared to 10% and 15% of Arabic Gum.

Table (6): Showed The results the effect of substitution of strong wheat flour 72% extraction rate with 5,10 and 15% of Arabic Gum on Farinogram parameters. It could be observed that the water absorption and the stability time was gradually increased as the level of substitution with Arabic gum increased respectively in compared to control wheat flour dough. while, both of arrival time and dough development time were not affected. On contrary, the degrees of softening values were gradually decreased with increasing replacement levels by Arabic gum Fig (1).

Table (7): presented the effect of Arabic gum on Extensograph properties of dough. From the obtained data, it could be noticed that the elasticity of wheat flour dough was in increased as result to increase substitution levels with Arabic gum, it was 240,275 and 445 mm for wheat flour replaced by 5,10 and 15% of Arabic gum, respectively, in compared with 140mm for wheat flour dough. Also, both of proportional number and energy had the same trained with dough elasticity Fig (2).

Table (8): Represented the effective of the partial replacement of wheat flour with 5,10 and 15% of Arabic gum on the physical examinations. It could be observed that, the partial replacement with Arabic gum increased the weight of loaves and bread volume gradually in parallel with increasing the level of substitution. As expected, the values of specific volume recorded the similar trend as that of volume.

Table(9): Showed that there were gradually improvement in all properties of produced pan bread by increasing the level of substitution with Arabic gum until 10% than, all the above mentioned properties of produced pan bread were decreased when, used 15% of Arabic gum.

Table(1):The effect of feeding with Arabic Gum on Blood glucose level in diabetic rats (mg/dl).

Groups Serum Glucose	Control negative (-ve)	Control positive (+ve)	Arabic Gum (5%)	Arabic Gum (10%)	Arabic Gum (15%)
Mg/dl	105 ±2.5	377±2.6	126.33±4.23	120±3.62	119±3.5
% of diabetic control	-72.25	-	-66.49	-68.17	-68.44
% of normal control	-	+259.5	+20.31	+14.28	+13.33

Normal value of glucose = (74 – 109)

Table (2): Body weight gain (BWG), feed intake (FI) and feed efficiency ratio (FER) of hyperglycemic rats fed on Arabic Gum.

Gruops Parameters	Control negative (-ve)	Control positive (+ve)	Arabic Gum (5%)	Arabic Gum (10%)	Arabic Gum (15%)
BWG	2.57±0.10	1.46±0.05	2.39±0.07	2.14±0.92	1.96±0.06
FI (gm/day)	15.63±0.08	13.67±0.07	15.42±0.03	14.21±0.08	13.90±0.04
FER	0.164±0.02	0.107±0.03	0.155±0.04	0.150±0.03	0.141±0.08

Table (3) Mean values of relative internal organs weights of Diabetic rats fed on Arabic Gum.

Groups / Internal organ	Control negative (-ve)	Control positive (+ve)	Arabic Gum (5%) treatment	Arabic Gum (10%) treatment	Arabic Gum (15%) treatment
Heart	0.48±0.13	0.75±0.03	0.55±0.02	0.6±0.01	0.57±0.02
Liver	4.73±0.24	5.05±0.27	4.7±0.26	4.65±0.28	4.57±0.28
Kidney	0.85±0.02	0.97±0.03	0.83±0.02	0.81±0.01	0.84±0.02
Spleen	0.47±0.01	0.53±0.02	0.50±0.01	0.52±0.01	0.52±0.02

Table(4) Mean values of serum Electrolytes of Diabetic rats fed on Arabic Gum.

Groups / serum Electrolytes	Control negative (-ve)	Control positive (+ve)	Arabic Gum (5%) treatment	Arabic Gum (10%) treatment	Arabic Gum (15%) treatment	Normal value of Electrolytes
Na	138.2±0.31	144.7±0.10	146.7±0.2	146.5±0.2	144±0.3	Up to 148
K	3.5±0.01	4.33±0.25	4.6±0.2	4.45±0.1	4.5±0.1	3.5 - 6.1
Ca	9.0±0.06	9.3±0.24	9.1±0.16	9.05±0.2	9.03±0.2	8.4 - 10.5
Ph	5.7±0.17	6.3±0.15	6.13±0.23	6.27±0.13	6.1±0.13	3.2 - 7.2

Table (5): Mean values of serum Analysis of kidney of Diabetic rats fed on Arabic Gum.

Groups / serum	Normal control	Diabetic control	Arabic Gum (5%) treatment	Arabic Gum (10%) treatment	Arabic Gum (15%) treatment	Normal value
Urea	35.1±0.24	36.33±0.27	34.0±0,25	37.0±0.23	30.33±0.23	Up to 48
creatinine	0.9±0.01	0.85±0.01	0.92±-.01	0.9±0.01	0.84±0.01	Up to 1.5
Alb	3.92±0.03	4.03±0.02	4.16±.02	4.0±0.02	4.3±0.02	3.6 - 5.7
T.P	6.72±0.13	6.76±0.10	6.46±0.11	5.92±0.10	6.36±0.10	3.5 - 6.8

Table (6): Effect of different percentage of Arabic gum on Farinograph properties of dough in comparison to control.

Sample / Parameters	Control sample	Arabic Gum (5%)	Arabic Gum (10%)	Arabic Gum (15%)
Water absorption (%)	52.6	57.3	58.2	58.6
Arrival time (min)	0.5	0.5	0.5	0.5
Dough development (min)	1.0	1.0	1.0	1.0
Dough stability (min)	2.0	3.5	12.0	15.5
Degree softening (B.U)	70	30	10	-----

Table (7): Effect of different percentage of Arabic gum on Extensograph properties of dough in comparison to control.

Sample / Parameters	Control sample	Arabic Gum (5%)	Arabic Gum (10%)	Arabic Gum (15%)
Elasticity (B.U)	140	240	275	445
Extensibility(mm)	125	130	130	120
properties Number P.N(B.U.mm)	1.1	1.8	2.1	3.7
Energy (cm)	17	24	26	38

Table (8): The physical examinations results of toast bread fortified by Arabic gum in comparison to control.

sample / Parameters	Control sample	Arabic Gum (5%)	Arabic Gum (10%)	Arabic Gum (15%)
Loaf weight (g)	187.0	187.3	188.0	188.7
Loaf volume (cm^3)	726.7	740.0	743.0	765.0
Specific volume (cm^3/g)	3.89	3.95	3.95	4.05

Table (9): The sensory evaluation results of toast bread fortified by Arabic gum in comparison to control.

Sample Parameters	Control sample	Arabic Gum (5%)	Arabic Gum (10%)	Arabic Gum (15%)
Crust Color (10)	8.4	9.2	9.4	8.2
Crust Quality (10)	9.2	9.2	9.4	9.0
Volume (10)	9.2	9.4	9.8	8.8
Crumb Color (10)	8.8	9.0	9.0	7.9
Crumb grain (10)	8.1	8.4	9.4	7.8
Texture (20)	17.8	18.0	18.5	17.4
Taste (20)	18.1	18.4	18.4	17.4
Aroma (10)	8.0	8.6	8.6	7.8
Total scores (100)	87.9	89.2	91.4	86.0

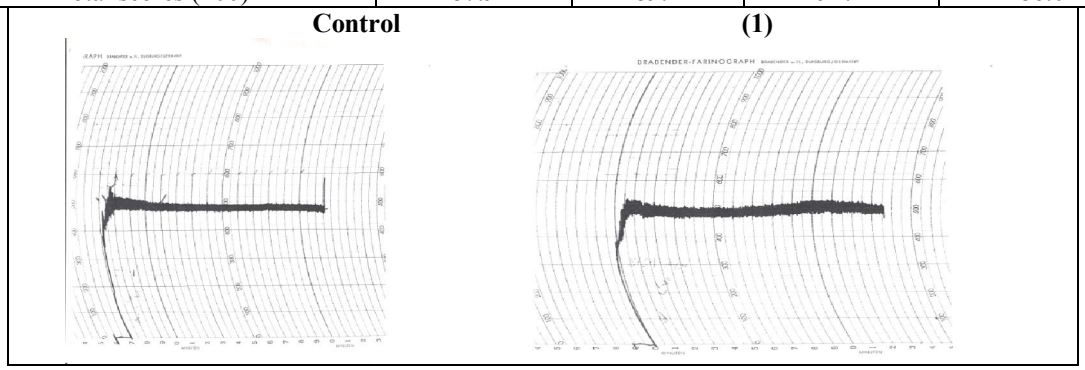
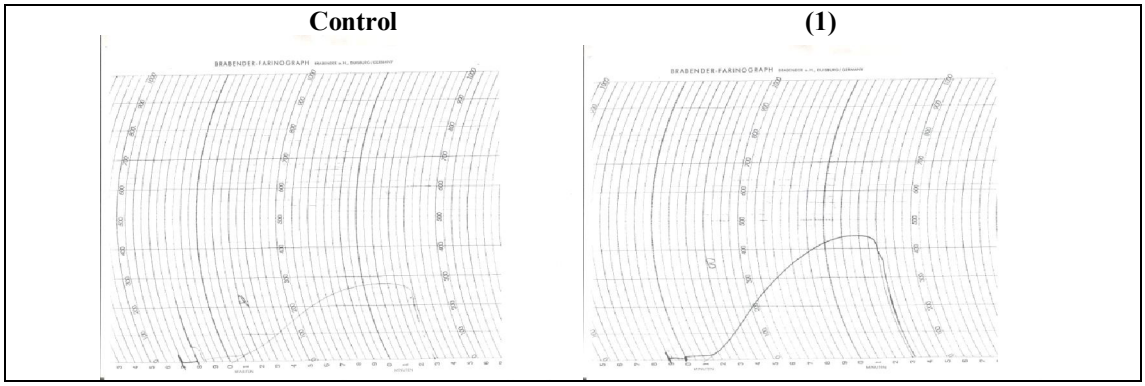


Fig.(1) Effect different percentage of Arabic gum on farinograph properties of dough in comparison to control.

Replacement 5%

- Replacement 10 %
- Replacement 15%



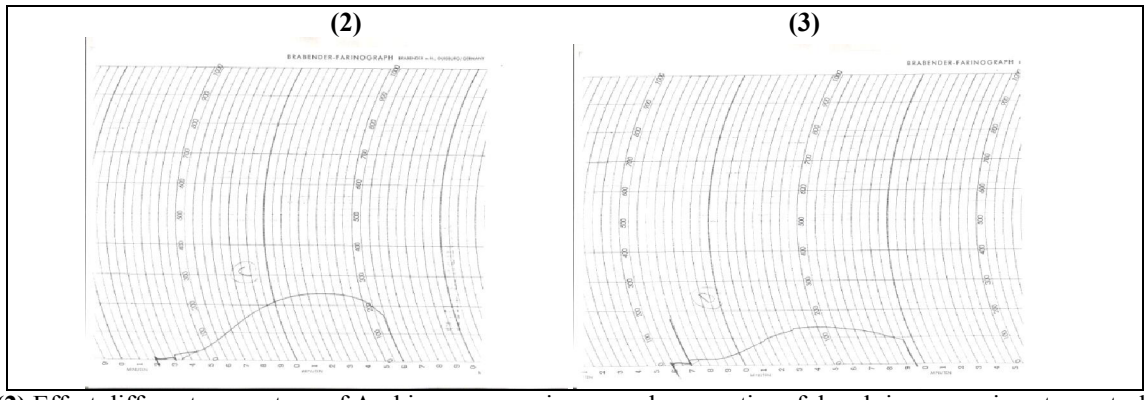


Fig.(2) Effect different percentage of Arabic gum on exiensograph properties of dough in comparison to control.

- Replacement 5%
- Replacement 10 %
- Replacement 15%

4.Discussion:

Wadood *et al.*(1989) concluded, albeit without experimental evidence, that Arabica initiated the release of insulin from pancreatic beta cells of normal rabbits. Previously, experiments were carried out *in vitro* and in normal human subjects to evaluate alternative food-grade viscous polysaccharides as agents for reducing postprandial hyperglycemia and to assess the relationship between the *in vitro* and *in vivo* performance of the polysaccharides

(Edwards *et al.*, 1987). Mixtures of different types of gum have been shown to inhibit glucose movement in vitro, and lower postprandial blood glucose and plasma insulin in human subjects when incorporated in a drink containing 50 g glucose **(Edwards *et al.*, 1987; Torsdottir *et al.*, 1989)**. Infusion of meals containing starch showed that a decrease in the digestion rate of starch in the upper small intestine accounted for part of the effect of viscosity on glycemic response, whereas the main effect of gum was apparently to slow gastric emptying **(Leclère *et al.*, 1994).** the results of our study showed that Arabic gum significantly treatment of diabetic rats increases gliclazide bioavailability and lowers blood glucose levels probably through the activation of B-cell function of Islet of Langerhans of pancreas or increase the formation of B-cell (proliferation cells) or it may be antagonists the blockage immune of receptors of B-cell of islets of Langerhans.

Also, the results of our study showed that the body weight is improved with controlling the diabetes through treatment compared to control groups. These results were agreement with **(Wapnir *et al.*, 1996, 1997)** who showed that drinking the GA-supplemented ORS *ad libitum* showed accelerated recovery in comparison to those receiving either water or ORS without gum. Recovery parameters included greater enhancement of weight gain, food and fluid intake, and a lower fecal output in rats whose ORS contained GA. This increase was evident after 4 h of recovery and persisted for 24 h. The authors ascribed the weight gain to the increased fluid intake and solid food consumption. However, no ready explanation for the persistent increased solid food intake was offered. The relative decrease of fecal output noted was ascribed to the increased fluid absorption – a feature that was also observed with GA in acute jejunal perfusion studies. The previous data suggest that GA is equally effective when consumed orally as when directly introduced post-stomach, as in intestinal perfusion studies **(Rehman *et al.*, 2000, 2001, 2003; Wingertzahn *et al.*, 2001).**

In this study the mean values of internal organs weight is effective in decreasing the mean weight values of the heart, liver and kidney, however, the mean weight value of spleens is not effectively decreased. fatty change (fatty degeneration) that means abnormal intra cellular accumulation of fats (free fatty acids or triglycerides and chylomicron) in the following organs particularly the liver, heart and kidney that are named as parenchymatous organs. Decreasing the weight of the parenchymatous organs improvement of its intra cellular fatty accumulation,redistribution of fatty subcutaneous fat occurs in uncontrolled diabetes**. (Mochida *et al.*, 1990).**

Phosphate and uric acid concentrations were reported to be significantly reduced by GA, while the treatment significantly increased that of serum calcium. It was concluded that GA could alleviate ‘‘adverse effects of CRF”. The small intestine is the major site of electrolytes and organic non-electrolytes absorption in the gastrointestinal tract (GIT) **(Wapnir and Teichberg, 2002).** It has been shown that GA improves small intestinal absorption of sodium in

normal rats **(Codipilly and Wapnir, 2004)** and of sodium and water in two animal models of diarrheal disease **(Wapnir *et al.*, 1997).** In normal male juvenile rats, addition of 5 and 10 g/L of GA increased the rates of sodium removal from the intestinal lumen perfused with oral rehydration solutions (ORS) containing either 60 mM or 90 mM sodium. Although GA tended to facilitate bidirectional fluid movement in these Addition of GA to the jejunal ORS-perfusate resulted in roughly a twofold increase in absorption of sodium, potassium and water in the chronic osmotic- secretory diarrheal model, and neutralized theophylline induced abolition of net sodium and potassium absorption, in addition to reversing water and glucose mal absorption **(Wapnir *et al.*, 1997)** The results of our study confirmed which the mean values of serum Electrolytes (Na,K,Ca,ph) of diabetic rats were affected by feeding on different percentage of Arabic Gum. The positive effects of the GA on fluids and electrolyte absorption observed in jejunal perfusion studies were also reported in rats recovering from chronic osmotic diarrhea induced by cathartic agents **(Teichberg *et al.*, 1999a,b).**

It could be observed from results of the effect of feeding with Arabic Gum on serum Analysis of liver and kidney function in diabetic rats, effects in Urea, creatinine, Alb and T.P, which the most valuable serological tests to identify the real liver function are total protein and total albumin measurements. That are more specific for liver when the proteins including albumin are decreased, this means impaired liver function. These results were in agreement with **Nasir (2007)** who showed one of the unexplained findings that GA treatment was associated with an increased 24 h-creatinine clearance in healthy mice. The exact mechanism for this remains unclear, since it represents a remote effect of GA on the kidney, which requires one or more humoral factors. It is well known that GA is fermented by intestinal bacteria leading to formation of various degradation products, such as short-chain fatty acids **(Bliss *et al.*, 1996).** In a recent study, serum butyrate concentrations were increased following treatment with GA in healthy subjects **(Matsumoto *et al.*, 2006)** and this may have a role in the claimed salutatory effect on creatinine clearance and GFR. In contrast, in an experimental model of chronic renal failure CRF (rat kidney remnant model), **Ali *et al.* (2004)** showed that treatment of rats with GA at doses of 3 or 6 g/100 mL in the drinking water for five consecutive weeks was not effective in either reversing the decrease in body weight or the increases in creatinine and urea observed 2 weeks after the surgical induction of the CRF. Recently, a report from Sudan assessed the effect of GA on the concentration of certain metabolites in the sera of patients with CRF on a low-protein diet **(Ali *et al.*, 2008).** Short chain fatty acids have considerable effects on intestinal and liver metabolism as either fuels or metabolic effectors. Propionate produced by bacterial fermentation from GA is the major SCFA metabolized by the liver **(Moundras *et al.*,1994)**, particularly as a gluconeogenic substrate. It is utilized at a faster rate than amino acids, thus reducing amino acids deamination and luminal ammonia generation. Bacterial growth within the large intestinal lumen requires a nitrogen source **(Younes *et al.*, 1995)** and GA fermentation provides the energy for bacteria to uptake ammonia as a nitrogen source. In addition, propionate is also known to reduce ureogenesis from ammonium chloride in hepatocytes **(Wyatt *et al.*, 1986; Kishimoto *et al.*, 2006).** The decrease in luminal ammonia concentration may enhance diffusion of urea down its concentration gradient from the blood into the lumen. As such, nitrogen is trapped for elimination in the faeces.(**Fujiwara *et al.*, 1995).**

Also, the results of our study showed the effect of Arabic gum on dough properties by Farinogram parameters, Extensograph properties and physical examinations. presented Arabic gum has been an effective in improver dough properties such as decreasing crumb hardness, increasing specific volume and dough stability and these results agreement with **McCarthy *et al.*, 2005).** Which showed Gluten may be to some extent replaced by natural or synthetic raw materials, which can significantly swell in water and form structural equivalent of gluten network in wheat dough. The most commonly used are such hydrocolloids as pectin, guar gum, Arabic gum, egg albumin, galactomannans and methylcellulose. Hydrocolloids and their mixtures impact rheology of the dough as well as its baking properties and the final bread texture. Technical difficulties during gluten-free bread production (as well as gluten-free pasta). Arabic gum has been used as a gluten substitute in the formation of gluten – free breads **(Toufeili *et al.*, 1994).** Arabic gum has also been an effective improver, decreasing crumb hardness and increasing specific volume of the bread obtained from frozen doughs **(Asghar *et al.*, 2006;** Ali ***et al.*, 2005).** Arabic gum does not affect hydration properties of the gluten. Arabic gum has a branched but compact structure that could inhibit possible interaction between its polar groups with the peptide chains of the gluten. Arabic gum act primarily on the viscometric properties of starch **(**Ali ***et al.*, 2005).**

The results in table organoleptic properties of pan bread showed their gradually improvement in all properties (crust color, crust quality, bread volume,

crumb color, crumb grain, texture, taste and aroma). The results confirmed with **Guarda *et al.*, 2004).** The effects of hydrocolloids on the functional properties of wheat bread have been investigated; in such products gums improve dough stability, bread performance and bread shelf. Exclusion of gluten from the diet is a formidable task for dietitians, as wheat flour is present in a wide range of products including bread, biscuits, cakes, and pastas. The situation is particularly irksome in the case of bread, as flat bread consumption constitutes the cornerstone of dietary patterns for these populations. Gluten-free breads require polymeric substances that mimic the viscoelastic properties of gluten in bread doughs. To this end, gluten-free pan breads have been successfully formulated by incorporating gums**.** At the lowest level of gum Arabic, gluten-free formulations met the reference criterion for Tearing1 over a wide range of methylcellulose **(Smith 1971)**.

Conclusions

GA is a non-digestible food ingredient that has found man applications in the food and pharmaceutical industries. The gums claimed therapeutic usefulness in hepatic and renal failure awaits further verification in animal models and humans.

Recommendation:

More studies are needed before the pharmacological properties of GA can be utilized in therapy.

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