Zagazig Journal of Agricultural Biochemistry and its Application 195-208

Zagazig J. Agric. Res., Vol. 43 No. (1) 2016

http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

EFFECT OF DIETARY INTERVENTION ON REDUCING LEVEL OF THE HYPERURICEMIA IN EXPERIMENTAL ANIMALS

Hamdy A. Mahdy* and Amal H. Emara

Nut. Biochem. and Metabolism Dept., Nat. Nut. Inst., Egypt

ABSTRACT

This study was carried out to investigate the effect of dietary intervention of different concentrations (5% and 10%) from parsley (seeds and leaves), cherry and tomato on hyperuricemia in rats. This study was carried on 80 male albino rats; Sprague-Dawley strain weighing (130±10 g). The experimental period was 6 weeks. The results showed significant decrease (P<0.05) in serum uric acid and urea nitrogen as compared to positive control (+ve) and also significant decrease (P<0.05) in serum total cholesterol, triglycerides and VLDL-C as compared to control positive group. The best results of histological examination of liver were in rats group treated with 5 and 10% cherry followed by parsley seeds and leaves 10%. While the best histological examinations of kidney were observed in parsley seeds and leaves 10% followed by 5%. It could be concluded that parsley (leaves and seeds), tomato and cherry reduce serum uric acid and urea nitrogen levels and improve kidney and liver functions.

Key words: Dietary, arthritis, uric acid, gout.

INTRODUCTION

Animal health depending on many factors and recently it has appreciated that diet plays a pivotal role in health maintenance and prevention of many diseases (Finkel and Hoolbrook, 2000). Hyperuricemia can be caused by overproduction of urate (Uric acid) or by insufficient excretion of urate by the kidney (Ford *et al.,* 2002). Dietary factors that contribute to Hyperuricemia include high alcohol intake and consumption of purine rich foods, such as red meat, seafood (Conon *et al.,* 2004) and high-fructose diet (Lima *et al.,* 2015). Uric acid is the metabolic product of purine metabolism in human. It is generated endogenously from xanthine and hypoxanthine by the action of xanthine oxidoreductases. Whereas most mammals further oxidize uric acid (urate), a gene silencing that occurred at some time during evolution resulted in loss of this enzymatic pathway in human and some of higher primates. Serum uric acid levels are comparably very high in human (Maia *et al.,* 2007; Kolz and Johnson, 2009). In addition, filtered urate is partially reabsorbed in renal proximal tubule and returned to the blood. The inherent difficulty in exactly controlling urate levels sometimes has pathological consequences, the classical example being gout. Urate is relatively insoluble and plasma levels increase above a certain level, urate crystals may deposit in joints and cause painful inflammatory reactions typical of this condition. Therefore, the development of probiotics that efficiently degrade purine compounds is a promising potential therapy for the prevention of hyperuricemia (Li *et al.,* 2014). Hyperuricemia is also a risk factor for renal stone formation (Sanchez *et al.,* 2007; Schlesinger, 2005), arteriosclerosis, cerebrovascular and cardiovascular diseases, and nephropathy in diabetic patients (Li *et al.,* 2014). Photochemical screening of parsley has revealed the presence of carotenoids (Francis and Isaksen, 1989), tocopherol (Fiad and El-Hamidi, 1993), Parsley (*Petroselinum crispum*) and its major flavonol constituents are capable of reducing the uric acid levels in

*** Corresponding author: Tel. :** +201111536483
E-mail address: emara1989@yahoo.com

hyperuricemic rats with no effects on the level of this biological metabolite in normal animals and prevent oxidative stress (Fatemeh *et al.*, 2011). Flavonoids (Aplin, luteolin and apigenin-glycosides) and volatile compounds (myristicin, apiole), coumarines (bergapten, imperatorin) (Fejes *et al.*, 2000). Supplementation with 500 mg/day of vitamin C for 2 months reduces serum uric acid, suggesting that vitamin C might be beneficial in the prevention and management of gout and other urate-related diseases (Huang *et al.*, 2005) and Davey *et al.* (1996) indicated that parsley is a good source of ascorbic acid. Ozsoy-Sacan *et al.* (2006) investigated the effects of parsaley (2g/kg) for 42 days on the liver tissue of streptozotocin-induced diabetic rats. In the diabetic group given parsley, blood glucose, serum alkaline phosphotase activity, uric acid, potassium and sodium levels, and liver lipid peroxidation decreased. It was concluded that probably, due to its antioxidant property, parsley has a protective effect against hepatotoxicity caused by diabetes.

Cherry have a high antioxidant properties and flavonoids which are inhabit xanthine oxidase and thus reduce uric acid production (Kelley *et al.*, 2006). Zhang *et al.* (2012) found that intake of cherry extract reduced the risk of gout attacks in those who suffered recurrent gout attacks by 45 – 50%.

Tomatos are very high in vitamins value, lycopene and flavonoids. Tomato is good source of potassium, β-carotene (vitamin A) and vitamin C, it is very low calories. Hundred grams of edible portion of tomato contain only 20 kcal, it is very important food for weigh reducing diets (Baillie *et al.*, 2007; Muir *et al.*, 2001).

The tomato is not acid forming, it contains a great deal of citric acid but is alkaline forming when it enters the bloodstream, this is because most vegetables and fruits contain potassium citrate, a mineral compound that's metabolized into potassium bicarbonate, which is a good source of alkalizing bicarbonate. It increases the alkalinity of the blood helps remove toxins, especially uric acid, from the system. Tomatoes are excellent in the form of .a liver cleanser (Campbell *et al.*, 2004).

MATERIALS AND METHODS

Materials

Parsley, cherry and tomato and starch were purchased from local market. (Casein, vitamins mix, minerals mix and fructose) were obtained from El-Gomhoria Co. and Morgan Co. Cairo, Egypt.

Male albino rats, Sprague- Dawley strain were derived from Vaccine and Immunity Organization, Hellwan farm, Cairo, Egypt. Kits were purchased from Gamma Trade Co. for chemicals, Cairo, Egypt.

Methods

Induction of hyperuricemia in rats

Rats will feed high fructose diet consist of (basal diet + 60% fructose as a source of carbohydrate that replace starch) according to Sanchez *et al.* (2007). Parsley, cherry and tomato will dryness process in National Nutritional Institute Cairo, Egypt and ground to fine particles.

Biological Investigation

Standard diet was prepared from fine ingredients per 100 g. The diet had the following composition: sun flower oil 10%, salt mixture 4% (Hegsted *et al.*, 1941), vitamins mixture 1% (Campbell, 1961), choline chloride 0.2%, protein 14 g, DL-methionin 0.3% and corn starch up to 100 g according to Reeves (1993)

Experimental design

Eighty male albino rats, Sprague-Dawley strain weighing (130 ± 10 g) were housed in well aerated wire cages. All animals were kept under normal healthy conditions and fed on basal diet for one week for adaptation. After the adaptation period, rats were divided into 10 groups (8 rats/group).

- Group A (Negative control): fed standard diet only.
- Groups B (Positive control): fed high fructose diet.
- Two Groups C: fed high fructose diet + parsley seeds, 5 and 10%.
- Two Groups D: fed high fructose diet + parsley leaves, 5 and 10%.

- Two Groups E: fed high fructose diet + 5 and 10% cherry for diet.
- Two Groups F: fed high fructose diet + 5 and 10% tomato for diet.

At the end of the experimental period (6 weeks) rats were fast over night before sacrificing, blood was collected then centrifuged, serum was separated and stored at -20Ć until biochemical analysis. After animals sacrificed, the internal organs (liver, kidney and spleen) were removed and washed in saline. Then the relative weight of organs was estimated according to the method described by (Chapman *et al.*, 1959). Liver and kidney were kept in 10% formalin for histological study**.**

Biochemical Analysis

The following parameters were determined: serum aspartate amino transferase (AST) and alanine amino transferase (ALT) according to Reitman and Frankel (1957). Serum urea, creatinine and uric acid were carried out by Patton and Crouch (1977), Tietz (1986) and Tietz (1994) respectively. Determination of serum total cholesterol was according to Henary *et al.* (1997). Triglycerol determined by (Fossati and Prancipel, 1982) and high density lipoprotein cholesterol (HDL-C) (Burstein, 1970). Low density lipoprotein cholesterol was calculated using Friedewald equation (Friedewald *et al.*, 1972).

Histological Investigation

Histological examination of liver and kidney were carried out according to the (Drurg and Wallington, 1980). All sections were examined in Faculty of Veterinary, Cairo University, Egypt.

Statistical Analysis

The obtained data was statistically analyzed according to the SPSS-PC statistical package software, version, 11.0 (SPSS, 1996).

RESULTS AND DISCUSSION

Table 1 illustrate that feed consumption was height in the group fed parsley seeds 5 and 10%, this reflect the increase in the body weight gain in their groups. However, the positive control showed decrease in body weight gain, this may be due to the fructose content in the diet. Fructose cause diarrhea leads to reduction absorption and retained of the diet also reduction of body weight.

Table 2 presents the mean values of absolute and relative weight of liver, kidney and spleen of rats fed on 5 and 10% parsley (leaves and seeds), tomato and cherry. It can be shown that the average absolute weight of liver of parsley (5 and 10%) seeds and 10% leaves were higher than that of tomato and cherry. The relative weight of liver of all the treated groups is highly significant decrease than that of the positive control group.

The absolute values of spleen weight in all treated groups were highly significant decrease ($P<0.001$) than the positive control except the result of parsley leaves (10%) and tomato 10% which showed insignificant effect.

Table 3 show that there was a highly significant increase in both uric acid and urea nitrogen in serum of rats groups which fed on positive control than that fed on negative control diet.

However feeding of 5% and 10% parsley seeds and leaves to rats, had decrease effect on both uric acid and urea in serum. While other treatments have no significant effects on the urea nitrogen but have a significant reduction in serum uric acid.

AST and ALT are two transaminase enzymes of clinical interest. Serum transaminase levels are low in normal subject, but after extensive tissue destruction, those enzymes are librating into serum elevating the levels of both AST and ALT.

On the other hand Table 3 also illustrate that there was a highly significant incease in serum AST in group fed on positive control diet than that fed on negative control, while different treatments have a significant decrease in serum AST than that fed on positive control. However there was a significant reduction on group of rats which fed 10%leaves parsley as compared with negative control. But there was an insignificant difference between serum AST in other treatment groups and that fed on negative control. However, the values of serum ALT were same in all groups.

Table 1. Effect of feeding different levels of parsley, tomato and cherry on feed intake and body weight gain in hyperuricemic rats

Parameter \ Groups	Negative control	Positive control	Parsley seeds 5%	Parsley seeds 10%	Parsley leaves 5%	Parsley leaves 10%	Cherry 5%	Cherry 10%	Tomato 5%	Tomato 10%
Food intake g/feeding period	206± 2.5	302± 3.6 *	378±3.1 ***	341.7±5.7 ***	315.5± 4.6 *	311± 4.7	307± 3.5	309.2± 1.18	312.6± 4.6	300± 4.9 *
Body weight gain/ feeding period	23.6± 5.6	23.5± 4.6	74.75± 5.1 ***	93.4±3.6 ***	46.7± 4.4 ***	37.5± 2.3 ***	53.5± 2.7 ***	49.5± 2.9 ***	58± 2.7 ***	46.4± 4.1 ***

Values expressed as means ± S.E *Significant at P < 0.05 **Moderate Significant at P < 0. 01 *** High Significant at P < 0.001

Table 2. Effect of feeding different levels of parsley, tomato and cherry on organs weight in hyperuricemic rats

Parameter \ Groups	Negative control	Positive control	Parsley seeds 5%	Parsley seeds 10%	Parsley leaves 5%	Parsley leaves 10%	Cherry 5%	Cherry 10%	Tomato 5%	Tomato 10%
Liver absolute	6.08±0.99	8.36± 0.3	13.12± 1.14 *	12.7± 1.0 ***	7.9± 057 *	9.98± 0.13 ***	7.99± 0.55 *	6.5±0.41 ***	8.17± 0.43 *	9.7± 0.81 *
Liver relative	3.462± 0.23	6.355± 0.18	5.61± 0.29 ***	4.94± 0.39 ***	2.89± 0.2 ***	3.83± 0.05 ***	3.058± 0.36 ***	2.34± 0.12 ***	3.32± 0.09 ***	3.73± 0.34 ***
Kidney absolute	1.261± 0.31	1.592± 0.05	1.447± 0.05	1.607± 0.03 *	1.61± 0.01	1.443± 0.03 *	1.608± 0.06	1.503±0.03	1.432± 0.03	1.639± 0.06
Kidney relative	0.718± 0.05	1.208± 0.04	0.621± 0.06	0.625± 0.02	0.59± 0.01	0.553± 0.02 *	0.616± 0.05	0.55±0.02	0.58± 0.04 *	0.63± 0.08 ***
Spleen absolute	0.864± 0.13	1.175± 0.19	0.78± 0.06 ***	0.58± 0.05 ***	1.005± 0.06 ***	1.18± 0.16	0.965± 0.06 ***	0.935±0.09 ***	0.946± 0.05 ***	1.186± 0.18
Spleen relative	0.492±0.05	0.89±0.8	0.335±0.03	0.23±0.01	0.368±0.02	0.432±0.1	0.37±0.008	0.336±0.02	0.38±0.02	0.456±0.04

Values expressed as means ± S.E *Significant at P < 0.05 **Moderate Significant at P < 0. 01 *** High Significant at P < 0.001

Table 3. Effect of feeding different levels of parsley, tomato and cherry on kidney and liver functions in hyperuricemic rats

Groups / Parameter	Negative control	Positive control	Parsley seeds 5%	Parsley seeds 10%	Parsley leaves 5%	Parsley leaves 10%	Cherry 5%	Cherry 10%	Tomato 5%	Tomato 10%
Uric acid mg/dl	2.29±0.09	4.3±0.11 ***	2.45±0.12 ***	2.14±0.18 ***	2.36±0.13 ***	2.19± 0.15 ***	3.18± 0.17 ***	2.81± 0.12 ***	3.15± 0.11 ***	2.93± 0.9 ***
Urea nitrogen mg/dl	15.3± 0.4	31.3± 1.35 ***	22.5± 0.9 ***	20.8±0.95 ***	21.6± 0.6 ***	20.3± 0.21 ***	28.0± 1.13 ***	29.1± 0.75 ***	27.3± 1.35 ***	29.0± 0.86 ***
AST u/l	34.2±1.8	47.3± 1.7 ***	35.5±1.8 ***	32.1±1.1 ***	30.0±1.2 ***	25.8± 0.9 ***	34.0± 2.1 ***	32.01± 1.9 ***	36.0± 2.2 ***	33.5± 1.2 ***
ALT u/l	22.17± 1.2	19.6±1.58 ***	20.6± 0.52 *	19.16±0.7 *	21.1± 0.6 ***	20.3± 0.12 *	21.3± 0.8 ***	21.9± 0.9 ***	21.2± 0.25 ***	23.0±1.2 ***

Values expressed as means ± S.E *Significant at P < 0.05 **Moderate Significant at P < 0. 01 *** High Significant at P < 0.001

Table 4 clear that there was a highly significant increase in lipids pattern which used as an indicator of coronary heart diseases such as total cholesterol, triglycerides, LDL cholesterol, VLDL- cholesterol while these was a significant decrease in serum HDL cholesterol in positive control as compared to negative control. However different treatments improved in lipids pattern than that fed on positive control.

Histological Examination

Liver microscopically

Liver of normal rats group showed normal structure of hepatic lobules (Fig.1). Liver of rats from control positive group revealed sinusoidal leucocytosis (Fig. 2) and apoptosis of hepatocytes (Fig. 3). Meanwhile, liver of rats treated with 5% and 10% cherry revealed no histopathological changes (Fig.4). Liver of rats treated with 5% tomato showed dilatation of and congestion of central vein (Fig. 5) and liver of rats treated with 10% tomato showed portal infiltration with leucocytes (Fig. 6). Examined sections treated with 10% parsley seeds revealed no histopathological changes (Fig. 7), whereas, sections from 5% parsley seeds group showed sinusoidal leucocytosis, apoptosis of hepatocytes (Fig. 8) and portal infiltration with leucocytes. No histological changes were noticed in liver of rats treated with 10% parsley leaves, except kuller cells activation, but liver of rats treated with 5% parsley leaves showed portal infiltration with leucocytes (Fig. 9). The best results of histological examination of liver were in rats group treated with 5% and 10% cherry followed by parsley seeds and leaves 10%.

Kidneys microscopically

Fig. 10 showed kidney of negative control group showing the normal histological structure of renal parenchyma. Kidney of rats from positive control group revealed vacillation of endothelial lining glomerular tufts, prevasculitis (Fig. 11) and focal interstitial nephritis (Fig. 12). Kidney of rats treated with 10% cherry revealed vacuolations of epithelial lining renal tubules (Fig. 13), kidney of rats treated with 5% cherry showed interstitial nephritis and focal tubular necrosis associated with inflammatory cells infiltration (Fig. 14). Moreover, kidneys of rats treated with 10% tomatoes revealed vacuolations of epithelial lining renal tubules, distention of Bowman's with protein cast (Fig. 15), while interstitial nephritis and focal tubular necrosis replaced by inflammatory cell infiltration (Fig. 16) had shown in rats kidney which treated with 5% tomato. Same examined sections from group treated with 10% parsley seeds showed no histopathological changes (Fig. 17), whereas, other section from 5% group revealed interstitial nephritis (Fig. 18). No histopathological changed observed in kidneys of rats treated with 10% parsley leaves and seeds (Fig. 19). Examined sections from group treated with 5% parsley leaves showed perivasculitis (Fig. 20) in some examined section.

DISCUSSION

Diet interventions may reduce the risk of urinary stone formation and its recurrence, but there is no conclusive consensus in the literature regarding the effectiveness of dietary interventions and recommendations about specific diets for patients with urinary calculi (Prezioso *et al.,* 2015).

In general, feeding diets containing parsley (leaves and seeds), cherry and tomato has a significant improvement with respect to food consumption, kidney and liver functions.

The results in Table 1 were in agreement with those obtained by Abbas (2010) who found that dietary parsley results were significantly increased in body weight gain and food intake.

The significant decrease in urea nitrogen and uric acid in the present study may be due to high antioxidant activities of parsley, cherry and tomato. The obtained results were in agreement with (Tipu *et al.,* 2006) who reported that parsley helps bladder, kidney and liver functions; it helps clearing uric acid from urinary tract preventing kidney stone formation. Also, these results were in agreement with that of Huang *et al.* (2005), Davey *et al.* (1996) they illustrated that parsley decrease uric acid, urea nitrogen and liver lipid peroxidation levels due to its antioxidant. Cherry has high vitamin C and flavonoids contents thus reduce uric acid production (Cao *et al.,* 1998).

Table 4. Effect of feeding different levels of parsley, tomato and cherry on lipid pattern in hyperuricemic rats

Groups / Parameter	Negative control	Positive control	Parsley seeds 5%	Parsley seeds 10%	Parsley 5%	Parsley 10%	Cherry 5%	Cherry 10%	Tomato 5%	Tomato 10%
T.Cholesterol mg/dl	96.7±1.2	106.17± 5.4 ***	89.67± 3.32 ***	86.0± 4.6 ***	88.33± 5.08 **	71.50± 5.0 ***	80.17± 3.5 ***	76.0±3.16 ***	90.67± 3.5 ***	86.33± 3.8 ***
Triglycerol mg/dl	44.3± 0.97	57.47± 0.73***	47.85± 1.4 ***	67.47± 1.49 **	47.07± 1.3 ***	54.47± 2.7	52.0± 1.4 **	53.0± 3.0 *	51.67± 2.9 ***	50.0± 1.4 ***
HDL-Cholesterol mg/dl	60.67± 1.6	50.93± 0.78 ***	62.0± 1.1 ***	51.69± 2.1 ***	52.1± 0.55	50.1± 2.6	52.8± 1.7 *	51.8±1.8	53.9± 1.9 **	51.9± 1.2 *
LDL-Cholesterol mg/dl	27.17± 1.16	43.75±0.9 ***	18.10± 0.6 ***	20.81± 3.3 ***	26.83± 0.5 **	10.51± 0.79 ***	16.97± 0.68 ***	13.6±0.19 ***	26.44± 0.7 **	24.43± 0.68 ***
VLDL-Cholesterol mg/dl	8.86± 0.27	11.49±0.48***	9.57± 0.68 ***	13.5± 0.9 *	9.4± 0.37 ***	10.89± 0.5 ***	10.4± 0.9 *	10.6±0.71 *	10.33± 1.4 **	10.0± 1.4 **
HDL/LDL	2.23±0.16*	1.11±0.029 ***	3.22± 0.08 ***	2.48± 0.055 ***	2.04± 0.06 ***	4.76±0.129 ***	3.22± 0.1 ***	5.49±0.11 ***	2.12±0.09 ***	2.14±0.07

Values expressed as means ± S.E *Significant at P < 0.05 **Moderate Significant at P < 0. 01 *** High Significant at P < 0.001

Effect of feeding different levels of parsley, tomato and cherry on liver tissues

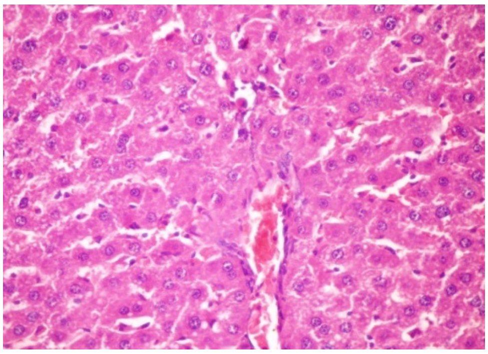

Fig. 1. Liver of rat from control negative group showing the normal histological structures of hepatic lobule (H and E x 400).

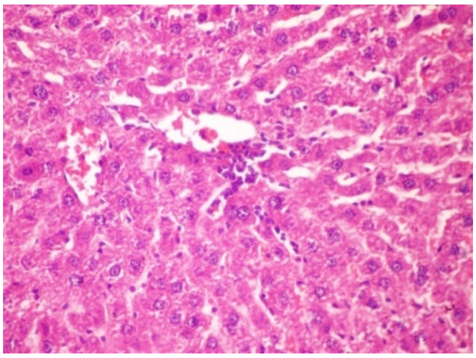

Fig. 2. Liver of rat from control positive group showing sinusoidal leucocytosis (H and E x400)

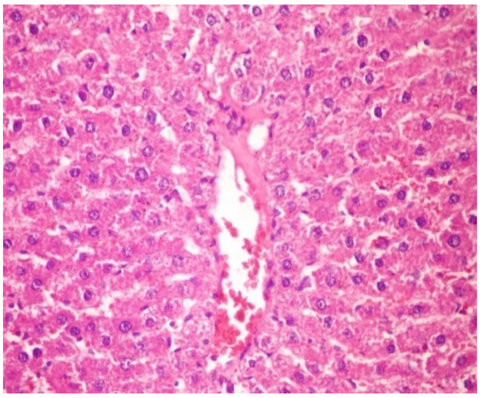

Fig. 3. Liver of rat from control positive group showing apoptosis of hepatocytes (h and E x 400).

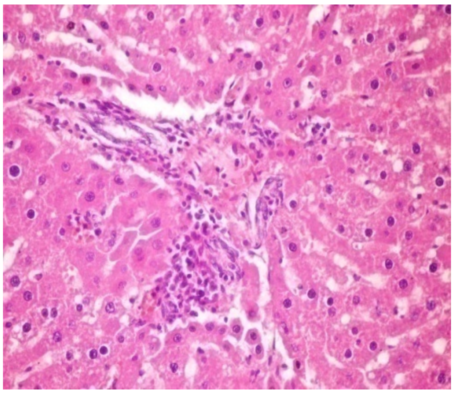

Fig. 4. Liver of rat treated with 5% and 10% cherry showing no histopathological changes (H and E x 400).

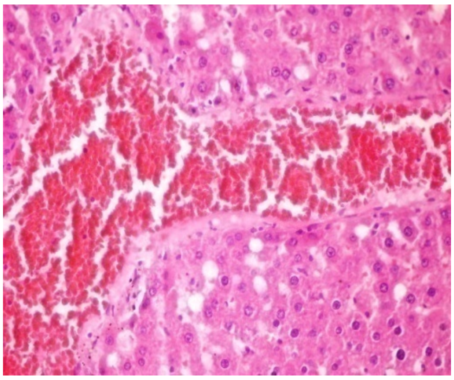

Fig. 5. Liver of rat treated with 5% tomato showing dilatation and congestion of central vein (H and E x 400).

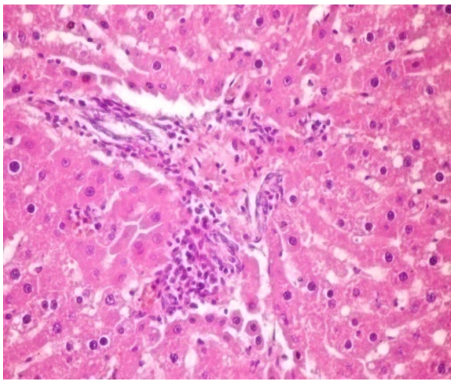

Fig. 6. Liver of rat treated with 10% tomato showing portal infiltration with leucocytes (H and E x 400).

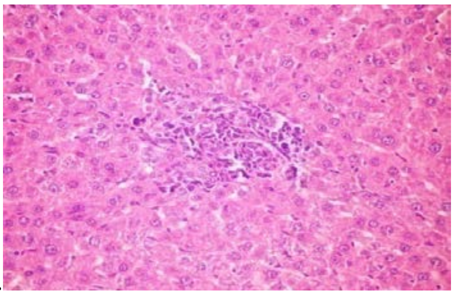

Fig. 7. Liver of rat treated with 5% parsley seeds showing sinusoidal leucocytosis and apoptosis of hepatocytes (H and E x 400)

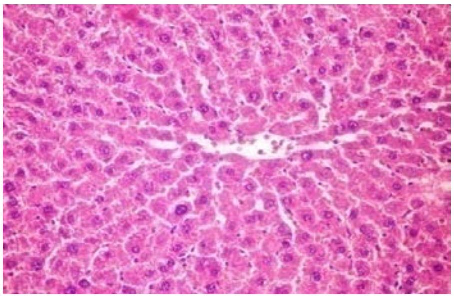

Fig. 8. Liver of rat treated with 10% parsley seeds showing no histopathological changes (H and E x 400)

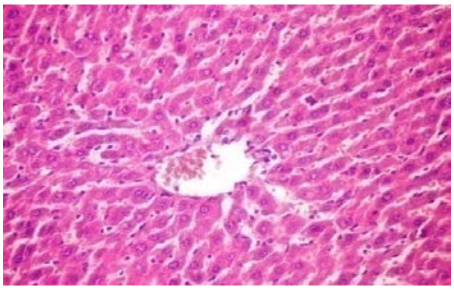

Fig. 9. Liver of rat treated with 5% parsley leaves showing kupffer cells activation (H and E x 400)

Effect of feeding different levels of parsley, tomato, and cherry on kidney tissues

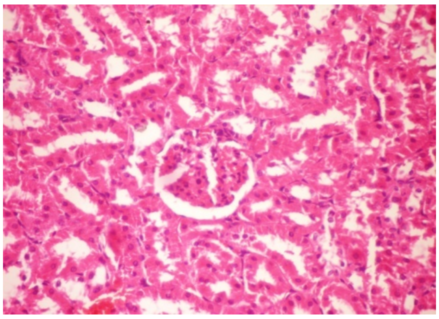

Fig. 10. Kidney of rat from control negative group showing the normal histological structure of renal parenchyma (H and E x 400)

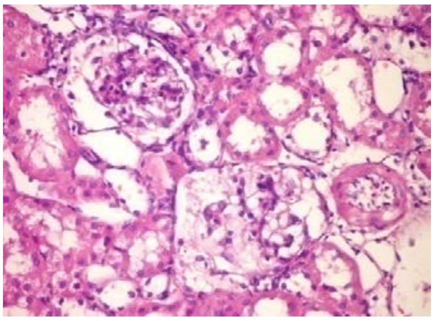

Fig. 11. Kidney of rat from control positive group showing vaculations of endothelial lining glomerular tufts and perivasculitis (H and E x400)

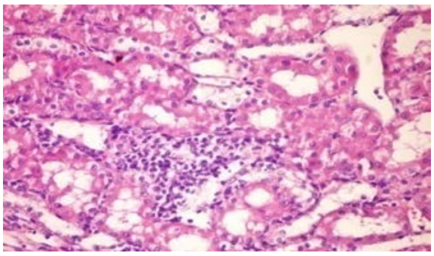

Fig. 12.Kidney of rat from control positive group showing focal interstitial nephritis (H and E x 400)

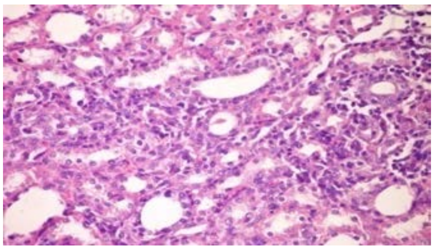

Fig. 13. Kidney of rat treated with 10% cherry showing vaculations of epithelial lining renal tubules (H and E x 400)

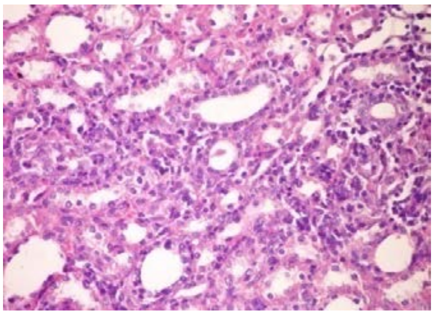

Fig. 14. Kidney of rat treated with 5% cherry showing interstitial nephritis (H and E x 400).

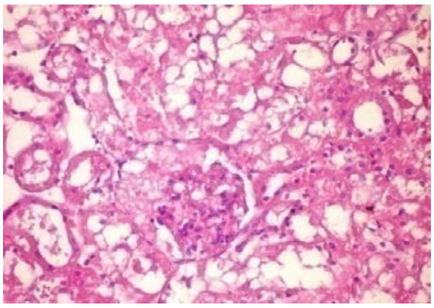

Fig. 15. Kidney of rat treated with 5% tomatoes showing vaculations of epithelial lining renal tubules and distension of Bowman's space with protein cast (H and E x 400)

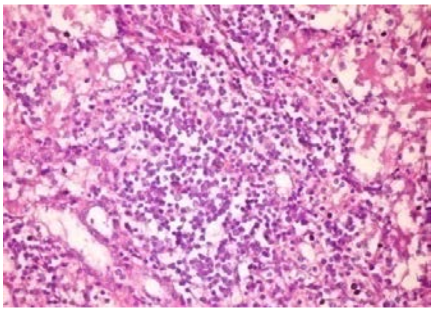

Fig. 16. Kidney of rat treated with 10% tomatoes showing focal tubular necrosis replaced by inflammatory cells infiltration (H and E x 400).

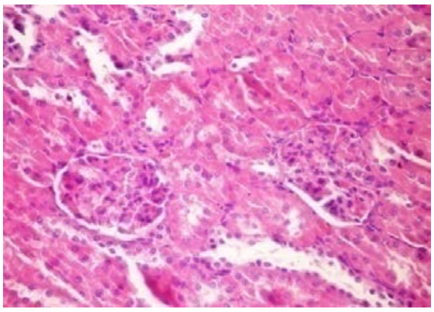

Fig. 17. Kidney of rat treated with 10% parsley seeds showed no histopathological changes (H and E x 400).

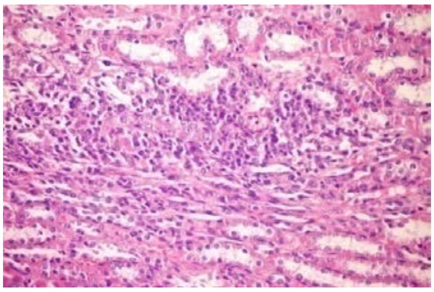

Fig. 18. Kidney of rat treated with 5% parsley seeds showing interstitial nephrites (H and E x 400).

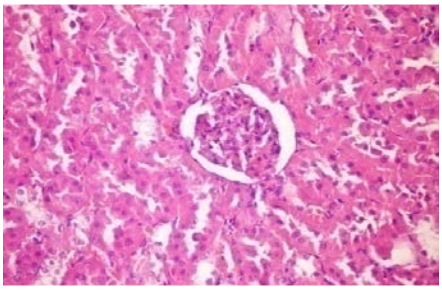

Fig. 19. Kidney of rat treated with 10% parsley leaves showed no histopathological changes (H and E x 400).

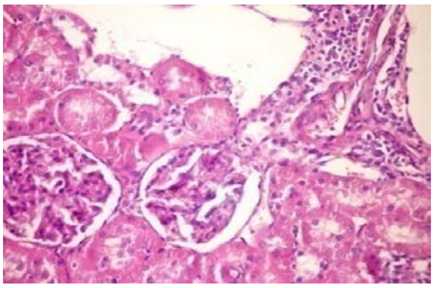

Fig. 20. Kidney of rat treated with 5% parsley leaves showing perivasculitis (H and E x 400)

With regard to liver results, these results agreed with the study by Kaustinson (2003) who recorded that parsley used as a tonic for the liver and the digestive tract. And also, Huang *et al.* (2005), Ozsoy-Sacan *et al.* (2006) indicated that parsley has reducing effect on uric acid and liver lipid peroxidation.

Regarding to serum lipid pattern (Table 4) the obtained results were in agreement with those reported by Basu *et al.* (2009) who reported that cherry were significantly lowered LDL-C levels at 4 weeks versus baseline. Also, Hazim *et al.* (2012) concluded that supplementation of the diet with parsley, lowered serum uric acid, total cholesterol, triglycerols, LDL-C, VLDL-C and creatinine.

The fructose causes hyperuricemia by accelerating the catabolism of adenine nucleotides (Lotito and Frei, 2004).

These results are in agreement with that of Halfrish *et al.* (1990) who reported that, high consumption of fructose induced hypertension, hypertriglycerides, which in turn increases intramyocellular triglycerides content.

Histological Examination

Our results were in the line with Mohan *et al.* (2006) who suggested that treatment with dietary flavonoid, spirulina significantly attenuated the histomorphological changes in nephrotoxic rats. In the same time, the results are in line with Duru *et al.* (2008) who demonstrated that treatment with an antioxidant N-acetylcysteine (NAC) provided a histological proven protection against Cyclosporine-A-induced nephrotoxicity in rats.

On the other hand, Abd El-Ghany *et al.* (2007) showed that kidney of rats fed parsley showing sever vaculation and destruction of some renal tubules. Kidney of rats fed on tomatoes or onions showing interstitial and periglomerular mononuclear cellular infiltration. While, liver of rats fed on tomatoes showed the hepatic cells in some areas where completely necrosis area and became pale eosinophilic mixed with red blood cells and surrounded by deeply eosinophilic hepatic cells with variations of their nuclear size and increase in the number of binucleated cells and agreed with Ibrahim *et al.* (2005) who reported that phytochemicals are most important antioxidants contained in human diet. Also, it may be due to its powerful antioxidant activities that neutralize free radicals, especially those derived oxygen, resulting in protection against chronic diseases especially coronary heart diseases and a tonic for the liver and digestive tract.

The best histological examination of kidney were observed in parsley seeds and leaves 10% followed by 5% of the same feeding parameters.

Conclusion

From this study it could be concluded that it is preferable to use parsley leaves, tomato and cherry with diets due to their reducing effect on serum uric acid, urea, total cholesterol, LDL-C and triglycerols and also reduce the pathogenic histological changes of liver and kidney.

REFERENCES

Abbas, R. (2010). Effect of using fenugreek, parsley and sweet basal seeds as feed additives on the performance of broiler chicken. J. Poult. Sci., 9 (3): 278-282.

Abd El-Ghanny, M.A., F.M. El-Tellawy and M.A. Hussien (2007). Effect of some vegetables intake on the precarcinogenic risk resulting from extreme grilled meat on experimental rats. Standards of quality assurance and accreditation in quality education Egypt and the Arab World. In the period 11-12 April, 959-989.

Baillie, J.K., M.G. Bates, AA. Thompson, W.S. Waring, R.W. Partridge, M.F. Schnopp, A. Simpson, F. Gulliver-Sloan and D.J. Maxwell (2007). Endogenous urate production augments plasma antioxidant capacity in healthy lowland subjects exposed to high altitude. Chest., 131 (5): 1473–1478.

Basu, A., M. Wilkinson and K. Penugonda (2009). Freeze-dried cherry powder improves lipid profile and lipid peroxidation in women with metabolic syndrome: baseline and post intervention effects. Nut. J., 8:43.

Burstein, M. (1970). Rapid method for isolation of lipoproteins from human serum by precipitation with poly-anion. J. Lipid Res., 11: 583-583.

Campbell, J.A. (1961). Methodology of protein evaluation. Nutritional Document R., 10. Add., 37, WHO/FAO, UNICEF.

Campbell, J.K., K. Canene-Adams and B.L. Linshiedl (2004). Tomato phytochemicals and prostate cancer risk. J. Nut., 134: 3486-3490.

Cao, G., R.M. Russell, N. Lischner and R.L. Prior (1998). Serum antioxidant capacity is increased by consumption of cherry, spinach, red wine or vitamin C in elderly women. J Nut., 128: 2383-2390.

Chapman, D.G., R. Castilla and J.A. Campbell (1959). Evaluation of protein in food. IA method for the determination of protein efficiency ratio. Can. J. Biochem. Physio., 676-686.

Conon, D., V. Wietlisbach, P. Bovet, C. Shamlaye, W. Riesen, F. Paccaud and M. Burnier (2004). Prevelence of hyperuricemia and relation of serum uric acid with cardiovascular risk factors in a developing country. BMC Public Health., 25: 4-9.

Davey, M.W., G. Bauw and Mv. Montagu (1996). Analysis of ascorbic in plant tissue by high performance capillary zone electrophoresis. Analytical Biochem., 239: 8-19.

Drurg, R. and E. Wallington (1980). Carltons Histological Techiques Oxford University Press, New York. Pronto., 206-225.

Duru, M., A. Nacar and Z. Yonden (2008). Protective effect of acetylcysteine on cyclosporine A-Induced Nephrotoxicity. Ren. Fail., 30 (4): 453-9.

Fatemeh, H., A. Seid, M. Keshavarz and R. Mohammad-Reza (2011). Effects of parsley (*Petroselinum crispum*) and its flavonol constituents, kaempferol and quercetin, on serum uric acid levels, biomarkers of oxidative stress and liver xanthine oxidoreductase activity inoxonate-induced hyperuricemic rats. Iran J. Pharm. Res., 10 (4): 811–819.

Fejes, S.Z., A. Bl'azovics, E. Lemberkovics, G. Petri, E. Sz'oke and A. Kery (2000). Free radical scavenging and membrane protective effects of methanol extracts from Anthriscus cerefolium and Petroselinum crispum. Phytotherapy Res., 14: 362-365.

Fiad, S. and M. El-Hamidi (1993). Vitamin E and trace elements. Seifen Oele Fette Wasche, 119: 25-26.

Finkel, T. and J. Hoolbrook (2000). Oxidant, oxidative stress and the biological of aging. Nat., 408 (9): 239-247.

Ford, E.S., W.H. Giles and W.H. Dietz (2002). Prevelence of the metabolic syndrome US adults: Findings from the Third National Health and Nutrition Examination Survey. JAMA., 287: 356-359.

Fossati, P. and L. Prancipel (1982). Triglycerides. Determination after enzymatic hydrolysis. Clin. Chem., 28: 2077.

Francis, G.W. and M. Isaksen (1989). Droplet counter current chromatography of the carotenoids of parsley petroselinum crispum. Chromatographia, 27: 549-551.

Friedewald, W., M. Levey and D. Fredrickson (1972). Estimation of the concentration of low density lipoprotein cholesterol in plasma. Clin. Chem., 18 (6): 499-502.

Halfrish, J., D. Muller and D. Drinkwater (1990). Continuing Diet Trends in Men: The Baltmore Longitudinal Study of Aging (1951 - 1987). J. Gerontol., 45 (6): M186-191.

Hazim, J., H. Mirza and W. A-Hayai (2012). The effect of utilization of parsley in local Iraqi geese diet on blood biochemistry. J. Ame. Sci., 8 (8): 427-432.

Hegsted, D.M., R.C. Mills, C.A. Elvehjen and E.B. Hart (1941). Choline in chicks. J. Biol. Chem., 138: 430-459.

Henary, R.J., D.C. Cannon and J.W. Winkelman (1997). Clinical Chemistry Principles and Tetchiness. Harper and Row. New York, 1440.

Huang, H.Y., L.J. Appel, M.J. Choi, A.C. Gelber, J. Charleston, E.P. Norkus and E.R. Miller (2005). The effect of vitamin C supplementation on serum concentration of uric acid: results of a randomized controlled trial, Arthritis Rheum., 52 (6): 1843-7.

Ibrahim, A.M., A.F. El-ashmawy and S.M. Osama (2005). Protective effect of volatile oil, alcoholic and aqueos extracts of origanium majorrana on lead acetate toxicity in mice. Basic. and Clin. Pharmacol. and Toxocol., 97: 238-October 1742-7843.

Kaustinson, T. (2003). Chicory, coffee. Herb Gardening. Suite Univ.

Kelley, D., R. Rasooly and R. Jacob (2006). Consumption of Bing sweet cherries lowers circulating concentrations of inflammation markers in healthy men and women. J Nut., 136: 981-6.

Kolz, M. and T. Johnson (2009). Meta-analysis of 28,141 individuals identifies common variants within five new loci that influence uric acid concentrations". PLoS Genet., 5 (6): 1000504-19503597

Li, M., D. Yang, L. Mei, L. Yuan, A. Xie and J. Yuan (2014). Screening and characterization of purine nucleoside degrading lactic acid bacteria isolated from Chinese sauerkraut and evaluation of the serum uric acid lowering effect in hyperuricemic rats. Plos., 39 (9) 105577 – 101371.

Lima, W., M. Martins-Santos and V. Chaves (2015). Uric acid as a modulator of glucose and lipid metabolism. Biochimie., 116:17-23.

Lotito, S.B. and B. Frei (2004). The increase in human plasma antioxidant capacity after apple consumption is due to the metabolic effect of fructose on urate, not applederived antioxidant flavonoids. Free Radic. Biol. Med., 37: 251-256.

Maia, L., R.O. Duarte, A.P. Freire, J.J.G. Moura and L. Mira (2007). NADH oxidase activity of rat and human liver xanthine oxidoreductase: potent role in superoxide production. J. Biol. Inorg. Chem., 12:777–787.

Mohan, L.K., M. Khan and J. Shobhan (2006). Protection against Cisplatin-Induced Nephrotoxicity by spirulina in rats cancer. Chemother. Pharmacol. Dec., 58960: 802-8.

Muir, S.R., G.J. Collins and S. Robinson (2001). Over expression of petunia chalcone isomerase in tomato results in fruit containg increased levels of flavonols. Nat. Biotechnol., 19 : 470-474.

Ozsoy-Sacan, O., R. Yanardag, Hb. Orak, Y. Ozgey, A. Yarat and T. Tunali (2006). Effect of parsley (*Petroselinum crispum*) extract versus glibomuride on the liver of streptozotocin-induced diabetic rats. J. Ethnophamacol., 104: 175-181.

Patton, C.J. and S.R. Crouch (1977). Enzymatic determination of urea (according to the urease modified Berthelot reaction). Anal. Chem., 49: 464-469.

Prezioso, D., P. Strazzullo, T. Lotti, G. Bianchi, L. Borghi, P. Caione, M. Carini, R. Caudarella, G. Gambaro, M. Gelosa, A. Guttilla, E. Illiano, M. Martino, T. Meschi, P. Messa, R. Miano, G. Napodano, A. Nouvenne, D. Rendina, F. Rocco, M. Rosa, R. Sanseverino, A. Salerno, S. Spatafora, A. Tasca, A. Ticinesi, F. Travaglini, A. Trinchieri, G. Vespasiani and F. Zattoni (2015). Dietary treatment of urinary risk factors for renal stone formation. Arch Ital Urol Androl., 787 (2): 105-120.

Reitman, S. and S. Frankel (1957). Colorimetric method for the *in vitro* determination of GOT and GPT in serum or plasma. Ame. J. Clin. Path., 28: 56-63.

Reeves, P., F. Nielsen and G. Fahey (1993). Reported of the American institute of nutrition, committee on the reformulation of the Ain 76, A rodent diet" J .nutrition, 123: 1939- 1951.

Sanchez, L.G., E. Tapia, A. Jimenez, P. Bautista, M. Crstobal, T. Nepomuceno V. Soto, C. Avila-Casado, T. Nakagawa, R.J. Johnson, J. Herrera-Acosta and M. Franco (2007).Fructose-induced metabolic syndrome is associated with glomerular hypertension and renal microvascular damage in rats. Ame. J. Physiol. Renal. Physiol. Jan, 292 (1): 423-429.

Sanchez, L.G., E. Tapia and C. Avila (2002). Mild hyperuricemia induces glomerular hypertension in normal rats. Am. J. Physiol. Renal Physiol., 283 : 1105 - 1110.

Schlesinger, N. (2005). Dietary factors and hyperuricaemia, current pharmaceutical design, 11 (32): 4133-4138.

SPSS (1996): SPSS-Pc for the IBM PC / XT computer version 11.0 SPSS Inc., 11.USA.

Tietz, N.W. (1986). Textbook of Clinical Chemistry. WB Saunders, Philadelphia, 1271- 1281.

Tietz, N.W. (1994). Fundamentals of Clinical Chemistry. 2nd Ed., NW Tietz, USA.

Tipu, M., M. Akhtar and M. Anjum (2006). New dimension of medicinal plants as animal feed. Pakistan Vet J., 26 (3): 144-148.

Zhang, Y., T. Neogi, C. Chen, C. Chaisson, D. Hunter and H. Choi (2012). Cherry consumption and decreased risk of recurrent gout attacks. Arthritis Rheum., 64 (12) : 4004 - 4011.

تأثير التدخل الغذائى على خفض مستوى حمض اليوريك المرتفع فى حيوانات التجارب

حمدى عبد النبى مهدى[1] - أمال حامد عمارة[2]

قسم كيمياء التغذية - المعهد القومى للتغذية - القاهرة - مصر

حمض اليوريك هو المنتج الأيضى للبيورين فى الانسان، ويترسب حمض اليوريك فى المفاصل عند زيادة نسبته فى الدم ويؤدى الى نوع من التهاب المفاصل المعروف بأسم مرض النقرس، ارتفاع حمض اليوريك فى الدم (فرط حمض يوريك الدم) ينتج من تناول كميات كبيرة من الأطعمة الغنية بالبيورين، وارتفاع استهلاك الفركتوز أو ضعف أفرازه عن طريق الكلى. قد تؤدى مستويات التشبع من حمض اليوريك فى الدم الى تكوين حصى الكلى، لذلك أجريت هذه الدراسة على ٨٠ من ذكور الجرذان من نوع الألبينو سلالة سبراغ داولى تتراوح أوزانها (١٣٠± ١٠ جرام) وضعت فى أقفاص سلكية جيدة التهوية، تم الاحتفاظ بجميع الحيونات فى ظل ظروف صحية طبيعية وتغذت على نظام غذائى قياسى لمدة اسبوع من أجل التكييف، تم تقسيم الفئران إلى ١٠ مجموعات (٨جرذان بكل مجموعة) كالتالى: المجموعة (أ) (الضابطة) غذيت على الغذاء القياسى فقط، المجموعة (ب) (ا ضابطة ايجابية) غذيت على الغذاء مرتفع الفركتوز فقط، المجموعة (ج): مجموعتان غذيت على الغذاء مرتفع الفركتوز + بذور البقدونس ٥ و ١٠%، المجموعة (د): مجموعتان غذيت على الغذاء مرتفع الفركتوز + أوراق البقدونس ٥ و ١٠%، المجموعة (هـ): مجموعتان غذيت على الغذاء مرتفع الفركتوز + الكريز ٥ و ١٠%، المجموعة (و): مجموعتان غذيت على الغذاء مرتفع الفركتوز + الطماطم ٥ و ١٠%، أستمرت فترة التجربة ٦ أسابيع وأظهرت النتائج أنخفاضا متوسطا (p<٠.٠٥) فى مصل الدم للجرزان التى تغذت على الكريز ٥ و١٠% لحمض البوليك واليوريا نيتروجين مقارنة مع المجموعة الضابطة الموجبة وانخفاض أيضاً معنوى (p<٠.٠٥) فى مصل الدم لكلا من الكوليسترول والدهون الثلاثية؛ VLDL-c بالمقارنة مع المجموعة الضابطة الموجبة، ويمكن أن نخلص إلى أن البقدونس (الأوراق والبذور) والطماطم والكريز تعمل على تقليل حمض اليوريك فى الدم ومستويات اليوريا نيتروجين وتحسين وظائف الكبد والكلى. كما أظهرت نتائج الفحص الهيستولوجى انخفاضا ملحوظا فى حدة التغيرات بأنسجة الكبد والكلى.

المحكمون :

١- أ.د. سعيد عبدالخالق حسانين أستاذ الكيمياء الحيوية ورئيس قسم الكيمياء والتغذية والتمثيل الغذائي بالمعهد القومي للتغذية.

٢- أ.د. رجب عبدالفتاح المصري أستاذ الكيمياء الحيوية – كلية الزراعة – جامعة الزقازيق.