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## **Administration of *Ficus Carica* L Fruit and Coenzyme Q10 Attenuate Potassium Bromide Induced Oxidative Stress in Rats**

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### **Abstract**

Figs fruit are considered good source of important bioactive constituents like phenolics and antioxidants. No systematic study has been done on protective efficacy of *Ficus carica* L (dried & juice) with coenzyme Q10 to treat oxidative stress caused by potassium bromide in rats, so it were investigated.

Fifty six albino rats divided into seven groups (n=8) for a six-weeks experimental period; group (1) normal control, group (2) KBrO<sub>3</sub>-intoxicated control, groups (3) treated with 15 % figs powder (FP) in diet, groups (4) administrated 150 mg/kg bwt figs Juice (FJ) by gastric tube and groups (5-7) treated with Q10 (15 mg/kg bwt), FP+Q10 (50/50) and AJ+Q10 (50/50).

Total phenolics was 60.23 expressed as gallic acid equivalent /100g dry matter, flavonoid content was 116.3 mg/100g and total antioxidant activity as ferric reducing antioxidant power (FRAP) was 6.3 Fe<sup>2+</sup> mmol/kg, those phytochemical characters and antioxidant capacity may responsible for potential health-promoting effects of figs.

Significant antioxidative stress effects were reported against KBrO<sub>3</sub> (200 mg/kg bwt. in drinking water along experimental period) as evident from decreased levels of serum kidney function biomarkers (creatinine, urea and uric acid), serum lipid biomarkers (CHO, TG, LDLc and VLDLc) also MDA levels in groups administrated figs powder and juice separately or with Q10 compared to the intoxicated control group. Administration of (FP) and (FJ) separately or with Q10

and Q10 also improves nutritional results, increases serum and kidney antioxidant enzymes and elevates the value of HDLc compared to intoxicated control.

Best results revealed that administration of (FP) or (FJ) with Q10 due to synergistic effects could afford significant dose-dependent protection against KBrO<sub>3</sub> inducing oxidative stress.

It is concluded that (FP) and (FJ) with and without Q10 has beneficial effects on growth performance, renal function and lower oxidative stress induced by KBrO<sub>3</sub> because of its phytochemical components and antioxidant effect.

**Key words:** Figs- CoQ10- KBrO<sub>3</sub>–lipid profiles- oxidative stress- rats.

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## **Introduction**

Potassium bromate (KBrO<sub>3</sub>) is widely used as a food-additive and is a major water disinfection by-product. Although it was added to flour as a maturing agent, to dough, to fish paste as a conditioner, and also to beer or cheese (Oni *et al.*, 2005), KBrO<sub>3</sub> causes severe toxicity in humans and experimental animals. Bromate is considered a probable human carcinogen and a complete carcinogen in animals. (Ahmad and Mahmood, 2016).

KBrO<sub>3</sub> was first reported as a treatment for epilepsy in human then decreased throughout the 20th century owing to undesirable effects of bromides in humans include sleepiness, confusion, hallucinations, muscle pain, nausea, vomiting, anorexia and coma (Korinthenberger *et al.*, 2007 and Field, 2004).

Administration of KBrO<sub>3</sub> to rats induces oxidative stress (OS) and lowers the activities of several antioxidant enzymes results in multiple organ toxicity with kidney being the primary target organ of this compound because of generating active oxygen radicals that implicated in its toxic and carcinogenic effects, because of 8-hydroxydeoxyguanosine production in rats' kidney. It exerted an enhancing effect on the induction by *N*-nitrosoethyl hydroxyl ethylamine of kidney tumours and dysplastic foci in animals (Song *et al.*, 2001, Akanjiet *et al.*, 2008, Ahmed *et al.*, 2012 and Ahmed *et al.*, 2015).

Oxidative stress causes the damage of biological components as lipids, proteins and genetic material, and is associated with the

appearance of many diseases. Therefore, it is important to increase antioxidant capacity in tissues to scavenge reactive oxygen species (Gutteridge, 1993). Medicinal plant has continued to attract attention in the global search for effective methods of using plants' parts for the treatment of many diseases affecting humans (Abd El-Ghany *et al.*, 2012).

CoQ10 which is known as Ubiquinone, also serves as an important antioxidant in both mitochondria and lipid membranes. CoQ10 acts as an antioxidant, inhibiting lipid peroxidation and scavenging free radicals (Kaikkonen *et al.*, 2002). The effect of CoQ10 supplementation on oxidative stress has been investigated in rats and in humans. The most well-known function of CoQ10 is enhancement of mitochondrial activity related to the synthesis of adenosine triphosphate (ATP). (Balakrishnan *et al.*, 2009).

In addition, CoQ10 plays a role in inhibiting lipid peroxidation by either scavenging reactive oxygen species directly or in conjunction with  $\alpha$ -tocopherol furthermore, CoQ supplementation enhances the free pool of CoQ, which stabilizes defined protein levels in kidney failure tissues rescuing oxidative stress. (Lass and Sohal 1998; Abd El-Ghany *et al.*, 2012 and Kleiner *et al.*, 2018).

*Ficus carica* Linn. (syn: *Ficussycomorus*; family: Moraceae) is commonly referred to as figs, which one of the only five plants mentioned in the holy Quran along with the olives, grapes, pomegranate, and dates. Its fruit, root, and leaves are used in the native system of medicine in different diseases (Vikaset *et al.*, 2010). For millennia, Figs are considered one of the health-promoting Mediterranean diets and it composes of high minerals, vitamins, dietary fibers, and phenolic contents which attributed to its antioxidant capacity (Veberic *et al.*, 2008). It has been traditionally used for metabolic, cardiovascular, respiratory, antispasmodic, and anti-inflammatory disorders (Vikaset *et al.*, 2010 and Tradet *et al.*, 2012).

Phenolic compounds are common secondary plant metabolites which not only provide important physiological functions in plants but also exert positive effects to the human health (Caliskan and Polat, 2011). In this concern, Figs (*Ficus carica* L) is a commercially valuable fruit cultivated in tropical climates in mediterranean countries. In fact, this fruit is a nutritional powerhouse providing numerous potential

health benefits. Polysaccharides present in Figs fruit have been reported to have antispasmodic, antitumor, anti-inflammatory, and antioxidant properties in a number of previous studies (Solomon *et al.*, 2006, Gilani *et al.*, 2008, Lansky *et al.*, 2008 and, Yang *et al.*, 2009) However, the comparative effects of the various types (dried and juice) of Figs on potassium bromide induced oxidative stress effects have not been investigated so far. Therefore, the purpose of this study was to evaluate the effect of *Ficus carica* L. in the form of powder or juice separately or in combination with Q10 enzymes in lowering oxidative stress induced by potassium bromide in rats.

## **Materials and Methods**

### **Preparation of plant materials**

Freshly harvested ripened purple *Ficus carica* L fruits were purchased from a local farm in Riyadh. Figs were sorted, washed and cut in half lengthwise using a stainless steel knife. Halves were sliced chopped into small pieces. Part of them was dried at 50-60°C for 1.5 hour using vacuum oven and grounded into powder that added as 15% to rat basal diet while other was mixed by blinder and filtrated to obtain juice (A.O.A.C., 2005). The fig juice was given to rats as 150 mg/kg by gastric tube.

### **Chemicals:**

Unless stated otherwise, all chemicals and Biochemical Kits used for determinations were of analytical grade and procured from Sigma Chemicals Co., USA.

### **Chemical determinations:**

To determine total antioxidant capacity (TAC), FRAP, the ferric reducing antioxidant power method, was conducted according to Pellegrini *et al.* (2003). Total phenolic content of the sample was determined using the Folin–Ciocalteu micro-method, each sample were measured according to Slinkard and Singleton (1977). Flavonoids were determined in figs' samples according to the method illustrated by Pric *et al.* (1987)

### **Preparation of basal diet**

The basal diet was prepared using AIN-93 according to the method described by Reeves *et al.* (1993). It consists of 20% protein (casein), 10% sucrose, 4.7% corn oil, 2% choline chloride, 1% vitamin

mixture, 3.5% salt mixture, and 5% fiber. The remainder was corn starch up to 100%.

#### **Experimental animals**

Fifty six adult male rats of Sprague Dawley Strain weighing  $120 \pm 5$  gm, procured from the college of pharmacy, King Saud University, KSA, were maintained in an air conditioned room ( $25 \pm 1^\circ\text{C}$ ) with a 12 h light/12 h dark cycle. Feed and water were provided *ad libitum* for one week before the start of the experiment for adaptation. Procedures involving animals and their care were approved by the CAMS Research Ethics Committee, King Saud University. (Ethics Number: CAMS 21 -38/39).

#### **Induction of oxidative stress:**

After adaptation, rats were randomly divided into seven groups of eight animals each. Group I (normal control) animals were administered only basal diet. Groups II-VII rats were administered ( $\text{KBrO}_3$ ) at dose of 200 mg/kg body weight in drinking water along experimental period to induce oxidative stress according to [Abd El-Ghany et al.\(2012\)](#) .Group II served as a treated group (intoxicated control). Group III treated with 15 % figs powder (FP) in diet, groups IV administered 150 mg/kg bwt figs Juice (FJ) by gastric tube and groups (V-VII) treated with Q10 (15 mg/kg bwt), FP+Q10 (50/50) and AJ+Q10 (50/50) respectively. All of these treatments were administered for six weeks. The biochemical parameters were estimated after an 18h fast following the last dose.

Food intake was calculated daily and body weight gain was recorded weekly ([Chapman et al., 1950](#)). Feed efficiency ratio (FER): FER = weight gain (g)/ feed intake (g) was then calculated. At the end of the experimental period, the animals were anesthetized by anesthetic ether. Blood samples were collected from jugular vein and centrifuged at 3000rpm for 15 min to obtain serum. kidney samples were immediately removed, washed, minced and homogenized in ice-cold sodium, potassium phosphate buffer (0.01 M, pH 7.4) containing 1.15% KCl in homogenizer. The homogenates were centrifuged at 3000rpm for 15 min for further biochemical analysis.

#### **Determination of serum biochemical indicators:**

Activity of superoxide dismutase(SOD), glutathione peroxidase (GPX), and catalase, enzymes were determined using commercial kits

according to the methods described by Sun et al. (1988), Tapple (1978) and Cohen (1970), respectively. Serum creatinine, urea and uric acid were estimated according to Bonsens and Taussky, (1984), Patton and Crouch (1977) and Fossati et al. (1980) respectively. Serum cholesterol (CHO), triglycerides (TG), and high density lipoprotein cholesterol (HDL-c) were determined by using enzymatic colorimetric methods (Abellet al., 1952; Buccolo and David, (1973) and Kostener, 1977, respectively), while concentration of VLDL-c was estimated according to the method described by Friedewald's equation (Friedewald et al., 1972). According to the method described by Friedewald et al. (1972). Low density lipoprotein cholesterol can be calculated as follows :  $LDL-c = Total\ cholesterol - (HDL-c) - (VLDL-c)$ .

#### **Kidney tissues biomarkers estimations:**

Kidney homogenates were used for determination of enzymatic antioxidant biomarker superoxide dismutase (SOD), glutathione peroxidase (GPX), glutathione transferase (GST), and tissue lipid peroxide as malondialdehyde (MDA) were determined according to Beuchamp and Fridovich (1971), Tapple (1978), Habig et al. (1974), and Uchiyama and Mihara (1978), respectively.

#### **Statistical analysis:**

Data were analyzed by one-way analysis of variance followed by Duncan's Multiple Range Test (DMRT) using SPSS version 11 (SPSS, Chicago, IL). The limit of statistical significance was set at  $P < 0.05$ .

#### **Results and Discussion**

Mediterranean diet have major nutritional-health benefits owing to the high levels of natural antioxidants' content, obtained from vegetables and fruits, including figs, which contribute with antioxidant, vitamins, and some of the highest polyphenols levels. (Solomon et al., 2006)

Figs are rich in chemical constituents mainly minerals, mostly fructose and glucose, anthocyanins, phytosterols, and fatty acids and dietary fibers those characterizations gives it power not only for physiological functions in plants but also positive effects in human health. (Genna et al., 2008; Yang et al., 2009; Oguzhan and Polat, 2011)

**Table (1): Determination of total phenolics, flavonoids and total antioxidants of dry *Ficus carica* L fruit**

Total Phenolics ( mg GAE/100 g ) *	Flavonoid content ( mg/100g)	Total Antioxidant activity ( mmol Fe <sup>2+</sup> /kg) **
60.23 ± 0.11	116.3	6.3 ± 0.19

\* Expressed as gallic acid equivalent per 100g dry matter.

\*\* Expressed as ferric reducing antioxidant power (FRAP).

\*\*\* All determinations were performed in triplicate.

In this study, total phenolics, flavonoids, and total antioxidant activity were estimated in dried *Ficus carica* L as shown in table (1). In ripening fruit, total phenolics and flavonoids were 60.23 mg/100g and 116.3 mg/100g of dry matter along with total antioxidant activity of 6.3 mmol respectively. These findings confirm that figs fruit contains considerable amounts of both total phenolics and flavonoids that may contribute to its antioxidant power.

By different ways, flavonoids can behave as antioxidants, including oxygen species trapping, chelation of metals' transition related to free radical formation process and decline of alkoxy and peroxy radicals that may prevent the peroxidation process (Heim *et al.*, 2002). Besides, they can modify the synthesis process of eicosanoids to inhibit platelet assembly and to protect oxidation of lipoproteins. (Svetlana *et al.*, 2015)

Our findings are in line with Oguzhan and Polat (2011) who determined total phenolic content of green, yellow, brown, purple, and black figs fruits range of 69.1–220.0, mean 118.9 mg GAE/100 g FW and the antioxidant capacity range of 7.9–16.1, mean 12.4 Fe<sup>2+</sup>-mmol/kg fresh weight. From other hand, the total phenolic content of *Ficus carica* methanolic extract was 11.696 mg gallic acid equivalent (GAE)/100 g dry methanolic extract. (Tahereh *et al.*, 2015)

Total flavonoid and total polyphenolics content of six fig varieties was measured by Solomon *et al.* (2006) which expressed that the fresh Bursa fig has 56 mg of GAE/100 g and the pulp contains 73.7 mg of GAE/100 g because of most flavonoids located in the fruit skin.

Also, in this study, oxidative stress of KBrO<sub>3</sub> was estimated in rats as shown in table (2). Oxidative stress induced by KBrO<sub>3</sub> produced

a remarkable decrease in body weight gain, food intake and FER at  $P < 0.05$  in intoxicated control group as compared with normal control. All treatments even if with fig's powder and juice resulted in significant ( $P < 0.05$ ) elevation in all previous parameters. Similarly, Q10 alone or in combinations with figs significantly indicated best results near normal control levels compared to normal control.

The decreased level of body weight may explained by the ability of KBrO<sub>3</sub> to generate free radicals, which may lead to DNA breakage, inhibition of protein biosynthesis and gluconeogenesis, lipid peroxidation. (Abd El-Ghanyet al., 2012)

Our results in agreement with Anderson and Woodend(2003), which mentioned that high glycemic-carbohydrate are associated with a reduction in appetite and food intake of experimental animals in a short time.

**Table (2): Changes of body weight, feed intake and FER of the experimental rat**

Parameters groups	BWG %	Feed intake(g/d)	FER
Normal Control	53.73±0.41 <sup>a</sup>	17.63±1.27 <sup>a</sup>	0.099±0.003 <sup>a</sup>
Intoxicated Control	39.42±0.32 <sup>c</sup>	13.34±1.16 <sup>b</sup>	0.060±0.008 <sup>c</sup>
KBr03 + FP (15% diet)	41.14±0.23 <sup>b</sup>	16.23±1.65 <sup>a</sup>	0.089±0.04 <sup>b</sup>
KBr03 +FJ (150ml/kg BW)	44.27±0.33 <sup>b</sup>	16.58±1.44 <sup>a</sup>	0.083±0.006 <sup>b</sup>
KBr03 + Q10 (15 mg / kg BW)	48.09±0.22 <sup>b</sup>	16.72±1.27 <sup>a</sup>	0.087±0.003 <sup>b</sup>
KBr03 + FP + Q10 (50/50)	50.24±0.14 <sup>ab</sup>	17.15±1.43 <sup>a</sup>	0.093±0.004 <sup>ab</sup>
KBr03 + FJ +Q10 (50/50)	51.18±0.17 <sup>a</sup>	17.644±1.51 <sup>a</sup>	0.095±0.0089 <sup>a</sup>

Values are expressed as mean ± S.D. n = 8 rats/group.

Values not sharing a common superscript differ significantly at  $P < 0.05$  (DMRT).



**Table (3): Effect of *Ficus carica* L fruit on serum lipid profiles of KBrO3-induced oxidative stress in rats.**

Parameters Groups	Total cholesterol (mg /dl)	Triglycerides (mg/dl)	HDL-c (gm /dl)	LDL-c (mg /dl)	VLDL-c (mg/dl)
Normal Control	105.12±3.21cd	90.77±1.14cd	41.40±3.2a	45.57±5.16d	18.15±4.1b
Intoxicated Control	189.27±2.11a	144.22±1.16a	30.04±3.1c	130.39±14.32a	28.84±4.3a
KBrO3 + FP (15% diet)	119.17±3.22b	108.27±1.22c	36.21±3.1b	81.31±7.24b	21.65±4.2b
KBrO3 +FJ (150ml/kg BW)	126.32±3.21bc	117.22±1.15c	33.51±3.3ab	69.37±7.11b	23.44±4.4b
KBrO3 + Q10 (15 mg / kg BW)	130.19±2.19b	122.22±1.15bc	34.21±3.6a	71.54±8.15b	24.44±4.2ab
KBrO3 + FP + Q10 (50/50)	114.14±3.05bc	109.33±1.23c	36.31±4.1a	55.97±6.71bc	21.86±6.2b
KBrO3 + FJ +Q10 (50/50)	120.11±3.07bc	115.71±1.73c	35.61±4.4a	61.36±6.22cd	23.14±2.3ab

Values are expressed as mean ± S.D. n = 8 rats/group.

Values not sharing a common superscript differ significantly at P < 0.05 (DMRT).

Effect of *Ficus carica* L fruit on serum lipid profiles of KBrO3-induced oxidative stress were illustrated in table 3, which showed significant elevation (P<0.05) in serum total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL-c), very low density lipoprotein cholesterol (VLDL-c), vice versa, high density lipoprotein cholesterol (HDL-c) for KBrO3-intoxicated control.

Diet supplemented with 15% FP and 150ml FJ induced a significant reduction (P<0.05) in all previous lipid fractions, on the contrary for HDL-c, on the same context enzyme Q10 groups. Intoxicated group feed FP+Q10 and FP 115% diet respectively were the best results compared to all groups with 39.7% and 37% reduction compared to intoxicated control.

Ample evidence exists with respect to the fact that, HDL-c is inversely related to total body cholesterol and LDL-c, Administration of figs powder, and juice to KBrO3-induced rats the decreased levels of

HDL-C and increased levels of TC, TG, LDL-C, and VLDL-C were back towards to normal control values.

Administration of KBrO<sub>3</sub> to mice resulted in alteration values of low density lipoprotein (LDL), high density lipoprotein (HDL) and cholesterol levels compared to control samples. (Naifet *et al.*, 2018)

Phenolics and flavonoids were reinforced the antioxidant activity found in figs, could therefore be considered favourable in increasing HDL and decreasing TC, TG, LDL, and VLDL in figs and Q10 treated groups. (Elshfi *et al.*, 2015)

It could be noticed that, administrating *Ficus carica* L leaves' aqueous decoction to rats suffering from hyperglycemia resulted in, remarkable lowering in the levels of T.C and a decrease in the T.C/HDL-c ratio, along with hypolipidemia and hypocholesterolemia effects of *Ficus carica* L were attributed to the presence of calotropenyl acetate, lupeol acetate and oleanolic acid. (Perez *et al.*, 2003)

The potent antioxidant activity of phenolic compounds may be related to its action as scavenger and inhibitors of lipid peroxidation. Hence, presence of steroids/triterpenoids and their glycosides and cumarins in the methanolic extract of leaves of *Ficus carica* L assumption to be responsible of those effects. (Dias *et al.*, 2005; Elshobakiet *et al.*, 2010)

**Table (4): Effect of *Ficus carica* L fruit on serum activity of antioxidant enzymes of KBrO<sub>3</sub>-induced oxidative stress in rats.**

Parameters groups	SOD(mmol/l)	GPX(mmol/l)	Catalase(μ/l)
Normal Control	55.55±3.19a	46.17±1.64a	133.75±5.24a
Intoxicated Control	24.15±2.41c	21.77±1.23c	71.41±4.81c
KBrO <sub>3</sub> + FP (15% diet)	42.21±3.61b	41.21±2.12a	117.70±5.51a
KBrO <sub>3</sub> +FJ (150ml/kg BW)	46.66±3.88b	44.05±2.19a	124.75±4.18ab
KBrO <sub>3</sub> + Q10 (15 mg / kg BW)	41.61±2.18b	39.88±3.33ab	121.67±4.84a
KBrO <sub>3</sub> + FP + Q10 (50/50)	50.45±3.11ab	46.77±3.71a	130.21±5.60a
KBrO <sub>3</sub> + FJ +Q10 (50/50)	48.66±3.77a	44.22±3.55a	125.61±5.14a

Values are expressed as mean ± S.D. n = 8 rats/group.

Values not sharing a common superscript differ significantly at P < 0.05 (DMRT).

Our results expressed in table 4, displayed the effect of *Ficus carica L* fruit on serum activity of antioxidant enzymes of KBrO<sub>3</sub>-induced oxidative stress, the mean values of serum SOD, GPX, and Catalase were significantly reduced (P<0.05) in intoxicated control group, the mean value of serum antioxidant enzymes revealed significant improving (p<0.05) in FP, FJ and Q10 groups compared to intoxicated control group. The most enhance values were appeared in FP+Q10, FJ+Q10 and FJ 150ml groups respectively as 90.81%, 87.6% and 84% respectively compared to normal control.

In this respect, excess of the polyphenol content, particularly anthocyanins in *Ficus carica L* fruit, boosts their antioxidant activity. Antioxidants found in figs protect plasma lipoproteins from oxidation therefore; remarkably raise plasma antioxidant capacity for 4 h after figs administration. (Vinson *et al.*, 2005).

Table 5 showed serum creatinine, urea, uric acid, the intoxicated group had a significant elevation (P<0.05) in serum creatinine, urea, and uric acid compared to normal control. FP, FJ, FPQ10 and FJQ10 had non- significant reduction in serum kidney biomarkers at (P<0.05) and appeared near normal values. An increase in blood urea nitrogen, and accordingly, kidney biomarkers may be due to renal dysfunction because of releasing oxidants, which cause a defined damage of the glomerular basement membrane, then induce proteinuria, those effects would lead to a fall in the glomerular filtration rate for the morphological changes observed in chronic kidney disease targeted by KBrO<sub>3</sub> administration. (Shah, 2006)

**Table (5): Effect of *Ficus carica L* fruit on serum kidney biomarkers of KBrO<sub>3</sub>-induced oxidative stress in rats.**

Parameters groups	Creatinine	Urea (µ /mg)	Uric acid(mg/dl)
Normal Control	0.78±0.1c	31.22±3.20bc	1.51±0.22b
Intoxicated Control	1.36±0.2a	52.65±5.24a	3.52±0.44a
KBrO <sub>3</sub> + FP (15% diet)	0.93±0.2bc	35.41±3.57b	1.79±0.23b
KBrO <sub>3</sub> +FJ (150ml/kg BW)	0.97±0.1bc	39.62±4.19b	1.85±.36b
KBrO <sub>3</sub> + Q10 (15 mg / kg BW)	1.07±0.2b	40.36±5.42b	1.90±0.37b
KBrO <sub>3</sub> + FP + Q10 (50/50)	0.95±0.5bc	32.99±3.36bc	1.70±0.41b
KBrO <sub>3</sub> + FJ +Q10 (50/50)	1.01±0.4b*	33.04±3.23bc	1.74±0.50b

Values are expressed as mean ± S.D. n = 8 rats/group.

Values not sharing a common superscript differ significantly at P < 0.05 (DMRT).

Our data also revealed that, non-significant reduction of kidney parameters were observed among *Ficuscarica* L, Q10 treated groups compared to intoxicated control. This may be attributed to the presence of flavonoids and their scavenging activities against hydroxyl and superoxide anion free radicals that affects kidney functions. (Musabayaneet al., 2007)

**Table (6): Effect of *Ficuscarica* L fruit on Kidney tissues Lipid peroxide MDA, GST, GPX, and SOD of KBrO3-induced oxidative stress in rats.**

Parameters groups	SOD ( $\mu$ /mg)	GPX ( $\mu$ /mg)	GST ( $\mu$ /mg)	MDA ( $\mu$ mol /g)
Normal Control	95.35 $\pm$ 3.71a	85.24 $\pm$ 8.16a	3.52 $\pm$ 0.33a	7.98 $\pm$ 1.33b
Intoxicated Control	34.42 $\pm$ 3.42d	24.31 $\pm$ 4.11c	1.01 $\pm$ 0.12c	14.76 $\pm$ 2.77a
KBrO3 + FP (15% diet)	90.12 $\pm$ 4.45a	73.21 $\pm$ 7.25b	3.44 $\pm$ 0.32a	8.59 $\pm$ 1.06b
KBrO3 +FJ (150ml/kg BW)	87.31 $\pm$ 5.61bc	79.23 $\pm$ 9.61ab	3.25 $\pm$ 0.44a	8.43 $\pm$ 1.11b
KBrO3 + Q10 (15 mg / kg BW)	84.43 $\pm$ 9.03bc	75.41 $\pm$ 7.14b	3.01 $\pm$ 0.42b	8.26 $\pm$ 1.14b
KBrO3 + FP + Q10 (50/50)	90.11 $\pm$ 5.72a	79.33 $\pm$ 8.77ab	3.49 $\pm$ 0.34ab	8.41 $\pm$ 1.31b
KBrO3 + FJ +Q10 (50/50)	88.22 $\pm$ 6.61a	78.10 $\pm$ 9.11ab	3.28 $\pm$ 0.55a	8.31 $\pm$ 1.42b

Values are expressed as mean  $\pm$  S.D. n = 8 rats/group.

Values not sharing a common superscript differ significantly at P < 0.05 (DMRT).

Table 6 showed the kidney tissues lipid peroxide MDA, GST, GPX, and COD levels of KBrO3- induced oxidative stress in rats. By studying previous biomarkers in kidney tissue, it could be noticed that, there were a significant reduction (P<0.05) in the mean value of kidney SOD, GPX and GST in intoxicated control and Q10 groups and significant elevation in MDA value (p<0.05) in intoxicated group compared to normal control. FP group showed non-significant differences in the mean value of kidney SOD, GST, and MDA (p<0.05) and significant reduction in GPX, while FJ group showed significant decreased in the mean value of kidney SOD (p<0.05) and non-significant difference in GPX, GST and MDA (p>0.05) compared to normal control group. Administration of FPQ10 and FJQ10 to KBrO3

rats resulted in bringing values of kidney antioxidant enzymes and MDA reversed to near normal that may be due to their synergistic effects. All the treatment groups showed increase in kidney antioxidant enzymes and decrease MDA levels compared to intoxicated group.

Oxidative stress seems to induce production of highly reactive oxygen species that causes cell toxicity, especially cell membrane in which these radicals interact with the lipid bilayer and produce lipid peroxides. However, a significant protective of *Ficuscarica* L fruit and coenzyme Q10 contributed with lowering the serum levels of malondialdehyde equivalent, an index of lipid peroxidation of kidney tissues were observed.

Due to its deleterious effects, one of the most negative impact of KBrO<sub>3</sub> is causing acute kidney damage, subsequently, KBrO<sub>3</sub> indeed, reduce the kidney' content of antioxidant biomarkers that endure the incidence of oxidative stress especially GSH. (Parsons and Chipman, 2000; Baoet *al.*, 2008 and Naifet *al.*, 2018).

In kidneys' tissue, activity of antioxidant enzymes; catalase, superoxide dismutase, glutathione peroxidase, glutathione-S-transferase, glutathione reductase, and reduced glutathione contents were decline while lipid peroxidation were increased with KBrO<sub>3</sub> treatment. (Khanet *al.*, 2012).

In other study, Kleiner *et al.* (2018) mentioned that long-term oral CoQ10 supplementation to mouse model prevents kidney failure by rescuing defects of sulfides oxidation and ameliorating oxidative stress. In agreement with previous studies, we observed a significant increase in the levels of lipid peroxidative markers in kidney tissues malondialdehyde (MDA) of KBrO<sub>3</sub>-induced rats to more than 2-folds of the results observed in normal control, and administration of *Ficuscarica* L powder and juice, also Q10 to KBrO<sub>3</sub>-induced rats significantly restored the non-enzymatic antioxidants biomarkers near normal levels.

### **Conclusion:**

It can be concluded that administration of *Ficuscarica* L powder and juice along with Q10 exert significant attenuate effects towards potassium bromide induced oxidative stress in rats based on its higher contents of both total phenolics and flavonoids together with total antioxidant activity that may contribute to its powerful effects for

improving health status of experimental rats, from other hand, elevation of antioxidant parameters such as SOD and total antioxidant capacity in serum and tissue with reducing serum TG, TC, LDL-C, VLDL-C, urea, creatinine, uric acid and MDA levels, while there are increase in HDL-C levels. These observations support assumptions of the anti-peroxidative and antioxidant effects of *Ficus carica* L fruit.

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## تناول فاكهة التين البرشومي وأنزيم كيو10 يخفف من الإجهاد التأكسدي الناجم عن بروميد البوتاسيوم في الفئران

### الملخص العربي:

تعتبر فاكهة التين البرشومي غذاءً وظيفيًا ومصدرًا هامًا للمكونات الحيوية النشطة مثل الفينولات ومضادات الأكسدة التي لها تأثيرات محتملة لتعزيز الصحة. لم يتم إجراء أي دراسة منهجية على فعالية حماية فاكهة التين البرشومي من الإجهاد التأكسدي، لذا تم دراسة تأثير فاكهة التين البرشومي (المجفف والعصير) مع أنزيم Q10 على الإجهاد التأكسدي الناتج عن بروميد البوتاسيوم في فئران التجارب.

تم تقسيم ستة وخمسين من الفئران البيضاء إلى سبع مجموعات (ن = ٨) لفترة تجريبية لمدة ستة أسابيع. مجموعة (١) الضابطة الطبيعية، المجموعة (٢) الضابطة المصابة (KBrO3) وقسمت الست مجموعات إلى المجموعه الغير معالجه (مريضة) والمجموعات من ٣-٧ المعالجه بكل من مسحوق التين بنسبة ١٥% من الوجبه القياسيه وعصير التين بنسبة ١٥٠ ملجم/ كجم من وزن الجسم و كوانزيم 10 بنسبة ( 15ملجم/ كجم من وزن الجسم) ومسحوق وعصير التين مع كوانزيم 10 (٥٠%+٥٠%). كانت نتائج الفينول الكلي ٢٣.٦٠ ملجم مكافئ حمض الجاليك لكل ١٠٠ جرام من الفاكهة الجافة، وكان محتوى الفلافونويد ١١٦.٣ ملجم وتم تحديد النشاط المضاد للأكسدة الكلي بواسطة اختبار قدرة الحديدك مضاد الأكسدة (FRAP) بقيمة ٦.٣ مللي مول، وهذه الخصائص الحيوية قد تزيد القدرة المحتمله لمحتوى فاكهة التين من مضادة للأكسدة على تعزيز الصحة.

تأثيرات الإجهاد التأكسدي بفعل بروميد البوتاسيوم (٢٠٠ ملجم / كجم مياه الشرب على طول فترة التجربة) وضحت من خلال انخفاض مستويات المؤشرات الحيوية لوظائف الكلى في السيرم (الكرياتينين واليوريا وحمض اليوريك) ، وكذلك المؤشرات الحيوية للدهون في السيرم (TG ،CHO ،LDLc و VLDLc) أيضا مستويات MDA في مجموعات المتناولة لمسحوق التين والعصير بشكل منفصل أو مع Q10 مقارنة بمجموعة الضابطة المصابة. تناول مسحوق التين والعصير بشكل منفصل أو مع Q10 و Q10 أيضا حسنت النتائج الغذائية، وزادت من الإنزيمات المضادة للأكسدة في السيرم وأنسجة الكلى وكذلك الارتفاع في مستوى الكوليسترول مرتفع الكثافة مقارنة مع المجموعة الضابطة المريضة. وقد أظهرت أفضل النتائج أن إعطاء مسحوق التين أو العصير مع Q10 بسبب التأثيرات التآزرية يمكن أن يوفر حماية كبيرة تعتمد على الجرعة من KBrO3 لتحفيز الإجهاد التأكسدي.

توصي الدراسة بضرورة تناول مسحوق التين والعصير مع وبدون Q10 لما له من تأثيرات صحية على النمو والاستفادة من الغذاء و تحسن وظائف الكلى وانخفاض الإجهاد التاكسدي الناجم عن تناول بروميد البوتاسيوم كما توصي بتدعيم منتجات المخبوزات بفاكهة التين وأدخالها في عصير الكوكتيل كنوع من التغذية العلاجي لمرضى الكلى لخفض التوتر المصاحب للمرض، والاستفادة الغذائية من إنزيم Q10 - تحت إشراف طبي - لما له من تأثير مضاد للأكسدة.

**الكلمات المفتاحية:** التين البرشومي -كوانزيم كيو10- بروميد البوتاسيوم – الإجهاد التاكسدي – وظائف الكلى- فئران التجارب .