Fruit's phytochemicals face the risk of low dopamine on the kidneys: Histological study

Rosas, A.; Mubarak, A. and Abd ELHady,F .*
***Home Economic Dept., Faculty of Specific Education, Menoufia Univ.**
Ferdouse Abd Elmonem Abd El Hady
Assistant Lecturer, Faculty of Specific Education, Menoufia University
Home Economics (Nutrition & Food Science)

ABSTRACT: Fruits play a critical role in dopamine neurons recovery during kidney injury and in neurodegenerative diseases. Phytochemicals, which fruits enriched, can modulate the neuro-inflammation dysfunction. Our work investigated the effect of phytochemicals against toxicity induced by 6-OHDA in rats which raised dopamine's level. Application on a sample of mal "Sprague-Dawley albino mice" contained 48 rats divided 8 groups each group containing 6 rats. A group of them used as a control negative, and other groups were injected (I.P) by 6-OHDA (0.5ml/5days), and isolated two groups of them as positive control. Groups 3-8 were treated with alcoholic extracts of fruits for 8 weeks. Then we studied the histopathological changes for kidney, Showed extracts of alcoholic recovery remarkable all of kidney tissues, especially kiwi, grapes, pineapple, blended with kidney sections normal histological structure of renal parenchyma, with the exception of peach extract showed focal necrosis of renal tubules associated with inflammatory cells infiltration and thickening of parietal layer of Bowman's capsule and presence of proteinaceous cast in the lumen of renal tubules, which indicates the presence of the stage of recovery of due Phytochemicals the rich fruits of those vehicles. Compared tissue anatomy of the kidneys infected group (the control postive) microscopically, revealed vacuolation of endothelial lining glomerular tuft, perivascular oedema, vacuolar degeneration of epithelial lining renal tubules, presence of proteinaceous cast in the lumen of renal tubules and cystic dilatation of renal tubules. So we hope that our work will be a light to clear the risk of lower dopamine.

Key words: Phytochemicals, Kiwi, Red grapes, Peach, Pineapple, Dopamine, 6-OHDA, Antioxidants.

Introduction

Phytochemicals are chemical compounds that occur naturally in plants; these include polyphenols, flavonoids, and other chemicals. These natural, potent phytochemicals have been shown to exert beneficial, protective effects in cardiovascular diseases, cancer, infections, and neurodegenerative disorders. In addition, these chemicals have been shown to scavenge pathological concentrations of ROS [22, 25 & 31] and reactive nitrogen species (RNS) and to chelate transition metal ions [2, 24, 26, 41 & 43]. Therefore, phytochemicals protect dopaminergic neurons and glial cells from psychostimulants or neurotoxins [2]. Interestingly, phytochemicals modulate not only neuron-inflammation by inhibiting the expression of inflammatory genes, but also levels of intracellular antioxidants [24].

Recently, several phytochemicals, such as flavanol (−) epigallocatechin-3-gallate (EGCG), flavone baicalein, and isothiocyanate sulforaphane (SFN), have demonstrated protective effects against the dopaminergic neuron-specific toxicity caused by psychostimulants or neurotoxins [28]. Flavonoids commonly consist of two aromatic rings bound together by three carbon atoms, forming an oxygenated heterocycle. Flavonoids can further be divided into six subclasses: flavonols, flavones, isoflavones, flavanones anthocyanidins and flavanols (catechins and proanthocyanidins)[33].

Phytochemical analysis of kiwi peel (Actinidia chinencis) crude extracts led to the isolation of vitamin C, vitamin E, α- and δ-tocopherol, 7 sterols, the triterpene ursolic acid, chlorogenic acid, lutein/zeaxanthin and 11 flavonoids. Chemical fractionation of pulp crude extracts led to the isolation of two caffeic acid glucosyl derivatives and two coumarin glucosydes, besides the three vitamin E, β-sitosterol, stigmasterol, campesterol, chlorogenic acid, and some flavone and flavanol molecules, [9, 16 & 23].

Peach fruits (*Prunus persica L.*) have laxative properties and are appropriate to prevent constipation and for the treatment of duodenum ulcers. Phenolic acids, flavonoids, [13 & 29] and anthocyanin compounds serve as a major source of potential antioxidants in peach fruit, which might have been responsible for these medicinal functions [10, 18 &42]. Many epidemiological studies suggest that increased fruit consumption decreases the risk of several degenerative diseases including atherosclerosis, heart and brain disorders, and different types of cancer [20] such human breast cancer cells [38].

Pineapple's root (*Ananas comsus*) was selected for screening of in-vitro antioxidant activity by scavenging of hydrogen peroxide (H2O2) and Ferric Reducing Antioxidant Power (FRAP) methods. The ethyl acetate extract of Ananas comosus root showed good antioxidant activity by scavenging of hydrogen peroxide and reducing power ability which may be due to presence of various phytochemicals such as alkaloids, phenolic compounds, tannins and saponins [4]. Pineapple is rich in phenolic acids, such as p-coumaric acid, caffeic acid, and other phenolics, highly relevant to the putative cardiovascular-protective effects, which suggests its potential to be a new plant medicine for treatment of cardiac disease [12].

Grape pomace (*Vitis vinifera*), which is an industrial waste from wine production and consists of grape seeds, skins, and stems, contains a large number of polyphenolic compounds [17]. The major phenolics found in grape skin include anthocyanin, ellagic acid, myricetin, quercetin, kaempferol, and trans-resveratrol. Gallic acid, catechin, and epicatechin are found in grape seeds, while grape stems contain rutin, quercetin 3-O-glucuronide, trans-resveratrol, and astilbin [8 &32]. Grape extracts rich in polyphenols prevent from cardiovascular disease. Consumption of grape and grape extracts and/or grape products such as red wine may be beneficial in preventing the development of chronic degenerative diseases such as cardiovascular disease[48]. Grape seed extract has inhibiting effect on the accumulation of age-related oxidative DNA damages in spinal cord and in various brain regions such as cerebral cortex, striatum and hippocampus [5].

Dopamine (DA) is a monoamine neurotransmitter distributed in the central neural system brain tissues and body fluids of mammals. It plays pivotal roles in the function of central nervous, renal, hormonal and cardiovascular system. Detection and quantification of DA is important in diagnoses, monitoring, prevention and treatments of some certain diseases, such as Parkinson's disease, Alzheimer's disease (AD), Huntington's disease, epilepsy, pheochromocytoma and neuroblastoma [31].

Dopamine acts on the sympathetic nervous system. Application of dopamine leads to increased heart rate and blood pressure. DA cannot cross the blood-brain barrier, so dopamine given as a drug does not directly affect the central nervous system [1]. Dopamine is synthesized

by the kidney, mainly by renal proximal tubule cells, independent of renal nerves. Unlike in neural tissue dopamine synthesized by renal tubules is not converted to norepinephrine. Renal dopamine is crucial in the maintenance of normal fluid, electrolyte balance, and redox balance and blood pressure [3]. The importance of renal endogenous dopamine in body homeostasis is demonstrated in genetically altered mice with decreased or increased renal dopamine production. The selective deletion in the mouse renal proximal tubule of aromatic amino acid decarboxylase (AADC), the enzyme responsible for the production of dopamine in the kidney, decreased intrarenal dopamine levels, and caused salt-sensitive hypertension [49]. Deletion of catechol-O-methyl transferase (COMT), which degrades dopamine to 3-methoxytyramine, is associated with increased dopamine levels. Transplanting the kidney from COMT−/− mice into diabetic wild-type mice ameliorated the consequences of diabetes, decreasing albuminuria, glomerulopathy, inflammation, oxidative stress, and fibrosis, effects that were aggravated by the proximal tubular deletion of AADC [50]. The purpose of this work was to evaluate the histipathological effect of Phytochemical's kiwi, grapes, peach, pineapple and mixture in rats model of 6-OHDA induced dopaminergic neuronal damage in renal tissuse, and how reinvestigation the damagement on renal tissuse by this phytochemicals.

Materials and Methods

Chemicals: 6 hydroxydopamine hydrochloride was bought from Sigma-Aldrich Company.

Experimental fruits: kiwi (*Actinidia chinencis*), pineapple (*Ananas comsus*), red grapes (*Vitis vinifera*) and peaches (*Prunus persica*) were bought from local market.

Fruit extracts preparation: Small pieces of whole the fruit were needed to dryness using oven temperature 55ºC for 24 h. Well grinded were done for the dry pieces to produce the powder. Ethanolic extracts have been prepared individually using magnetic stirrer for 3 h before filtration. Equal amounts of each dried fruit to form total 100 gm were extracted in 200 ml ethanol to produce the mixture. Concentrated samples (20 ml) were refrigerated on (5ºC) until the biological experiment.[27 & 37]

Biological experiment: Biological experiments have been done in this research work up to 8 weeks to declare the role of 6-OHDA as a risk factor and the defence system in another view using theses fruits. 6-OHDA appeared to have oxidative stress factor by reducing dopamine [7, 11&19] , so edible ethanolic extracts were used as preventive agents against dopamine decreased.

Fourty eight male Sprague-Dawley rats were aged approximately 6-9 mounths. They were housed individually in healthy standard cages with metallic covers under strict hygienic measures. Rats were divided into 8 groups, given two weeks acclimation period, during which they were fed basal diet, with alternated 12 h dark/light cycle. The ambient temperature was held at constant temperature between 20-25ºC. Six rats per group has mean weight 290 to 370 g were randomly assigned as the following below;

(1) **Control group (c):** Rats were fed on the basal diet, and food intake was recorded weekly after giving each rat calculated 30 g daily.

Rats from groups 2-8 were injected intraperitoneal (IP) by 6Hydroxydopamine (6-OHDA) 100mg/kg dissolved in 0.5ml physiological saline containing 0.01% ascorbic acid as an antioxidant, pH 7.4 for 5 consecutive days [15, 39 &46].

(2) **6-OHDA group (6-OHDA):** Rats were only injected (IP) by (6-OHDA), and were kept feeding on the normal basal diet until the end of the experiment. Groups 3 – 7 were tested the potential impact of some vitamins or edible ethanolic extracts.

(3) **Group 3:** Rats were fed on basal diet with oral injection of 0.2 ml concentrated for kiwi extract (100 g/ 200 ml EtOH) for 8 weeks.

(4) **Group 4:** Rats were fed on basal diet with oral injection of 0.2 ml concentrated for red graps extract (100 g/ 200 ml EtOH) for 8 weeks.

(5) **Group 5:** Rats were fed on basal diet with oral injection of 0.2 ml concentrated for peach extract (100 g/ 200 ml EtOH) for 8 weeks.

(6) **Group 6:** Rats were fed on basal diet with oral injection of 0.2 ml concentrated for pineapple extract (100 g/ 200 ml EtOH) for 8 weeks.

(7) **Group 7:** Rats were fed on basal diet with oral injection of 0.2 ml concentrated for the mixture extract (100 g equally mixed from the four samples / 200ml EtOH) for 8 weeks .

(8) **Group 8:** Rats were fed on basal diet for a week, and sacrificed.

The animals were sacrificed at the end of the biological experiment (8weeks).

Histopathological examination:

Autopsy kidney samples were taken from the rats in different groups. Then, samples were fixed in 10% formol saline solution for twenty four hours. Washing was done in tap water then serial dilutions of absolute ethyl alcohol were used for dehydration. Specimens were cleared in xylene and embedded in paraffin at 56°C in a hot air oven for twenty four hours. Paraffin bees wax tissue blocks were prepared for sectioning at 4 microns thickness by slidge microtome. The obtained tissue sections were collected on glass slides, deparaffinized and stained by hematoxylin and eosin stain for histopathological examination through the electric light microscope [6].

Histopathological results and discussion

Role of individual and mixture ethanolic fruit extracts in 6-OHDA effects on kidney tissues:

Microscopically, kidney sections of control revealed the normal histological structure of renal parenchyma (Fig.1). However, kidney of 6-OHDA group2 revealed vacuolation of endothelial lining glomerular tuft, perivascular oedema, vacuolar degeneration of epithelial lining renal tubules, presence of proteinaceous cast in the lumen of renal tubules and cystic dilatation of renal tubules (Fig.2).

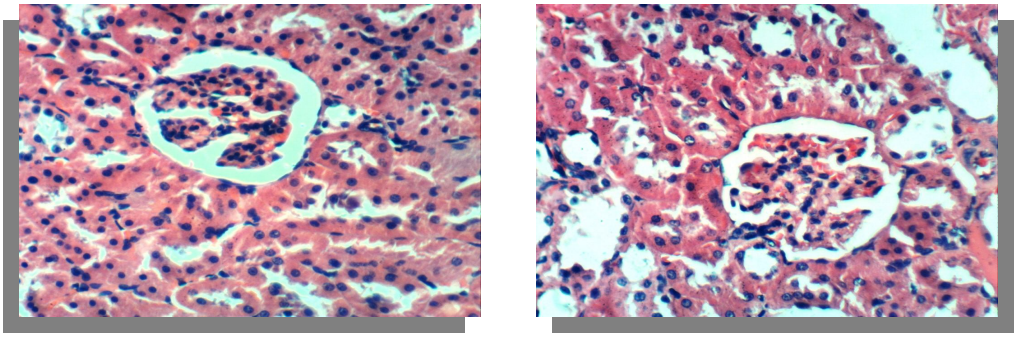

Fig (1): Histogram for kidney sections of control group (H and E x 400).

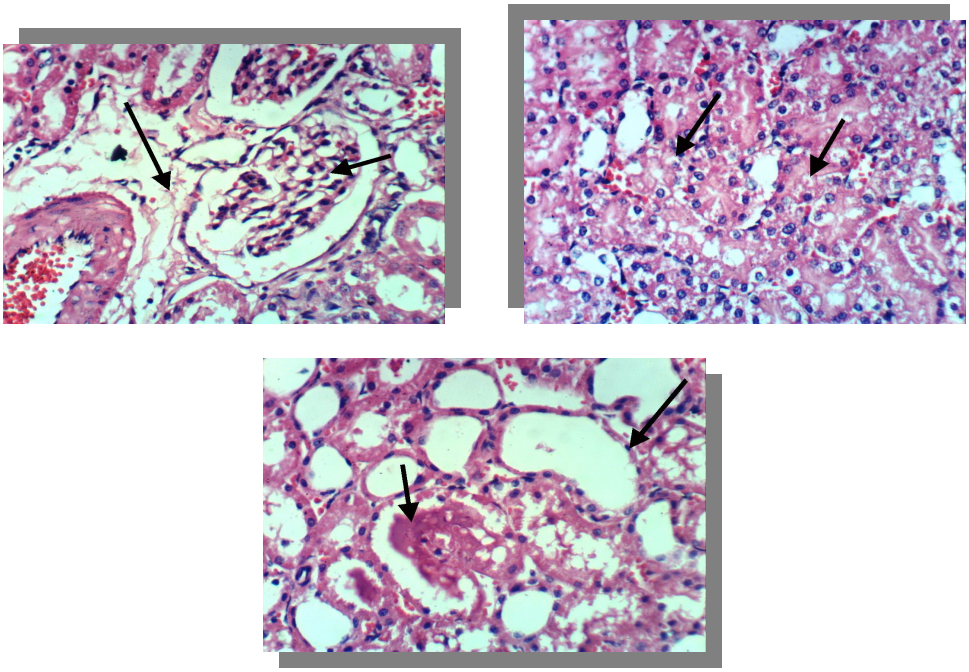

Fig (2): Histogram for kidney sections of 6-OHDA group$_2$ (H and E x 400).

The oxidative stress results in different types of neuronal death, including necrosis and apoptosis, which are known to occur in the course of AD [34 & 45]. Nevertheless, it is not known whether reactive species overproduction is a primary or secondary event in AD, because tissue injury itself can induce reactive species. If free radicals generation is a secondary event, it is still deleterious and can exacerbate the pathological situation. So, direct therapeutic efforts towards oxidative events in the pathway of neuron degeneration and death are important for AD treatment. Con- cerning mitochondrial dysfunction, it leads to the appearance of all of the histological modifications of AD, including tau phosphoryla- tion, processing of amyloid precursor protein to amyloid, tangle formation and neurodegeneration [44].

Recently researchstated the phytochemical contents of fruits are influenced by numerous factors such as climatic conditions, agronomic practices, and varietal differences. Moreover, contents of organic acids, carbohydrates and phenolics are not uniformly distributed within different parts of fruits, and most of them are concentrated in the epidermal and sub-epidermal layers of fruit [34, 35 & 47]. Moreover, examined sections from 6-OHDA groups1 and 6-OHDA + kiwi extract showed no histopathological changes, except congestion of renal blood vessels was noticed in some examined sections (Figs.3).

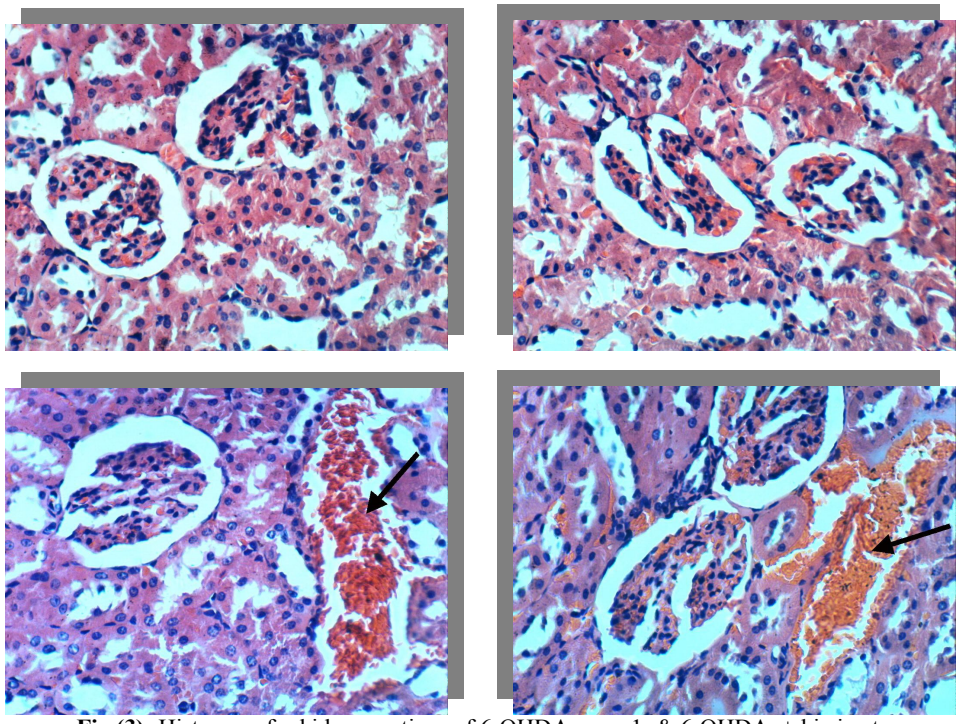

Fig (3): Histogram for kidney sections of 6-OHDA group1 & 6-OHDA + kiwi ext.

(H and E x 400).

Red grapes extract showed presence of proteinaceous cast in the lumen of renal tubules, whereas, other sections showed no histopathological changes. Grape seeds and red wine also contain a large amount of polyphenols. French scientists have confirmed that grape polyphenols can inhibit the oxidative stress of the apoptosis of vascular cells through inhibiting ROS produced by xanthine oxidase [14] and insulin resistance induced by fructose in type II diabetic patients at the first phase [21].

However, kidney's peach extract showed focal necrosis of renal tubules associated with inflammatory cells infiltration and thickening of parietal layer of Bowman's capsule and presence of proteinaceous cast in the lumen of renal tubules (Fig.4).

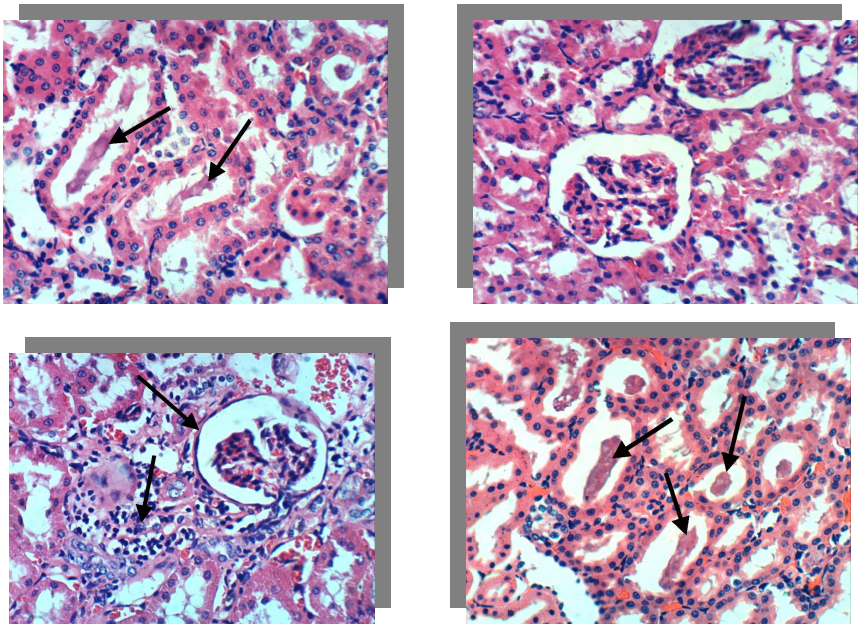

Fig (4): Histogram for kidney sections of 6-OHDA + red grapes ext. & 6-OHDA + peach ext. (H and E x 400, respectively).

Peach polyphenols can be used as a combinatorial treatment method of chemotherapy to inhibit tumor development at the early stage of tumor [38]. Its rich amount of natural phenolic phytochemicals such as phenolic acids, flavonoids and anthocyanin which constitute valuable components of our diet both in terms of dietary and medicinal values [13 &29]. A previous report suggests that prune extract and juice inhibit oxidation of isolated human low density lipoprotein [40].

On the other hand, pineapple extract and mixture extract showed normal histological structure, except some pineapple sections showed presence of proteinaceous cast in the lumen of renal tubules (Fig.5).

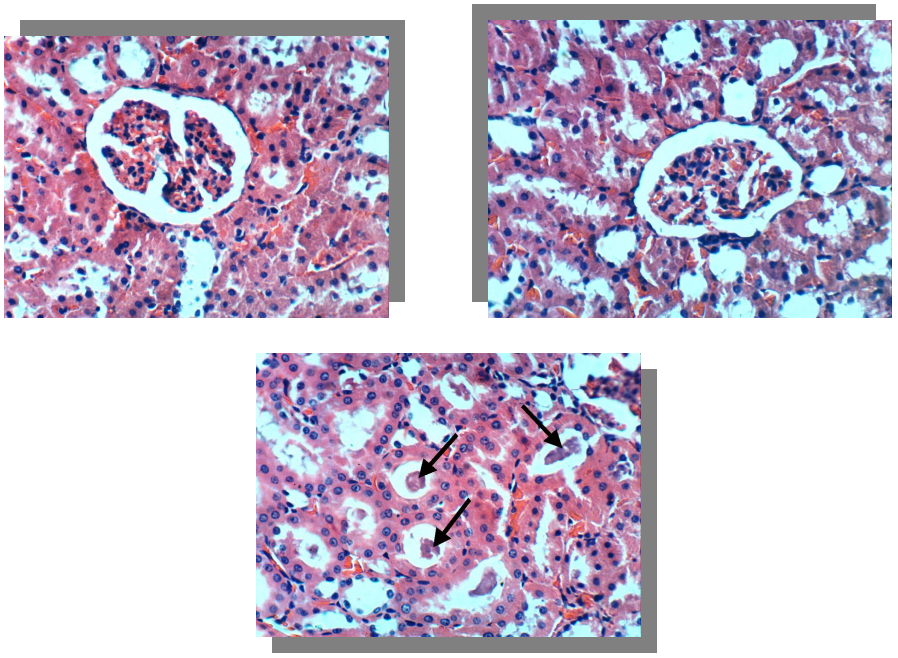

Fig (5): Histogram for kidney sections of 6-OHDA + pineapple ext. & 6-OHDA + mixture ext. (H and E x 400, respectively).

Finally, this work with many others in dopamine is spotting light on the bad role of decreasing DA on renal. The beginning elapsed decade our research proved the improvement role of some plant extracts have been proved optimistic results, specially shown by kiwi, grapes, pineapple and mixture extracts. We hope that it can be one step with others to protect humanity from the risk of decreasing dopamine.

Abbreviations

AADC	**Aromatic Amino acid Decarboxylase**	**FRAP**	**Ferric Reducing Antioxidant Power**
AD	**Alzheimer Diseases**	IP	**Intraperitoneal**
COMT	**Catechol-o-methyl Transferase**	**6-OHDA**	**6-hydroxydopamine**
DA	**Dopamine**	**RNS**	**Reactive Nitrogen Species**
EGCG	**(−)-Epigallocatechin-3-Gallate**	**ROS**	**Reactive oxygen species**
EtOH	**Ethanol Extract**	**SFN**	**Sulforaphane**
Ext.	**Extract**		

References:

1. Ananya, M.D. (2013). What is Dopamine? News Medical.
2. Aquilano, K.; Baldelli S.; Rotilio, G. and Ciriolo, MR. (2008) Role of nitric oxide synthases in Parkinson's disease: a review on the antioxidant and anti-inflammatory activity of polyphenols. Neuro¬chem Res. (33), 2416–2426.
3. Armando, I.; Villar, V.A. and Jose, P.A. (2011). Dopamine and renal function and blood pressure regulation. Compr. Physiol. (1), 1075–1117.
4. Augus, R. A.; Christy, K. J., Sunitha, T.; Helen, M. T.; Stephy, S. S. and Hepzy, S. (2013). In-vitro antioxidant activity of ethyl acetate extract of *ananas comosus* (pineapple) root. Ethnopharmacology, Inventi: pep. (7), 75-13.
5. Balu, M.; Sangeetha, P.; Murali, G. and Panneerselvam, C. (2006). Modulatory role of grape seed extract on age-related oxidative DNA damage in central nervous system of rats. Brain Research Bulletin Vol. (68), 469–473.
6. Banchroft, J.; Stevens, A. and Turner, D. (1996). Theory and practice of histological techniques. 4th Ed. Churchil Livingstone, New York, London, San Francisco, Tokyo.
7. Blum, D.; Torch, S.; Lambeng, N.; Nissou, M.; Benabid, A.L.; Sadoul, R. and Verna, J.M. (2001). Molecular pathways involved in the neurotoxicity of 6-OHDA, dopamine and MPTP: contribution to the apoptotic theory in Parkinson's disease. Prog Neurobiol, (65); 135-172.
8. Bonilla, E.P.; Akoh, C.C.; Sellappan, S. and Krewer, G. (2003). Phenolic content and antioxidant capacity of muscadine grapes. J Agric Food Chem; vol.51,(6), 5497–5503.
9. Bursala, E. and Gülçin, İ. (2009). Polyphenol contents and in vitro antioxidant activities of lyophilised aqueous extract of kiwifruit (*Actinidia deliciosa*). Food Research International, Vol.44, (5), 1482–1489.

10. Casals, B.A.; Byrne, D.; Okie, W.R. and Zevallos, L. (2006). Selecting new peach and plum genotypes rich in phenolic compounds and enhanced functional properties. Food Chem. (96), 273–280.

11. Cohen, G. and Heikkila, R.E.(1974). The generation of hydrogen peroxide, superoxide radical, and hydroxyl radical by 6-hydroxydopamine, dialuric acid, and related cytotoxic agents. J Biol. Chem., (249); 2447-2452.

12. Dang, Y.J. and Zhu, C.Y. (2015) Genomic Study of the Absorption Mechanism of p-Coumaric Acid and Caffeic Acid of Extract of *Ananas Comosus L.* Leaves . Journal of Food Science,vol. 80, (3), 504–509.

13. Dorota WT. (2008) Characteristics of Plums as a Raw Material with Valuable Nutritive and Dietary Properties – A Review. Polish Journal of Food and Nutrition Sciences; 58: 401-405.

14. Du, Y.; Guo, H. and Lou, H. (2007). Grape seed polyphenols protect cardiac cells from apoptosis via induction of endogenous antioxidant enzymes, J. Agric. FoodChem. (55), 1695–1701.

15. Dubuisson , L.; Desmouliere, A.; Decourt, B.; Evade, L.; Bedin, C. and Boussarie, L. (2002). Inhibition of rat liver fibrogenesis through noradrenergic antagonism. Hepatology. (35), 325-331.

16. Fiorentino, A.; Abrosca , D.B.; Pacifico, S.; Mastellone, C.; Scognamiglio, M. and Monaco, P.(2009). Identification and Assessment of Antioxidant Capacity of Phytochemicals from Kiwi Fruits, J. Agric. Food Chem., vol.57 (10), 4148–4155.

17. Gehm, B.D.; McAndrews, J.M.; Chien, P.Y.; Jameson, J.L.(1997). Resveratrol, a polyphenolic compound found in grapes and wine, is an agonist for the estrogen receptor. Proc Natl Acad Sci USA.(94), 14138–14143.

18. Gil, M.; Barberan, F. T; Pierce, B.H. and Kader, A. (2002). Antioxidant capacities, phenolic compounds, carotenoids, and vitamin A contents of nectarine, peach, and plum cultivars from California. J. Agric. Food Chem., (50), 4976–4982.

19. Glinka, Y.; Gassen, M. and Youdim, M.B. (1997). Mechanism of 6-hydroxydopamine neurotoxicity. J Neural Transm Suppl (50), 55–56.

20. Hegedús, A.; Engel, R.; Abrankó, L. and Balogh, E. (2010). Antioxidant and antiradical capacities in apricot (*Prunus armeniaca L.*) fruits: Variations from genotypes, years, and analytical methods. J. Food Sci., (75), 722–730.

21. Hokayem, M.; Blond, E. and Vidal, H. (2013). Grape polyphenols prevent fructose-induced oxidative stress and insulin resistance in first-degree relatives of type 2 diabetic patients. J. Diabetes Care, (36), 1454–1461.

22. Huang, D.; Ou, B. and Prior, R.L. (2005).The Chemistry behind Antioxidant Capacity Assays. J Agric Food Chem., (53), 1841-1856.

23. Hunter, D.C.; Skinner, M.A.; Wolber, F.M. and Booth, C.L. (2012). Consumption of gold kiwifruit reduces severity and duration of selected upper respiratory tract infection symptoms and increases plasma vitamin C concentration in healthy older adults. Br J Nutr., vol. (108), (7), 35-45.

24. Iriti, M.; Vitalini, S.; Fico, G. and Faoro, F. (2010). Neuroprotective herbs and foods from different traditional medicines and diets. Molecules, (15), 3517–3555.

25. Irshad, M. and Chaudhuri, P.S. (2002). Oxidant Antioxidant System: Role and Significance in Human Body. Indian J Exp Biol., (40), 1233- 1239.

26. Jang, E.Y.; Park, K.A.; Lee, J.R.; Yang, C.H. and Hwang, M. (2012). Protective effect of sauchinone on methamphetamine-induced neurotoxicity in mice. J. Pharmacol Sci., (118), 531–536.

27. Kamkar ,A.; Shariatifar, N.; Jamshidi, A.H. and Mohammadian, M. (2011). Study of Antioxidant Functional of the Water, Methanol, and Ethanol Extracts of Endemic Cuminum cyminum L. and Cardaria draba L. in the In-vitro Systems, Ofoghe danesh, pp 38.

28. Kita, T.; Asanuma, M.; Miyazaki, I. and Takeshima, M. (2014). Protective Effects of Phytochemical Antioxidants Against Neurotoxin- Induced Degeneration of Dopaminergic Neurons. J. Pharmacol Sci., (124), 313– 319.

29. Kristl, J.; Slekovec, M.; Tojnko, S. and Unuk, T. (2011). Extractable antioxidants and non-extractable phenolics in the total antioxidant activity of selected plum cultivars (*Prunus domestica L.*): Evolution during on-tree ripening. Food Chem., (125), 29–34.

30. Lee, J.; Koo. N. and Min, D.B. (2004). Reactive Oxygen Species, Aging, and Antioxidative Nutraceuticals. Compr Rev Food Sci F., (3), 21-33.

31. Liu, L.; Wang, G.; Feng, Q.; Xing, Y.; Han, H. and Jing, M. (2013). Specific and Amplified Voltammetric Detection of Dopamine at Nitrilotriacetic acid-Iron Modified Gold Electrode. Int. J. Electrochem. Sci., (8), 3814 – 3824.

32. Makris, D.P.; Boskou, G.; Andrikopoulos, N.K. and Kefalas. P. (2008). Characterisation of certain major polyphenolic antioxidants in grape (*Vitis vinifera cv. Roditis)* stems by liquid chromatography-mass spectrometry. Eur Food Res Technol., (226), 1075–1079.

33. Manach, C.; Scalbert, A.; Morand, C.; Remesy, C. and Jimenez, L. (2004). Polyphenols: food sources and bioavailability. Am J Clin Nutr., Vol; (79), (5), 727–747.

34. Manzoor, M.; Anwar, F.; Saari, N. and Ashraf, M. (2012). Variations of antioxidant characteristics and mineral contents in pulp and peel of different Apple (*Malus domestica Borkh.)* cultivars from Pakistan. Molecules., (17), 390–407.

35. Mattila, P.; Hellström, J. and Törrönen, R. (2006). Phenolic acids in berries, fruits, and beverages. J. Agric. Food Chem., (54), 7193–7199.

36. Mattson, M.B. (2000). Apoptosis in neurodegenerative disorders, Nature Reviews Molecular Cell Biology, (1), 120–130.

37. Nema, N.; Arjariya, S.; Bairagi, S.M.; Jha, M. and KJharya, M.D (2013). In Vivo Topical Wound Healing Activity of *Punica Granatum* Peel Extract on Rats. AJPCT1., (2), 195-200.

38. Noratto, G.; Porter, W. and Byrne, D. (2014). Polyphenolics from peach (*Prunus persica* var. Rich Lady) inhibit tumor growth and metastasis of MDA-MB-435 breast cancer cells in vivo, J. Nutr. Biochem., (25), 796–800.

39. Oben, J.A.; Roskams, T. and Shiqi Yang, S. (2003). Sympathetic Nervous System Inhibition Increases Hepatic Progenitors and Reduces Liver Injury. Hepatology, vol. (38); (3), 664-673.

40. Qaiser, J. and Naveed, A. (2011). The Pharmacological Activities of Prunes: The Dried Plums. Journal of Medicinal Plant Research, (5), 1508- 1511.

41. Ren, Z.L. and Zuo, P.P. (2012). Neural regeneration: role of traditional Chinese medicine in neurological diseases treatment. J Pharmacol Sci., (120), 139–145.

42. Rupasinghe, V.H.P. and Clegg, S. (2007). Total antioxidant capacity, total phenolic content, mineral elements, and histamine concentrations in wine of different fruit sources. J. Food Comp. Anal., (20), 133–137.

43. Schaffer, S.; Asseburg, H.; Kuntz - Walter E.S. Muller and Eckert, G.P. (2012). Effects of Polyphenols on Brain Ageing and Alzheimer's Disease: Focus on Mitochondria. Mol Neurobiol, (46),161–178.

44. Swerdlow, R.; Burns, J. and Khan, S. (2010). The Alzheimer's disease mitochondrial cascade hypothesis, Journal of Alzheimer's disease, (20), 265–279.

45. Takatori, Y.T.; Kume, T.; Sugimoto, M.; Katsuki, M.; Sugimoto, H. and Akaike, A. (2006). Acetylcholinesterase inhibitors used in treatment of Alzheimer's disease prevent glutamate neurotoxicity via nicotinicacetylcholine receptors and phosphatidylinositol 3-kinase cascade, Neuropharmacology, (51), 474–486.

46. Tang ,Y.; Shankar, R.; Gamboa, M.; Desai , S.; Gamelli, R. and Jones, S.B. (2001). Norepinephrine modulates myelopoiesis after experimental thermal injury with sepsis. Ann Surg., (233), 266-275.

47. Tavarini, S.; Innocenti, E.D.; Remorini, D.; Massai, R. and Guidi, L. (2008). Antioxidant capacity, ascorbic acid, total phenols and carotenoids changes during harvest and after storage of Hayward kiwifruit. Food Chem., (107), 282–288.

48. Wayne, R.L. and Mahinda Y.A. (2008). Cardioprotective actions of grape polyphenols. Nutrition Research Vol. (28); (11), 729–737.

49. Zhang, M.Z.; Yao, B.; Wang, S.; Fan, X.; Wu, G.; Yang, H.; Yin, H.; Yang, S. and Harris, R.C. (2011). Intrarenal dopamine deficiency leads to hypertension and decreased longevity in mice. J. Clin. Invest., (121), 2845–2854.

50. Zhang, M.Z.; Yao, B.; Yang, S.; Yang, H.; Wang, S.; Fan, X.; Yin, H.; Fogo, A.B.; Moeckel, G.W. and Harris, R.C. (2012). Intrarenal dopamine inhibits progression of diabetic nephropathy. J. Diabetes, (61), 2575–2584.

المركبات الفيتوكيميائية لثمار الفاكهة في مواجهة خطر انخفاض الدوبامين على الكلى : دراسة هستولوجية

* علي بدوي رصاص، عادل السيد صادق مبارك وفردوس عبد المنعم عبد الهادي.

* قسم الاقتصاد المنزلي – كلية التربية النوعية – جامعة المنوفية.

المستخلص العربى:

تلعب الفاكهة دوراً حيوياً وفعالاً في اعادة اطلاق الدوبامين للخلايا العصبية أثناء الاصابة العصبية للكلى. والمركبات الفيتوكيميائية (الموجودة بالفاكهة) تستطيع فعل هذا الاصلاح العصبي. ويبرهن هذا العمل علي تأثير تلك المركبات ضد السمية التي يحدثها ٦-هيدروكسي الدوبامين في الفئران، محدثةً انخفاض بمستوى الدوبامين بالخلايا العصبية. بالتطبيق علي عينة من فئران الالبينو(ذكر) بلغت قوامها ٤٨ فأر، مقسمة الي ٨ مجموعات كل واحدة تحتوي علي ٦ فئران ، ستة منهم استخدموا كمجموعة ضابطة سالبة، وباقي المجموعات حقنت ب ٦-هيدروكسي الدوبامين في الغشاء البريتوني لمدة ٥ أيام . وبعد ذلك تم عزل مجموعتان (ضابطة موجبة)، والمجموعات ٣-٨ تم معاملتهم بالمستخلصات الكحولية للفاكهة المنتقاه لمدة ٨ أسابيع . بعد ذلك ذبحت الفئران وأخذت الكلى لدراسة التأثيرات الهستوباثولوجية عليها. وأظهرت المستخلصات الكحولية تعافياً ملحوظاً للأنسجة الكلي، خاصةً الكيوي، العنب، الأناناس والمخلوط حيث ظهرت شرائح الكلى دون تغيرات في الشكل التشريحي لها، فيما عدا مستخلص الخوخ فظهرت سماكة في الغشاء الطلائي للأنابيب الكلوية مع وجود لبعض البروتينات في تجاويف الأنابيب الكلوية في بعض الشرائح علي الرغم من عدم ظهور أي تغيرات هستولوجية في باقي شرائح الكلى لمستخلص الخوخ مما يدل علي وجود مرحلة من مراحل المعافاه وذلك بسبب المركبات الفيتوكيميائية الغنية بها تلك الثمار. وبالمقارنة بالنسيج التشريحي لكلى المجموعة المصابة (الضابطة الموجبة) مجهرياً، تبين الآتي: وجود فجوات في خصل وبطانة المحفظة الشحمية للكلى، مع ظهور حالات من الاستسقاء حول الأوعية الدموية، تكيسات فجوية للأغشية المبطنة الأنابيب الكلوية مع وجود للبروتينات بتجاويف الأنابيب الكلوية مما أدى الي اتساع بتلك الأنابيب الكلوية. لذا نأمل أن يكن هذا العمل بمثابة البؤرة الضوئية الموضحة خطر انخفاض مستوى الدوبامين علي أنسجة الكلى.

الكلمات الافتتاحية: مركبات الفيتوكيميائية، كيوي، عنب أحمر، خوخ، أناناس، دوبامين، ٦- هيدروكسي دوبامين، مضادات الأكسدة.