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Effect of Tomato Juice In Lipid Profile and Antioxidant Status in Old Femele Rats

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Abstract: Aging is considered to be either "primary," that is, the inevitable deterioration of cells and tissues structure and function that occurs independent of disease, lifestyle, and environmental causes, or"secondary," where the decline in tissue structure and function occurs as a result of external influences, including diseases**.** Chemical constituent, total phenolic, lycopene , β-Carotene and total flavonoids contents were determined in tomato juice. Fed the diet of twenty old female rats administrated different orally levels as tomato juice to improve their lipid profile and antioxidant status. The result showed that after (28)days the level of Glutathione reductase (GSH), catalase(CAT) and Superoxide Dismutase (SOD) in 12 ml tomato juice group were significantly ($p \leq 0.05$) increased when compared with the positive control group ,but the mean value of Malondialdehyde (MAD) in 12 ml tomato juice group was lower than that in positive control group. Significant correlations were observed among the levels of serum triglyceride, serum total cholesterol, serum total lipid, high-density lipoprotein (HDL) cholesterol ,atherogenic indices (Atherogenic Coefficient (AC), Cardiac Risk Ratio (CRR) and Atherogenic Index (AI)) .So, it could be concluded that tomato juice at level 12 ml was partly attributed to the reduced absorption of lipid ,cholesterol and increased antioxidant Parameters.

Keywords: Aging- total phenolic- lycopene - β-Carotene and total flavonoids.

1.Introduction

Aging is considered as a biological process characterized by a progressive deterioration in physiological functions and metabolic processes that drive to morbidity and mortality. In agreement with the free radical theory of aging, reactive oxygen species (ROS), generated as by-products of biological oxidations, induce casual and cumulative oxidative damage to macromolecules inducing to cellular dysfunction with age and eventually cell death **(Harman, 1956)**. Major changes in fat mass and distribution occur during aging **(Kuk *et al.*, 2009).** For instance, aging subjects contained higher amounts of body fat than young adults; furthermore, fat distributions of aging subjects are different from that of young adults, in which more visceral accumulation than subcutaneous depots is observed in the former than in the latter **(Kuk *et al.*, 2009).** The accumulation of visceral (abdominal) adiposity in aging populations may be accompanied with insulin resistance, hypertension and dyslipidemia [hypertriglyceridemia, reduced (HDL) and (LDL) particles] **(Carr, 2003);** in turn, risks of metabolic syndrome-related diseases, such as coronary heart disease, obesity and diabetes. **Schlenker (2010)** reported that the incidence of disorders such as diabetes, cancer, heart disease, memory impairment, hypertension, and stroke usually increases with age such declines in health. There is an interrelationship between ageing and nutrition, good nutrition helps in maintaining functional status and prevents the onset of disability. The benefit of good nutrition to health is considered as important to elderly as it is to younger people. Conversely nutritional deficiency has been associated with numerous health problems in the elderly involving anemia, anorexia and weight loss, constipation, dehydration, gastric atrophy, cancer, vision disorders, coronary heart disease, diabetes, obesity, osteoporosis, hypertension, frailty, pedal edema, infections and adverse drug reaction **(Puranik, 1999).**

Tomato *(Lycopersicon esculentum)* is one of the most popular and versatile fruits in the world, because of its taste, color, high nutritive value and its diversified use. Tomato and its products are rich in antioxidants and considered to be a good source of vitamins C, E and carotenoids, particularly lycopene and beta-carotene and other phenolic compounds **(Ilahy *et al.*, 2011and Pinela *et al.*, 2012).** Tomato juice is the most important fruits juice with respect to per capita consumption,

about 3-7% of raw material is lost as waste during tomato juice processing **(Otto and Sulc, 2001**. The consumption of tomato juice and tomato products reduced hallmarks of steatosis, plasmatic triglycerides and (VLDLP) and increased lipid metabolism by inducing an over expression of genes involved in more efficient fatty acid oxidation **(Martín-Pozuelo *et al.*, 2014).**

Tomato juice reduced inflammation in overweight and obese females. Thus, increasing tomato intake may provide a useful approach for reducing the risk of inflammatory diseases such as cardiovascular diseases CVD and diabetes, which are associated with obesity **(Ghavipour *et al.*, 2013)**. Tomato consumption is scientifically acknowledged as an indicator of a healthy lifestyle due to its properties, associated with the risk reduction of CVD and certain cancer types **(Tyssandier *et al*., 2002 and Tyssandier *et al*., 2004)**.

Therefore, the present investigation aims to evaluate the effect of tomato juice to improve lipid profile and antioxidant parameters in old female rats .

2.Material And Methods

2.1. Materials:

Tomato Juice

Tomato *(Solanum lycopersicum* L.*)* were purchased from a local market (Shiben El-Kom, El-Minofia Governorate, Egypt). It was washed under running water, cut into four pieces and tomato juice were prepared using (National juicer MJ-176N.Japan) and juice stored at (-18°C) untill analyses.

2.2.Chemical composition:

The samples were analysed for chemical composition (moisture, protein, fat, ash and carbohydrates by difference) using the methods of **A.O.A.C (2012)**. The extraction procedure used for the determination of total phenols and total flavonoids was extracted as described by **Chun *et al*. (2003) and Franke *et al*. (2004).**

2.3.Determination of total phenolics:

Total phenolic content was determined by the Folin–Ciocalteu micro-method **(Saeedeh and Asna, 2007).** A 20 μL aliquot of extract solution was mixed with 1.16 mL of distilled water and 100 μL of Folin–Ciocalteu's reagent followed by 300 μL of 200 g L^{-1} Na_2CO_3 solution. The mixture was incubated in a shaking incubator at 40°C for 30min and

its absorbance at 760 nm was measured. Gallic acid was used as standard for the calibration curve. Total phenolic content expressed as gallic acid equivalent (GAE) was calculated using the following linear equation based on the calibration curve: $A = 0.98C + 9.925 \times 10{-}3$ (R2 = 0.9996)

Where A is the absorbance and C is the concentration (mg GAE g−1 dry weight).

2.4. Determination of total flavonoids:

Total flavonoid content was determined by the method of **Ordon *et al.*, (2006)**. A 0.5 mL aliquot of 20 g L^{-1} $AlCl_3$ ethanolic solution was added to 0.5 mL of extract solution. After 1 h at room temperature, the absorbance at 420 nm was measured. A yellow colour indicated the presence of flavonoids. Extract samples were evaluated at a final concentration of 0.1 mg mL^{-1}. Total flavonoid content expressed as quercetin equivalent (QE) was calculated using the following equation based on the calibration curve: y = 0.0255x (R2 = 0.9812)

Where x is the absorbance and y is the concentration (mg QE g−1 DW).

2.5.Determination of β-Carotene and lycopene:

The contents of chlorophyll and carotenoid in tomato fruits have been analyzed respectively by different methods in a conventional way. The study used simple method for simultaneous determination of pigments in tomato. All pigments in sample (1.0 g) are extracted with acetone-hexane (4:6) at once, then optical density of the supernatant at 663 nm, 645 nm, 505 nm and 453 nm are measured by spectrophotometer at the same time. From these values, the content of lycopene and β-carotene could be estimated using our proposed equations. Tomatoes of different ripening stage were analyzed by using this method. Also the same samples were analyzed by conventional methods. The results by using this method were similar to those by Mackinney's method and of lycopene contents by Kimura's method. It confirmed the availability of these method**. (Nagata and Yamashita,1992).**

Lycopene (mg/100ml) = $-0.0458_{A663} + 0.204_{A645} + 0.372_{A505} - 0.0806_{A453}$

β-Carotene (mg/100ml) = $0.216_{A663} - 1.22_{A645} - 0.304_{A505} + 0.452_{A453}$

(A663, A645, A505 and A453 are absorbance at 663nm, 645nm, 505nm and 453nm each other.).

2.6.Experimental design:.

Twenty old female albino rats weighing 300±5g and five female albino rats weighing 120±5g each at the beginning of the experiment, were obtained from the research Institute of Opthalmology, Medical Analysis, Department Giza, Egypt. Rats were housed in wire cages under normal laboratory conditions and were fed on standard diet for one week as an adaption period. Diet was introduced to rats in special food cups to avoid scattering of food. Also, water was provided to rats by glass tubes projecting through the wire cages from an inverted bottle supported to one side of the cage. Standard diet was prepared from fine ingredients according to **AIN, (1993).** The rats were divided randomly into two main groups, the first, negative control group (normal) (n= 5), fed on basal diet and the second group (old female rats) (n=20) was divided into four subgroups, 5 rats per each. First subgroup (positive control group) was fed on basal diet, the second, third and fourth received basal diet +3, 6 and 12 ml of tomato juice respectively, which were given orally by gavages for 4 weeks daily.

2.8.Blood collection:

At the end of the experimental durations(28days), animals were sacrificed by decapitation. Blood samples were collected immediately in centrifuge tubes containing acid-citrate-dextrose solution (1.0 ml 4.0 ml of blood). Plasma and buffy coat (consisting of leukocytes and platelets) were removed by centrifugation at 860g for 20 min. Red blood cells were washed three times with buffered saline (0.9% saline in 0.01 M phosphate buffer, pH 7.4). The packed cells were then suspended in an equal volume of the buffered saline and stored at -20 ^{o}C for antioxidant enzymes analysis. And Serum was carefully aspirated and transferred into clean cuvette tube and stored frozen at -20°C for analysis according to the procedure of **(Schermer, 1967).**

2.10.Biochemical assays:

The serum triglycerides (TG), high density lipoprotein (HDL), total cholesterol (TC) and total lipids (TL) were determined according to the methods described by **Fossati and Prencipe (1982)** ; **Demacker *et al*. (1980) ; Richmound , (1973) and Covaci *et al*., (2006)** respectively. The determination of low density lipoprotein cholesterol (LDLc) and very low density lipoprotein cholesterol (VLDLc) were carried out according to the method of **Lee and Nieman (1996)**. Atherogenic

indices [(cardiac risk ratio (CRR), atherogenic coefficient (AC) and atherogenic index (AI)] were determined according to **Casterlli and Levitar, (1977) ; Kikuchi-Hayakawa *et al*., (1998) and Dobia´sˇova´ & Frohlich, (2001)** respectively. Thiobirbituric acid reactive substances (TBARS) was estimated according to the methods of **Esterbauer and Cheeseman (1990)**. Superoxide dismutase (SOD) and reduced glutathione (GSH.Rd) were assayed according to the methods of **Misra and Fridovich (1972)** and **Beutler *et al*. (1963)** respectively. Catalase (CAT) activity was determined by measuring the decomposition of hydrogen peroxide (H_2O_2) at 240 nm according to the method of **Aebi (1983)**

2.11.Statistical analysis:

The experimental data were subjected to an analysis of variance (ANOVA) for a completely randomized design using a statistical analysis system **SAS (2000)**. Duncan's multiple range tests were used to determine the differences among means at the level of 95%.

3. Results And Discussion

3.1. Proximate Compositions Of Tomato Juice.

The proximate chemical compositions of tomato juice presented in table (1).Tomato juice contained 86% moisture, 4.47% protein, 0.3% crude fat, 5.36% fiber, 0.53% ash and 3.34% carbohydrate respectively The result of this study came in accordance with that reported by **(Mahmud *et al*.,2007 and Gould, 1992)**.Also it is agreed with **Maghsoud *et al*.(2008)**,who reported that most by-products were low in protein and high in fiber content .

3.2 Total phenolic , flavonoid compounds , β-Carotene and lycopene of tomato juice

The proximate total phenolic and flavonoids compounds of tomato juice presented in table (2). Tomato juice contained 0.501 mg GAE g^{-1} phenolic compounds. According to **Cristina *et al* .(2013)** , Total phenolics of tomato juice were 284.09(mg/kg) .Total flavonoids in tomato juice were 0.011mg QE g^{-1}. Also, to free flavonoids in tomato juice were 35.91(mg/kg) . The proximate lycopene and β-Carotene of tomato juice presented in table (2). Tomato juice contained 0.706 mg/100 ml as lycopene. **Lin and Chen (2003)** found that a mixture of acetone/hexane (3:5, v/v) led to lower lycopene extraction rates in tomato juice. The result by **Etminan *et al*.(2004)** showed that the

tomato derived carotenoid lycopene may reduce risk of cancer .Lycopene also prevented total body according to **Aluko (2012).** It was detected by another study **Odriozola-Serrano *et al*.(2009)** that tomato juice contained 7.13% lycopene while, β-Carotene in tomato juice were found to be lower than those reported by **Habanabashaka *et al*.(2014).**

3.3Lipid Profile and Atherogenic Indices:

Table (3) revealed the effect of adding tomato juice on serum lipid profile in old female rats. Data indicated that the levels of serum total lipids and total cholesterol in negative control group (normal rats) has a significant decrease ($p \leq 0.05$) which were (221.59±1.63) (96.98±1.69) respectively than the other groups which were administrated with tomato juice in different ratios, followed by 12 ml tomato juice group, 6ml tomato juice group and 3ml tomato juice group , finally, positive control group was the highest group which being (451.11±2.98) and (193.22±1.15) respectively. Also, it could be observed that old female group administrated with 12 ml tomato juice significantly ($p \leq 0.05$) reduced in serum triglycerides which was (97.76±1.49), when compared with control positive group which was (175.36±1.64), followed by 6ml tomato juice group and 3ml tomato juice group which were, (120.39±0.99)and (155.98±1.37) respectively. **Bobek (1999)** confirmed the previous data which found that dried tomato reduced cholesterol, VLDL and LDL increased HDL. **Fujiwara *et al*.,(2007)** showed that Esculeogenin A as a type of glycoside in the tomato can significantly decreased cholesterol, triglyceride, LDL and reduced atherosclerotic lesions in ApoE (Apolipoprotein E) deficient mice.The best treatment was that of 12 ml tomato juice for improving total lipids, total cholesterol and triglycrides in eldery female groups compared with positive control group. These results are in agreement with studies reported by **Jacob *et al*. (2008) and Lien *et al*. (2009).**

Table (4) summarized the effect of adding tomato juice on lipoprotein cholesterol in old female rats .The results demonstrated that the levels of low density lipoprotein (LDL), and very low density lipoprotein (VLDL) were decreased in group administrated with tomato juice compared to positive control group (normal rats) ,while high density lipoprotein (HDL) elevated .More considerable reduction ($p \leq 0.05$) in LDL was observed in rats administrated with 12 ml tomato juice group which was (94.53± 0.79) compared to positive control

group and other groups followed by 6 ml tomato juice group, and 3 ml tomato juice group which were 121.88± 0.62 and 132.40± 0.79 respectively. The best values of VLDL in by12 ml tomato juice group (19.55± 0.29) which showed a significant ($p \leq 0.05$) decrease comparing with positive control group (35.07±0.33) and the other female groups. In the same table when rats fed on different ratio of tomato juice , the mean value of HDL in 12 ml tomato juice group which was significantly higher ($p \leq 0.05$) than that in positive control group and followed by 6 ml tomato juice group and 3ml tomato juice group.

Table (5) illuminated the effect of adding tomato juice on HTR and LHR % in old female rats. Generally, all treatments improved the HTR and LDL/HDL. The best treatment that improved HTR and LHR in the eldery female groups which supplemented with 12ml tomato juice for 28 consecutive.

Table (6) showed the effect of adding tomato juice on the atherogenic indices in old female rats .The level of Atherogenic Coefficient (AC) and Cardiac Risk Ratio (CRR) in the group which administrated 12 ml tomato juice were (4.50±0.04) and (5.50±0.04) respectively and were significantly ($p \leq 0.05$) lower than the corresponding value of positive control group which being(10.46±0.4) and (11.46±0.45) respectively followed by 6 ml tomato juice group and 3ml tomato juice group. The AI was significantly ($p \leq 0.05$) produced a gradual decrease in the old female groups especially by adding 12 ml tomato juice group (0.58± 0.01)compared to positive control group(1.01± 0.01) followed by 6 ml tomato juice group and 3ml tomato juice group which were (0.71± 0.00) and (0.88± 0.00) respectively.

3.4Antioxidant Status:

Data recorded in table (7) shows the effect of adding tomato juice on antioxidant status in old female rats .The level of GSH, CAT and SOD in 12 ml tomato juice group were significantly ($p \leq 0.05$) higher than the corresponding value positive control group and the other old female groups, followed by 6 ml and 3 ml tomato juice group respectively. In the same table when rats fed a different ratio of tomato juice, the mean value of MAD in 12 ml tomato juice group was 4.24±0.22 , which was significantly ($p \leq 0.05$) lower than other groups, followed by 6ml tomato juice group and 3ml tomato juice group. Finally , the positive control group was the highest group which was (8.45±0.30)

.**Gitenay.*et al*., (2007) and Jacob *et al*. (2008)** showed that tomato juice decreased the effect of free redical which effects on oxidative stress in rats. Also tomato increased superoxide dismutase enzyme levels of red blood cells.

In conclusion, high daily dietary intake of tomato juice was beneficial in reducing a symptoms of aging , improving antioxidant status and lipid profile in old female rats. Emerging research underscores the relationship between consuming tomatoes and tomato products with reducing risk of certain cancers, heart disease, osteoporosis, and other conditions.

Table (1): Chemical composition of tomato juice (on fresh weight basis)

Parameters %	Moisture	Ash	Protein	Fiber	Fat	Carbohydrate
Tomato Juice	84.2±0.11	0.53±0.05	0.07±0.15	5.36±0.38	0.3± 0.1	9.52±0.58

• Each value represents the mean of three replicates

Table (2): Antioxidant activity ,Total phenolic , flavonoid compounds , β-Carotene and lycopene of tomato juice (on fresh weight basis) .

Parameters	Antioxidant activity %	Total phenolic (mg GAE. g^{-1})	Total flavonoid (mg QE. g^{-1})	Lycopene (mg/100ml)	B- Carotene (mg/100ml)
Tomato Juice	73.1±0.75	0.501±0.1	0.011±6.43	0.706±0.03	15.57±1.02

• Each value represents the mean of three replicates ± SD .

Table (3): Effect of feeding different levels of orally tomato juice on serum lipid profile to old femal rats .

Parameters	Negative control group (normal)	Positive control group	Tomato Juice			LSD
			3ml	6ml	12ml	
LDL (mg/dl)	34.51^{e}± 0.87	141.2^{a}± 1.28	132.40^{b}± 0.79	121.88^{c}± 0.62	94.53^{d}± 0.79	1.18
HDL (mg/dl)	45.70^{a}± 0.93	16.86^{e}± 0.66	20.09^{d}± 0.12	23.05^{c}± 0.47	25.28^{b}± 0.26	0.70
VLDL (mg/dl)	16.77^{e}± 0.17	35.07^{a}± 0.33	31.11^{b}± 0.27	24.07^{c}± 0.19	19.55^{d}± 0.29	0.34

* Each value represents the mean of five replicates ± SD . Values in the same row not sharing a common superscript letter differ significantly at $P \leq 0.05$.

Table-4. Effect of feeding different levels of orally tomato juice on lipoprotein cholesterol to old femal rats .

Parameters	Negative Control (normal)	Positive control group	Tomato Juice			LSD
			3ml	6ml	12ml	
TL (mg/dl)	221.59^{e}±1.63	451.11^{a}±2.98	414.04^{b}±2.14	351.34^{c}±1.26	287.58^{d}±2.25	2.82
TG (mg/dl)	83.85^{e}±0.88	175.36^{a}±1.64	155.98^{b}±1.37	120.39^{c}±0.99	97.76^{d}±1.49	1.72
TC (mg/dl)	96.98^{e}±1.69	193.22^{a}±1.15	183.61^{b}±0.68	169.31^{c}±0.79	139.36^{d}±0.90	1.45

• Each value represents the mean of five replicates ± SD . Values in the same row not sharing a common superscript letter differ significantly at P ≤ 0.05

Table (5): Effect of feeding different levels of orally tomato juice on HTR and LHR % to old femal rats .

Parameters	Negative control group (normal)	Positive control group	Tomato Juice			LSD
			3ml	6ml	12ml	
HTR* (mg/dl)	0.46^{a}±0.01	0.08^{e}±0.00	0.10^{d}±0.01	0.13^{c}±0.01	0.17^{b}±0.00	0.01
LHR (mg/dl)	0.74^{e}±0.01	8.38^{a}±0.38	6.58^{b}±0.07	5.23^{c}±0.05	3.73^{d}±0.04	0.23

• Each value represents the mean of five replicates ± SD . Values in the same row not sharing a common superscript letter differ significantly at P ≤ 0.05.

*HTR = HDL/TC Ratio, LHR= LDL/HDL Ratio.

Table (6): Effect of feeding different levels of orally tomato juice on atherogenic indices to old femal rats.

Parameters	Negative Control (normal)	Positive control group	Tomato Juice			LSD
			3ml	6ml	12ml	
AC* (mg/dl)	1.11^{e}±0.01	10.46^{a}±0.45	8.13^{b}±0.08	6.28^{c}±0.06	4.50^{d}±0.04	0.27
CRR* (mg/dl)	2.4^{e}±0.38	11.46^{a}±0.45	9.13^{b}± 0.08	7.28^{c}±0.06	5.50^{d}±0.18	0.35
AI* (mg/dl)	0.25^{e}±0.01	1.01^{a}±0.01	0.88^{b}±0.00	0.71^{c}±0.00	0.58^{d}±0.01	0.01

* Each value represents the mean of five replicates ± SD . Values in the same row not sharing a common superscript letter differ significantly at P ≤ 0.05.

*AC = TC-HDL/HDL, CRR =TC/HDL, AI= Log (TG/HDL).

Table (7): Effect of feeding different levels of orally tomato juice on antioxidant status to old femal rats.

Parameters	Negative control group (normal)	Positive control group	Tomato Juice			LSD
			3ml	6ml	12ml	
GSH (U/L)	0.38^{a} ± 0.02	0.19^{e}± 0.01	0.27^{d}± 0.01	0.30^{c}± 0.01	0.34^{b}± 0.01	0.01
CAT (U/L)	25.8^{a}± 0.86	16.95^{e}± 1.46	18.14^{c}± 1.59	21.00^{b}± 1.61	24.6^{a}± 0.35	1.68
SOD (u/ml)	266.05^{a}± 0.64	190.30^{e}± 0.70	202.24^{d}± 1.08	215.86^{c}± 0.51	230.44^{b}± 0.39	0.93
MAD (nmol/ml)	1.24^{e}± 0.28	8.45^{a}± 0.30	7.09^{b}± 0.07	6.33^{c}± 0.21	4.24^{d}± 0.22	0.31

• Each value represents the mean of five replicates ± SD .Values in the same row not sharing a common superscript letter differ significantly at $P \leq 0.05$

5. Refrences

A.O.A.C. (2012): International Official Methods of Analysis, 19th ed., Gaithersburg.

Aebi, H. (1983): Catalase in vitro. Methods Enzymol .,105: 121-126.

AIN (1993): Purified diet for laboratory rodent: Final Report. American Institute of Nutrition .J. Nutrition, 123:1939-1951.

Beutler, E.; Duron, O. and Kelly, B.M. (1963): An improved method for the detection of blood glutathione. J. Lab. Clin. Med., 61: 882–888.

Carr, M. C. (2003). The emergence of the metabolic syndrome with menopause. J. Clin. Endocrinol. Metab., 88: 2404–2411.

Casterelli, T. and Levitar, Y. (1977): Atherogenic Index. Curr. Presc., 39.

Chun, O.K.; Kim, D. O.; Moon, H. Y.; Kang, H. G. and Lee, C. Y. (2003). Contribution of individual polyphenolics to total antioxidant capacity of plums. J. Agric. Food Chem., 51: 7240–7245.

Covaci, A. V.; Thomsen S. C.; Van, B. B. and Neels, H. (2006): Evaluation of Total Lipids Using Enzymatic Methods for the Normalization of Persistent Organic Pollutant Levels in Serum. Science of The Total Environment., 366 (1): 361–366.

Cristina, B.; Martín-Pozuelob, G.; Lozanoa, A.; Angel, S.; Javier, C. G.; Manuel, C. and María, J. P. (2013): Lipid biomarkers and metabolic effects of lycopene from tomato juice on liver of rats with induced hepatic steatosis. Journal of Nutritional Biochemistry, 24: 1870–1881

Demacker, P. M.; Von-janssen, H. E. and Hifman, A. M. (1980): Vants lear, A. and jansen, A.P. Measurment of high density lipoprotein cholesterol in serum. Comparison of six isolation methods combined with enzymatic cholesterol analysis. Clin. Chem., 26:1780-1789.

Dobia´sˇova, M. and Jiri, F. (2001): The plasma parameter log (TG/HDL-C) as an atherogenic index: Correlation with lipoprotein particle size and esterification rate in apoB-lipoprotein-depleted plasma (FERHDL). Clinical Biochemistry, 34(7):583–588.

Esterbauer, H. and Cheeseman, K. H. (1990): Determination of aldehydic lipid peroxidation products: malonaldehyde and 4-hydroxynonenal. Meth. Enzymol., 186: 407–421.

Etminan, M.; Takkouche, B. and Caamano-Isorna, F. (2004): The role of tomato products and lycopene in the prevention of prostate cancer: A meta-analysis of observation studies. Cancer Epidemiol Biomarkers Prev.,13 (3):340-345.

Fossati, P. and Prencipe, I. (1982): Serum triglycrides determination colorimetrically with an enzyme that produce hydrogen peroxide. Clin.Chem.,28: 2077-2083.

Franke, A. A.; Custer, L. J.; Arakaki, C. and Murphy, S. P. (2004): Vitamin C and flavonoid levels of fruits and vegetables consumed in Hawaii. Journal of Food Composition and Analysis., 17:1–35.

Fujiwara, Y.; Kiyota, N.; Hori, M.; Matsushita, S.; Iijima, Y. and Aoki, K. (2007): Esculeogenin A, a new tomato sapogenol, ameliorates hyperlipidemia and atherosclerosis in ApoE-deficient mice by inhibiting ACAT. Arterioscler Thromb Vasc Biol.,27(11): 2400-2406.

Ghavipour, M, A.; Sotoudeh, G.and Ghorbani, M. (2013): Tomato juice consumption improves blood antioxidative biomarkersin overweight and obese females: Clinical Nutrition .,1–5.

Gitenay, D.; Lyan, B.; Rambeau, M.; Mazur, A. and Rock, E. (2007): Comparison of lycopene and tomato effects on biomarkers of oxidative stress invitamin E deficient rats. Eur J Nutr., 46(8): 468-75.

Gould, W. A. (1992): Tomato Production, Processing and Technology. 3rd ed. CTIpublications INC, Baltimore.

Harman, D. (1956): Aging: Atheory based on free radicaland radiation chemistry. J Gerontol.,11: 298–300.

Ilahy, R.; Hdider, C.; Lenucci, M. S.; Tlili, I. and Dalessandr, G. (2011):Phytochemical composition and antioxidant activity of highlycopene tomato (Solanum lycopersicum L.) cultivars grown in Southern Italy. Sci. Hort., 127: 255–261.

Jacob, K.; Periago, M. J. ; Bohm, V. and Berruezo, G. R. (2008): Influence of lycopene and vitamin C from tomato juice on biomarkers of oxidative stress and inflammation. Br J Nutr., 99:137–146

Kikuchi-Hayakawa, H.; Onodera, N.; Matsubara, S.; Yasuda, E.; Shimakawa, Y. and Ishikawa, F. (1998): Effects of soya milk and Bifidobacterium-fermented soya milk on plasma and liver lipids, and faecal steroids in hamsters fed on a cholesterol-free or cholesterol-enriched diet.British Journal of Nutrition. 79(01) : 97-105.

Kuk, J. L.; Saunders, T. J.; Davidson, L. E. and Ross, R. (2009): Age-related changes in total and regional fat distribution. Ageing Res. Rev., 8: 339–348.

Lee, R. and Nieman, D. (1996): Nutritional assessment. 2nd Ed., Mosby, Missouri.

Lin, C. H. and Chen, B. H. (2003): Determination of carotenoids in tomato juice by liquid chromatography. Journal of Chromatography., 1012: 103–109.

Lin, C. H. and Chen, B. H. (2005): Stability of carotenoids in tomato juice during storage. Food Chem., 90: 837–846.

Mahomud, M. S.; Islam, S.; Islam, M. N. and Ashraf M. A. (2007): Effect of starch and carboxymethyl cellulose on physic-chemical properties of tomato juice. Progress, agric., 18(2): 235-240.

Martín-Pozuelo,G. ; Navarro-González, I. ; González-Barrio,R .; Santaella, M. ;García-Alonso, J. ;Hidalgo, N; Gómez-Gallego, C. ; Ros, G. and Periago.M.J. (2014): The effect of tomato juice supplementation on biomarkers and gene expression related to lipid metabolism in rats with induced hepatic steatosis . European Journal of Nutrition. ;54(6):933-44.

Misra, H. P. and Fridovich, I. (1972): The role of superoxide anion in the autoxidation of epinephrine and a simple assay for superoxide dismutase. J. Biol. Chem., 247: 3170–3175.

Nagata, M. and Yamashita, A. (1992): Simple method for simultaneous determination of chlorophyll and carotenoids in tomato fruit. J. Japan. Soc.Food Sci.Technol. 39(10): 925-928.

Odriozola-Serrano, I., Soliva-Fortuny, R., Hernandez-Jover, T. and Martin-Belloso, O. (2009): Carotenoid and phenolic profile of tomato juices processed by high intensity pulsed electric fields compared with conventional thermal treatments. Food Chem., 112: 258–266.

Ordon, J. D.; Gomez, M. A. and Vattuone, M. I. (2006): Antioxidant activities of Sechium edule (Jacq.) Swartz extracts. Food Chem., 97: 452–458.

Pinela, J.; Barros, L.; Carvalho, A. M. and Ferreira, I. C. (2012): Nutritional composition and antioxidant activity of four tomato(Lycopersicon esculentum L.) farmer's varieties in Northeastern Portugal homegardens. Food Chem. Toxicol., 50: 829–834.

Puranik, D. B. (1999): Proteins in geriatric nutrition. Indian Dairy Man., 51(5): 5-10.

Richmound, W. (1973): Preparation and properties of cholesterol oxidas from Nacadia sp. And its application to enzymatic assay of total cholesterol in serum .Clin. Chem., 19(12): 1350-6.

Saeedeh, A. and Asna, U. (2007): Antioxidant properties of various solvent extracts of mulberry (Morus indica L.) leaves. Food Chem., 102: 1233–1240.

SAS (2000): Statistics analysis system. SAS Users Guide: Statistics Version 5th Ed., SAS. Institute Inc., Cary NC.

Schermer, S. (1967): The Blood Morphology of Laboratory Animals: The Blood Morphology of Laboratory Animals, 3rd ed., F. A. Davis ed., F. A. Davis Company, 5- 4.

Schlenker, E. D. (2010): Healthy aging : Nutrition concepts for older adults, nutrition and health., 215-226.

Tyssandier, V.; Feillet-Coudray, C.; Caris-Veyrat, C.; Guilland, J. C.; Coudray, C.; Bureau, S.; Reich, M.; Amiot-Carlin, M. J.; Bouteloup-Demange, C.; Boirie, Y. and Borel, P. (2004): Effect of tomato product consumption on the plasma status of antioxidant microconstituents and on the plasma total antioxidant capacity in healthy subjects. J .Am. Coll .Nutr., 23(2):148-56.

Tyssandier, V.; Feillet-Coudray, C.; Caris-Veyrat, C.; Guilland, J. C. and Weisburger, J. (2002) : Lycopene and tomato products in health promotion Exp .Biol .Med .,227: 924.

Upritchard, J. E.; Sutherland, W. H. and Mann, J. I. (2000): Effect of supplementation with tomato juice, vitamin E, and vitamin C on LDL oxidation and products of inflammatory activity in type 2 diabetes. Diabetes Care., 23: 733-738.

مجلة الاقتصاد المنزلي- مجلد ٢٥- العدد الأول – ٢٠١٥م

تأثيرعصير الطماطم علي دهون الدم والحالة المضادة للأكسدة لإناث الفئران المسنة

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الملخص العربي

من الممكن أن تكون الشيخوخة بداية حيث أن تدهور الخلايا والانسجه البينية والوظيفية التي تحدث تكون ناتجة عن المرض، ونمط الحياة ، وأسباب بيئية، أو "ثانوية"، حيث تتراجع بنية الأنسجة ووظيفها كما يحدث نتيجة لمؤثرات خارجية، بما في ذلك الأمراض.تم تحليل عصير الطماطم لمعرفه التركيب الكيميائي له ،،مجموع الفينولات الكلية، الليكوبين، البيتا كاروتين ومجموع مركبات الفلافونويدات .عشرون من إناث الفئران المسنة تم تقديم لها مستويات مختلفة من عصير الطماطم عن طريق الفم وذلك بهدف تحسين مستوى الدهون في الدم والحالة التأكسدية الخاصة بهم .بعد (٢٨ يوم) قد أوضحت النتائج ان مستوى الجلوتاثيون ، والكتاليز والسوبر اوكسيديز في مجموعه ١٢ مل من عصير الطماطم معنويا($P < ٠.٠٥$) أعلى بالمقارنة بالمجموعة الضابط الموجبة ، ولكن كانت القيمة الوسطية للمانولدهيد في المجموعه التي تغذت علي ١٢ مل عصير طماطم أقل من المجموعه الضابطة الموجبه كما لوحظ ارتباط كبير بين مستويات الدهون الثلاثيه والكوليسترول الكلي في الدم و البروتين الدهني عالي الكثافة و مؤشرات تصلب الشرايين . لذلك يمكن أن نتوصل إلى أن مستوى ١٢مل من عصير الطماطم كان مؤثر في إنخفاض امتصاص الدهون والكوليسترول وزيادة مضادات الاكسدة .

كلمات البحث: الشيخوخة – الليكوبين – بيتا كاروتين – الفلافونويدات- الفينولات الكلية