Biochemical studies on antioxidant and oxidant activities of some plant extracts

El-Khawaga, OY (El-Khawaga, O. Y.)[1];
Abou-Seif, MAM (Abou-Seif, M. A. M.)[1]

Abstract

Background: Many changes can occur in proteins, including amino acid modification, fragmentation, changes in absorption and fluorescence spectra and others. All these modifications can be used as markers of protein damage by free radicals.

Aim of the Work: The aim of the present study was to investigate the antioxidant activities of the aqueous extracts of dry green of pods Phaseolus vulgaris, leaves of Olea europaea, unripe fruits of Bitter melon and leaves of Morus nigra. The pro-oxidant activities of the aqueous extracts of the above plants towards protein and estimation of some markers of the protein oxidation were also investigated.

Methods: The antioxidant activities of the above plants extracts, such as superoxide dismutase (SOD)- like and scavenging of diphenyl picrylhydrazyl (DPPH) radicals were observed. A soluble protein (bovine serum albumin: BSA) was incubated with different concentrations of the aqueous extracts of the plants of the present study. An aliquot from this mixture was used for sodium dodecyl sulphate/polyacrylamide gel electrophoresis (SDS-PAGE). Oxidative protein damage was assessed as tryptophan oxidation, carbonyl, quenone and advanced oxidation protein products (AOPP) generation in BSA in separate aliquots of the mixture.

Results: All the plant extracts of this study had an antioxidant activity, but the aqueous extracts of both Olea europaea and Morus nigra leaves showed the highest antioxidant activities. In addition only the extracts of the Olea europaea and Morus nigra leaves showed highly oxidative fragmentation on BSA, but not the other plant extracts, which was evaluated by sodium dodecyl sulphate/polyacrylamide gel electrophoresis (SDS-PAGE) technique. The increase in protein oxidation products was in concentration dependent manner. The carbonyl, quenone and AOPP contents were highly significantly elevated in Olea europaea and Morus nigra leaves-treated protein when compared to the control protein. The tryptophan fluorescence was also significantly decreased in Olea europaea and Morus nigra leaves-treated protein when compared to the control sample.

Conculsion: These data demonstrate the antioxidant and pro-oxidant activities of the aqueous extracts of the plants examined, while the highly effective are Olea europaea and Morus nigra leaves. The pro-oxidant activity of these plant extracts may be attributed to the unstable state of their phenoxyl radicals.

Source: EUROPEAN REVIEW FOR MEDICAL AND PHARMACOLOGICAL
Author Keywords: Phaseolus vulgaris; Olea europaea; Bitter millon; Morus nigra; Pro-oxidants; BSA electrophoresis; Quenone; Tryptophan fluorescence
KeyWords Plus: HUMAN SERUM-ALBUMIN; PROTEIN OXIDATION; NATURAL-PRODUCTS; HEALTH-ASPECTS; FREE-RADICALS; DAMAGE;

FLAVONOIDS; OXYGEN; DERIVATIVES; COMPONENTS
Reprint Address: El-Khawaga, OY (reprint author), King Khalid Univ, Fac Comm, Rejal Almaa, Saudi Arabia.
Addresses:
[1] Mansoura Univ, Fac Sci, Dept Chem, Div Biochem, Mansoura, Egypt
E-mail Address: dr_elkhawaga@yahoo.com
Publisher: VERDUCI PUBLISHER, VIA GREGORIO VII, ROME, 186-00165, ITALY
Web of Science Categories: Pharmacology & Pharmacy
Research Areas: Pharmacology & Pharmacy
References:

1.Title: Evaluation of some biochemical changes in diabetic patients

Author(s): Abou-Seif, MA; Youssef, AA

Source: CLINICA CHIMICA ACTA Volume: 346 Issue: 2 Pages: 161-170 DOI: 10.1016/j.cccn.2004.03.030 Published: AUG 16 2004

2. Title: Cyperus rotundus suppresses AGE formation and protein oxidation in a model of fructose-mediated protein glycoxidation

Author(s): Ardestani, Amin; Yazdanparast, Razieh

Source: INTERNATIONAL JOURNAL OF BIOLOGICAL MACROMOLECULES Volume: 41 Issue: 5 Pages: 572-578 DOI: 10.1016/j.ijbiomac.2007.07.014 Published: DEC 1 2007

3. Title: NUTRITION AND HEALTH-ASPECTS OF FREE-RADICALS AND ANTIOXIDANTS

Author(s): ARUOMA, OI

Source: FOOD AND CHEMICAL TOXICOLOGY Volume: 32 Issue: 7 Pages: 671-683 DOI: 10.1016/0278-6915(94)90011-6 Published: JUL 1994

4. Title: Methodological considerations for characterizing potential antioxidant actions of bioactive components in plant foods

Author(s): Aruoma, OI

Conference: Conference on Dietary and Medicinal Antimutagens and Anticarcinogens - Molecular Mechanisms and Chempreventive Potential Location: SEOUL, SOUTH KOREA Date: OCT 17-19, 2001

Source: MUTATION RESEARCH-FUNDAMENTAL AND MOLECULAR MECHANISMS OF MUTAGENESIS Volume: 523 Special Issue: SI Pages: 9-20 DOI: 10.1016/S0027-5107(02)00317-2 Published: FEB-MAR 2003

5. Title: Protein oxidation in aging, disease, and oxidative stress

Author(s): Berlett, BS; Stadtman, ER

Source: JOURNAL OF BIOLOGICAL CHEMISTRY Volume: 272 Issue: 33 Pages: 20313-20316 DOI: 10.1074/jbc.272.33.20313 Published: AUG 15 1997

6. Title: Antioxidants, oxidative damage and oxygen deprivation stress: a review

Author(s): Blokhina, O; Virolainen, E; Fagerstedt, KV

Conference: 7th Conference of the International-Society-for-Plant-Anaerobiosis Location: NIJMEGEN, NETHERLANDS Date: JUN 12-16, 2001

Sponsor(s): Int Soc Plant Anaerobiosis

Source: ANNALS OF BOTANY Volume: 91 Issue: 2 Special Issue: SI Pages: 179-194 DOI: 10.1093/aob/mcf118 Published: JAN 2003

7. Title: Antioxidant effects of flavonoids

Author(s): Bors, W; Michel, C; Stettmaier, K

Source: BIOFACTORS Volume: 6 Issue: 4 Special Issue: SI Pages: 399-402 Published: 1997

8. Title: Antioxidant activity and phenolic compounds of 112 traditional Chinese medicinal plants associated with anticancer

Author(s): Cai, YZ; Luo, Q; Sun, M; et al.

Source: LIFE SCIENCES Volume: 74 Issue: 17 Pages: 2157-2184 DOI: 10.1016/j.lfs.2003.09.047 Published: MAR 12 2004

9. Title: Proteins but not nucleic acids are molecular targets for the free radical attack during reoxygenation of rat hepatocytes

Author(s): Caraceni, P; DeMaria, N; Ryu, HS; et al.

Source: FREE RADICAL BIOLOGY AND MEDICINE Volume: 23 Issue: 2 Pages: 339-344 DOI: 10.1016/S0891-5849(96)00571-0 Published: 1997

10. Title: [not available]Author(s): CUMUTTE JT

Source: CLIN IMMUNOL IMMUNOP Volume: 67 Pages: S1 Published: 1993

11. Title: REACTIVE SPECIES AND THEIR ACCUMULATION ON RADICAL-DAMAGED PROTEINS

Author(s): DEAN, RT; GIESEG, S; DAVIES, MJ

Source: TRENDS IN BIOCHEMICAL SCIENCES Volume: 18 Issue: 11 Pages: 437-441 DOI: 10.1016/0968-0004(93)90145-D Published: NOV 1993

12. Title: Biochemical and histopathological evidences for beneficial effects of Satureja Khuzestanica Jamzad essential oil on the mouse model of inflammatory bowel diseases.

Author(s): Ghasanfari, G.; Minaie, B.; Yasa, N.; et al; Leilu, A.N.; Azadeh, M.

Source: Toxicol. Mech. Meth Volume: 16 Pages: 365-372 Published: 2006

13. Title: The influence of diet on protein oxidation

Author(s): Griffiths, HR

Source: NUTRITION RESEARCH REVIEWS Volume: 15 Issue: 1 Pages: 3-17 DOI: 10.1079/NRR200134 Published: JUN 2002

14. Title: Screening of antioxidant and antimicrobial activities of anise (Pimpinella anisum L.) seed extracts

Author(s): Gulcin, I; Oktay, M; Kirecci, E; et al.

Source: FOOD CHEMISTRY Volume: 83 Issue: 3 Pages: 371-382 DOI: 10.1016/S0308-8146(03)00098-0 Published: NOV 2003

15. Title: STUDIES ON BALANITES-AEGYPTIACA FRUITS, AN ANTIDIABETIC EGYPTIAN FOLK MEDICINE

Author(s): KAMEL, MS; OHTANI, K; KUROKAWA, T; et al.

Source: CHEMICAL & PHARMACEUTICAL BULLETIN Volume: 39 Issue: 5 Pages: 1229-1233 Published: MAY 1991

16. Title: Anti-oxidant activity and total phenolic content of some Asian vegetables

Author(s): Kaur, C; Kapoor, HC

Source: INTERNATIONAL JOURNAL OF FOOD SCIENCE AND TECHNOLOGY Volume: 37 Issue: 2 Pages: 153-161 DOI: 10.1046/j.1365-2621.2002.00552.x Published: FEB 2002

17. Title: [not available]Author(s): KERGETA M

Source: FOOD CHEM Volume: 89 Pages: 191 DOI: 10.1016/j.foodchem.2004.02.025 Published: 2005

18. Title: [not available]

Author(s): LAEMMLI UK

Source: NATURE Volume: 4 Pages: 680 DOI: 10.1038/227680A0 Published: 1970

19. Title: CARBONYL ASSAYS FOR DETERMINATION OF OXIDATIVELY MODIFIED PROTEINS

Author(s): LEVINE, RL; WILLIAMS, JA; STADTMAN, ER; et al.

Source: OXYGEN RADICALS IN BIOLOGICAL SYSTEMS, PT C Book Series: METHODS IN ENZYMOLOGY Volume: 233 Pages: 346-357 Published: 1994

20. Title: Protective role of phytochemicals in whole foods: implications for chronic disease prevention

Author(s): Liu, R H.

Source: Appl. Biotechnol. Food Sci. Policy Volume: 1 Pages: 39-46 Published: 2003

21. Title: Quercetin is recovered in human plasma as conjugated derivatives which retain antioxidant properties

Author(s): Manach, C; Morand, C; Crespy, V; et al.

Source: FEBS LETTERS Volume: 426 Issue: 3 Pages: 331-336 DOI: 10.1016/S0014-5793(98)00367-6 Published: APR 24 1998

22. Title: Effects of antioxidant enzymes in the molecular control of reactive oxygen species toxicology

Author(s): Mates, JM

Source: TOXICOLOGY Volume: 153 Issue: 1-3 Pages: 83-104 Published: NOV 16 2000

23. Title: Isoflavonoids and lignans in legumes: Nutritional and health aspects in humans

Author(s): Mazur, WM; Duke, JA; Wahala, K; et al.

Source: JOURNAL OF NUTRITIONAL BIOCHEMISTRY Volume: 9 Issue: 4 Pages: 193-200 DOI: 10.1016/S0955-2863(97)00184-8 Published: APR 1998

24. Title: Screening of Brazilian plant extracts for antioxidant activity by the use of DPPH free radical method

Author(s): Mensor, LL; Menezes, FS; Leitao, GG; et al.

Source: PHYTOTHERAPY RESEARCH Volume: 15 Issue: 2 Pages: 127-130 DOI: 10.1002/ptr.687 Published: MAR 2001

25. Title: METAL-CATALYZED OXIDATION OF HUMAN SERUM-ALBUMIN - CONFORMATIONAL AND FUNCTIONAL-CHANGES - IMPLICATIONS IN PROTEIN AGING

Author(s): MEUCCI, E; MORDENTE, A; MARTORANA, GE

Source: JOURNAL OF BIOLOGICAL CHEMISTRY Volume: 266 Issue: 8 Pages: 4692-4699 Published: MAR 15 1991

26. Title: The protein oxidation product 3,4-dihydroxyphenylalanine (DOPA) mediates oxidative DNA damage

Author(s): Morin, B; Davies, MJ; Dean, RT

Source: BIOCHEMICAL JOURNAL Volume: 330 Pages: 1059-1067 Part: Part 3 Published: MAR 15 1998

27. Title: [not available]

Author(s): MURRAY RS

Source: SCHAUMS OUTLINE SERI Published: 1982

28. Title: Antioxidative activity of natural products from plants

Author(s): Ng, TB; Liu, F; Wang, ZT

Source: LIFE SCIENCES Volume: 66 Issue: 8 Pages: 709-723 DOI: 10.1016/S0024-3205(99)00642-6 Published: JAN 14 2000

29. Title: OCCURRENCE OF SUPEROXIDE ANION IN REACTION OF REDUCED PHENAZINE METHOSULFATE AND MOLECULAR-OXYGEN (View record in MEDLINE)

Author(s): NISHIKIM.M; APPAJI, N; YAGI, K

Source: BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS Volume: 46 Issue: 2 Pages: 849-& DOI: 10.1016/S0006-291X(72)80218-3 Published: 1972

30. Title: SPECIFIC DETECTION OF QUINOPROTEINS BY REDOX-CYCLING STAINING

Author(s): PAZ, MA; FLUCKIGER, R; BOAK, A; et al.

Title: Oxidative damage to proteins: Spectrophotometric Method for carbonyl assay

Author(s): Reznick, A. Z.; Packer, L.

Source: Methods in Enzymology Volume: 233 Pages: 257-263 Published: 1994

32. Title: HPLC-DAD/MS characterization of flavonoids and hydroxycinnamic derivatives in turnip tops (Brassica rapa L. subsp sylvestris L.)

Author(s): Romani, A; Vignolini, P; Isolani, L; et al.

Source: JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY Volume: 54 Issue: 4 Pages: 1342-1346 DOI: 10.1021/jf052629x Published: FEB 22 2006

33. Title: Plant phenolic antioxidant and prooxidant activities: phenolics-induced oxidative damage mediated by metals in plants

Author(s): Sakihama, Y; Cohen, MF; Grace, SC; et al.

Source: TOXICOLOGY Volume: 177 Issue: 1 Pages: 67-80 Article Number: PII S0300-483X(02)00196-8 DOI: 10.1016/S0300-483X(02)00196-8 Published: AUG 1 2002

34. Title: The interaction of quercetin with human serum albumin: a fluorescence spectroscopic study

Author(s): Sengupta, B; Sengupta, PK

Source: BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS Volume: 299 Issue: 3 Pages: 400-403 Article Number: PII S0006-291X(02)02667-0 DOI: 10.1016/S0006-291X(02)02667-0 Published: DEC 6 2002

35. Title: PROTECTION BY ALBUMIN AGAINST THE PROOXIDANT ACTIONS OF PHENOLIC DIETARY-COMPONENTS

Author(s): SMITH, C; HALLIWELL, B; ARUOMA, OI

Source: FOOD AND CHEMICAL TOXICOLOGY Volume: 30 Issue: 6 Pages: 483-489 DOI: 10.1016/0278-6915(92)90099-7 Published: JUN 1992

36. Title: Assessment of the content of phenolics and antioxidant actions of the Rubiaceae, Ebenaceae, Celastraceae, Erythroxylaceae and Sterculaceae families of Mauritian endemic plants

Author(s): Soobrattee, Muhammad A.; Bahorun, Theeshan; Neergheen, Vidushi S.; et al.

Source: TOXICOLOGY IN VITRO Volume: 22 Issue: 1 Pages: 45-56 DOI: 10.1016/j.tiv.2007.07.012 Published: FEB 2008

37. Title: OXIDATION OF FREE AMINO-ACIDS AND AMINO-ACID-RESIDUES IN PROTEINS BY RADIOLYSIS AND BY METAL-CATALYZED REACTIONS

Author(s): STADTMAN, ER

Source: ANNUAL REVIEW OF BIOCHEMISTRY Volume: 62 Pages: 797-821 DOI: 10.1146/annurev.biochem.62.1.797 Published: 1993

38. Title: Influence of heating on antioxidant activity and the chemical composition of some spice essential oils

Author(s): Tomaino, A; Cimino, F; Zimbalatti, V; et al.

Source: FOOD CHEMISTRY Volume: 89 Issue: 4 Pages: 549-554 DOI: 10.1016/j.foodchem.2004.03.011 Published: MAR 2005

39. Title: Modulation of oxidative damage by natural products

Author(s): Tripathi, Rakshamani; Mohan, H.; Kamat, J. P.

Source: FOOD CHEMISTRY Volume: 100 Issue: 1 Pages: 81-90 DOI: 10.1016/j.foodchem.2005.09.012 Published: 2007

40. Title: Inhibition of LDL oxidation by flavonoids in relation to their structure and calculated enthalpy

Author(s): Vaya, J; Mahmood, S; Goldblum, A; et al.

Source: PHYTOCHEMISTRY Volume: 62 Issue: 1 Pages: 89-99 Article Number: PII S0031-9422(02)00445-4 DOI: 10.1016/S0031-9422(02)00445-4 Published: JAN 2003

41. Title: Advanced oxidation protein products as novel mediators of inflammation and monocyte activation in chronic renal failure

Author(s): Witko-Sarsat, V; Friedlander, M; Khoa, TN; et al.

Conference: 29th Annual Meeting of the American-Society-of-Nephrology Location: NEW ORLEANS, LOUISIANA Date: NOV 03-06, 1996

Sponsor(s): Amer Soc Nephrol

Source: JOURNAL OF IMMUNOLOGY Volume: 161 Issue: 5 Pages: 2524-2532 Published: SEP 1 1998

42. Title: FRAGMENTATION OF PROTEINS BY FREE-RADICALS AND ITS EFFECT ON THEIR SUSCEPTIBILITY TO ENZYMATIC-HYDROLYSIS (View record in MEDLINE)

Author(s): WOLFF, SP; DEAN, RT

Source: BIOCHEMICAL JOURNAL Volume: 234 Issue: 2 Pages: 399-403 Published: MAR 1 1986

Source: JOURNAL OF BIOLOGICAL CHEMISTRY Volume: 266 Issue: 2 Pages: 689-692 Published: JAN 15 1991

Oxidative fragmentation of proteins by a natural antioxidant

Abou-Seif, MAM (Abou-Seif, M. A. M.);

El-Khawaga, OY (El-Khawaga, O. Y.)

Conference: 13th Biennial Meeting of the Society-for-Free-Radical-Research-International
Location: Davos, SWITZERLAND Date: AUG 15-19, 2006
Sponsor(s): Soc Free Rad Res Int

Source: FREE RADICAL RESEARCH Volume: 40 Supplement: 1 Pages: S99-S99 Published: 2006

Addresses:
[1] Univ Mansoura, Fac Sci, Mansoura 35516, Egypt

Publisher: TAYLOR & FRANCIS LTD, 4 PARK SQUARE, MILTON PARK, ABINGDON OX14 4RN, OXON, ENGLAND

Web of Science Categories: Biochemistry & Molecular Biology

Research Areas: Biochemistry & Molecular Biology