荔枝草之抗氧化能力研究

張逵揚、

E-mail: 364791@mail.dyu.edu.tw

摘 要

許多疾病被證實與體內氧化壓力（oxidative stress）有關，具有良好的抗氧化能力則可降低氧化壓力水平。荔枝草為唇型花科二年生草本植物，在東亞地區如：中國、韓國、台灣、印度、馬來西亞與澳洲等皆能發現其分佈。在亞洲各國傳統民俗用藥中，荔枝草被用來治療腫瘤、泌尿道感染、痔瘡，以及與發炎有關之疾病包含：肝炎、腹瀉及淋病。本研究使用四種溶劑（水、甲醇、70%乙醇、乙酸乙酯）透過熱迴流萃取，將所得之萃取物進行抗氧化成分含量分析：總酚化合物與總類黃酮，及抗氧化活性分析：DPPH自由基清除能力、ABTS陽離子自由基清除能力、超氧陰離子清除能力、亞鐵離子螯合能力及還原力，評估荔枝草萃取物之抗氧化活性。細胞試驗則以細胞生存能力試驗來評估荔枝草之水萃物對Hep G2存活度的影響。 實驗結果顯示，水萃物有最高萃取率，達16.3%；總酚化合物含量以70%乙醇萃取物為最高，達62.5±0.9 mg/g；總類黃酮含量以乙酸乙酯萃取物為最高，達22.5±2.2 mg/g。於抗氧化活性方面，乙醇萃取物在DPPH自由基清除能力於濃度0.1 mg/mL有最高清除活性（98.9%）；在抑制TBARS能力於濃度0.8 mg/mL有最高抑制率（86.1%）；在螯合能力於濃度0.8 mg/mL有最高螯合率（69.5%）。荔枝草水萃取物在清除超氧陰離子能力於濃度1　mg/mL有到最高清除活性（62.6%）。荔枝草甲醇萃取物在ABTS陽離子自由基清除能力於濃度0.5 mg/mL有最高清除活性，為99.9%；相對還原能力於濃度0.8 mg/mL時與標準品BHA相比，有最高相對還原力（188.3%）。細胞生存能力試驗結果顯示，水萃物對Hep G2細胞的存活度沒有負面影響。綜合上述，荔枝草水、70%乙醇及甲醇萃取物具有良好的抗氧化能力，而水萃物對Hep G2沒有負面影響。

關鍵詞 : 荔枝草、氧化壓力、抗氧化能力、Hep G2

目錄

參考文獻

1.中華人民共和國藥典第一部。1977。中華人民共和國國家藥典委員會。1977:395-396。 2.林勁宏。2000。運動與脂質氧化傷害。中華體育季刊。14(3):78-86。 3.林榮貴、張建雄、林俊清。1992。台灣民間藥七層塔之生藥學研究。嘉南學報。18:28-43。 4.林榮貴、張建雄、林俊清。1994。台灣民間藥七層塔之保肝藥效評估。中醫藥雜誌。5(4):148-149。 5.周志輝。2009。砂仁、紅棗、荔枝草及細本山葡萄

等水萃物對調節血脂及腸道保健之探討。中興大學食品暨應用生物科技學系碩士論文。台中。 6.郭肇凱。2005。七種中草藥免疫調節功能之研究。台灣大學園藝學研究所碩士論文。台北。 7.喻樊。荔枝草的化痰、止咳、抗炎藥效學的研究。2009。海峽藥學。21(10):31-33。 8.葉怡琳。2008。熊果酸與齊墩果酸對HepG2肝癌細胞之抗腫瘤作用。慈濟大學生命科學研究所碩士論文。花蓮。 9.陳弘明。2011。天麻萃取物之抗氧化活性與細胞保護效用。大葉大學生物產業科技學系碩士論文。彰化。 10.陳雅紋。2008。亞麻籽中酚類化合物之萃取、轉換及其抗氧化活性之評估。東海大學食品科學系碩士論文。台中。 11.陳惠英、顏國欽。1998。自由基、抗氧化防禦與人體健康。中華民國營養學會雜誌。23:105-121。 12.莊曉莉、李祥麟、黃檀溪。2003。蠶蛹草具有顯著之抗氧化性與自由基清除能力。師大學報。48(1,2): 13-24。 13.莊鼎彬。2011。彩葉萃取物之抗氧化能力與細胞試驗。大葉大學生物產業科技學系碩士論文。彰化。 14.郭婕、李寧遠。2007。科學發展。411:40-45。 15.鄭志昌。2008。荔枝草化學成份的光譜分析及其總黃酮抗菌抗氧化研究。揚州大學碩士論文。江蘇。 16.蔡旻都、陳皓君。蔬果中類黃酮之抗氧化作用與生物活性。化學季刊。64(3):353-367。 17.賴儀倩。2006。高濃度葡萄糖對人類肝癌細胞之凝血及抗凝血因子基因表現之影響。靜宜大學食品營養學系碩士論文。台中。 18.趙克然、楊毅軍、曹道俊。2003。氧自由基與臨床。第52頁。合記圖書出版社。台北。 19.蘇鵬翰。2011。何首烏之抗微生物與抗氧化活性研究。大葉大學生物產業科技學系碩士論文。彰化。 20.簡錦慈。2004。刺蔥之抗氧化性及安全性探討。靜宜大學食品營養學系碩士論文。台中。 21.謝德熾。2006。Fluvastatin對血液透析病人的發炎指標與氧化壓力之影響。成功大學臨床藥學研究所碩士論文。台南。 22.Andersen, O. M. and Markham, K. R. 2006. Flavonoids: chemistry, biochemistry and applications. p.2. CRC Press, Boca Raton, FL. 23.Bray, H.G., and Thorpe, W.V. 1954. Analysis of phenolic compounds of interest in metabolism. Meth. Biochem. Anal., 1:27-52. 24.Cai, Y., Luo, Q., Sun, M. and Corke, H. 2004. Antioxidant activity and phenolic compounds of 112 traditional Chinese medicinal plants associated with anticancer. Life Sci., 74:2157-2184. 25.Cao, G., Alessio, H. M. and Cutler, R. G. 1993. Oxygen-radical absorbance capacity assay for antioxidant. Free Rad. Biol. Med., 14:303-311. 26.Chen, H. and Chen, F. 1999. Effects of methyl jasmonate and salicylic acid on cell growth and cryptotanshinone formation in Ti transformedSalvia militorrhiza cell suspension cultures. Biotechnol. letter., 21:803-807. 27.Chen, H., F. Chen, Y. L. Zhang and Song, J. Y. 1999. Production of lithospermic acid B and rosmarinic acid in hairy root cultures of Salvia miltiorrhiza. J. Ind. Microbiol. Biotechnol., 22:133-138. 28.Christel, Q., Bernard, G., Jacques, V. and Claude, B.M. 2000. Phenolic compounds and antioxidant activities of buckwheat (Fagopyrum esculentum Moench) hulls and flour. J. Ethnopharmacol., 72:35-42. 29.Chopra, R. N., Nayar, S. I. and Chopra, I. C. 1986. Glossary of indian medicinal plants (including the supplement). Council of Sci. and Industrial Research, New Delhi, India. 30.Dalle-Donne, I., Rossi, R., Colombo, R., Giustarini, D. and Milzani, A. 2006. Biomarkers of oxidative damage in human disease. Clin. Chem., 52(4):601-623. 31.Dinis, T. C. P., Madeira, V. M. C. and Almeida, M. L. M. 1994. Action of phenolic derivates (acetoaminophen, salycilate and 5-aminosalycilate) as inhibitors of membrane lipid peroxidation and as peroxyl radical scavengers. Arch. Biochem. Biophys., 315:161-169. 32.Duh, P.D., Yen, G.C., Yen, W.J., Wang, B.S. and Chang, L.W. 2004. Effects of pu-erh tea on oxidative damage and nitric oxide scavenging. J. Agric. Food Chem., 52:8169-8176. 33.Dziezak, J. D. 1986. Preservatives: antioxidant. Food Technol., 40:94-102. 34.Foote, I. S. 1976. Photosensitised oxidation and singlet oxygen: consequences in biological systems. In free radical in biology. Vol. II. p.85-133. ed. W. A. Pryor. Academic Press, New York. 35.Green, M. J. and Hill, H. A. O. 1984. Chemistry of dioxygen. Methods of Enzymol 105:3-22. 36.Giese, J. 1996. Antioxidants: tool for preventing lipid oxidation. Food Technology, 11:73-82. 37.Gu, L. and Weng, X. 2001. Antioxidant activity and components of Salvia plebeia R. Br. – a Chinese herb. Food Chem., 73:299-305. 38.Halliwell, B., Gutteridge, J. M. C. and Aruoma, O. I. 1987. The deoxyribose method: A simple ‘ ‘ test?tube ’ ’ assay for determination of rate constants for reactions of hydroxyl radicals. Anal Biochem., 165:215 – 219. 39.Halliwell, B., 1994. Free radicals and antioxidants: a personal view. Nutr. Res., 52: 253-265. 40.Halliwell, B., Murcia, M. A., Chirico, S. and Aruoma, O. I. 1995. Aruoma, free radicals and antioxidants in food and in vivo: What they do and how they work. Critical Reviews in Food Sci. and Nutrition, 35:7 – 20. 41.Halliwell, B. and Gutteridge, J. M. C. 1999. Free radicals in biology and medicine. Anal Biochem., 165:215 – 219. 42.Harman, D. 1986. Free radical theory of aging. Role of free radicals in the origination and evolution of life, aging, and disease processes. “ In Free radicals, Aging, and Degenerative Diseases. ” p.3. Johnson, J. E., Jr., Walford, R., Harman, D. and Miqued, J., Alan, R. Liss. New York. 43.Harman, D. 1992. Role of free radicals in aging and disease. Annals of New York Academy of Sci., 673:126 – 141. 44.Hipkiss, A. R., Brownson, C. and Carrier, M. J. 2001. Carnocine, the antiaging, antioxidant dipeptide may react with protein carbonyl group. Mech. Age and Develop., 122:1431 – 1445. 45.Hirai, S., Tanaka, M. and Sotomatsu, A. 1990. Free radicals and degenerative diseases of the nervous system. Nippon Ronen Igakkai Zashi., 27(2):171 – 176. 46.Hollman, P. C. H., Van Trijp, J. M. P. and Buysman, M. N. C. P. 1996. Fluorescence detection of flavonols in HPLC by postcolumn chelation with Aluminum. Anal. Chem., 68(19):3511 – 3515. 47.Hollman, P. C. H. and Katan, M. B. 1999. Diettary flavonoids: intake, health effects and bioavailability. Food and Chem. Toxi., 37:937-942. 48.Hra?, A. R., M. Hadolin, Z. Knez and Bauman, D. 2000. Comparison of antioxidative and synergistic effects of rosemary extract with τ-tocopherol, ascorbyl palmitate and citric acid in sunflower oil. Food Chem., 71:229-233. 49.Hsu, H., Coupar, I. M. and Ng, K. 2006. Antioxidant activity of hot water extract from the fruit of the doum palm, Hyphaene thebaica. Food Chem., 98:317-328. 50.Jin, X. F., Lu, Y. H., Wei, D. Z. and Wang, Z. T. 2008. Chemical fingerprint and quantitative analysis of Salvia plebeia R. Br. by high-performance liquid chromatography. J. of Pharmaceutical and Biomed. Analysis, 48:100-104 51.Jin, X. F., Qian, J. and Lu, Y. H. 2011. The role of hepatoprotective effect of a flavonoid-rich extract of Salvia plebeian R. Br. on carbon tetrachloride-induced acute hepatic injury in mice. J. of Med. Plants Research, 5(9):1558-1563. 52.Jung, H. J., Song, Y. S., Lim, C. J. and Park, E. H. 2009. Anti-inflammatory, anti-angiogenic and anti-nociceptive activities of an ethanol extract of Sal?via plebeia R. Br. J. of Ethnopharmacology, 126:355-360. 53.Kamat, J. P., Devasagayam, T. P. A., Priyadarsini, K. I. and Mohan, H. 2000. Reactive oxygen species mediated membrane damage induced by fullerene derivatives and its possible biological implications. Toxicology, 155:55 – 61. 54.Karasu, C. 2010. Glycoxidative stress and cardio- vascular complications in

experimentally-induced diabetes: effects of antioxidant treatment. Open Cardiovasc Med J., 26(4):240 – 256. 55.Kim, N. H., Jeong, M. S., Choi, S. Y. and Kang, J. H. 2004. Peroxidase activity of cytochrome c. Bull. Korean Chem., 25:1889-1892. 56.Kintzios, S., Nikolaou, A. and Skoula, M. 1999. Somatic embryogenesis and in vitro rosmarinic acid accumulation in Salvia officinalis and S.fruticosa leaf callus cultures. Plant Cell Rep., 18:462-466. 57.Kintzios, S. 2000. Chapter one: The folklore and cosmetic use of various salvia species. p.17-18. CRC press, Boca Raton, FL. 58.Labuza, T. P. 1971. Kinetics of lipid oxidation in foods. CRC Critical Reviews in Food Science and Technology, 2:355-405. 59.Lefer, D.J. and Granger, D.N. 2000. Oxidative stress and cardiac disease. Am. J. Med., 109:315-323. 60.Lu, Y. and Foo, L. Y. 2002. Polyphenolics of Salvia sp. a review. Phytochem., 59:114 – 140. 61.Madamanchi, N. R., Hakim, Z. S. and Runge, M. S. 2005. Oxidative stress in atherogenesis and arterial thrombosis: he disconnect between cellular studies and clinical outcomes. J. Thromb Haemost, 3(2):254-267. 62.Majerza, I. and Natkaniec, I. 2006. Experimental and theoretical IR, R, and INS spectra of 2,2,4,4-tetramethyl -3-t-butyl-pentane-3-ol. Journal of Mole. Structure., 788(1-3):93 – 101. 63.Marx, J. L. 1987. Oxygen free radicals linked to many disease. Science, 235:529-531. 64.Min, D. B., S. H. Lee and Lee, E. C. 1988. Singlet oxygen oxidation of vegetable oils. In Min, D. B. and Smouse, T. H. (Eds.), Flavor Chemistry of Lipid Foods. p.57-97. American Oil Chemist ' s Society, Champaign, U.S. 65.Namiki, M. 1990. Antioxidants/antimutagenes in food. Crit. Rev. Food Sci. Nutr., 29:273-300. 66.Niki, E. 1991. Vitamin C as an antioxidant. World Rev. Nutr. Diet, 64:1 – 30. 67.Nordberg J. and Arner, E. S. 2001. Reactive oxygen species, antioxidants, and the mammalian thioredoxin system. Free Radic. Biol. Med., 31:1287 – 1312. 68.Okamoto, H., Kurai, K., Okda, S. I., Yamamoto, K., Lizuka, H., Tanaka, T., Fukuda, S., Tsuda, F. and Mishw, O. S. 1992. Full-length sequence of a hepatitis C virus genome having poor homology to reported isolates-comparative study of four distinct genotypes. Virology, 188:331-341. 69.Oyaizu, M. 1986 Studies on products of browning reaction prepared from glucoseamine. Jpn. J. Nutr., 44:307-314. 70.Parnham, M. J. and Kesselring, K. 1985. Rosmarinic acid. Drugs of the Future 10:756-757. 71.Park, S. U., Uddin, R. U., Xu, H., Kim, Y. K. and Lee, S. Y. 2008. Biotechnological applications for rosmarinic acid production in plant. African J. of Biotech., 7(25):4959-4965 72.Petersen, M. and Simmonds, M. S. 2003. Rosmamarinic acid. Phytochemistry, 62:121-125. 73.Petersen, M., Simmonds, M. S., Abdullah, Y., Benner, J., Eberle, D., Gehlen, K., Hucherig, S., Janiak, V., Kim, K. H., Sander, M., Weitzel, C. and Wolters, S. 2009. Evolution of rosmarinic acid biosynthesis. Phytochem., 70:1663-1679. 74.Pryor, W. A. and Godber, S. S. 1991. Noninvasive measures of oxidative stress status in humans. Free Red. Biol. Med., 10:177-184 75.Qu, X. J., Xia, X., Wang, Y. S., Song, M. J., Liu, L. L., Xie, Y. Y., Cheng, Y. N., Liu, X. J., Qiu, L. L., Gao, J. J., Zhang, X. F. and Gui, S. X. 2009. Protective effect of Salvia plebeia compound homoplantaginin on hepatocyte injury. Food and Chem. Toxicology, 47:1710-1715. 76.Qu, Y., Xu, F., Nakamura, S., Matsuda, H., Pongpiriyadacha, Y., Wu, L. and Yoshikawa, M. 2009. Sesquiterpenes from Curcuma comosa. J. Nat. Med., 63:102-104. 77.Ramarathnam, N., Osawa, T., Namiki, M. and Kawakishi, S. 1988. Chemical studies on novel rice hull antioxidants. 1. isolation, fractionation, and partial characterization. J. Agric. Food Chem., 36:732 - 737. 78.Ren, J., Pan, S. S., Lu, X. Z., Zhou, M. and Hu, K. 2010. Antitumor activity of dichloromethane extract from Salvia plebeia and induction of apoptosis on K562 cells. Chinese Herbal Med., 3(1):36-40. 79.Robak, J. and Gryglewski, I. 1988. Flavonoides are scavengers of superoxide anions. Biochem. Pharmacology., 37:837-841. 80.Sato, M., Ramarathnam, N., Suzuki, Y., Ohkubo, T., Takeuchi, M. and Ochi, H. 1996. Varietal differences in the phenolic content and superoxide radical scavenging potential of wines from different sources. J. Agric. Food Chem., 44:37-41 81.Shirsat, R., Suradkar, S. and Koche, D. 2012. Some phenolic compounds of Salvia plebeia R. Br. Biosci. Discovery, 3(1):61-63 82.Shimada, K., Fujikawa, K., Yahara, K. and Nakamura, T. 1992. Antioxidative properties of xanthan on the autoxidation of soybean oil in cyclodextrin emulsion. J. of Agricultural and Food Chem., 40:945-948. 83.Sies, H. 1991. In oxidative stress: oxidants and antioxidants. p. xv – xxii, Academic Press, London 84.Szabo, E., Thelen, A. and Petersen, M. 1999. Fungal elicitor preparations and methyl Jasmonate enhance rosmarinic acid accumulation in suspension cultures of Coleus blumei. Plant Cell Rep., 18:485-489. 85.Takeuchi, N., Matsumiya, K., Takahashi, Y., Higashino, K. and Tanaka, F. 1977. Thiobarbituric acid reactive substances (TBARS) and lipid metabolism in tocopherol deficient rats. Experimental Gerontology. 86.Vanithadevi, B. and Anuradha, C. V. 2008. Effect of rosmarinic acid on insulin sensitivity, glyoxalase system and oxidative events in liver of fructose-fed mice. International J. of Diabetes and Metabolism., 16:35-44 87.Vickers, T., After, Y. I. S., and McEneny, J. 2001. Lipoprotein oxidation and atherosclerosis. Biochem. Soc. Trans., 29(2):358 – 362. 88.Wang, X. M., Yu, J., Chen, H., Yang, J. and Wang, Q. 2010. Study on the flavonoids in different collection period of Salvia plebeia R. Br. by HPLC. Chinese Wild Plant Resources, 29(4):34-36 89.Wassmann, S., Wassmann, K. and Nickenig, G. 2004. Modulation of oxidant and antioxidant enzyme expression and function in vascular cells. Hypertension, 44(4):381-386. 90.Weng, X. C. and Wang W. 2000. Antioxidant activity of compounds isolated from Salvia plebeia. Food Chem., 71:489-493 91.Wiart, C. 2006. Ethnopharmacology of Medicinal Plants: Asia and the Pacific, p.188. Humana Press, New York. 92.Yang, T. H. and Chen, K. T. 1972. Constituents of formosan Salvia plebeia, flavonoid components of Salvia plebeia. Journal of Chinese Chemical Society, 19:131 – 141. 93.Yamaguchi, H., Hirai, S., Morimatsu, M., Shoji, M. and Harigaya, Y. 1988. Diffuse type of senile plaques in the brains of Alzheimer-type dementia. Acta Neuropathol, 77(2):113-119. 94.Yu, T. W. and Ong, C. N. 1999, Lag-time measurement of antioxidant capacity using myoglobin and 2,2 ' azino-bis 3-ethylbenthiazoline-6-sulfonic acid: rational, application, and limitation. Anal. Biochem., 275:217-223.