月桃種子之抗氧化及降血脂作用

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摘 要

本研究以月桃種子為材料，經清洗、風乾、攪碎後以水蒸氣蒸餾萃取方式萃取精油，再以氣相層析儀及氣相層析質譜儀鑑定其揮發性成分，並探討月桃種子之水及乙醇萃取物之抗氧化性。最後，以動物試驗探討月桃種子之降血脂功效。研究結果如下:月桃種子的精油收率為0.51 %；精油中以?烯類化合物為主要的成份，而其?烯類化合物中又以單?烯類化合物(monoterpenes)為其主要成份，其含量約佔總揮發性成分的77.58%。月桃種子精油經矽膠管柱區分，在正戊烷區分溶洗部分，主要的組成以單?烯碳氫化合物為主，其含量約佔總揮發性成分的75.66%。乙醚溶洗部分中則以單?烯含氧化物為主，倍半?烯含氧化物為次主要組成，分別佔總揮發性成分的27.10%及24.53 %。另外，月桃種子精油經矽膠管柱區分後可發現，在正戊烷溶洗部分比未區分精油新鑑定到2種化合物，而乙醚溶洗部分則為新鑑定到7種化合物。　　在抗氧化活性分析中，DPPH自由基捕捉之能力以乙醇萃取物之能力較佳，濃度10 mg/mL時達到91.68 %；螯合亞鐵離子之能力以水萃取物之能力較佳，濃度100 mg/mL時達到52.46 %；在抑制油脂之自氧化能力上則以乙醇萃取物較水萃取物較佳，於濃度20 mg/mL時達到68.64%。在芸香?(rutin)及槲皮酮(quercetin)含量分析結果，以乙醇萃取物之含量最高，每100公克含量分別達6.06mg及46.29 mg。另外在總酚部份結果，以乙醇萃取物之含量最高，每毫升達2033 mg。　　月桃種子之降血脂功效，以雄性倉鼠為實驗對象，探討添加0.01%、0.05%及0.1%月桃種子精油及添加1%、3%及5 %月桃種子粉末飼料餵食倉鼠8週，犧牲後分析其血液及肝臟中脂質型態，結果顯示餵食月桃種子精油組與粉末組皆可降低血清及肝臟中膽固($p<0.05$)，其中精油組以餵食0.05%濃度之精油效果最佳，粉末組則以餵食5%濃度之粉末效果最佳。兩組間相比則以餵食5%粉末降血脂的效果最好。可使血液及肝臟中三酸甘油脂、膽固醇、低密度脂蛋白膽固醇含量恢復至空白組之水平。

關鍵詞 : 月桃種子 ; 精油 ; ?烯類化合物 ; 倉鼠 ; 抗氧化 ; 降血脂

目錄

參考文獻

1. 杜姿瑩。2000。，具調節血脂功能的機能性食品漫談，食品工業，32(10):22-32,台北。 2. 張隆仁。2000。蕎麥的再利用。台灣區農業

專訊。28:16-20。 3. 許詩淵。1988。月桃根莖成分對於各種胃及十二指腸損傷之保護作用。中國醫藥研究所。台灣。中國藥學雜誌40:41-48。 4. 陳建州。2001。黃莪?之抗氧化性質及抗致突變性質.國立中興大學食品科學系碩士論文。台中，台灣。 5. 陳秀雯。2003。簡介胃潰瘍，食品工業發展研究所，38(8):1-11。 6. 陳惠英。1996。茶葉萃取物抗致突變性及抗氧化特性之研究。國立中興大學食品科學系碩士論文。台中，台灣。 7. 彭郁玲。1993。魚油與膽固醇對倉鼠血液、肝臟脂質及肝臟LDL-R mRNA之影響。國立台灣大學生物化學系碩士論文。台北，台灣。 8. 楊雅欒。2006。月桃不同部位(根、莖及葉)之精油成分分析及抗氧化性測定。國立中興大學食品科學系碩士論文。台中，台灣。 9. 衛生署。2002。中華民國公共衛生概況。行政院衛生署編印。 10.謝宜仁。1993。月桃葉部精油成分之研究.中原大學化學研究所碩士論文。桃園，台灣。 11.羅郁中。2003。台灣六種野生植物果實之抗氧化功能評估.中央研究院高中生命科學資優生培育計畫專題研究報告。台北，台灣。 12. Alan, L. and Miller N.D. 1996. Antioxidant Flavonoids : Structure , Function and Chiical Usage. Altern. Med Rev.1: 103-111. 13. Alonso, R., Orue, E. & Marzo, F.1998. Effects of extrusion and conventional processing methods on protein and antinutritional factor contents in pea seed.Food Chem. 63:505-512. 14. American Institute of Nutrition.1977.Report of the American Institute of Nutrition ad hoc committee on standards of nutritional studies. J.Nutr.107:1340-1348 15. Asgary, S., Naderi, G., Sarrafzadegan, N., Ghassemi, N., Bos htan, M., Rafie, M.& Arefian, A. 1999.Anti-oxidant effect of flavonoids on hemoglobin glycosylation. Pharm. Acta. Helv.7:223-226. 16. Ayorinde, F. O., Clifton, J. J., Afolabl, O. A., and Shepar, R. L. 1988. Rapid transesterification and mass pectrometric approach to seed oil analysis.JAOCS,65:942-947. 17. Bartlett, G.R. 1958. Phosphorous assay in column chromatography. J. Biol.Chem. 234:466-468. 18. Bezerra, M. A. C., Leal-Cardoso, J. H., Coelho-deSouza, A. N., Criddle, D. N.,& Fonteles, M. C.2000. Myorelaxant and antispasmodic effects of the essentialoil of Alpinia speciosa on rat ileum. Phytotherapy Research, 14, 549-551. 19. Burns J., Gardner P. T., O ’ Neil J., Crawford S., Morecroft I ., McPhail D. B.,Lister C., Matthews D., MacLeanM. R., Lean M. E. J., Duthie G. G. and Crozier A. 2000.: Relationship among antioxidant activity , vasodilation capacity, and phenolic conctent of red wines. J. Agric. Food Chem. 48:220-230. 20. Burtt, B.L. & Smith, R.M. Key species in the taxonomic history of Zingiberacea ae. Notes from the Royal Botanic Garden Edinburgh 31: 177-227. 1972 21. Branen, A. L.1975. Toxicology and biochemistry of butylated hydroxyl anisole and butylated hydroxytoluene. J.Am.Oil Chem.Soc.52:59-63. 22. Chau C. F, Chen C. C, Chien P. J, and Hsu P.K.2006. Carrot insoluble fiber-rich fraction lowers lipid and cholesterol absorption in hamsters. L. W. T. 39:337-342 23. Chen, W. J., Anderson, J.W., and Jennings, D.1984.Propionate may mediate the hypocholesterolemic effects of certain soluble plant fibers in cholesterol-fed rats Proc. Soc. Exp. Biol. Med.175:215-218. 24. Cushing SD, Berliner JA, Valente, AJ, Territo MC, Navab M, Parhami F,Gerrity RG, Schwartz CJ, Fogelman AM.1990. Minimally modified low density liporote in induces monocytechemotactic protein-1 in human endothelial cells and SMC.Proc Natl Acad Sci USA 87: 5134-5138. 25. Duthie, S. J. & Dobson, V. L. 1999. Dietary flavonoids protect human colonocyte DNA form oxidative attack in vitro. Eur. J. Nutr. 38:28-34. 26. Dinis, T. C. P., Madeira, V. M. C. and Almeida, L. M. 1994. Action of phenolic derivatives(acetaminophen, salicylate , and 5-amino salicylate) as inhibitors of membrane lipid peroxidation and as peroxyl radical scavengers. Arch. Biochem. Biophys. 315:161-169. 27. Eastwood, M. A. 1992. The physiological effect of dietary fiber: anupdate.Annu.Rev. Nutr. 12:19-35. 28. Elizabeth S. Fernandes , Giselle F. Passos , Rodrigo Medeiros , Fernanda M. da Cunha ,Juliano Ferreira , Maria M. Campos , Luiz F. Pianowski , Joao B. Calixto. 2007 . Anti-inflammatory effects of compounds alpha-humulene and (?)-transcaryophyllene isolated from theessential oil of Cordia verbenacea. European Journal of Pharmacology.22:1-9 29. Emmons C. L., Peterson D. M. and Paul G. L. 1999.:Antioxidant capability of oat(Avena sativa L.) extracts. 2. In vitro antioxidant activity and contents of phenolic and total antioxidants. J. Agric. Food Chem., 47:4895-4898. 30. Foger, B., Chase, M., Amar, MJ. And Vaisman, BL. 1999.Cholesteryl ester transfer protein corrects dysfunctional HDL and reduces aortic atherosclerosis in lecithin: cholesterol (LCAT)-transgenicmice. J. Biol Chem. 274:36912-36920. 31. Folch JM, Lees M Solane Stanley GH. 1957. A simple method for the isolation and purification of total lipid from animal tissue. J Biol Chem 226: 497-509. 32. Frankel, E. N., Kanner , J., Kanner, J. B., Parks, E. & Kinsella, J. E. 1993.Inhibition of oxidation of human low-density lipoprotion by phenolic substances in rad wine. Lancet 341:454-457. 33. Friedman M. and Brandon D.L .2001. Nutritional and health benefits of soy proteins. J Agric Food Chem 49:1069-1086. 34. Frostegard J, Nilsson J, Haegerstrand A, Hamsten A, Wigzell H,Gidlund M. 1990.Oxidized low density lipoprotein induces differdntiation and adhesion of human monocytes and monocytic cell line U937. Proc Natl Acad Sci of USA 87:904-908. 35. Fungwe, T. V., Cagen, L. M., Wilcox, H. G. And Heiberg, M. 1992.Regulation of hepatic secretion of very low density lipoprotein by dietary cholesterol. J. Lipid Res.33:179-191. 36. Fuleki, T. 1999. Rutin, the main component of surface deposits on pickled green asparagus. J. Food Sci. 64: 252-254. 37. Halliwell, B., Murcia, M. A. Chirico, S. and Aruoma, O. I. 1995. Free radicals and antioxidants in food and in vivo:what they do and how they work. Crit. Rev. Food Sci. Nutr. 35:7-20. 38. Havsteen, B. 1983. Flavonoids, a class of natural products of high pharmacological potency. Biochem. Pharmacol.32:1141-1148. 39. Hertog, M. G. 1996. Epidemiological evidence on potential health properties of flavonoids. Proc. Nutr. Soc.:5:385-397. 40. Hiroe, K. Shoko, T. and Nobuij, N.2001. Phenylbutanoid dimmer from the leave of Alpinia flabellate. Phytochem.56:109-114. 41. Hong, X. X. Hui, D. and Keng, Y. S .1996. Labdane diterpenes from Alpinia zerumbet. Phytochem. 42:149-151。 42. Imada, K. Fukushima, S. Shivai, T. Ohtani, M.Nakanishi, K. and Ito, N. 1983. Promoting activities of butylated hydroxyanisole and butylated hydroxytoluene on 2-stage urinary bladder carcinogenesis and inhibition of γ -glutamyl transpeptidase-positive foci development in the liver of rat. Carcinogenesis4:885-889。 43. Ito, N. Fukushima, S. and Tsuda, H.1985. Carcinogenicity and modification of the carcinogenic response by BHA, BHT and other antioxidant. CRC Crit. Rev.Toxicol.15:109-150。 44. Itokawa, H., M., & Mihashi, S. 1981. Phenolic compounds form the rhizomes of Alpinia speciosa. Phytochemistry, 20, 2503-250-2506. 45. Iwata, K., Miwa , S., Inayama, T., Sasaki, H., Soeda, K. & Sugahara, T. 1990.Effects of Kangra buckwheat on spontaneously hypertensive rats J. Kagawa Nutr. College 21:55-61. 46. Kalt W., Forney C. F., Martin A. and Prior R. L.1999.: Antioxidant capacity,Vitamin C, phenolics, and anthocyanins after fresh storage of small fruits. J. Agric.Food Chem.

47:4638-4644. 47. Knekt, P., Kumpulainen, J., Jarvinen, R., Rissanen, H.,Heliovara, M., Reunanen,A., Hakulinen, T.& Aroma, A. 2002. Flavonoid intake and risk of chronic diseases. Am J. Clin. Nutr. 76:560-568. 48. Kressmann, S., Biber, A., Wonnemann, M., Schug, B., Blume, H. H. & Muller,W. E. 2002. Influence of pharmaceutical quality on the bioavailability of active components form Ginkgo biloba preparations. J. Pharm. Pharmacol.54:1507-1514. 49. Krishna, B. M. & Chaganty, R. B. 1973.Cardamonin and alpinetin form the seed of Alpinia speciosa. Phytochemistry, 12,238. 50. Lahlou S, Interaminense LF, Leal-Cardoso JH, and Duarte GP. 2003. Antihypert ensive effects of the essential oil of Alpinia zerumbet and its main constituent,terpine-4-ol, in DOCA-salt hypertensive conscious rats. Fundam Clin Pharmacol 17(3): 323-330。 51. Lahlou S, Galindo CA, Leal-Cardoso JH, and Duarte GP.2002. Cardiovascular effects of the essential oil of Alipinia zerumbert leaves and its main constituent,Terpinen-4-ol,in rats:role of the autonomic nervous system. Planta Med 68(12):1097-1102。 52. Liao MC, Arakaki H, Li Y, Takamiyagi A,Tawata S, Aniya Y, Sakurai H,and Nonaka S.2000. Inhibitory effects of Alpinia speciosa K. SCHUM on the porphyrin photooxidative reaction. J Dermatol 27(5):312-317。 53. MacGowan MW, Artiss JD, Strandbergh DR, Zak B. 1983.A peroxidese-couple menthod for the colorimetric determination of serum triglycerides. Clin Chem 29:538-542. 54. Matsuzaki Y, Kawaguchi E, Morita Y et al. Evaluation of Two Kinds of Reagent for Direct Determination of HDL-Cholesterol. 1996.J Anal Bio-Sc 19:419-427. 55. Maria A. C. Bezerra, Jose H. Leal-Cardoso, Andrelina N.Coelho-de-Souza,Davi Neil Criddle and Manasses C. Fonteles.2000. Myorelaxant and Antispasmodic Effects of the Essential Oil of Alpinia speciosa on rat ileum.Phytother. Res.14,549-551. 56. Masuda, T., Mizuguchi, S., Tanaka, T., Iritani, K. & Takeda, Y. 2000. Isolation and structure determination of new antioxidative ferulic acid glucoside esters form the rhizome of Alpinia speciosa , a zingiberaceae plant used in Okinawan food culture . Journal of Agricultural and Food Chemistry, 48,1479-1484. 57. Matsubara, Y., Kumanoto, H., Iizuka, Y., Murakami, T., Okamoto, K., Miyake,H. & Yokoi, K.1985. Structure and hypotensive effect of flavonoids glycosides in citrus peelings. Agric. Biol. Chem. 49:909-914. 58. Middleton, E. & Kandaswami, C. 1992. Effects of flavonoids on immune and inflammatory cell functions. Biochem. Pharmacol. 43;1167-1179. 59. Mitsuda, H., K. Yasumoto, K. Iwami. 1966. Antioxidative action of indole compound during the autoxidation of linoleic acid. Eiyo to Shokuryo 19: 210-214. 60. Mizui, T., Sato, H., Hirose, F. & Doteuchi, M. 1987. Effect of antiperoxidative druge on gastric damage induced by ethanol in rat.Life Sci. 41:755-763. 61. Morita, M., Nakanishi, H., Morita, H., Mihashi, S. & Itokawa, H. 1996.Structure and spasmolytic activities of derivatives form sesquiterpenes of Alpinia speciosa and Alpinia japonica. Chemical & Pharmaceutical Bulletin, 44:1479-1484. 62. Mpalantinos, M. A., de Moura, R. S., Parente, J. P.,& Kuster, R. M. 1998.Biologically active flavonoids and kava pyrones form the aqueous extract of Alpinia zerumbet. Phytotherapy Research, 12:442-444. 63. Nanjo F, Goto K, Seto R, Suzuki M, Sakai M, Hara Y.1996. Scavenging effects oftea catechins and their derivatives on 1, 1-diphenyl-2-picrylhydrazyl radical.Free Radic Biol Med, 21:895-902. 64. Neda, M.d., B. Biljana, S. Marina, M. Biserka, M. Milan. 2003. Antimicrobial and antioxidant activities of three Mentha species essential oils. Planta Med.69:413-419. 65. Park, S. Y., Bok, S. H., Jeon, S. M., Park, Y. B., Lee, S. J., Jeong, T. S. and Choi, M. S. 2002. Effect of rutin and tannic acid supplements on cholesterol metabolism in rats. Nutr. Res. 22:283-295. 66. Pisani T,Gebski CP, Leary ET, et al. 1995. Aecurate Direct Determination of Low-Density Lipopotein Cholesterol Using an lmmunoseperation Reagent and Enzymatic Cholesterol Assay. Arch Pathol Lab Med:119-1127. 67. Pisha, E. & Pezzuto, J. M.1994. Fruits and vegetables containing compounds that demonstrate pharmacological. Activity in humans. In Economic and Medical. Plant Research, Vol.6; Wagner, H., Hikino, H., Fransworth, N. R., Eds.;Academic Press: London, UK, pp.189-233. 68. Quinn, M.T., Parthasarathy, S., Fong, L.G. and Steinberg, D. 1987.Oxidatively modified low density lipooroteins_a potential role in recruitment and retention of monocyte/macrophages during atherogenesis. Proc. Natl Acad. Sci. U.S.A. 84:2995-2998. 69. Richmond W. 1973. Preparation and properties of a cholesterol oxidase from Nocardia sp. and it ’ s application to the enzymatic assay of total cholesterol in serum. Cline Chem 19: 1350-1356. 70. Ruberto, G., M.T. Baratta. 2000. Antioxidant activity of selected essential oil components in two lipid model systems.Food Chem. 69 (2): 167-174 . 71. Sanchez-Moreno C., Satue-Gracia M. T. and Frankel E.N.2000: Antioxidant activity of selected Spanish wine in corn oil emulsions. J. Agric. Food Chem.48:5581-5587. 72. Sessiion, VA., Martin, A., Gomez-Munoz A., Brindley DN. and Salter AM. 1993.Cholesterol feeding induces hypertriglyceridemia in hamsters and increases the activity of the Mg2＋-dependent phosphatidate phosphohydrolase in the liver.Biochem Biophy Acta 1166:238-248. 73. Shimada, K., Fujikawa, K., Yahara, K. and Nakamura, T.1992. Antioxidative properties of xanthan on the autoxidation of sobean oil in cyclodextrin emulsion. J.Agnic. Food Chem.40:945-948. 74. Shinnick FL, InK SL and Marlett JA 1990. Dose response to a dietary oat bran fraction in cholesterol-fed rat. J Nutr. 120:561-568 75. Sugiuchi H, Uji Y, Ckabe H, lrie T et al.Direct Measurement of High-Density Lipoprotein Cholesterol in Serum with Polyethylene Glycol-Modified Enzymes and Sulfated α-Cyclodextrin. 1995 . Clin Chem.41:717-723. 76. Taga, M. S., Miller, E. E. and Pratt D. E. 1984. Chia seeds as a source of natural lipid antioxidants. J. Am. Oil Chem. Soc. 61:928-931. 77. Teng C. M.., Hsu S.Y., Lin C.H., Yu S.M., Wang K.J,. Lin M.H., Chen CF.1990.Chin J Physiol 33(1):41-48. 78. Trnovsky, J., Letoureneau, R., Haggog, E., Boucher, W.& Theoharides, T. C.1993. Quercetin-induced expression of rat mast cell protease II andaccumulateion of secretory granules in rat basophilic leukaemia cell. Biochem.Pharmacol. 46:2315-2316. 79. Varma, S. D. 1986. Inhibition of aldose reducetase by flavornoids: possible attenuation of diabetic complications. Prog. Clin. Biol. Res. 213:343-358. 80. Wang S. Y. and Lin H. S. 2000 : Antioxidant activity in fruits and leaves of blackberry, raspberry, and strawberry varies with cultivar and developmental stage. J. Agric. Food Chem. 48:140-146. 81. Wiliam, A. R. and Thomson, M D .1978. Medicines from the earth. Mc Graw Book Company, New York. 82. Yasuhiro T, Mohammad S. Ali, Arjun H. Banskota and Shigetoshi Kadota.2000.Blepharocalyxins C-E: three novel antiproliferative disarylheptanoids from the seeds of Alinia blepharocalyx. Tetrahedrom Letters 41:5903-5907。 83. Yildizogle-Ari, N., Altan, V. M.,Altinkurt, O.& Ozturk ,Y. 1991.Pharmacological effects of rutin. Phytotherapy Res. 5:19-23.