Effect of Chinese Medicinal Herbs and Essential Oils on Bioactive Compositions of Antrodia cinnamomea Cultured on Solid

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ABSTRACT

Antrodia cinnamomea is a indigenous fungus in Taiwan, it was also well known as one of the most expensive medicinal mushrooms effective for anticancer, antitumor and liver protection. For the present time, it is well known that polysaccharides and triterpenes are major effective compositions in this medicinal fungus. The objectives of this research were to study different effects of Chinese medicinal herbs and essence on solid culture of A.cinnamomea. The mycelium diameter and growth were investigated at different culture intervals. At the end of culture, the mycelia were freeze-dried and its triterpenes and polysaccharides were analyzed by High Performance Liquid Chromatography. The bio-diversion of the compositions in Chinese medicinal herbs and essence into bioactive substances by A. cinnamomea were expected. Research on polysaccharides showed that medium supplemented with Perilla(10g/L) and Safrole(0.5%) resulted in higher polysaccharide content as 20.29 mg/ml and 13.86mg/ml, respectively, with its bio-diversion rates of 2.22 and 1.80 respectively. As triterpenoids were analysed, addition of Magnolia officinalis (5g/L) and Ganoderma lucidum (20g/L) to the basic medium had bio-diversion rates of 4.05 and 4.93, respectively. Data from HPLC, revealed that addition of Ganoderma lucidum (20g/L) resulted in the highest triterpenes content of 37.61mg/g in mycelia in 30-days culture. Basil, Magnolia officinalis and Perilla also increased triterpenes content in cultured mycelia efficiently. Therefore, this experiment provided some substitutes for woods of Cinnamomum kanehirai to culture A. cinnamomea with high bio-activity products.

Keywords : Antrodia cinnamomea ; triterpenoids ; polysaccharide ; bio-diversion

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REFERENCES

1.中村克哉。1982。中藥事典。朝倉書店。p.85-104。東京。 2.水野卓、河岸洋合。1988。食品的開發。日本。 3.水野卓。富田勳。1987。昭合61年度健康情報調查報告書:p.51-96。保健同人社。東京。 4.宮野弘斯。2003。香草栽培事典。第183-185頁。晨星出版社。 5.淺井一彥。1969。教學和醫學。日本。 6.鈴木春已、飯山賢治、阿保達彥、太久保明、山崎素直、戶田招三。1989。農化。日本。 7.鈴木富士男。1976。蛋白質、核酸、酵素。日本。 8.王元林、鄧敏銳。2005。東南亞檳榔文化探析。世界民族3:63-69。 9.安寶貞、黃德昌、王姻婷。2002。台灣荖葉與荖花病原菌之鑑定。植物病理學會刊。11(4):179-188。 10.朱自平、張明發。1997。厚朴的陣痛抗炎藥理作用。中草藥28(10):613-615。 11.吳崇厚、陳蘊如。1989。中藥化學。P.323-360。科學技術出版社。上海。 12.吳德鵬。1995。樟芝微量成分的研究。國立台灣師範大學化學研究所碩士論文。台北。 13.李宛蓁。2003。樟芝菌絲體培養與生理活性成分生成之研究。東海大學化學工程研究所碩士論文。台中。 14.李思穎。2002。檳榔嚼塊對口腔上皮細胞轉錄因子NF-kB活性之調控。國立陽明大學口腔生物研究所碩士論文。台北。 15.李淑玲、許美智。2003。營養增補劑－靈芝之探討。大專體育(64):165-167。 16.沈立言、陳怡欣、林文川。2001。牛樟芝菌絲體發酵萃取液對肝臟生理機能性之影響。中華民國食品科學技術學會第三十一次會員大會論文摘要。 17.林文鑫、陳俊憲、陳勁初、呂鋒州。2000。樟芝液態發酵萃取物對腫瘤細胞株之毒殺性分析。中華民國食品科學技術學會第三十次會員大會論文摘要。 18.林素民、白純櫻、林靜晞、張基煌、陳勁初、喬長誠。2001。樟芝菌絲體及子實體脂肪酸及麥角固醇之分析。中華保健食品學會第二屆第一次會員大會。 19.徐易。2002。爪哇型香茅油。香料香精化妝品4:47-48。 20.徐敬衡、文榮輝、賴秋梅、翁偉恆。2000。利用深層發酵生產樟芝菌絲體及其抗菌研究。第十五屆全國技術及職業教育研討會論文集(農業類:環境組)。p.23-32。 21.祝麗香、周生海、劉根節。2003。食藥兼用的香料植物－九層塔。特種經濟動植物6(6):23-23。 22.張上鎮。2003。牛樟抽出成份的分離、鑑定對牛樟菇生長之影響。行政院農業委員會林務局委託研究計畫。國立台灣大學森林系。台北。 23.張中姿、陳俊憲、林文鑫、陳勁初、呂鋒州。2001。深紅色樟芝菌絲體之甲醇萃取物對肝癌細胞株之研究。中華民國食品科學技術學會第三十一次會員大會論文摘要。 24.張怡潔。2003。樟屬植物之牛樟芝菌絲體生長促進因子。國立台北醫學大學生藥學研究所碩士論文。台北。 25.張東柱、邱文慧、華傑。1997。台灣木生性無褶菌培養彩色圖鑑(第二輯)。食品工業發展研究所。 26.張衛明、劉月秀。1998。紫蘇葉的成份分析與利用初探。中國野生植物資源17(2):32-33。 27.郭淑卿。2002。樟芝發酵液對大鼠肝臟纖維化及胃腸功能之改善作用。國立中國醫藥學院中國醫藥研究所碩士論文。 28.陳勁初、林文鑫、陳清農、許勝傑、黃仕政、陳炎鍊。2001。台灣特有真菌－樟芝菌絲體之開發。中華真菌學會會刊 16:7－22。 29.陳清農、高柄煌、楊梅春、陳勁初。1999。台灣森林中的紅寶石—樟芝。鄉間小路 1:22。 30.陳雯賢。2006。不同碳源對樟芝液態培養生產菌絲體及胞外多醣之影響。明新科技大學碩士論文。新竹。 31.陳藝文。2003。培養條件對樟芝菌絲體生長與抗氧化成分活成之影響。私立東海大學化學工程研究所碩士論文。台中。 32.陳體強、方忠玉。2003。台灣珍稀藥用菌樟芝及其寄(腐)生樹種牛樟。福建農業科技1:41-42。 33.彭平健。1992。生薑的藥理研究與臨床應用。中國中藥雜誌17(6):370-373。 34.斯金平、潘心平。1994。人工栽培凹葉厚朴中厚朴酚與厚朴酚含量的研究。浙江林業科技14(5):21-22。 35.程伶。1999。紫蘇提取物的特性及其應用。食品資訊。168:67-41。 36.黃惟敏。2000。樟芝微量成分的研究。靜宜大學應用化學研究所碩士論文。台中。 37.黃啟飛、丁德蓉。1999。紫蘇的研究進展。中國野生植物資源18(2):12-15。 38.黃惠琴。2001。樟芝菌絲體深層培養之研究。私立東海大學化學工程所碩士論文。台中。 39.廖仁宏。2002。固態培養生產靈芝菌絲體之研究。私立東海大學化學工程所碩士論文。台中。 40.臧穆、蘇慶華。1990。我國台灣產靈芝屬新種—樟芝。南植物研究。12:395-396。 41.賴慶亮。1997。菇的化學、生化學。國立編譯館13:374。 42.潘若芝。2004。不同培養方式對樟芝多醣及乙醇抽出物生產之研究。私立大葉大學生物產業科技學系碩士論文。彰化。 43.餘珍、巫華美。1998。生薑的揮發性化學成份。雲南植物研究20(1):113-118。 44.盧珍妏。2003。紫蘇在生物醫學上所扮演之角色。科學與技術。35(3):50-60。 45.戴宇昀。2001。樟芝菌絲體與子實體對四氯化碳及酒精誘發之慢性及急性肝損傷之保肝功能評估。國立中興大學食品科學研究所碩士論文。台中。 46.顏正華 編著。1994a。中藥學(上)。第320-323頁。知音出版社。台北，台灣。 47.顏正華 編著。1994b。中藥學(下)。第678-679頁。知音出版社。台北，台灣。 48.蘇雁揮。2002。樟芝深層培養液及多糖體之抗氧化特性。國立中興大學食品科學系研究所碩士論文。台中。 49.蘇雁暉、宋祖瑩、陳嬿如、顏國欽。2001。樟芝菌絲體液體深層培養液對過氧化氫誘發人類肝細胞氧化傷害之保護作用。中華民國食品科學技術學會第三十一次會員大會論文摘要。 50.Ainsworth, G. C., Sparrow, F. K., & Sussman, A. S., 1973. A taxonomic review with keys: Ascomycetes and fungi imperfecti. Academic Press. Inc. p.621. New York and London. 51.Chang, T. T., & Chou, W. N., 1995. A. cinnamomea sp. novel on Cinnamomum kanehirai in Taiwan. Mycol. Res. 99: 756-758. 52.Cherng, I. H., Wu, D. P., & Chiang, H. C., 1996. Triterpenoids from A. cinnamomea. Phytochem. 41(1):263-267. 53.Cherng, I. H., Wu, D. P., & Chiang, H. C., 1996. Triterpenoids from A. cinnamomea. Phytochem. 41(1):263-267. 54.Cherng, I. W., & Chiang, H. C., 1995. Three new triterpenoids from Antrodia camphorata. J. Nat. Prod. 58:365-371. 55.Chiang, H. C., Wu, D. P., Cherng, I. H., & Ueng, C. H. A., 1995. Sesquiterpene lactone, phenyl and biphenyl compounds from A. cinnamomea. Phytochem. 39(3):613-616. 56.Chibata, I., Okumura, K., Takeyama, S., & Kotera, K., 1969. Experientia. Food science 25:1237. 57.Hawksworth, D. L., Kirk, P. M., Sutton, B. C., & Pegler, D. N., 1999. Dictionary of the fungi. International Mycological Institute. 58.Hikino, H., Konno, C., Mirin Y., & Hayashi, T., 1985. Isolation and hypoglycemic activity of Ganoderans A and B: Glycans of ganoderma lucidum fruit bodies. Planta Med. 51(4): 339-340. 59.Hseu, Y. C., Chang, W. C., Hseu, Y. T., Lee, C. Y., Yech, Y. J., Chen, P. C., Chen, J. Y., & Yang, H. L., 2002. Protection of oxidative damage by aqueous extract from Antrodia Camphorata mycelia in normal human erythrocytes. Life Sci. 71:469-482. 60.Huang, K. F., W. M. Huang, & Chiang, H. C., 2001. Phenyl compounds from A. cinnamomea. The Chinese Pharmaceutical J. 53:327- 331. 61.Kawagishi, H., Inagake, R., Kanao, T., Mizuno, T., Shimura, K., Ito, H., Hagiwara, T., & Nakamura, T., 1989. Formolysis of a potent Antitumor complex from Agaricus blazei fruiting bodies and antitumor. Carbohydr. Res. 183:150-154. 62.Lee, I. H., Chen, C. T., Chen, H. C., Hsu, W. C., & Lu, M. K., 2002. Sugar flux in response to carbohydrate-feeding of cultured Antrodia camphorata, a recently described medicinal fungus in Taiwan. J. Chinese Med. 13(1):21-31. 63.Manitto, P., 1981. Biosynthesis of Natural Products p. 319. Horwood, Chichester & New York, USA. 64.Mizuno, T., 1999. The extraction and development of antitumor-active polysaccharides from medicinal mushrooms in

Japan(Review). Inter. J. Med. Mushrooms (1):9-29. 65.Ren, G., & Chen, F., 1999. Simultaneous quantification of ginsenosides in American Ginseng (Panax quinquefolium) root powder by visible/near-infrared reflectance spectroscopy. J. Agric. Food Chem. 47:2771-2775. 66.Shih, I. L., Pan, K. & Hsieh, C., 2006. Influence of nutritional components and oxygen supply on the mycelial growth and bioactive metabolites production in submerged culture of A. cinnamomea. Process Biochemistry 41:1129 – 1135. 67.Song, T. Y., & Yen, G. C., 2002. Antioxidant properties of A. camphorata in submerged culture. J. Agric. Food Chem. 50:3322-3327. 68.Song, T. Y., & Yen, G. C., 2003. Protective effects of fermented filtrate from A. camphorata in submerged culture against CCl4-induced hepatic toxicity in rats. J. Agric. Food Chem. 51:1571-1577. 69.Tang, Y. J., & Zhong, J. J., 2003. Role of oxygen supply in submerged fermentation of Ganoderma lucidum for production of Ganderma polysaccharide and ganoderic acid. Enzyme Microb. Technol. 32:478-84. 70.Ukawa, Y., Ito, H., & Hisamatsu, M., 2000. Antitumor effects of (1→3)- β -D-glucan purified from newly cultivated mushroom, hatakeshimeji (Lyophyllum decastes Sing). J. Biosci Bioeng 90: 98～104. 71.Umezawa, H., Takeuchi, T., Iinuma, H., Suzuki, K., Matsuzaki, M., Mat-suzaki, M., 1970. Biological sciences: Adrenal tyrosine hydroxylase and dopamine β -hydroxylase in spontaneously hypertensive Rats. J. Antibiot 23:514. 72.Wang, S. Y., Hsu, H. C., Tzeng, C. H., Lee, S. S., Shiao, M. S., & Ho, C. K., 1997. The anti-tumor effect of Ganoderma lucidum is mediated by cytokines released from activated macrophages and T lymphocytes. Int. J. Cancer 70:699-795. 73.Wang, Y. Y., Khoo, K. H., Chen, S. T., Lin, C. C., Wong, C. H., & Lin, C. H., 2002. Studies on the immuno-modulating and antitumor activities of Ganoderma lucidum (Reishi) polysaccharides: functional and proteomic analyses of a fucose-containing glycoprotein fraction responsible for the activities. Bioorganic & Medicinal Chemistry. 10:1057-1062. 74.Wu, D. P., & Chiang, H. C., 1995. Constituents of Antrodia cinnamomea. J. Chinese Chem. Soc. 42:797-800. 75.Yang, S. W., Shen, Y. C., & Chen, C. H., 1996. Steroids and triterpenoids of A. cinnamomea —A fungus parasitic on Cinnamomum micranthum. Phytochem. 41(5):1389-1392. 76.Young, D. S., Chiang, H. C., & Liu, L. K., 1998. Identification of bioactive components in A. cinnamomea by MS/MS via EI ionization. J. Chinese Chem. Soc. 45:123-125.