Antioxidant Effect of Herbal Tea on Lipid Oxidation in Raw Chicken

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ABSTRACT

Looking for natural antioxidants has become important research trend in recent years. This study was aimed at evaluating the antioxidation effects of 95% and 47.5% ethanol extracts of herbal tea on raw chicken and antioxidant properties of the extract. Herbal tea materials include sage (Salvia officinalis), rosemary (Rosmarinus officinais), lavender (Lavandula officinalis),cornflower (Centaurea cyans) , sweet violet(Viola ordorata), mint (Mentha piperita), marigold (Calendula officinalis), lemon balm (Melissa officinalis), leaves of linden (Tillia sp.), lemon verbena (Lippia citriodora), lemongrass (Cymbopogon sp.), chamomile (Matricaria chamomilla). Antioxidant effects of various concentrations (5、20 and 40 mg/mL) of both extracts were investigated against lipid oxidantion in POV and TBA of raw chicken breast and leg meat during storage of 4±1 ℃ for 8 days and -20±2 ℃ for 6 months. Effects of lemon balm 95% ethanol extract (5 mg/mL) for breast and leg meat was comparable to 0.02% BHT. For 47.5% ethanol extracts against lipid oxidation, TBA value of breast meat in 5 mg/mL lemon balm extracts (0.06) was lower than control group. However, the lowest value of leg meat was immersed in 5 mg/mL extract of lemon grass. During long-term frozen storage, TBA value of breast meat immersed in leaves of linden and lemon grass 95% ethanol extracts was not significantly different, and then effect of rosemary was less than them. Rosemary and marigold 95% ethanol extracs against lipid oxidation for leg meat got better result than 0.02% BHT. Rosemary and marigold 47.5% ethanol extracts (5 and 20 mg/mL) for breast meat against lipid oxidation during long-term storage could comparable to 0.02% BHT, but marigold extract was good for leg meat. Besides of lemon verbena 、marigold and mint, POV of breast meat in 95% or 47.5% ethanol eatracts during 8 days storage was comparable to 0.02% BHT. Effect medium and high level of concentrations decreased. The POV of leg meat immersing lemon balm and chamomile 95% ethanol extracts during storage refrigeration for 8 days was significantly lower than that of 0.02% BHT ($p<0.05$). Antioxidant effect of 47.5% ethanol extract for leg meat, all concentractions of extracts were comparable to 0.02% BHT, except cornflower extracts.The POV of breast meat in high concentraction during long-term frozen storage would increase. Effect of 47.5% ethanol extracts of camomile (5 and 20 mg/mL) and rosemary (5 mg/mL) was comparable to 0.02% BHT. 47.5% ethanol extracts of lavender (5 mg/mL) got better results than 0.02% BHT. The antioxidant properties of both extracts stated that scavening DPPH free radical activity of 95% ethanol extracts was not related with concentractions, except marigold. There was no significant difference from 0.02% BHT. Scavening activity of 47.5% ethanol extracts was lower than that of 95% ethanol extracts. Metal chelating 47.5% ethanol extracts (20 and 40 mg/mL) was higher than that of 0.02% BHT and greater than 96%.

Keywords : DPPH free radical scavenging activity, Metal chelating effect, TBA value, POV, Herbal tea

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REFERENCES

中文部份 1、中國國家標準。1984。食品中粗脂肪之檢驗方法。總號5036，類號N6117。經濟部中央標準局。 2、尤新。2001。機能性發酵製品。第317-333頁。藝軒圖書出版社。台北。台灣。 3、王仕賢、張元聰、王裕權和陳燿煌。2004。紫羅蘭生產技術及利用。台南區農業專訊47:9-13。台南。 4、朱燕華。2001。類胡蘿蔔素簡介。食品工業 33(4):1-5。 5、張為憲。1992。高等食品化學。第43-157頁。華香園出版。台北。 6、張明憲、吳天賞和蘇正德。1996。茵陳蒿抗氧化成分之研究食品科學 23(4):594-607。 7、張為憲。2001。食品化學。第79-101頁。華香園出版社。台北。 8、張隆仁、陳榮五和邱建中。2001。保健植物－香蜂草之栽培與利用。台中區農情月刊 21:4-9。台中。 9、張元聰、王裕權和王仕賢。2002。南部地區紫羅蘭栽培技術介紹。台南區農業專訊 39:1-8。台南。 10、張隆仁。2003(a)。金盞菊。台中區農情月刊 42:12-14。台中。 11、張隆仁。2003(b)。禾本科香藥草植物－檸檬香茅(lemon grass)。台中區農情月刊 48:5-10。台中。 12、張元聰、王仕賢和王裕權。2004。台灣香草植物品種圖鑑。台南區農業改良場技術專刊 124(4):13-71。 13、張元聰和王仕賢。2005。香草栽培與食譜利用。台南區農業改良場技術專刊 109(11):8-21。台南。 14、郭孚燿。2003。德國甘菊。台中區農業專訊 43:10-11。台中。 15、陳正芸。1989。油脂色素對其品質之影響(上)。食品工業 21(6):29-38。 16、黃雅玲。2003。香草植物-矢車菊。高雄區農情月刊 65:7-8。 17、趙文婉、張珍田和周淑姿。2002。淺談植物類化學物質對抗自由基之機制。食品科學與技術 34(2):49-59。 18、鄭靜桂。1988。芝麻及芝麻油中天然抗氧化成分探討。食品工業 20:11-18。 19、樊謙騰。1996。鳳凰花及山竹果殼抗氧化成分與花青素之研究。東海大學食品科學系碩士論文。台中。 20、謝衣鵑。2001。花青素簡介。食品工業 33(4):6-16。 21、蘇正德、大澤俊彥、川案舜朗和並木滿夫。1992。紫地丁酸分離、純化、構造確認及抗氧協力作用。東海學報 33:1131-1142。 英文部份 1、Bajaj, K. L., Kansal, B. D., Chadha, M. L. and Kaur, P. P. 1990. Chemical composition of some important varieties of egg plant (Solanum melongena L.). Tropical Science 30(3):255-261. 2、Cook, N. C. and Samman, S. 1996. Flavonoids:Chemistry, metabolism, cardio-portective effects, and dietary sources. Journal of Nutrition and Biochemistry 7:66-76. 3、Decker, E. A. and Faraji, H. 1990. Inhibition of lipid oxidation by carnosine. Journal of the American Oil Chemists ’ Society 67:650-652. 4、Dorman, H. J. D., Kosar, M., Kahlos, K., Holm, Y. and Hiltunen, R. 2003. Antioxidant properties and composition of aqueous extracts from Mentha species, hybrids, varieties, and cultivars. Journal of Agricultural and Food Chemistry 51:4563-4569. 5、Endo, Y., Usuki, R. and Kaneda, T. 1984. Prooxidant activities of chlorophylls and decomposition products on the photooxidant of methyl linolate. Journal of the American Oil Chemists ’ Society 61:781-785. 6、Frankel, E. N. 1991. Recent advances in lipid oxidation. Journal of the Science of Food and Agriculture 54:495-511. 7、Frankel, E. N., Huang, S. W., Aeschbach, R. and Prior, E. 1996. Antioxidant activity of a rosemary extract and its constituents, carnosic acid, carnosol, and rosmarinic acid in bulk oil and oil-in-water emulsion. Journal of Agricultural Food Chemistry 44:131-135. 8、Gunstone, F. D. 1984. Reaction of oxygen and unsaturated fatty acids. Journal of the American Oil Chemists ’ Society 61:441-447. 9、Gulcin I., Sat I.G., Beydemir S., Elmastas M., and Kufrevirglu O.I. 2004. Comparison of antioxidant activity of clove (Eugenia caryophylata Thunb) buds and lavender (Lavandula stoechas L.). Food Chemistry 87:393-400. 10、Halliwell, B., Murcia, M. A., Chirico, S. and Aryoma, O.I. 1995. Free radicals and antioxidants in food and in vivo: what they do and how they work. Critical Reviews in Food Science and Nutrition 35(1&2):7-20. 11、Halliwell, B. 1994. Free radicals and antioxidants:A personal view. Nutrition

Review 52(8):253-265. 12、Holvoet, P. 1990. Endothelial dysfunction, oxidation of low-density lipoprotein, and cardiovascular disease. Therapeutic Apheresis 3:287-293. 13、Huang, Y., Liu, D. and Sun, S. 2000. Mechanism of free radicals on the molecular fluidity and chemical structure of the red cell membrane damage. Clinical Hemorheology and Microcirculation 23:287-290. 14、Jayasingh, P. and Cornforth, D. P. 2003. Comparison of antioxidant effects of milk mineral, butylated hydroxytoluene and sodium tripolyphosphate in raw and cooked ground pork. Meat Science 66:83-89. 15、Johnson, L. E. 1995. Food technology of the antioxidant nutrients. Critical Reviews in Food Science and Nutrition 35(1&2):141-159. 16、Kanner, J., German, J. B. and Kinsella, J. E. 1987. Initiation of lipid peroxidation in biological system. Critical Reviews in Food Science and Nutrition 25(4): 317-363. 17、Kovacheva, E. G., Koleva, I. I., Ilieva, M., Povlov, A., Mincheva, M. and Konushlieva, M. 2001. Antioxidant activity of extracts from Lavandula vera MM culture. Food chemistry 72:295-300. 18、Larson, R. A. 1988. The antioxidants of higher plants. Phytochemistry 27:969-978. 19、McCarthy, T. L., Kerry, J. P., Kerry, J. F., Lynch, P. B. and Buckley, D. J. 2001. Evaluation of the antioxidant potential of natural food/plant extracts as compared with synthetic antioxidants and vitamin E in raw and cooked pork patties. Food chemistry 57:45-52. 20、Miliauskas, G.., Venskutonis, P. R. and Beek, T. A. 2004. Screening if radical scavenging activity of some medicinal and aromatic plant extracts. Food chemistry 85:231-237. 21、Narwar, W. W. 1996. Chap.3:Lipids. In Frennema, O. R. (Ed.), Food Chemistry. p225-319. Marcel Dekker Inc., New York, USA. 22、Niamiki, M. 1990. Antioxidants/antimutagens in foods. Critical Reviews in Food Science and Nutrition 29:273-300. 23、Porter, N. A., Caldwell, S. E. and Mills, K. A. 1995. Mechanisms of free radical oxidation of unsaturated lipids. Lipids 30(4):277-290. 24、Sallam, K. I., Ishioroshi, M. and Samejima, K. 2004. Antioxidant and antimicrobial effects of garlic in chicken sausage. Lebensmittel-Wissenschaft und-Technologie 37:849-855. 25、Shahidi, F. and Amarowicz, R. 1996. Antioxidant activity of protein hydrolyzates from aquatic species. Journal of the American Oil Chemists ’ Society 73(9): 1197-1199. 26、Shimada, K., Fujikawa, K., Yahara, K. and Nakamura, T. 1992. Antioxidative properties of xanthane on the autoxidation of soybean oil in cyclodextrin emulsion. Journal of Agricultural Food Chemistry 40:945-948. 27、St Angelo, A. J. 1996. Lipid oxidation on foods. Critical Reviews in Food Science and Nutrition 36:175-224. 28、Stadler, R. H. and Fay, L. B. 1995. Antioxidative reactions of caffeine: formation of 8-oxocaffeine (1,3,7-Trimethyiuric acid) in coffee subjected to oxifative stress. Journal of Agricultural Food Chemistry 43:1332-1338. 29、Stadtman, E. R, and Oliver, C. N. 1991. Metal-catalyzed oxidation of protein. Journal of Biological Chemistry 266:2005-2008. 30、Thomas, M. J. 1995. The role free radicals and antioxidants: How do we know that they are working? Critical Reviews in Food Science and Nutrition 35:21-39. 31、Torel, J., Cillard, J. and Cillard, P. 1986. Antioxidant activity of flavonoids and reactivity with peroxyl radicals. Phytochemistry 25(2):383-385.