探討農藥快速檢測及去除農藥殘留之方法

朱珮瑜 (5110)

2016/1/6

Outline

一、前言

二、發展一個用於檢測食品中農藥殘留之新式可視覺化快速檢測卡

三、利用高靜水壓去除櫻桃番茄之農藥殘留

四、利用臭氧微泡沫在不同水溫下去除生菜及櫻桃番茄之農藥殘留與測定其物理性質之影響

五、結論

Abstract

在現代有機磷(Organophosphorus, OP)及氨基甲酸酯類(Carbamate, CM)農藥約佔 70%，農藥檢測大多需使用精密之儀器測量，現有之快速檢測片仍需利用分光光度計做檢測，購買儀器成本高，因此需要發展一個可視覺化之快速檢測片，利用 AChE 之酵素活性抑制率由顏色顯示做為基礎，經過實驗證明檢測片上加 5 μl 、800 U/ml 之 AChE 溶液有最佳測試效果，對歐滅松、二氯松、達馬松、陶斯松、加保利、比加普之偵測極限(Limit of detection, LOD)分別為 1、0.1、2、0.05、1.5、0.8μg/mL，結果發現除了達馬松之外，其餘農藥之偵測極限皆低於公告之偵測極限。近年來，食品與農業殺蟲劑的污染已成為一個主要的健康問題，因而發展利用高靜水壓去除櫻桃番茄中陶斯松(Chlorpyrifos)之殘留，藉由 25~400 MPa 之靜水壓測試農藥之殘留量，發現 75 MPa 能得到最佳之效果，並且在 5℃及 25℃下測試此農藥之殘留，得到 5℃能使櫻桃番茄有更低的殘留量。利用臭氧微泡沫去除生菜以及櫻桃番茄中之撲芬松(Fenitrothion, FT)，比較臭氧泡沫(Ozone millibubble)、臭氧微泡沫(Ozone microbubble, OMCB)及連續臭氧微泡沫(bubbling OMCB)三種方式在不同的溫度相同作用時間之農藥去除率，接著以最佳溫度在不同時間相同溫度下比較農藥去除率，結果在 bubbling OMCB 之作用下效果最佳，在 30℃時有最好的去除率；另一方面檢測葉菜之 LAB 值及拉伸試驗下，連續臭氧微泡沫不會對於色澤及拉伸程度有影響。總結以上，在發展快速檢測試片的實驗中有成功的發展，同時兩種實驗方法皆能有效去除農藥之殘留。

参考文獻

Badiani M, Fuhrer J, Paolacci AR, Giovannozzi SG. (1996). Deriving critical levels of ozone effects on peach trees (*Prunus persica* L. Batsch) grown in open-top chambers in Central Italy. *Fresenius environmental bulletin* 5,594–603.

Chu LB, Xing XH, Yu AF, Zhou YN, Sun XL, Jurcik B. (2007). Enhanced ozonation of simulated dyestuff wastewater by microbubbles. *Chemosphere* 68,1854–1860.

Dmello, G. D. (1993). Behavioral toxicity of anticholinesterases in humans and animals e a review. *Human & Experimental Toxicology*, 12(1), 3-7.

Guo X, Zhang X, Cai Q, Shen T, Zhu S. (2013). Developing a novel sensitive visual screening card for rapid detection of pesticide residues in food. *Food Control* 30,15-23.

Hayashi, R., (1991). Pressurized cooking. Principle and characteristic. *Chori Kagaku* 24 (3), 260–265.

Iizuka T, Maeda S, Shimizu A., (2013). Removal of pesticide residue in cherry tomato by hydrostatic pressure. *Journal of Food Engineering* 116,796-800.

Ikeura, H., Kobayashi, F., Tamaki, M., (2011a). Removal of residual pesticide, fenitrothion, in vegetables by using ozone microbubbles generated by different methods. *Journal of Food Engineering* 103, 345–349.

Ikeura, H., Kobayashi, F., Tamaki, M., (2011b). Removal of residual pesticides in vegetables using ozone microbubbles. *Journal of Hazardous Materials* 186, 956–959.

Ikeura H, Kobayashi F, Tamaki M., (2013). Ozone microbubble treatment at various water temperatures for the removal of residual pesticides with negligible effects on the physical properties of lettuce and cherry tomatoes. *Journal of Food Science* 78, 350-355.

Karaca H., Velioglu YS. (2007). Ozone applications in fruit and vegetable processing. *Food Reviews International* 23,91–106.

Kasprzyk-Hordern B, Zioekb M, Nawrocki J., (2003). Catalytic ozonation and methods of enhancing molecular ozone reactions in water treatment. *Apply Catalysis B：Environmental* 46,639–669

Kimura, T., Ogawa, Y., (1976). Cleansing effect on vegetables and fruits by ultrasonic irradiation removal of detergent, dusts and cupric ions from vegetables and fruits. *Eiyou to Shokuryo (Journal of Japanese Society of Food and Nutrition)* 27, 250–254.

Klaiber RG, Baur S, Magel L, Hammes WP, Carle R., (2004). Qulity of shredded, packaged carrots as affected by different washing treatments. *Journal of Food Science* 69,161-166

Lewis L, Zhuang H, Payne FA, Barth MM., (1996). Beta-carotene content and color assessment in ozone treated broccoli florets during modified atmosphere packing. *In: Book of abstracts Chicago, Ill.: Institute of Food Technologists.* , 99.

Li P, Takahashi M, Chiba K., (2009a). Enhanced free-radical generation by shrinking microbubbles using a copper catalyst. *Chemosphere* 77, 1157–1160.

Li P, Takahashi M, Chiba K., (2009b). Degradation of phenol by the collapse of microbubbles. *Chemosphere* 77, 1371–1375.

Miao, Y. Q., He, N. Y., & Zhu, J. J., (2010). History and new developments of assays for cholinesterase activity and inhibition. *Chemical Reviews*, 110(9), 5216-5234.

Nadas A, Olmo M, Garcia JM., (2003). Growth of *Botrytis* cinerea and strawberry quality in ozone-enriched atmospheres. *Journal of Food Science* 68,1798–1802.

Ong KC, Cash JN, Zabik MJ, Siddi M, Jones AL., (1996). Chlorine and ozone washes for pesticide removal from apples and processed apple sauce. *Food Chemistry* 55, 153–160.

Pugliese, P., Molt´ob, CJ., Damiania, P., Mar´ınb, R., Cossignania, L., Mañes, J., (2004). Gas chromatographic evaluation of pesticide residue contents in nectarines after non-toxic washing treatments. *Journal of Chromatography* A 1050, 185–191.

Sumikura M, Hidaka M, Murakami H, Nobutomo Y, Murakami T., (2007). Ozone micro-bubble disinfection method for wastewater reuse system. *Water Sci Technol* 56,53–61.

Takahashi M, Chiba K, Li P., (2007a). Free-radical generation from collapsing microbubbles in the absence of a dynamic stimulus. *The Journal of Physical Chemistry* B 111(6),1343–1347.

Takahashi M, Chiba K, Li P., (2007b). Formation of hydroxyl radicals by collapsing ozone microbubbles under strongly acidic conditions. *The Journal of Physical Chemistry* B (111),11443–11446.

TianLi, Y., ZhengKun, Z., YaHong, Y., ZhenPeng, G., XiaoRong, Z., (2009). Optimization of conditions for organochlorine pesticide residues removal in apples using ultrasonic. *Transactions of the Chinese Society of Agricultural Engineering* 25 (12), 324–330.

Wu, J., Luan, T., Lan, C., Lo, T.W.H., Chan, G.Y.S., (2007). Removal of residual pesticides on vegetable using ozonated water. *Food Control* 18, 466–472.

Yamaguchi, Y., (2006). Environmental and food hygiene approach to pesticide. *Seikatsu Eisei* 50 (5), 283–290.

Yamashita, M., Noma, Y., Honda, K., (2009). Removal of pesticide residues in farm products by ultrasonic washing. *Journal of Environmental Chemistry* 19 (3), 389–393.

Zohair, A., 2001. Behavior of some organophosphorus and organochlorine pesticides in potatos during soaking in different solutions. *Food and Chemical Toxicology* 39, 751–755