

Volatile Flavor Compounds in Commercial Liquid Smokes

**Sung-Young Park, Hun Kim, Woo-Jin Cho, Young-Mi Lee,
Jung-Suck Lee* and Yong-Jun Cha**

Department of Food and Nutrition, Changwon National University,
*East Coastal Marine Bioresources Research Center, Kangnung National University,

Introduction

Liquid smoke is made by concentration of smoke generated from charcoal of broad-leaved trees, or by refinement of smoke originated from incomplete combustion of wood condensate (Park et al., 1994). Generally, it is well known that phenol and its derivatives have antioxidative effect, while acids and formaldehyde have antimicrobial effect (Park et al., 1994). Meanwhile, some studies (Alonge, 1988; Dungal, 1961) reported that the high incidence of stomach cancer has been associated with the consumption of smoked fishes, and these were investigated to direct intake of fishes treated with smoke, containing polycyclic aromatic hydrocarbons (PAHs) (Moret et al., 1999). The objectives of this study are to identify volatile flavor compounds and simultaneously estimate whether it might be safe or not for application to the fishery processing industry through presence of PAHs in commercial liquid smokes.

Materials and Methods

Materials : Liquid smokes used were Scansmoke PB 2110 (P. Broste A/S, Denmark), Zestismoke (Hickory Specialties Inc., USA), Imported product (Backgeung Food Inc., Korea), SF-3, SF-10 and SF-26 (Donghae Hwasung Co. LTD., Japan), and these were donated from each product company and stored in a refrigerator (3°C) until use.

Analysis of volatile flavor compounds and GC/MSD conditions : **1. Solvent extraction method** : Solvent extraction was performed by the method of Park et al. (2001). **2. Purge and trap (P&T) method** : The instrument used for P&T method was HP 7695 P&T concentrator (Hewlett-Packard Co., USA). Ten μ L of diluted solution and 10 μ L of tridecene were taken into P&T sparger. More details

were described Park et al. (2001). **3. GC/MSD conditions** : In case of solvent extraction method, A 0.3 μ L of extract was injected into HP 6890 GC/5973 mass selective detector (MSD) (splitless mode; helium carrier gas at 1.2 mL/min) equipped with a Ultra-2TM capillary column (50m length \times 0.2 mm i.d \times 0.33 μ m film thickness). In case of Purge & Trap Method, the sample was programmed to automatically inject into GC/MSD after cryofocusing, oven temperature was programmed from 50 to 240°C at 5°C/min with initial and final hold times of 5 and 0 min, respectively, and hold time of 30 min for 280°C.

Identification and relative abundance of volatile flavor compounds

Volatile compounds were identified by matching retention indices (RI) and mass spectra of unknown with those authentic standard compounds.

Results and Discussion

A total of 156 volatile flavor compounds were detected in 6 commercial liquid smokes, and these compounds were composed mainly of 12 aldehydes, 60 ketones, 7 alcohols, 14 acids, 20 esters, 24 aromatic compounds, 7 furans and 12 miscellaneous compounds. Ketones (806.6~7,573.9 μ g/mL) and aromatic compounds (282.6~7,896.3 μ g/mL) were more abundant than others. The PAHs known as carcinogen have not been detected in this study. The acids (422.9~4,903.1 μ g/mL) was identified in relatively high concentration compared to other groups. Phenol and its derivatives among aromatic compounds were in relatively high concentration. Especially, the phenol and its derivatives including o-cresol, guaiacol, 4-ethylguaiacol and syringol were in higher concentration.

References

- Park, Y.H., D.S. Chang and S.B. Kim. 1994. Sea food processing and utilization. Hyungseul Press, pp.727~745 (in Korean).
- Alonge, D.O. 1988. Carcinogenic polycyclic aromatic hydrocarbons (PAH) determined in Nigerian Kundi (smoked dried meat). J. Sci. Food Agric., 43, 167~172.
- Dungel, N. 1961. The special problem of cancer in Iceland with particular reference to dietary factors. J. Am. Med. Assoc., 178, 93~95.
- Park, S.Y., H. Kim, W.J. Cho, Y.M. Young, J.S. Lee, Y.J. Cha. 2001. A Study on the quality properties of seasoned-dried Pacific saury treated with liquid smoke. 1. Volatile Flavor Compounds in Commercial Liquid Smokes. J. Fish. Sci. Tech., 4, (in processing).