

ENVIRONMENTAL LEVELS - POSTERS

POLYCHLORINATED DIBENZO-P-DIOXINS AND POLYCHLORINATED DIBENZOFURANS IN VEGETATION IN THE VICINITY OF INDUSTRIAL AREA IN KOREA

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Introduction

Various sources same as industrial factory, MSWI, and automobiles directly emit polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans into atmosphere.¹ PCDDs/DFs of gas and particle phase in atmosphere, transport a short or long distance and undergo removal process of wet and dry deposition.² These compounds contained PCDDs/DFs were accumulated in soil, vegetation and biotic material. Vegetation sample can be used an environmental media to get local contamination. Therefore, we investigated concentration of PCDDs/DFs using vegetation as an indicator of local air pollution in the vicinity of industrial area, Korea.

Experimental methods

Sampling

Vegetation samples were collected at paddy field and orchard of industrial area in September 1996, 1997 and 1998. Sampling points were illustrated in Fig. 1.

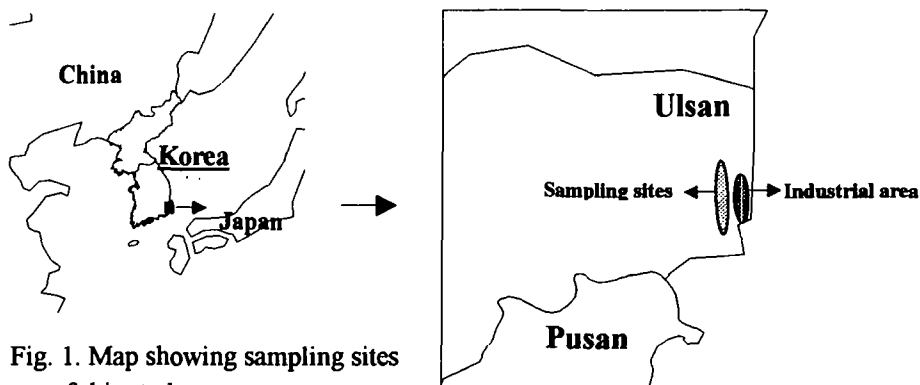


Fig. 1. Map showing sampling sites of this study

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Analytical procedure

Vegetation samples were dried at room temperature and then cut into a size of about 1cm. After spiking of internal standards(EDF-8999, CIL Inc.), samples(ca. 20g) were extracted with toluene for 5 hours under reflux. The extracts were filtered to remove a bulk of chlorophyll using silica gel. The filtrate was concentrated and transferred to n-hexane. The solution was purified by a multi-layer silica gel and activated alumina column chromatography. The purified extracts were concentrated and analyzed by HRGC(HP6890)/HRMS(JMS 700). Analytical methods and conditions described in previous several papers.³⁻⁴

Results and discussion

Concentration

Table 1 shows concentration of PCDDs/DFs in vegetation samples.

Table 1. Total and I-TEQ concentration of PCDDs/DFs at each site (pg/g dry wt).

| Sampling site | Total concentration(pg/g) | | | I-TEQ concentration(pg/g) | | |
|---------------------------|---------------------------|--------|--------|---------------------------|-------|------|
| | PCDDs | PCDFs | Sum | PCDDs | PCDFs | Sum |
| <u>Paddy field</u> | | | | | | |
| A | 22.80 | 13.15 | 35.95 | 0.45 | 0.20 | 0.65 |
| B | 75.98 | 48.77 | 124.75 | 0.70 | 0.44 | 1.14 |
| C | 84.17 | 48.00 | 132.17 | 0.00 | 0.49 | 1.40 |
| D | 59.49 | 38.41 | 97.90 | 1.29 | 0.48 | 1.77 |
| E | 28.85 | 24.33 | 53.18 | 0.32 | 0.32 | 0.64 |
| F | 99.31 | 51.35 | 150.66 | 0.86 | 0.62 | 1.48 |
| G | 87.12 | 51.57 | 138.68 | 0.64 | 0.53 | 1.17 |
| H | 12.19 | 12.60 | 24.79 | 0.11 | 0.12 | 0.23 |
| I | 11.69 | 10.05 | 21.74 | 0.20 | 0.11 | 0.31 |
| J | 9.50 | 12.67 | 22.17 | 0.11 | 0.11 | 0.22 |
| K | 53.37 | 24.86 | 78.23 | 0.38 | 0.28 | 0.66 |
| L | 37.48 | 43.69 | 81.18 | 0.40 | 0.48 | 0.88 |
| M | 66.41 | 61.11 | 127.52 | 1.20 | 0.71 | 1.91 |
| N | 37.63 | 35.01 | 72.64 | 0.51 | 0.39 | 0.90 |
| <u>Orchard</u> | | | | | | |
| O | 45.33 | 44.31 | 89.64 | 0.58 | 0.50 | 1.08 |
| P | 17.85 | 16.32 | 34.17 | 0.22 | 0.21 | 0.43 |
| Q | 8.35 | 10.46 | 18.81 | 0.09 | 0.13 | 0.22 |
| R | 47.64 | 47.41 | 95.06 | 0.49 | 0.45 | 0.94 |
| S | 26.99 | 29.75 | 56.74 | 0.41 | 0.31 | 0.72 |
| T | 28.38 | 118.74 | 147.12 | 0.77 | 1.55 | 2.32 |
| U | 20.39 | 22.48 | 42.87 | 0.24 | 0.35 | 0.59 |
| V | 24.91 | 24.81 | 49.73 | 0.32 | 0.28 | 0.59 |

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Total concentration of PCDDs/DFs in rice straw collected at Paddy field ranged 21.74~150.66pg/g and I-TEQ concentration was 0.21~1.91pg/g. In the case of pear leaf collected at Orchard site, total level was 18.81~147.12pg/g and I-TEQ was 0.22~2.32pg/g. F, G and T site showed the highest value for all sites, because this site is located in the nearest place from industrial area as compared with other sites. Average total and I-TEQ concentration presents in Fig. 2.

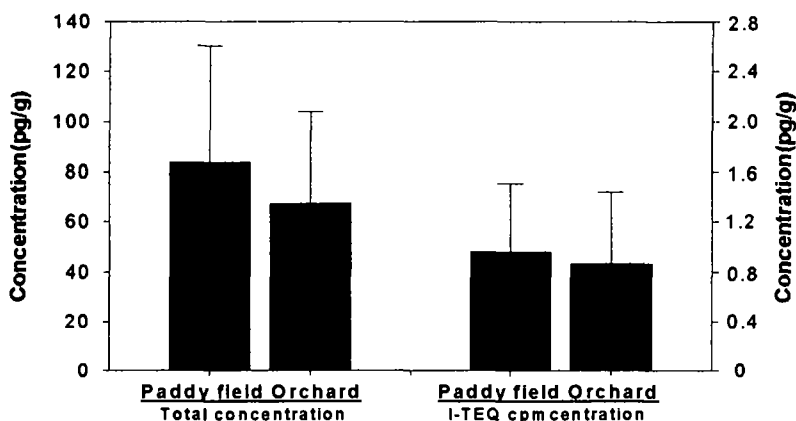


Fig.2. Total and I-TEQ concentration of PCDDs/DFs in vegetation samples collected at paddy field and orchard.

Congener profile

Fig. 3 illustrates congener profiles of PCDDs/DFs for vegetation and atmosphere(gas and particle phase) collected at the same area. Congener profile of vegetation collected at paddy field and orchard showed that the low chlorinated such as TCDDs and TCDFs was the predominant congener. This is similar to congener pattern of PCDDs/DFs of gas phase in atmosphere. It means that PCDDs/DFs of gas phase rather than particle phase were absorbed by air-to-leaf. Therefore, pollutants of gas phase contribute to contamination of PCDDs/DFs in vegetation samples.

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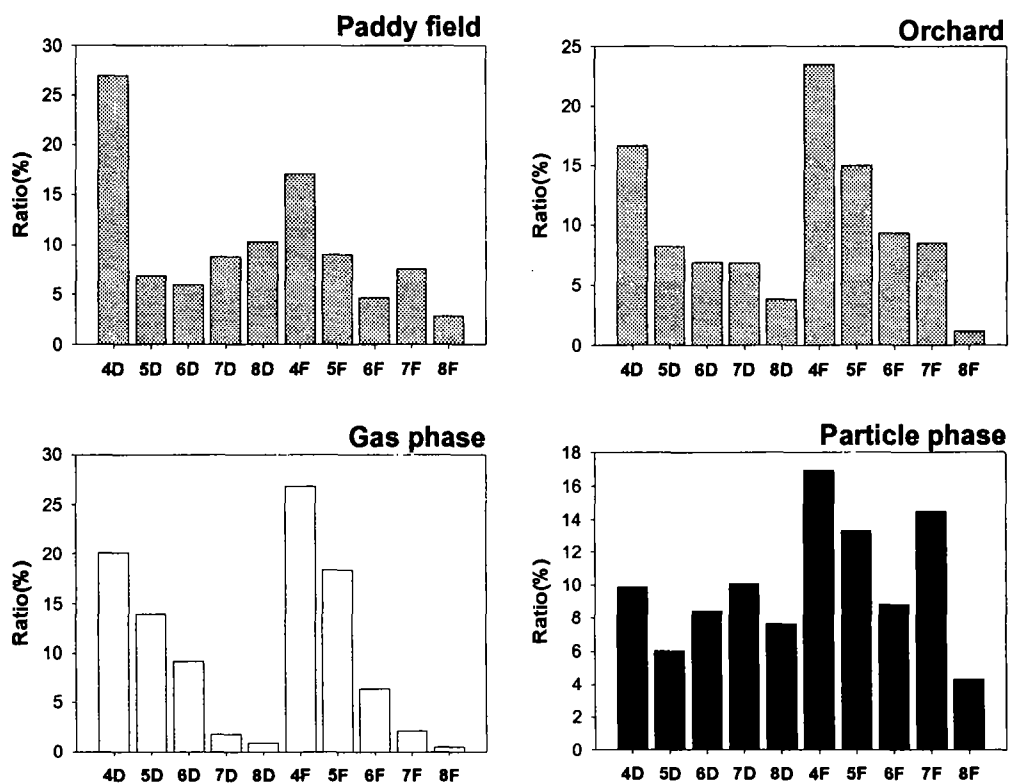


Fig. 3. Congener profiles of total PCDDs/DFs for vegetation and air sample collected at industrial area.

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