

Congener Profiles of PCDD/Fs in Soil and Vegetation Samples Collected Near to a Municipal Waste Incinerator

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Introduction

The primary pollutants of concern over the potential risks of emissions from municipal solid waste incinerators (MSWI) are polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs). Although there is currently no feasible method for continuously measuring PCDD/F emissions from MSWI, the control of these emissions is very important from regulatory and risk assessment perspectives (1).

In recent years, the levels of PCDD/Fs emitted by MSWI, as well as those in ambient air have been frequently used to detect and quantify the atmospheric concentrations of these pollutants in zones near to MSWI. However, taking into account the potential variability of PCDD/F emissions and their concentrations in ambient air (day-to-day composition and properties of waste, composition of flue gas, meteorological conditions, etc.), the average atmospheric levels of PCDD/Fs could not be necessarily the most adequate monitor for these compounds.

PCDD/F emissions result in subsequent aerial deposition onto soil and vegetation. Therefore, these matrices can be also used as environmental monitors of PCDD/Fs. Anyhow, the levels of these pollutants in ambient air, soil and vegetation samples collected in the vicinity of a MSWI can be remarkably increased by the presence of other emission sources of PCDD/Fs in the same area. Recently, we determined the concentrations of PCDD/Fs in soil and herbage samples taken near a MSWI from Tarragona (Catalonia, Spain) (2-5). The plant is located in an active industrial zone, which is also crossed by a highway and two motorways with heavy traffic. Consequently, other emissions of PCDD/Fs additional to those from the MSWI could be expected. The congener profiles of PCDD/Fs in soil and vegetation samples collected near to the plant in 1996 and again in 1997 are here presented and compared with those from samples collected in a close area (Constantí, Catalonia, Spain), which is outside of direct emissions of the MSWI (6,7).

Method

Congener profiles are the fractional distribution of PCDD/F congeners in an environmental release, or in an environment or biological sample. As numerous procedures can be chosen to derive a congener profile, and there is no single agreed-upon convention (8), in this paper the percentage contribution of the 2,3,7,8-substituted congeners to the I-TEQ for concentrations in air, soil and vegetation was used.

Data corresponding to soil and herbage samples were recently obtained in our laboratory (2-7).

Twenty-four samples of soil and herbage were collected in 1996 and again in 1997 in the vicinity of the MSWI (2-5), while 40 soil and 40 herbage samples were taken in 1996 and also in 1998 in an area outside of the direct influence of the plant emissions (6,7). Finally, the results of PCDD/Fs emitted by the MSWI were taken from a recent report by Abad et al. (9).

Results and Discussion

PCDD/F congener profiles from soil and herbage samples collected at 250-500 m from the MSWI are shown in Figure 1. Data are presented according to four directions of the wind. The predominant winds in the area are SE and SW. In turn, the results of PCDD/Fs emitted by the plant are presented in Figure 2, while Figures 3 and 4 show the PCDD/F congener profiles corresponding to the total 24 soil and 24 herbage samples collected near to the MSWI in 1996 and in 1997, as well as those corresponding to the total 40 soil and 40 herbage samples taken in a close area (6,7).

The inspection and comparison of the PCDD/F congener profiles in soil and herbage samples show the following results: **1)** OCDD is the dominant congener in all profiles. **2)** The PCDD/F congener profiles in soil and vegetation samples taken near to the MSWI are, in general terms, very similar for both collections (1996 and 1997). **3)** No differences in PCDD/F congener profiles were found in soil or herbage samples collected near to the plant depending on the directions of the wind, which suggests that the MSWI is not the main source of PCDD/Fs in the area under study. **4)** The comparison of the data in soil samples (24 + 24) collected near to the MSWI and in an area (40 + 40) outside of the direct influence of the plant (Constantí) shows quite similar congener profiles, while the profiles including the total number of herbage samples area also very similar for both areas. Again, this finding suggests that the presence of PCDD/Fs in the area under direct influence of the plant is mainly due to other emission sources (industrial activities, traffic, etc.), which also affect other close areas. **5)** The differences between the congener profiles corresponding to emissions of the MSWI (Fig. 2) and those found in soil and herbage samples collected near to the plant could be also an additional indicator of the above.

The current study suggests that in order to establish the environmental and public health impact of PCDD/Fs emitted from a MSWI located in an area under the potential influence of other emission sources, it is essential to determine not only the levels of PCDD/Fs emitted by the plant, but also the concentrations in environmental matrices collected in the vicinity of the facility.

References

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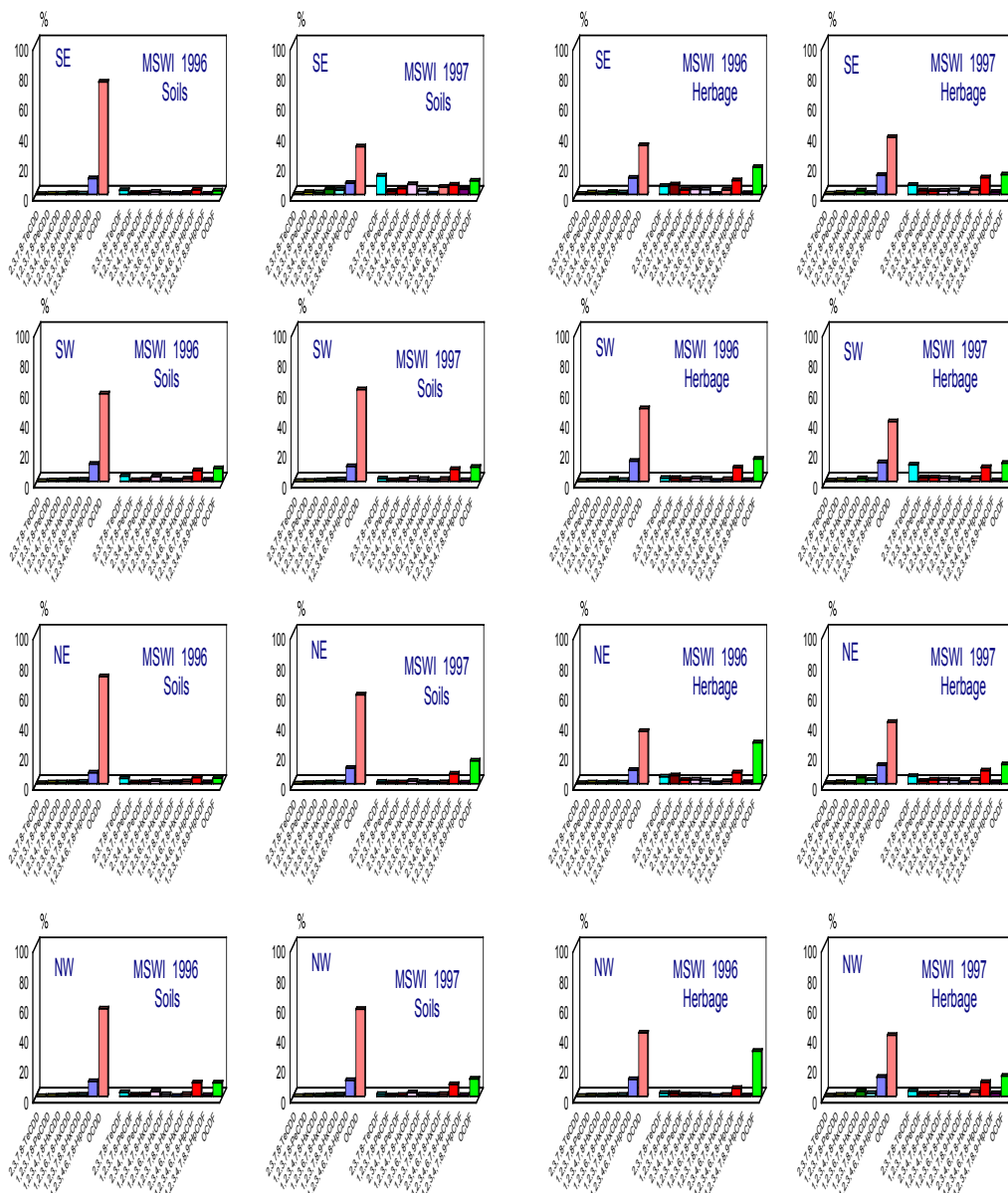


Fig. 1. The congener profiles of PCDD/Fs in soil and herbage samples collected at 250-500 m from a MSWI according to four directions of the wind.

Fig. 2. Congener profiles of PCDD/Fs emitted by a MSWI from Tarragona (Catalonia, Spain).

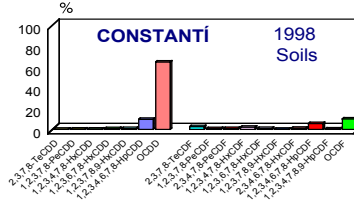
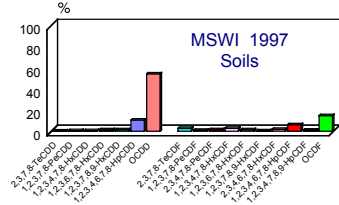
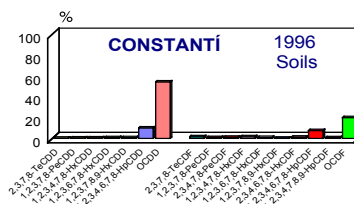
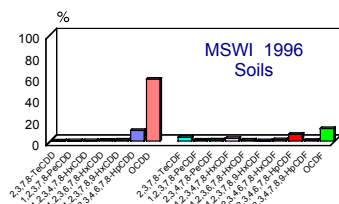
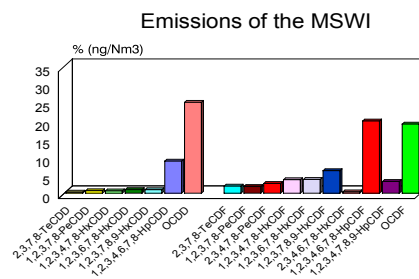


Fig. 3. Congener profiles of PCDD/Fs in soil samples collected near a MSWI and in a close area (Constantí) outside of the direct influence of the MSWI.

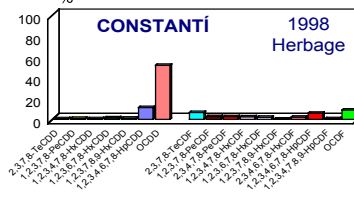
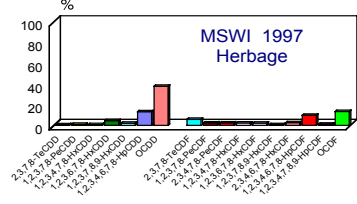
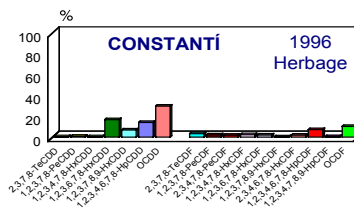
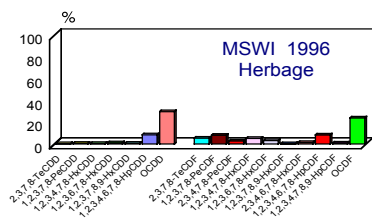


Fig. 4. Congener profiles of PCDD/Fs in herbage samples collected near a MSWI and in a close area (Constantí) outside of the direct influence of the MSWI.