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DETERMINATION OF PCDDs/PCDFs IN TECHNICAL GRADE PESTICIDES USED IN KOREA

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Introduction

As of 2001, a total of 435 pesticide actives were registered in Korea which have been increased nearly double number every 10 year since 1970s. On the other hand, total consumed amounts based on manufacturer's and formulator's gate have recorded around 24,000 M/T, which has reversely been decreased from the highest record of 27,000 M/T in 1991 by introducing the highly active pesticides with low dose.

Meanwhile, serious and continuous concern on dioxin contamination in food and environment from public have resulted in a strong suspicion that agricultural pesticides would impart one of the possible sources of the contamination.

In this regards, a brief monitoring of PCDDs/PCDFs in pesticide technical grade materials which are used to make practical formulations is required to elucidate the possible sources and to establish a test guideline as well as standard operation procedure (SOP) for quantitative analysis of the toxicants.

This study was aimed to set up the SOP and to monitor the PCDDs/PCDFs level in one of the major pesticide technical grade material used in the country.

Materials and Methods

Sample

Ten technical grade pesticides having chloro-benzene moiety were selected among the registered pesticides in Korea.

Analytical Methods

The technicals 10g were finely ground, transferred to a pre-extracted cellulose thimble. The samples were spiked with fifteen ¹³C-labeled standards(Cambridge Isotope Laboratories, MA, USA) and extracted with Soxhlet extraction using toluene and hexane/methylene chloride(6:4) for

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12hours, according as the solubility of technical grade pesticides. The extract was partitioned using sulfuric acid, KOH solution. Washed extracts were dried through sodium sulfate and concentrated to 5ml and purified on a series of silica gel, alumina prior to instrumental analysis.

Instruments

Determinations were performed with Trace 2000 gas chromatograph interfaced with Finnigan MAT95XL mass spectrometer at resolution > 10,000 using DB-5MS capillary column (30m× 0.25 μm×0.1mm).

Results and Discussion

Table 1 showed the results for the concentration of PCDDs/DFs in tested technicals. The concentration were calculated as TEQ values by multiplying the corresponding international TEFs for each congener and under the concentration of limit of quantification were considered to zero. As technical grade pesticides have their own synthetic procedures, the PCDDs/DFs concentration levels were differentiate to manufacturing methods. Average concentration of PCDDs/DFs was 123.36 pg/g and I-TEQ concentration was 6.65 pg/g. In the pattern of conger distribution, TCDD which is most toxic congener, is not detected in all technicals. The total concentration of PCDDs is lower than PCDFs's. In synthetic procedure, the use of chloro substituted benzene at two position as starting material has more chance to produce PCDFs than others. PCDDs/DFs concentration in technical grade pesticide is lower than environmental source and further studies for understanding the PCDDs/DFs formation step in synthetic procedure is needed.

References

1. EPA method 1613 (1997)
2. Hoogerbrugge R., Djien Liem.A.K. (2000) Organohalogen compounds. 45. 13-15
3. KACIA (2000) Agrochemical Year Book

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Table 1. Total and I-TEQ concentration of PCDDs/DFs in tested technicals

Technicals	(pg/g a.i.)					
	Total Concentration			I-TEQ concentration		
	PCDDs	PCDFs	Total	PCDDs	PCDFs	Total
AC 1	0.56	9.20	9.76	0.28	0.25	0.53
AC 2	112.04	550.70	662.74	1.06	29.20	30.26
AC 3	1.46	21.76	23.22	0.07	2.25	2.32
AC 4	0.26	9.96	10.22	0.13	0.01	0.14
AC 5	-	-	-	-	-	-
AC 6	1.24	106.86	108.10	0.62	8.64	9.26
AC 7	14.84	262.36	277.20	2.33	10.86	13.19
AC 8	54.49	48.92	103.41	3.45	4.06	7.51
AC 9	16.32	22.65	38.97	1.91	1.43	3.34
AC10	5.88	8.68	14.56	0.01	0.01	0.02

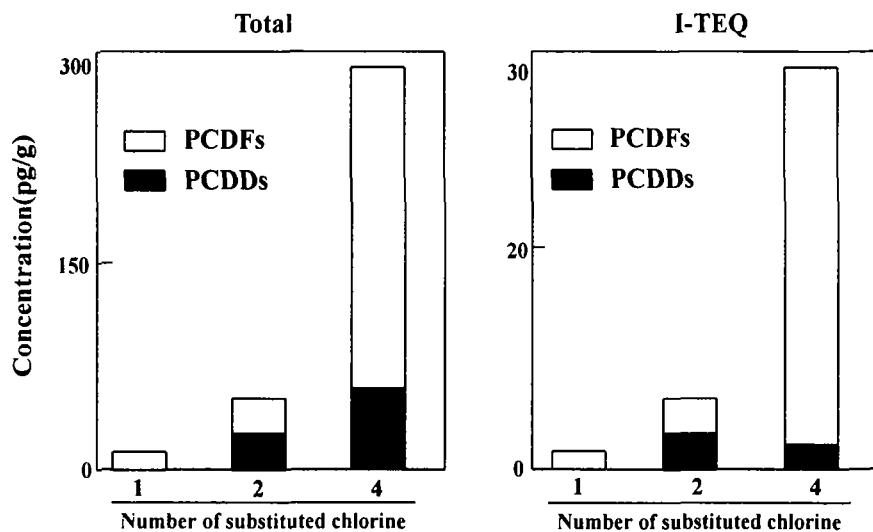


Fig.1. Average total and I-TEQ concentration of PCDDs/DFs depends on number of chlorine substituted