

Supplementary material

Development of an isotope dilution-liquid chromatography/tandem mass spectrometry method for the accurate determination of neonicotinoid pesticides, imidacloprid, clothianidin and thiamethoxam in kimchi cabbage reference materials

Table S1. Measurement results of the ID-LC/MS/MS method for imidacloprid from 10 bottles of kimchi cabbage reference materials

Bottle No.	Mass fraction			
j	C_j (mg/kg)	$u_{ran,j}$ (mg/kg)	$u_{sys,j}$ (mg/kg)	u_j (mg/kg)
1	0.864	0.0020 (0.23 %)	0.0072 (0.84 %)	0.0075 (0.87 %)
2	0.863	0.0018 (0.20 %)	0.0072 (0.84 %)	0.0074 (0.86 %)
3	0.865	0.0021 (0.24 %)	0.0072 (0.84 %)	0.0075 (0.87 %)
4	0.861	0.0025 (0.29 %)	0.0072 (0.84 %)	0.0076 (0.89 %)
5	0.866	0.0021 (0.24 %)	0.0073 (0.84 %)	0.0075 (0.87 %)
6	0.852	0.0015 (0.18 %)	0.0071 (0.84 %)	0.0073 (0.86 %)
7	0.855	0.0022 (0.26 %)	0.0072 (0.84 %)	0.0075 (0.88 %)
8	0.859	0.0028 (0.32 %)	0.0072 (0.84 %)	0.0077 (0.90 %)
9	0.859	0.0033 (0.38 %)	0.0072 (0.84 %)	0.0079 (0.92 %)
10	0.858	0.0018 (0.21 %)	0.0072 (0.84 %)	0.0074 (0.86 %)
Mean/Pool uncertainty	0.860	0.022 (0.26 %)	0.0072 (0.84 %)	0.0075 (0.88 %)
Standard deviation (SD_{bb})	0.004 (0.51 %, $\nu=9$)			
Combined Standard uncertainty	0.008 (0.98 %, $\nu=7$)			
Expanded uncertainty	0.020 (2.31 %, $k=2.37$ in 95 % confidence level)			

Table S2. Measurement results of the ID-LC/MS/MS method for clothianidin from 10 bottles of kimchi cabbage reference materials

Bottle No.	Mass fraction	$u_{ran,j}$ (mg/kg)	$u_{sys,j}$ (mg/kg)	u_j (mg/kg)
j	C_j (mg/kg)			
1	0.524	0.0013 (0.26 %)	0.0044 (0.84 %)	0.0046 (0.88 %)
2	0.524	0.0016 (0.30 %)	0.0044 (0.84 %)	0.0047 (0.90 %)
3	0.525	0.0015 (0.29 %)	0.0044 (0.84 %)	0.0047 (0.89 %)
4	0.524	0.0020 (0.38 %)	0.0044 (0.84 %)	0.0048 (0.93 %)
5	0.526	0.0026 (0.50 %)	0.0044 (0.84 %)	0.0052 (0.98 %)
6	0.520	0.0020 (0.38 %)	0.0044 (0.84 %)	0.0048 (0.93 %)
7	0.524	0.0027 (0.51 %)	0.0044 (0.84 %)	0.0052 (0.99 %)
8	0.523	0.0006 (0.27 %)	0.0044 (0.84 %)	0.0046 (0.89 %)
9	0.526	0.0014 (0.12 %)	0.0044 (0.84 %)	0.0045 (0.85 %)
10	0.527	0.0017 (0.26 %)	0.0044 (0.84 %)	0.0047 (0.88 %)
Mean/Pool uncertainty	0.524	0.017 (0.26 %)	0.0044 (0.84 %)	0.0048 (0.88 %)
Standard deviation (SD_{bb})	0.0021(0.40 %, $\nu=9$)			
Combined Standard uncertainty	0.008 (0.98 %, $\nu=7$)			
Expanded uncertainty	0.012 (2.21 %, $k=2.37$ in 95 % confidence level)			

Table S3. Measurement results of the ID-LC/MS/MS method for thiamethoxam from 10 bottles of kimchi cabbage reference materials

Bottle No.	Mass fraction	$u_{ran,j}$ (mg/kg)	$u_{sys,j}$ (mg/kg)	u_j (mg/kg)
j	C_j (mg/kg)			
1	0.788	0.0029 (0.26 %)	0.0054 (0.69 %)	0.0062 (0.78 %)
2	0.790	0.0019 (0.30 %)	0.0054 (0.69 %)	0.0058 (0.73 %)
3	0.790	0.0026 (0.29 %)	0.0054 (0.69 %)	0.0060 (0.77 %)
4	0.785	0.0030 (0.38 %)	0.0054 (0.69 %)	0.0062 (0.79 %)
5	0.792	0.0027 (0.50 %)	0.0054 (0.69 %)	0.0061 (0.77 %)
6	0.782	0.0031 (0.38 %)	0.0054 (0.69 %)	0.0062 (0.77 %)
7	0.788	0.0022 (0.51 %)	0.0054 (0.69 %)	0.0059 (0.74 %)
8	0.786	0.0035 (0.27 %)	0.0054 (0.69 %)	0.0064 (0.82 %)
9	0.780	0.0014 (0.12 %)	0.0054 (0.69 %)	0.0055 (0.71 %)
10	0.786	0.0025 (0.26 %)	0.0054 (0.69 %)	0.0060 (0.76 %)
Mean/Pool uncertainty	0.787	0.026 (0.69 %)	0.0054 (0.69 %)	0.0060 (0.77 %)
Standard deviation (SD_{bb})	0.0036 (0.46 %, $\nu=9$)			
Combined Standard uncertainty	0.007 (0.98 %, $\nu=11$)			
Expanded uncertainty	0.014 (1.83 %, $k=2.20$ in 95 % confidence level)			

Fig. S1. Graphic illustration of measurement results of 10 bottles of kimchi cabbage reference materials (RM). Error bars are the expanded measurement uncertainties ($k \cdot u_j$) of the unit, where k is the coverage factor with the confidence level of 95 %, is ranging from 2.3 ~ 2.8 depending on data points.

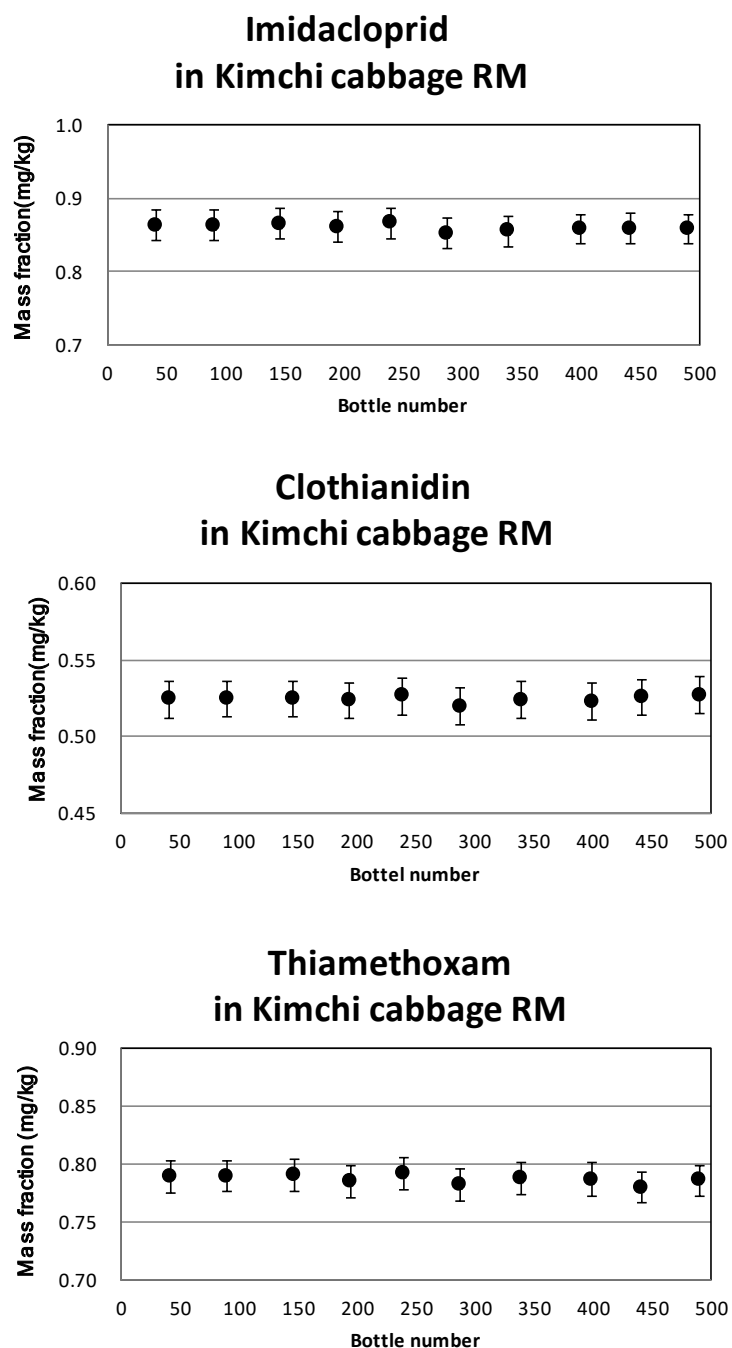


Fig. S2. Comparison of the measurement values at different time periods with the developed ID-LC/MS/MS method.

