

2016 SCIENTIFIC REPORT



MINISTRY OF FOOD AND DRUG SAFETY

National Institute
of Food and Drug Safety Evaluation

Risk Assessment of Diazinon

Diazinon is an organophosphorus pesticide, acaricide, and nematicide used against harmful insects in crops and soil, fleas or mites in animals, and nematodes in grass. In Korea, it was first registered for use in 1981 and is currently registered in emulsion, powder, and granule forms. The local MRL of diazinon is set at 0.02–0.3 mg/kg for 15 foodstuffs, such as potato and persimmon (MRLs for Pesticides in Foods, May 31, 2016).

Diazinon's key toxicity effect that appears after short- or long-term exposure is the inhibited activation of acetylcholinesterase, and no genetic toxicity or carcinogenic effect has been discovered. Its ADI is 0.0002 mg/kg bw/day, which was established by applying the safety factor of 100 (differences between species and individual entities) to the NOAEL of 0.02 mg/kg bw/day obtained from oral tests on beagles for 90 days and 1 year. In both tests, the NOAEL was set based on the results of inhibited activation of cholinesterase in red blood cells and the brain, the key toxic effects of diazinon.

The intake amount of diazinon was estimated based on the results of 2,082 samples of 52 foodstuffs, including rice, in the Monitoring of Agricultural Products in Korea (2011–2015) by the National Institute of Food and Drug Safety Evaluation. The results showed that diazinon was detected in seven samples in amounts below MRL, excluding one sample of chili pepper; the pesticide level was below the LOQ and was not detected in 99.7% of the samples. Concerning data lower than the LOQ, in case more than 60% of data were below the LOQ, estimation was made by applying 0 (non-detection) as the lower exposure limit or LOQ (upper exposure limit), according to the “evaluation of low level contamination of foods” recommended by the WHO. Food consumption was calculated through SAS 9.4 using the tertiary food code data from the KNHANES conducted for five years (2010–2014). For the

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average weight of all age groups, 60 kg, the weight currently (as of 2016) applied for establishment and revision of pesticide residue standards, was used. Concerning the average weights of different age groups, the data from KNHANES was used, applying 12.3, 19.2, 37.4, 59.5, 65, and 58.3 kg to the 1–2 year group, 3–6 year group, 7–12 year group, 13–19 year group, 20–64 year group, and the group aged 65 years or older, respectively. Risk characterization was made by calculating the HI in consideration of the EDI calculated in the exposure assessment and the ADI, the safe level of human exposure.

In general, when HI is 1 or higher, adverse effects of toxicity may be expected, and when HI is lower than 1, adverse effects are not expected. The results of the risk assessment of diazinon in different age groups revealed HI between 0.012 (non-detection data, 0 applied) and 0.330 (non-detection data LOQ applied), as shown in the table below, and that its concentration is within the safe level of human exposure.

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Table 1. ADI and HI of diazinon

Age	EDI (mg/person/day)		Average weight (kg)	EDI (mg/kg bw/day)		ADI (mg/kg bw/day)	HI	
	0	LOQ (mg/kg)		0	LOQ (mg/kg)		0	LOQ (mg/kg)
All	0.3×10^{-3}	1.9×10^{-3}	60	0.1×10^{-4}	0.3×10^{-4}	0.0002	0.026	0.155
1-2	0.3×10^{-4}	0.8×10^{-3}	12.3	0.2×10^{-5}	0.1×10^{-3}		0.012	0.330
3-6	0.1×10^{-3}	1.1×10^{-3}	19.2	0.3×10^{-5}	0.1×10^{-3}		0.017	0.280
7-12	0.2×10^{-3}	1.4×10^{-3}	37.4	0.4×10^{-5}	0.4×10^{-4}		0.021	0.181
13-19	0.2×10^{-3}	1.6×10^{-3}	59.5	0.4×10^{-5}	0.3×10^{-4}		0.020	0.132
20-64	0.4×10^{-3}	2.0×10^{-3}	65.0	0.1×10^{-4}	0.3×10^{-4}		0.028	0.157
≥ 65	0.2×10^{-3}	1.7×10^{-3}	58.3	0.4×10^{-5}	0.3×10^{-4}		0.020	0.149

Key words: Diazinon, Risk Assessment, Organophosphorus insecticide, ADI, Monitoring, Pesticide