Pesticide residues in food 2007

Evaluations
Part I – Residues

Sponsored jointly by FAO and WHO

Joint meeting of the
FAO Panel of Experts on Pesticide Residues in Food and the Environment
and the
WHO Core Assessment Group
Geneva, Switzerland, 18–27 September 2007
Monographs containing summaries or residue data and toxicological data considered at the 2007 JMPR, together with recommendations, are available upon request from FAO or WHO under the title:

**Pesticide residues in food 2007**
**Evaluations**
**Part I: Residues**
FAO Plant Production and Protection Paper

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INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY

The preparatory work for the toxicological evaluation of pesticide residues carried out by the WHO Expert Group on Pesticide Residues for consideration by the FAO/WHO Joint Meeting on Pesticide Residues in Food and the Environment is actively supported by the International Programme on Chemical Safety (IPCS). IPCS is a joint venture of the United Nations Environment Programme, the International Labour Organization and the World Health Organization. One of the main objectives of IPCS is to carry out and disseminate evaluations of the effects of chemicals on human health and the quality of the environment.


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* New compound.

** Evaluated for the Periodic Review Programme of the Codex Committee on Pesticide Residues.
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GENEVA, 18–27 SEPTEMBER 2007

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ABBREVIATIONS

(Well-known abbreviations in general use are not included. Specific abbreviations for pesticide degradation products, etc., may be used in the monographs and these are either identified where first used or in a table within the monograph. Two-letter codes for pesticide formulations are given in the Manual on development and use of FAO and WHO specifications for pesticides, 1st Ed., FAO Plant Production and Protection Paper 173, FAO, Rome, 2002.)

AChE anti-acetylcholinesterase
ACN acetonitrile
ADI acceptable daily intake
AFID alkali flame-ionization detection or detector (equivalent to TSD, forerunner of NPD)
ai active ingredient
AR Applied radioactivity
ARfD acute reference dose
AUC area under the curve for concentration–time

BBCH Biologische Bundesanstalt, Bundessortenamt and Chemical industry.
bw body weight

CA Chemical Abstracts
CAC Codex Alimentarius Commission
CAS Chemical Abstracts Services
CCN Codex classification number (for compounds or commodities)
CCPR Codex Committee on Pesticide Residues
CCRVDF Codex Committee on Residue of Veterinary Drugs in Food
CEC cation exchange capacity
CI chemical ionization
CV coefficient of variation (RSD)
CXL Codex Maximum Residue Limit (Codex MRL). See MRL

d days
DAT days after (last) treatment
DCM dichloromethane
DFG Deutsche Forschungsgemeinschaft
DT$_{50}$ time for 50% decomposition (i.e., half-life)
DT$_{90}$ time for 90% decomposition
2D-TLC two dimensional thin layer chromatography
dw dry weight

ECD electron capture detection or detector
EI electron-impact (ionization), now more usually electron ionization
EPA Environmental Protection Agency (usually US EPA)
eq residue expressed as ai equivalent

F$_1$ first filial generation
F$_2$ second filial generation
FAO Food and Agriculture Organization of the United Nations
FID flame-ionization detection or detector
FPD flame-photometric detection or detector

GAP good agricultural practice(s)
GC gas chromatography; the detector system used is usually also abbreviated as a suffix
GC-ECD gas chromatography with electron capture detection
GC-FID  gas chromatography with flame ionisation detection
GC-MS  gas chromatography with mass spectrometric detection
GC-NPD  gas chromatography with nitrogen phosphorus specific detection, also called alkali-metal doped flame ionisation detection (alkali FID) or thermionic ionisation detection (TID) or thermionic specific detector (TSD)
GEMS/Food  Global Environment Monitoring System–Food Contamination Monitoring and Assessment Programme
GLP  good laboratory practice (i.e., the defined system, not in the general sense)
GPC  gel-permeation chromatography
GSH  glutathione
HPLC  high-performance liquid chromatography
HPLC-MS  high-performance liquid chromatography – mass spectrometry
HPLC-UV  high-performance liquid chromatography with UV absorption detection
h  hour
HR  highest residue in the edible portion of a commodity found in trials used to estimate a maximum residue level in the commodity
HR-P  highest residue in a processed commodity calculated by multiplying the HR of the raw commodity by the corresponding processing factor
IARC  International Agency for Research on Cancer
IEDI  international estimated daily intake
IESTI  international estimate of short-term dietary intake
IPCS  International Programme on Chemical Safety
IR  infrared spectroscopy
ITD  ion-trap detector or detection
IUPAC  International Union of Pure and Applied Chemistry
JECFA  Joint Expert Committee on Food Additives
JMPR  Joint Meeting on Pesticide Residues
JMPS  Joint FAO/WHO Meeting on Pesticide Specifications
LC  liquid chromatography
LC-MS  liquid chromatography – mass spectrometry
LC_{50}  median lethal concentration
LD_{50}  median lethal dose
LOAEL  lowest-observed-adverse-effect level
LOAEC  lowest-observed-adverse-effect concentration
LOD  limit of detection
LOQ  limit of quantification
LSC  liquid scintillation counting or counter
M  molar = mole/L
MID  multiple ion detection (mass spectrometric)
MRL  Maximum Residue Limit. MRLs include draft MRLs and Codex MRLs (CXLs). The MRLs recommended by the JMPR on the basis of its estimates of maximum residue levels enter the Codex procedure as draft MRLs. They become Codex MRLs when they have passed through the procedure and have been adopted by the Codex Alimentarius Commission.
MS  mass spectrometry or mass spectrometric detector (suffix to GC- or LC-)
MSD  mass-selective detection or detector
MS/MS  tandem mass spectrometry
NOAEL  no-observed-adverse-effect level
NMR  nuclear magnetic resonance
NPD  nitrogen/phosphorus detector
OECD Organization for Economic Co-operation and Development
om amount of organic matter in soil
PES post extracted solids
PF  processing factor
PHI pre-harvest interval
ppm parts per million (used only with reference to the concentration of a pesticide in a diet, in all other contexts the terms mg/kg or mg/l are used)

P_{\text{ow}} octanol–water partition coefficient
RAC raw agricultural commodity
r.d. relative density (formerly called specific gravity)
RfD reference dose (usually in phrase “acute RfD”)
RSD precision under repeatability conditions (measurements within one day or one run) expressed as relative standard deviation (= coefficient of variation)
SD  standard deviation
SPE solid-phase extraction (may also describe a post-extraction clean-up process)
STMR supervised trials median residue
STMR-P supervised trials median residue in a processed commodity calculated by multiplying the STMR of the raw commodity by the corresponding processing factor

\text{t} tonne (metric ton)
TAR total applied (or administered) radioactivity
TLC thin-layer chromatography
TRR total radioactive residue
TMDI theoretical maximum daily intake
TSD thermionic specific detection or detector (equivalent to AFID, forerunners of NPD)
USDA US Department of Agriculture
US FDA US Food and Drug Administration
UV ultraviolet (radiation)
UV-VIS absorption spectrometry in ultraviolet and visible part of the spectrum

W the previous recommendation is withdrawn, or withdrawal of the existing Codex or draft MRL is recommended
WHO World Health Organization
Most of the summaries and evaluations contained in this report are based on unpublished proprietary data submitted for use by JMPR in making its assessments. A registration authority should not grant a registration on the basis of an evaluation unless it has first received authorization for such use from the owner of the data submitted for the JMPR review or has received the data on which the summaries are based, either from the owner of the data or from a second party that has obtained permission from the owner of the data for this purpose.
INTRODUCTION

The Report of the Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group (JMPR), held in Geneva, 18-27 September 2007, contains a summary of the evaluations of residues in foods of the various pesticides considered, as well as information on the general principles followed by the Meeting (JMPR, 2007). The present document contains summaries of the residues data considered, together with the recommendations made.

The Evaluations are issued in two parts:
Part I: Residues (by FAO);
Part II: Toxicology (by WHO).

For those interested in both aspects of pesticide evaluation, both parts and the Report containing summaries of residues and toxicological considerations are available.

Some of the compounds considered at the Meeting were previously evaluated and reported on in earlier publications. In general, only new information is summarized in the relevant monographs but reference is made to previously published evaluations, which should also be consulted. In the case of older compounds which are re-evaluated as part of the periodic review programme of the CCPR, a review of all available data, including data which may have previously been submitted, is carried out. Compounds evaluated for the first time are indicated by a single asterisk and those evaluated in the CCPR periodic review programme by double asterisks in the Table of Contents.

Summaries of recommended MRLs, STMR and HR levels and assessments of dietary intake, are published as Annexes 1, 3 and 4 in the Report, and reference is made to this report.

The name of the compound appearing as the title of each monograph is followed by its Codex Classification Number in parentheses.

Acknowledgements
The monographs in these Evaluations were prepared by the following participants in the 2007 JMPR, for the FAO Panel of Experts on Pesticide Residues in Food and the Environment:

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Note. Any comment on residues in food and their evaluation should be addressed to the:

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