



Food and Agriculture
Organization of the
United Nations



World Health
Organization

FAO
PLANT
PRODUCTION
AND PROTECTION
PAPER

231

Pesticide residues in food 2016

**Joint FAO/WHO Meeting
on Pesticide Residues**

EVALUATIONS

2016

PART I - RESIDUES

Pesticide residues in food 2016

Evaluations Part I - Residues

**FAO
PLANT
PRODUCTION
AND PROTECTION
PAPER**

231

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
Rome, Italy 13-22 September 2016

**WORLD HEALTH ORGANIZATION
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2017**

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) or of the World Health Organization (WHO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these are or have been endorsed or recommended by FAO or WHO in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters. All reasonable precautions have been taken by FAO and WHO to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall FAO and WHO be liable for damages arising from its use. The views expressed herein are those of the authors and do not necessarily represent those of FAO or WHO.

ISBN 978-92-5-109678-9

© FAO and WHO, 2017

FAO and WHO encourage the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, provided that appropriate acknowledgement of FAO and WHO as the source and copyright holder is given and that FAO and WHO's endorsement of users' views, products or services is not implied in any way.

All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via www.fao.org/contact-us/licence-request or addressed to copyright@fao.org.

FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org

Contents

List of participants	iv
Abbreviations	vii
Use of JMPR reports and evaluations by registration authorities	xi
Introduction	xiii
ACIBENZOLAR-S-METHYL (288)	1
BENZOVIDIFLUPYR (261)	145
BIXAFEN (262)	257
BUPROFEZIN (173)	273
CHLORANTRANILIPROLE (230)	281
DELTAMETHRIN (135)	301
DIMETHOMORPH (225)	313
FIPRONIL (202)	323
FLUAZIFOP-P-BUTYL (283)	331
FLUENSULFONE (265)	997
FLUPYRADIFURONE (285)	1055
IMAZETHAPYR (289)	1417
ISOFETAMID (290)	1535
METHOPRENE (147)	1619
METRAFENONE (278)	1623
OXATHIPIPROLIN (291)	1649
PENCONAZOLE (182)	1811
PINOXADEN (293)	1901
SAFLUFENACIL (251)	2037
SPIROMESIFEN (294)	2083
SULFOXAFLOL (252)	2261
TEFLUBENZURON (190)	2293
TOLFENPYRAD (269)	2395

LIST OF PARTICIPANTS**2016 Joint FAO/WHO Meeting on Pesticide Residues****Rome, 15–22 SEPTEMBER 2016**

- Dr Michael Doherty, Office of Pesticide Programs, Health Effects Division, Risk Assessment Branch II, United States Environmental Protection Agency, Washington, DC 20460, USA (*FAO Expert*)
- Dr Paul Humphrey, Scientific Assessment and Chemical Review Program, Australian Pesticides and Veterinary Medicines Authority (APVMA), Canberra, Australia (*FAO Expert*)
- Mr Makoto Irie, Plant Products Safety Division, Food Safety and Consumer Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8950, Japan (*FAO Expert*)
- Professor Mi-Gyung Lee, Department of Food Science & Biotechnology, College of Natural Science, Andong National University, #1375 Gyeongdong-ro, Andong-si, Gyeongsangbuk-do 36729, Republic of Korea (*FAO Expert*)
- Mr David Lunn, Principal Adviser (Residues), Plants, Food & Environment Directorate, Ministry for Primary Industries, PO Box 2526, Wellington, New Zealand (*FAO Member*)
- Dr Dugald MacLachlan, Australian Government Department of Agriculture and Water Resources, GPO Box 858, Canberra, ACT 2601, Australia (*FAO Chairman*)
- Dr Farag Mahmoud Malhat, Central Agricultural Pesticide Laboratory, Pesticide Residues, Environmental Pollution Department, 7-Nadi El-Saad Street, Dokki, Giza 12618, Egypt (*FAO Expert*)
- Dr Samuel Margerison, Residues and Trade Section, Scientific Assessment and Chemical Review Program, Australian Pesticides and Veterinary Medicines Authority (APVMA), Canberra, Australia (*FAO Expert*)
- Mr Christian Sieke, Residue Assessment of Pesticides and Biocides Unit, Department of Chemicals Safety, Federal Institute for Risk Assessment, Max-Dohrn-Strasse 8-10, D-10589 Berlin, Germany (*FAO Member*)
- Dr Canping Pan, Department of Applied Chemistry, College of Science, China Agricultural University, China (*FAO Expert*)
- Ms Monique Thomas, Pest Management Regulatory Agency, Health Canada, 2720 Riverside Drive, Ottawa, Ontario, Canada K1A 0K9 (*FAO Expert*)
- Mrs Trijntje van der Velde-Koerts, Centre for Nutrition, Prevention and Health Services (VPZ), National Institute for Public Health and the Environment (RIVM), Antonie van Leeuwenhoeklaan 9, PO Box 1, 3720 BA Bilthoven, the Netherlands (*FAO Member*)
- Dr Yukiko Yamada, Ministry of Agriculture, Forestry and Fisheries, 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8950, Japan (*FAO Member*)
- Dr Guibiao Ye, Institute for the Control of Agrochemicals, Ministry of Agriculture, Maizidian 22, Chaoyang District, Beijing 100125, China (*FAO Expert*)

Secretariat

Mr Kevin Bodnaruk, 26/12 Phillip Mall, West Pymble, NSW 2073, Australia (*FAO Editor*)

Ms Gracia Brisco, Food Standards Officer, Joint FAO/WHO Food Standards Programme, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Rome, Italy (*Codex Secretariat*)

Dr Ronald Eichner 13 Cruikshank Street, Wanniassa, ACT 2903, Australia (*FAO Editor*)

Dr Xiongwu Qiao, Shanxi Academy of Agricultural Sciences, 2 Changfeng Street, Taiyuan, Shanxi 030006, China (*CCPR Chairman*)

Ms Yong Zhen Yang, Plant Production and Protection Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Rome, Italy (*FAO JMPR Secretariat*)

ABBREVIATIONS

ADI	acceptable daily intake
ae	acid equivalent
ai	active ingredient
AR	applied radioactivity
ar	as received
ARfD	acute reference dose
asp gr fn	aspirated grain fraction
AU	Australia
BAM	2,6-dichlorobenzamide
BBCH	B iologischen Bundesanstalt, B undessortenamt und C hemische Industrie
bw	body weight
CA	Chemical Abstracts
CAC	Codex Alimentarius Commission
CAS	Chemical Abstracts Service
CCN	Codex classification number (for compounds or commodities)
CCPR	Codex Committee on Pesticide Residues
cGAP	Critical GAP
CXL	Codex MRL
DAA	Days after application
DALA	days after last application
DAP	days after planting
DAT	days after treatment
DM	dry matter
DT ₅₀	time required for 50% dissipation of the initial concentration
DT ₉₀	time required for 90% dissipation of the initial concentration
dw	dry weight
ECD	electron capture detector
EFSA	European Food Safety Authority
equiv	equivalent
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
fw	fresh weight
GAP	good agricultural practice
GC	gas chromatography
GC-ECD	gas chromatography with electron capture detection

GC/MS	gas chromatography/mass spectrometry
GC/MSD	gas chromatography/mass selective detector
GC-NPD	gas chromatography coupled with nitrogen-phosphorus detector
GEMS/Food	Global Environment Monitoring System – Food Contamination Monitoring and Assessment Programme
GLC	gas liquid chromatography
GLP	good laboratory practice
GPC	gel permeation chromatography
HPLC	high performance liquid chromatography
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
IEDI	international estimated daily intake
IESTI	international estimate of short-term dietary intake
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
JP	Japan
LC	liquid chromatography
LOD	limit of detection
log P_{ow}	octanol-water partition coefficient
LOQ	limit of quantification
MOA	mode of action
MRL	maximum residue limit
MS	mass spectrometry
MS/MS	tandem mass spectrometry
ND	non-detect - below limit of detection
OECD	Organisation for Economic Co-operation and Development
OP	organophosphorus compound
PBI	plant back interval
Pf	processing factor
PH	pre-harvest
PHI	pre-harvest interval
ppm	parts per million
QuEChERS	Quick, Easy, Cheap, Effective, Rugged, and Safe–Multiresidue pesticide analysis
RAC	raw agricultural commodity
RSD	relative standard deviation

RTI	re-treatment interval
SC	suspension concentrate
SL	soluble liquid
SPE	solid phase extraction
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
TAR	total administered radioactivity
TF	transfer factor
TLC	thin-layer chromatography
TRR	total radioactive residues
UK	United Kingdom
USA	United States of America
US/CAN	United States and Canada
USEPA	United States Environmental Protection Agency
WG	wettable granule
WHO	World Health Organization
WP	wettable powder

USE OF JMPR REPORTS AND EVALUATIONS BY REGISTRATION AUTHORITIES

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

A Joint Meeting of the Food and Agriculture Organization of the United Nations (FAO) Panel of Experts on Pesticide Residues in Food and the Environment and the World Health Organization (WHO) Core Assessment Group on Pesticide Residues (JMPR) was held at FAO Head-quarters, Rome (Italy), from 13 to 23 September 2016. The FAO Panel Members met in preparatory sessions from 8–12 September.

The Meeting was opened by Mr Bill Murray, Deputy Director, Plant Production and Protection Division (AGP), FAO. On behalf of FAO and WHO, Mr Murray welcomed and thanked the participants for providing their expertise and for devoting significant time and effort to the work of the JMPR. Mr Murray noted the important contribution of the JMPRs work in trade facilitation through the establishment of global standards for pesticide residues in food and feed, and in food safety via the published pesticide risk assessments, further underscoring the continued relevance of the JMPRs work.

Mr Murray also acknowledged the progress made by the JMPR in recent years in improving the transparency of its procedures and operational efficiencies while at the same time continuing to consider and incorporate new scientific principles and methodologies. He suggested the success of these efforts was demonstrated by the increasing importance and impact of the JMPRs work internationally. He highlighted recent examples such as the incorporation of JMPR Evaluations by national and regional regulatory authorities into their assessments; the increasing level of adoption by member countries of CODEX MRLs as recommended by JMPR; and the contribution of the JMPRs recent assessment of glyphosate to the global discussion on its continued use.

Mr Murray then suggested that perhaps the most significant example of JMPRs success was the continued and growing demand for JMPR assessments, with the number of compound nominations from member countries, through the Codex Committee on Pesticide Residues (CCPR), having increased by 70% from 2010 to 2015, while noting the constraints under which the JMPR operates.

During the meeting, the FAO Panel of Experts was responsible for reviewing residue and analytical aspects of the pesticides under consideration, including data on their metabolism, fate in the environment and use patterns, and for estimating the maximum levels of residues that might occur as a result of use of the pesticides according to good agricultural practice (GAP). Maximum residue levels and supervised trials median residue (STMR) values were estimated for commodities of animal origin. The WHO Core Assessment Group was responsible for reviewing toxicological and related data in order to establish acceptable daily intakes (ADIs) and acute reference doses (ARfDs), where necessary.

The Meeting evaluated 29 pesticides, including nine new compounds and three compounds that were re-evaluated within the periodic review programme of the CCPR, for toxicity or residues, or both.

The Meeting established ADIs and ARfDs, estimated maximum residue levels and recommended them for use by CCPR, and estimated STMR and highest residue (HR) levels as a basis for estimating dietary intake.

The Meeting also estimated the dietary exposures (both short-term and long-term) of the pesticides reviewed and, on this basis, performed dietary risk assessments in relation to their ADIs or ARfDs. Cases in which ADIs or ARfDs may be exceeded were clearly indicated in order to facilitate the decision-making process of CCPR. The rationale for methodologies for long- and short-term dietary risk assessment are described in detail in the FAO Manual on the submission and evaluation of pesticide residue data for the estimation of maximum residue levels in food and feed (2016).

The Meeting considered a number of current issues related to the risk assessment of chemicals, the evaluation of pesticide residues and the procedures used to recommend maximum residue levels.

The annual Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group on Pesticide Residues was held in Rome, Italy, from 13 to 23 September 2016. The FAO Panel of Experts had met in preparatory sessions from 08 to 12 September 2016. The Meeting was held in pursuance of recommendations made by previous Meetings and accepted by the governing bodies of FAO and WHO that studies should be undertaken jointly by experts to evaluate possible hazards to humans arising from the occurrence of pesticide residues in foods. During the meeting the FAO Panel of Experts was responsible for reviewing pesticide use patterns (use of good agricultural practices), data on the chemistry and composition of the pesticides and methods of analysis for pesticide residues and for estimating the maximum residue levels that might occur as a result of the use of the pesticides according to good agricultural use practices. The WHO Core Assessment Group was responsible for reviewing toxicological and related data and for estimating, where possible and appropriate, acceptable daily intakes (ADIs) and acute reference doses (ARfDs) of the pesticides for humans. This report contains information on ADIs, ARfDs, maximum residue levels, and general principles for the evaluation of pesticides. The recommendations of the Joint Meeting, including further research and information, are proposed for use by Member governments of the respective agencies and other interested parties.