

Pesticide residues in food 2011

Joint FAO/WHO Meeting
on Pesticide Residues

FAO
PLANT
PRODUCTION
AND PROTECTION
PAPER

212

**EVALUATIONS
2011**

PART I - RESIDUES



World Health
Organization



Food and Agriculture
Organization of
the United Nations

Pesticide residues in food 2011

Evaluations

Part I - Residues

FAO
PLANT
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212

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 20-29 September 2011

Monographs containing summaries or residue data and toxicological data considered at the 2011 JMPR, together with recommendations, are available upon request from FAO or WHO under the title:

Pesticide residues in food 2011

Evaluations

Part I: Residues

FAO Plant Protection Paper 212

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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).

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CONTENTS

	pages
List of participants	v
ABBREVIATIONS	viii
USE OF JMPR REPORTS AND EVALUATIONS BY REGISTRATION AUTHORITIES	xiii
INTRODUCTION	xv
ACEPHATE (095) AND METHAMIDIPHOS (100).....	1
ACETAMIPRID (246) ²	27
AZOXYSTROBIN (229)	135
CLOTHIANIDIN (238) / THIAMETHOXAM (245).....	151
CYPERMETHRINS (including alpha- and zeta-cypermethrin) (118).....	159
DICAMBA (240).....	195
DIFLUBENZURON (130).....	205
EMAMECTIN BENZOATE (247) ²	231
ETOFENPROX (184) ¹	405
FLUTRIAFOL (248) ²	501
GLYPHOSATE (158) AND METABOLITES	619
HEXYTHIAZOX (176).....	710
ISOPYRAZAM (249) ²	727
PROFENOFOS (171).....	873
PROPYLENE OXIDE (250) ²	877
PYRACLOSTROBIN (210).....	905
SAFLUFENACIL (251) ²	1089
SPINOSAD (203)	1193
SPIROTETRAMAT (234).....	1221
SULFOXAFLOL (252) ²	1271
TEBUCONAZOLE (189) ¹	1419
THIAMETHOXAM (245).....	1615
Annex 1: Previous WHO and FAO Documents	1619

^{1/} Evaluated for the Periodic Review Programme of the Codex Committee on Pesticide Residues.

^{2/} New compound.

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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	acetylcholinesterase
ACTH	adrenocorticotropic hormone
ADI	acceptable daily intake
ae	acid equivalent
ai	active ingredient
ALT	alanine aminotransferase
AMPA	aminomethylphosphonic acid
AP	alkaline phosphatase
AR	applied radioactivity
ARe	androgen receptor
ARfD	acute reference dose
asp gr fn	aspirated grain fraction
AST	aspartate aminotransferase
AU	Australia
BBCH	B iologischen Bundesanstalt, B undessortenamt und C hemische Industrie
BMD	benchmark dose
BMDL	lower limit on the benchmark dose
BROD	benzyloxyresorufin- <i>O</i> -dealkylase
bw	body weight
CAC	Codex Alimentarius Commission
CAR	constitutive androstane receptor
CAS	Chemical Abstracts Service
CCN	Codex classification number (for compounds or commodities)
CCPR	Codex Committee on Pesticide Residues
ChE	cholinesterase
C_{\max}	maximum concentration
CXL	Codex MRL
CYP	cytochrome P450
DAP	days after planting
DAT	days after treatment

DCSA	3,6-dichlorosalicylic acid
DDT	dichlorodiphenyltrichloroethane
DM	dry matter
DM-PCA	3-trifluoromethyl-1H-pyrazole-4-carboxylic acid
DNA	deoxyribonucleic acid
DT ₅₀	time required for 50% dissipation of the initial concentration
dw	dry weight
ECD	electron capture detector
EC ₅₀	the concentration of agonist that elicits a response that is 50% of the possible maximum
EPO	early post-emergence
EPSPS	5-enolpyruvylshikimate-3-phosphate synthase
ER	estrogen receptor
EROD	ethoxyresorufin- <i>O</i> -deethylase
EtOAc	ethyl acetate
EU	European Union
F ₀	parental generation
F ₁	first filial generation
F ₂	second filial generation
FAO	Food and Agriculture Organization of the United Nations
FPD	flame photometric detector
fw	fresh weight
GAP	good agricultural practice
<i>GAT</i>	glyphosate-N-acetyltransferase
GC	gas chromatography
GC-ECD	gas chromatography with electron capture detection
GC-FPD	gas chromatography with flame photometric detection
GC/MS	gas chromatography/mass spectrometry
GC/TSD	gas chromatography with thermionic sensitive detection
GD	gestation day
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
IPCS	International Programme on Chemical Safety
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
JECFA	Joint FAO/WHO Expert Committee on Food Additives
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
JMPS	Joint FAO/WHO Meeting on Pesticide Specifications
JP	Japan
LC	liquid chromatography
LC ₅₀	median lethal concentration
LD ₅₀	median lethal dose
LH	luteinizing hormone
LHR	luteinizing hormone receptor
LOAEC	lowest-observed-adverse-effect concentration
LOAEL	lowest-observed-adverse-effect level
LOD	limit of detection
LOQ	limit of quantification
LPO	late post-emergence
MFO	mixed-function oxidase
MG	methylguanidine
MOA	mode of action
MRL	maximum residue limit; maximum residue level
MS	mass spectrometry
MS/MS	tandem mass spectrometry
nAChR	nicotinic acetylcholine receptor
NOAEC	no-observed-adverse-effect concentration
NOAEL	no-observed-adverse-effect level
NOEL	no-observed-effect level
NPD	nitrogen phosphorous detector
NTE	neuropathy target esterase
OECD	Organisation for Economic Co-operation and Development
PAM	1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide
PBI	plant back interval
PCA	1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxylic acid

Pf	processing factor
PH	pre-harvest
PHI	pre-harvest interval
ppm	parts per million
PRE	pre-emergence
PROD	pentoxyresorufin- <i>O</i> -deethylase
PXR	pregnane X receptor
RAC	raw agricultural commodity
RSD	relative standard deviation
RTI	re-treatment interval
SC	suspension concentrate
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
T ₃	triiodothyronine
T ₄	thyroxine
T _{max}	time to reach maximum concentration
TAR	total administered radioactivity
TF	transfer factor
TLC	thin-layer chromatography
TRIS	tris(hydroxymethyl)aminomethane
TRR	total radioactive residues
UGT	uridine diphosphate glucuronosyltransferase
UK	United Kingdom
USA	United States of America
US/CAN	United States and Canada
US-FDA	USA – Food and Drug Administration
WG	wettable granule
WHO	World Health Organization

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

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, 20–29 September 2011, 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, 2011). 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 summarised 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.

References to previous Reports and Evaluations of Joint Meetings are listed in Annex I.

Acknowledgements

The monographs in these Evaluations were prepared by the following participants in the 2011 JMPR, for the FAO Panel of Experts on Pesticide Residues in Food and the Environment:

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JMPR, 2011. Pesticide residues in Food – 2011. 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 on Pesticide Residues, Geneva, Switzerland, 20-29 September 2011. WHO and FAO, Rome, 2011.

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1	Horticulture: a select bibliography, 1976 (E)	26	Pesticide residues in food 1980 – Report, 1981 (E F S)
2	Cotton specialists and research institutions in selected countries, 1976 (E)	26 Sup.	Pesticide residues in food 1980 – Evaluations, 1981 (E)
3	Food legumes: distribution, adaptability and biology of yield, 1977 (E F S)	27	Small-scale cash crop farming in South Asia, 1981 (E)
4	Soybean production in the tropics, 1977 (C E F S)	28	Second expert consultation on environmental criteria for registration of pesticides, 1981 (E F S)
4 Rev.1	Soybean production in the tropics (first revision), 1982 (E)	29	Sesame: status and improvement, 1981 (E)
5	Les systèmes pastoraux sahéliens, 1977 (F)	30	Palm tissue culture, 1981 (C E)
6	Pest resistance to pesticides and crop loss assessment – Vol. 1, 1977 (E F S)	31	An eco-climatic classification of intertropical Africa, 1981 (E)
6/2	Pest resistance to pesticides and crop loss assessment – Vol. 2, 1979 (E F S)	32	Weeds in tropical crops: selected abstracts, 1981 (E)
6/3	Pest resistance to pesticides and crop loss assessment – Vol. 3, 1981 (E F S)	32 Sup.1	Weeds in tropical crops: review of abstracts, 1982 (E)
7	Rodent pest biology and control – Bibliography 1970-74, 1977 (E)	33	Plant collecting and herbarium development, 1981 (E)
8	Tropical pasture seed production, 1979 (E F** S**)	34	Improvement of nutritional quality of food crops, 1981 (C E)
9	Food legume crops: improvement and production, 1977 (E)	35	Date production and protection, 1982 (Ar E)
10	Pesticide residues in food, 1977 – Report, 1978 (E F S)	36	El cultivo y la utilización del tarwi – <i>Lupinus mutabilis</i> Sweet, 1982 (S)
10 Rev.	Pesticide residues in food 1977 – Report, 1978 (E)	37	Pesticide residues in food 1981 – Report, 1982 (E F S)
10 Sup.	Pesticide residues in food 1977 – Evaluations, 1978 (E)	38	Winged bean production in the tropics, 1982 (E)
11	Pesticide residues in food 1965-78 – Index and summary, 1978 (E F S)	39	Seeds, 1982 (E/F/S)
12	Crop calendars, 1978 (E/F/S)	40	Rodent control in agriculture, 1982 (Ar C E F S)
13	The use of FAO specifications for plant protection products, 1979 (E F S)	41	Rice development and rainfed rice production, 1982 (E)
14	Guidelines for integrated control of rice insect pests, 1979 (Ar C E F S)	42	Pesticide residues in food 1981 – Evaluations, 1982 (E)
15	Pesticide residues in food 1978 – Report, 1979 (E F S)	43	Manual on mushroom cultivation, 1983 (E F)
15 Sup.	Pesticide residues in food 1978 – Evaluations, 1979 (E)	44	Improving weed management, 1984 (E F S)
16	Rodenticides: analyses, specifications, formulations, 1979 (E F S)	45	Pocket computers in agrometeorology, 1983 (E)
17	Agrometeorological crop monitoring and forecasting, 1979 (C E F S)	46	Pesticide residues in food 1982 – Report, 1983 (E F S)
18	Guidelines for integrated control of maize pests, 1979 (C E)	47	The sago palm, 1983 (E F)
19	Elements of integrated control of sorghum pests, 1979 (E F S)	48	Guidelines for integrated control of cotton pests, 1983 (Ar E F S)
20	Pesticide residues in food 1979 – Report, 1980 (E F S)	49	Pesticide residues in food 1982 – Evaluations, 1983 (E)
20 Sup.	Pesticide residues in food 1979 – Evaluations, 1980 (E)	50	International plant quarantine treatment manual, 1983 (C E)
21	Recommended methods for measurement of pest resistance to pesticides, 1980 (E F)	51	Handbook on jute, 1983 (E)
22	China: multiple cropping and related crop production technology, 1980 (E)	52	The palmyrah palm: potential and perspectives, 1983 (E)
23	China: development of olive production, 1980 (E)	53/1	Selected medicinal plants, 1983 (E)
24/1	Improvement and production of maize, sorghum and millet – Vol. 1. General principles, 1980 (E F)	54	Manual of fumigation for insect control, 1984 (C E F S)
24/2	Improvement and production of maize, sorghum and millet – Vol. 2. Breeding, agronomy and seed production, 1980 (E F)	55	Breeding for durable disease and pest resistance, 1984 (C E)
25	<i>Prosopis tamarugo</i> : fodder tree for arid zones, 1981 (E F S)	56	Pesticide residues in food 1983 – Report, 1984 (E F S)
		57	Coconut, tree of life, 1984 (E S)
		58	Economic guidelines for crop pest control, 1984 (E F S)
		59	Micropropagation of selected rootcrops, palms, citrus and ornamental species, 1984 (E)
		60	Minimum requirements for receiving and maintaining tissue culture propagating material, 1985 (E F S)
		61	Pesticide residues in food 1983 – Evaluations, 1985 (E)

62	Pesticide residues in food 1984 – Report, 1985 (E F S)	93/1	Pesticide residues in food 1988 – Evaluations – Part I: Residues, 1988 (E)
63	Manual of pest control for food security reserve grain stocks, 1985 (C E)	93/2	Pesticide residues in food 1988 – Evaluations – Part II: Toxicology, 1989 (E)
64	Contribution à l'écologie des aphides africains, 1985 (F)	94	Utilization of genetic resources: suitable approaches, agronomical evaluation and use, 1989 (E)
65	Amélioration de la culture irriguée du riz des petits fermiers, 1985 (F)	95	Rodent pests and their control in the Near East, 1989 (E)
66	Sesame and safflower: status and potentials, 1985 (E)	96	Striga – Improved management in Africa, 1989 (E)
67	Pesticide residues in food 1984 – Evaluations, 1985 (E)	97/1	Fodders for the Near East: alfalfa, 1989 (Ar E)
68	Pesticide residues in food 1985 – Report, 1986 (E F S)	97/2	Fodders for the Near East: annual medic pastures, 1989 (Ar E F)
69	Breeding for horizontal resistance to wheat diseases, 1986 (E)	98	An annotated bibliography on rodent research in Latin America 1960-1985, 1989 (E)
70	Breeding for durable resistance in perennial crops, 1986 (E)	99	Pesticide residues in food 1989 – Report, 1989 (E F S)
71	Technical guideline on seed potato micropropagation and multiplication, 1986 (E)	100	Pesticide residues in food 1989 – Evaluations – Part I: Residues, 1990 (E)
72/1	Pesticide residues in food 1985 – Evaluations – Part I: Residues, 1986 (E)	100/2	Pesticide residues in food 1989 – Evaluations – Part II: Toxicology, 1990 (E)
72/2	Pesticide residues in food 1985 – Evaluations – Part II: Toxicology, 1986 (E)	101	Soilless culture for horticultural crop production, 1990 (E)
73	Early agrometeorological crop yield assessment, 1986 (E F S)	102	Pesticide residues in food 1990 – Report, 1990 (E F S)
74	Ecology and control of perennial weeds in Latin America, 1986 (E S)	103/1	Pesticide residues in food 1990 – Evaluations – Part I: Residues, 1990 (E)
75	Technical guidelines for field variety trials, 1993 (E F S)	104	Major weeds of the Near East, 1991 (E)
76	Guidelines for seed exchange and plant introduction in tropical crops, 1986 (E)	105	Fundamentos teórico-prácticos del cultivo de tejidos vegetales, 1990 (S)
77	Pesticide residues in food 1986 – Report, 1986 (E F S)	106	Technical guidelines for mushroom growing in the tropics, 1990 (E)
78	Pesticide residues in food 1986 – Evaluations – Part I: Residues, 1986 (E)	107	Gynandropsis gynandra (L.) Briq. – a tropical leafy vegetable – its cultivation and utilization, 1991 (E)
78/2	Pesticide residues in food 1986 – Evaluations – Part II: Toxicology, 1987 (E)	108	Carambola cultivation, 1993 (E S)
79	Tissue culture of selected tropical fruit plants, 1987 (E)	109	Soil solarization, 1991 (E)
80	Improved weed management in the Near East, 1987 (E)	110	Potato production and consumption in developing countries, 1991 (E)
81	Weed science and weed control in Southeast Asia, 1987 (E)	111	Pesticide residues in food 1991 – Report, 1991 (E)
82	Hybrid seed production of selected cereal, oil and vegetable crops, 1987 (E)	112	Cocoa pest and disease management in Southeast Asia and Australasia, 1992 (E)
83	Litchi cultivation, 1989 (E S)	113/1	Pesticide residues in food 1991 – Evaluations – Part I: Residues, 1991 (E)
84	Pesticide residues in food 1987 – Report, 1987 (E F S)	114	Integrated pest management for protected vegetable cultivation in the Near East, 1992 (E)
85	Manual on the development and use of FAO specifications for plant protection products, 1987 (E** F S)	115	Olive pests and their control in the Near East, 1992 (E)
86/1	Pesticide residues in food 1987 – Evaluations – Part I: Residues, 1988 (E)	116	Pesticide residues in food 1992 – Report, 1993 (E F S)
86/2	Pesticide residues in food 1987 – Evaluations – Part II: Toxicology, 1988 (E)	117	Quality declared seed, 1993 (E F S)
87	Root and tuber crops, plantains and bananas in developing countries – challenges and opportunities, 1988 (E)	118	Pesticide residues in food 1992 – Evaluations – Part I: Residues, 1993 (E)
88	Jessenia and Oenocarpus: neotropical oil palms worthy of domestication, 1988 (E S)	119	Quarantine for seed, 1993 (E)
89	Vegetable production under arid and semi-arid conditions in tropical Africa, 1988 (E F)	120	Weed management for developing countries, 1993 (E S)
90	Protected cultivation in the Mediterranean climate, 1990 (E F S)	120/1	Weed management for developing countries, Addendum 1, 2004 (E F S)
91	Pastures and cattle under coconuts, 1988 (E S)	121	Rambutan cultivation, 1993 (E)
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