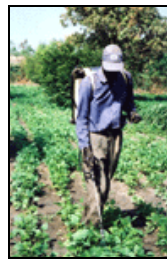


PAN International

List of

Highly Hazardous Pesticides

(PAN List of HHP)



This 'PAN International List of Highly Hazardous Pesticides'
has been drafted by Pesticide Action Network Germany
for 'Working Group 1: Pesticides & Corporations of
Pesticide Action Network International.

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About this publication

For decades, the distribution and use of hazardous pesticides is an issue of concern. Since its founding in 1982, Pesticide Action Network (PAN) has been the civil society organisation (CSO) most steadily and continuously calling for effective international action towards the elimination of hazardous pesticides. And PAN has been one of the key driving forces among non governmental organisations (NGOs) for improving plant protection policies towards safer, socially just and economically viable pest management systems.

In 1985, the “Code of Conduct on the Distribution and Use of Pesticides” was adopted by FAO to respond to the growing evidence of risks associated with the use of pesticides. Already this first version of the Code indirectly questioned the “safe use” concept as an overall approach to solve pesticide related problems, as it says in Article 5.2.3 that industry should halt sale and recall products when handling or use pose an unacceptable risk under any use directions or restrictions. And since the 1980th a number of international instruments and guidelines have been adopted¹ to tackle pesticide related problems. Additionally, many public and private initiatives have been implemented to reduce the adverse effects of pesticide use in agriculture. However, overall the initiatives have been successful only to a limited extent and the concept of a safe use of highly hazardous pesticides has been questioned increasingly by NGOs/CSOs, scientists, governmental representatives and in the private sector.

Meanwhile initiatives in food, forest and flower production and distribution chain resulted in black lists for some pesticides. In June 2008 the Agricultural Council of the European Union agreed on a common position regarding new rules for placing pesticides on the EU market and decided that substances proven to be carcinogenic, mutagenic or toxic for reproduction shall not be authorized in the EU.

In November 2006 the FAO Council discussed and endorsed SAICM, the Strategic Approach to International Chemicals Safety. In view of the broad range of activities envisaged within SAICM, the Council suggested that the activities of FAO could include **risk reduction, including the progressive ban on highly hazardous pesticides**, promoting good agricultural practices, ensuring environmentally sound disposal of stock-piles of obsolete pesticides and capacity-building in establishing national and regional laboratories.

In April 2007 the FAO Council informed COAG² of its intention to develop a new initiative for pesticide risk reduction. COAG welcomed the initiative to reduce risks associated with the use of hazardous pesticides including the progressive ban on highly hazardous pesticides.

In October 2007 the FAO Panel of Experts on Pesticide Management discussed the so-called thought starter “*Addressing Highly Toxic Pesticides (HTPs)*” with a note from the Secretariat explaining: “*Through this thought-starter FAO wishes to start its work on highly hazardous pesticides.*” (...) “*This thought-starter builds on the information document provided to COAG on pesticide risk reduction*”³. As a first step, this paper focuses on options for defining highly hazardous pesticides.” Based on this thought starter the Panel of Experts outlined criteria to identify highly hazardous pesticides (HHP, see Table 1). In addition, the Panel of Experts “recommended that FAO and WHO, as a first step, should prepare a list of HHPs based on the criteria identified, and update it periodically in cooperation with

¹ E.g. the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (<http://www.pic.int>), the Stockholm Convention on Persistent Organic Pollutants (<http://www.pops.int>) or the Strategic Approach to International Chemicals Management (<http://www.chem.unep.ch/saicm>)

² The FAO Committee on Agriculture (COAG) conducts periodic reviews and appraisals of agricultural and nutritional problems in order to propose concerted action by Member Nations and the Organization. It also reviews the agriculture and food and nutrition work programmes of the Organization and their implementation, with emphasis on the integration of all social, technical, economic, institutional and structural aspects in promoting agricultural and rural development. Its functions are enumerated in Rule XXXII of the General Rules of the Organization. Membership must be renewed formally each biennium.

³ This document is available at: http://www.fao.org/unfao/bodies/coag/coag20/index_en.htm

UNEP. It further requested that such a list should be made widely known to all stakeholders involved in pesticide regulation and management.”⁴

PAN strongly welcomes these decisions made by the FAO Council, the COAG and the FAO/WHO Panel of Experts on Pesticide Management. PAN is of the opinion however, that the list of indicators accomplished by Panel of Experts has some important shortcomings; in particular pesticides with endocrine disrupting potencies, eco-toxicological properties, or inhalative toxicity have not been taken into account.

Because of these shortcomings, PAN International decided to independently develop a definition of “Highly Hazardous Pesticides” with a more comprehensive set of indicators and to achieve a list of HHP based on the PAN list of indicators.

This publication describes how PAN defines HHP by identifying the indicators. An explanation of the indicators is followed by a list of HHP on the basis of the indicators.

It is important to note that also the list of HHP presented in this publication is *still not complete*. There are several reasons for the limitations in completeness:

- A major reason is that the indicators used for the PAN definition of HHP are based on widely accepted classifications. Due to the time needed for achieving consented classifications these classifications do have shortcomings as explained in the text below.
- Correspondingly, there are “emerged priorities” e.g. pesticides with endocrine disrupting properties. Such properties are not sufficiently operationalised for pesticides as yet.
- Measures to identify substances of high environmental concern have been restricted to the application of consented criteria indicating ubiquitous environmental occurrence and hazardous properties for one ecosystem service. This means that internationally consented criteria on ecological risks e.g. for aquatic or terrestrial species have not been considered.
- In addition, pesticides that may be shown to be linked with a high incidence of severe or irreversible adverse effects on human health or the environment are not identified yet. On the basis of ongoing community monitoring, PAN will identify and list such highly hazardous pesticides in the near future.
- Experiences in the past show that pesticides being classified as “moderately hazardous” by the World Health Organisation give reason for concern even though they are not classified as “highly hazardous”. Examples are endosulfan and paraquat, pesticides that caused hundreds of poisonings, or pyrethrins which just recently became known to cause various incidences in the US. For systematic reasons and with view on prioritisation PAN has not added WHO II to the list of indicators. This is all the more reason to immediately improve the documentation of pesticide poisonings in order to identify the highly hazardous pesticides being classified by WHO in Class II as “moderately hazardous”.

For the FAO initiative supported by the FAO Council, the COAG, the FAO/WHO Panel of Experts for Pesticide Management and others, there needs to be clarification of when the progressive ban of highly hazardous pesticides (HHP) should happen, and who should make it happen. These are questions not being dealt with in this publication.

Activities to implement the progressive ban of HHP need to be developed in the global regions, on national and local level, by governments, standard setting organisations, in the food sector by companies and associations, the pesticide industry, workers unions, NGOs/CSO etc. This is especially important as there are currently no legal instruments available to achieve a structured and clearly targeted global progressive ban of HHP other

⁴ The minutes of the panel of experts meeting October 2007 are available at:
<http://www.fao.org/ag/agp/agpp/pesticid/Code/Reports.htm>

than the Stockholm convention for Persistent Organic Pollutants which focuses only on a very small group of HHPs.

This PAN list of HHP provides a basis for action to implement the progressive ban of highly hazardous pesticides. PAN would like to encourage individuals, institutions, organizations and companies to develop a plan of action with priorities, timeframes and concrete measures. PAN itself will support such initiatives wherever possible.

Carina Weber / PAN Germany for PAN International
Hamburg, January 2009

PAN International Indicators for Identifying ‘Highly Hazardous Pesticides’

A pesticide is considered to be highly hazardous by PAN if it has one of the following characteristics,

- high acute toxicity (including inhalative toxicity) and/or,
- long-term toxic effects at chronic exposure (carcinogenicity, mutagenicity, reproductive toxicity, endocrine disruption) and/or,
- high environmental concern either through ubiquitous exposure, bioaccumulation or toxicity, and/or
- known to cause a high incidence of severe or irreversible adverse effects on human health or the environment

In order to obtain an initial PAN International List of Highly Hazardous Pesticides, the criteria, classifications and sources shown in table 1 were utilised.

Table 1: Characteristics of ‘Highly Hazardous Pesticides’ and sources used to identify HHP pesticides	
Criteria	Measure
High acute toxicity	<p>‘Extremely hazardous’ (Class Ia) or ‘highly hazardous’ (Class Ib) according to WHO Recommended Classification of Pesticides by Hazard</p> <p>‘Very toxic by inhalation’ (R26) according to EU Directive 67/548 ⁵</p>
Long term toxic effect at chronic exposure	<p>‘Human carcinogen’ according to IARC, US EPA</p> <p>‘Known to be carcinogenic to humans’ according to EU Directive 67/548 (Category 1)</p> <p>‘Probable/likely human carcinogen’ according to IARC, US EPA</p> <p>Sufficient evidence to provide a strong presumption that human exposure to a substance may result in the development of cancer (Category 2) according to EU Directive 67/548</p> <p>‘Possible human carcinogen/ ‘Suggestive evidence of carcinogenic potential’ according to IARC, US EPA</p> <p>‘Substances which cause concern for humans owing to possible carcinogenic effects’ (Category 3) according to EU Directive 67/548</p>
	‘Substances known to be mutagenic to man’ (Category 1) according to EU Directive 67/548
	‘Substances which should be regarded as if they are mutagenic to man’ (Category 2) according to EU Directive 67/548
	‘Substances known to impair fertility in humans’ (Category 1) according to EU Directive 67/548
	‘Substances which should be regarded as if they impair fertility in humans’ and/or ‘Substances which should be regarded as if they cause developmental toxicity to humans’ (Category 2) according to EU Directive 67/548
	Endocrine disruptor or potential endocrine disruptor according to EU Category 1 and Category 2
	Categories 1A and 1B of the GHS for carcinogenicity, mutagenicity, and

⁵ The classification in this Directive is the equivalent to the GHS classification for inhalative toxicity. It has been updated several times, the proposal of the 30st Adaptation to the Technical Progress (ATP) is used for the PAN List of HHP.

	reproductive toxicity will be used for the PAN HHP list as soon as it is available
High environmental concern	Stockholm Convention: Pesticides listed in Annex A & B
	Ozone depleting according to the Montreal Protocol
	'Very bioaccumulative' according to REACH criteria as listed by FOOTPRINT (BCF >5000)
	'Very persistent' according to REACH criteria as listed by FOOTPRINT (half-life > 60 d in marine- or freshwater or half-life > 180 d in marine or freshwater sediment)
	Hazard to ecosystem services – 'Highly toxic for bees' according to U.S. EPA as listed by FOOTPRINT data (bee toxicity: LD50, µg/bee < 2)
Known to cause a high incidence of severe or irreversible adverse effects	Rotterdam Convention: Pesticides listed in Annex III
	Incidences to be documented

Explanatory notes and comments regarding the classification systems, lists and indicators being used by PAN to identify Highly Hazardous Pesticides

The Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

The aim of the GHS is a global harmonization of the classification and labeling of chemicals. The Plan of Implementation of the World Summit on Sustainable Development (WSSD), adopted in Johannesburg in 2002, encourages countries to implement the GHS as soon as possible with a view to having the system fully operational by 2008. However, it has not been fully implemented yet. Therefore the GHS classification has not been used by PAN to develop the PAN International List of HHP, but will be used in the future.

The WHO Recommended Classification of Pesticides by Hazard

The latest revision of the WHO Recommended Classification of Pesticides by Hazards was conducted in 2004 and contains about 870 pesticides. PAN included those pesticides listed in WHO Class Ia and Ib into the PAN HHP list.

The most recent version of the WHO classification must be considered incomplete for the following reasons:

- Since the last revision a large number of new active ingredients entered for example the European market, but their hazards have not been classified by WHO.
- Additionally LD₅₀ values for inhalative toxicity are not included in the WHO classification. This is a major deficiency because users of pesticides are often exposed via inhalation.
- Also endocrine disruption is not included in the WHO classification.
- And formulations are not included in the classification. The acute toxicity of formulations and mixtures can be calculated based on the percentage and the LD₅₀ values of the active ingredients in the formulation or mixture. However, so-called 'inert' ingredients⁶ are neglected in this calculation although they may have an influence on the toxicity of the formulation or the mixture.

Source used:

WHO (2005): The WHO recommended classification of pesticides by hazard and guidelines to classification 2004, International Program on Chemical Safety (IPCS) & World Health Organization (WHO), Geneva)

Council Directive 67/548/EC

The Globally Harmonized System (GHS) is based on the EU classification system. The combination of danger symbols for acute hazards with descriptive risk phrases for acute as well as sub-chronic and chronic toxicity, plus the categories for mutagenic, carcinogenic and reproductive effects, presents a fairly comprehensive instrument for the evaluation of chemicals.

⁶ "Inert" ingredient: substances which can enhance the efficiency of the active substance, make a product more degradable or easier to use. 'Inerts' are mostly handled as trade secrets of the manufacturer, which means they are not labelled on the product and therefore not included in the calculation. (More information see footnote 22.)

The major legislative framework in force dealing with dangerous substances in the European Union is the Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances. For the PAN HHP list the final proposal for the 30th amendment⁷ was used to identify pesticides which are very toxic by inhalation as well as pesticides considered carcinogenic, mutagenic and/or toxic to reproduction.

Sources used:

EC (1967): Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances. Official Journal of the European Community No. 196. Brussels

ECB (2007): Final proposal of the Technical Committee on Classification and Labelling of Dangerous Substances for the 30th Adaptation to Technical Progress of Directive 67/548/EEC. European Chemical Bureau (ECB) <http://ecb.jrc.ec.europa.eu/classification-labelling>

REACH

REACH, the 'Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)' is a European Union Regulation (EC/2006/1907 of 18 December 2006). It addresses the production and use of chemical substances, and their potential impacts on both human health and the environment. REACH applies to all chemicals imported or produced in the EU.

The Technical Guidance Document (TGA)⁸ on risk assessment defines the criteria for persistence and bioaccumulation, which are used for the PAN list of HHP.

According to REACH chemicals are "very bioaccumulative" if their Bio-Concentration Factor (BCF) is larger than 5,000 and "very persistent" if their half-life in marine water or fresh water exceeds 60 days or their half-life in marine or freshwater sediment exceeds 180 days.

Source used:

ECB (2003): Technical Guidance Document on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. Part II. Institute for Health and Consumer Protection. European Chemicals Bureau (ECB)

International Agency for Research on Cancer (IARC)

The International Agency for Research on Cancer (IARC) is part of the World Health Organisation (WHO). The goal of IARC is to evaluate, with the assistance of international working groups of experts, critical reviews and evaluations of evidence of carcinogenicity and to publish them in monographs. This series of monographs started in 1972 and since then, almost 900 agents have been reviewed. Participants in the working groups are individual scientists who do not represent organisations, industry or governments.

⁷ Final proposal of the Technical Committee on Classification and Labelling of Dangerous Substances for the 30th Adaptation to Technical Progress of Directive 67/548/EEC, <http://ecb.jrc.ec.europa.eu/classification-labelling/>

⁸ ECB (2003): Technical Guidance Document on Risk Assessment in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. Part II. Institute for Health and Consumer Protection. European Chemicals Bureau (ECB)

All pesticides which are classified as 'carcinogenic to humans' (Group 1), 'probably carcinogenic to humans' (Group 2A) or 'possibly carcinogenic to humans' (Group 2B) have been included in the PAN List of HHP.

Source used:

IARC (2006): Agents reviews by the IARC Monographs, Volumes 1-95 (by CAS Numbers), International Agency for Research on Cancer (IARC), Lion, France. Website: <http://monographs.iarc.fr/index.php>

U.S. Environmental Protection Agency (U.S. EPA)

Cancer Classification

The U.S. EPA Office of Pesticide Programs maintains a List of Chemicals Evaluated for Carcinogenic Potential.⁹ This list is a product of the general risk assessment included in the process of pesticide registration. This classification can be seen as a further development of the IARC classification system, but also includes the potential exposure of humans.¹⁰ Therefore, a low exposure potential can place a pesticide in a lower category even when sufficient evidence of carcinogenicity exists. U.S. EPA's classification of carcinogenicity has changed several times over the last 20 years. The list is updated annually, but its focus is mostly on pesticides registered in the USA.

Source used:

US EPA (2007): Chemicals Evaluated for Carcinogenic Potential, April 26, 2006, Science Information Management Branch, Health Effects Division, Office of Pesticide Programs U.S. Environmental Protection Agency (US EPA), Washington DC, USA

Classification for bee toxicity

The US EPA also defines categories for environmental toxicity of pesticides¹¹. US EPA defines a pesticide highly toxic to bees if the LD 50 is lower than 2 microgramm/bee ($\mu\text{g}/\text{bee}$). Pesticides highly toxic to bees are included in the PAN List of HHP.

Source used:

US EPA (2007b): Technical Overview of Ecological Risk Assessment Analysis Phase: Ecological Effects Characterization, U.S. Environmental Protection Agency, Washington, DC Website: www.epa.gov/oppefed1/ecorisk_ders/toera_analysis_eco.htm

EU categorization of endocrine disruptors

The issue of endocrine disrupting pesticides gained widespread public, political and scientific attention at the beginning of the 1990s. Today there are still no confirmed lists of pesticides with endocrine disrupting properties on any official national or international level (e.g. EU, WHO). However, the EU has developed a priority list of pesticides with evidence for endocrine disrupting properties.

⁹ US Environmental Protection Agency Office of Pesticide Programmes (2000): List of Chemicals Evaluated for Carcinogenic Potential, U.S. EPA Office of Pesticide Programmes, Washington, DC, USA

¹⁰ Altenburger, R., Bodeker, W., Brückmann, S., Oetken, G., Weber, C. (1999): Zur Human- und Ökotoxizität von Pestiziden, die im Bananenanbau verwendet werden, Pestizid Aktions-Netzwerk e.V. (PAN Germany), Hamburg, Germany

¹¹ US EPA (2007): Technical Overview of Ecological Risk Assessment Analysis Phase: Ecological Effects Characterization, U.S. Environmental Protection Agency, Washington, DC www.epa.gov/oppefed1/ecorisk_ders/toera_analysis_eco.htm

In the PAN list of HHP all EU Category 1 pesticides (at least one study providing evidence of endocrine disruption in an intact organism) and Category 2 pesticides (in vitro evidence of endocrine disruption) are included.

Sources used:

EC (2000): Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption - preparation of a candidate list of substances as a basis for priority setting, European Commission, Delft

EC (2004): Commission Staff Working Document SEC (2004) 1372 on implementation of the Community Strategy for Endocrine Disrupters - a range of substances suspected of interfering with the hormone systems of humans and wildlife (COM (1999) 706), European Commission, Brussels

EC (2007): Commission staff working document on the implementation of the "Community Strategy for Endocrine Disrupters" - a range of substances suspected of interfering with the hormone systems of humans and wildlife (COM (1999) 706), (COM (2001) 262) and (SEC (2004) 1372). SEC(2007) 1635. European Commission (EC).Brussels, 30.11.2007

International Conventions & Treaties on chemicals of high concern

The **Stockholm Convention** aims at the elimination of Persistent Organic Pollutants (POPs), some of the most unwanted chemicals in the world. POPs are toxic, bioaccumulative, highly persistent and pose a global threat to living beings. All pesticides formally adopted under these criteria to the Stockholm Convention are on the PAN HHP list.

The **Rotterdam Convention** on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade regulates the exchange of information in international trade in certain hazardous pesticides (active ingredients and formulations). All pesticides formally adopted under the Rotterdam Convention are on the PAN list of HHP.

The **Montreal Protocol** on Substances that Deplete the Ozone Layer is an international treaty designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion. Currently, there is one pesticide listed as ozone depleting chemical. This pesticide (methyl bromide) is on the PAN list of HHP.

Sources used:

Website of the Stockholm Convention at <http://www.pops.int>

Website of the Rotterdam Convention at <http://www.pic.int>

Website of Montreal Protocol at <http://ozone.unep.org/>

Ecosystem services – pollination by bees

The U.S. EPA Office of Pesticide Programs after reviewing individual toxicity or ecological effect studies for a pesticide summarizes the toxicity to certain species groups. In developing its ecological effect characterization, EPA uses a three-step scale of toxicity categories to classify pesticides based on bee toxicity data. All pesticides classified as 'highly toxic to bees' have been included to the HHP list by PAN.

Source used:

FOOTPRINT (2007): The FOOTPRINT Pesticide Properties DataBase. Database collated by the University of Hertfordshire as part of the EU-funded FOOTPRINT project (FP6-SSP-022704) (<http://www.eu-footprint.org>).

Method applied to identify highly hazardous pesticides

The classification systems and lists mentioned above have been integrated in a pesticide database. In this database the criteria for defining highly hazardous pesticides were searched. Pesticides which are considered to be 'obsolete' by the WHO/IPCS were omitted from the search, if they are not targeted by any of the international conventions (PIC/ POP).

The FOOTPRINT Pesticide Properties Database has been used to identify pesticides with the characteristics of being persistent, bioaccumulative and/or toxic to bees (LD50 <2 microgram/bee).

Pesticides listed by PAN International as Highly Hazardous

1,2,4-triazole	Chlordimeform hydrochloride	EPN
1,3-dichloropropene	Chlorethoxyphos	Epoxiconazole
2,4,5-T	Chlorfenapyr	Esbiothrin
2,4,5-T, butyric acid	Chlorfenvinphos	Esfenvalerate
2,4,5-trichlorophenol	Chlormephos	Ethalfuralin
2,4,6-trichlorophenol	Chlorobenzilate	Ethiofencarb
2,4-D	Chloroform	Ethiozin
2,4-DB	Chlorophacinone	Ethofumesate
2,4-dichlorophenol	Chloropicrin	Ethoprophos
2,4-DP, isooctyl ester	Chlorothalonil	Ethylene dibromide
2,6-Dichlorbenzamid	Chlorotoluron	Ethylene dichloride
2-Mercaptobenzothiazole	Chlorpyrifos	Ethylene oxide
3-CPA	Chlorpyrifos-methyl	Ethylene thiourea
Abamectin	Chlorsulfuron	Etofenprox
Acephate	Chlorthal-dimethyl	Famphur
Acetochlor	Chlozolinat	Fenamiphos
Acifluorfen, sodium salt	Cholecalciferol	Fenarimol
Acrinathrin	Cinidon-ethyl	Fenazaquin
Acrolein	Clodinafop-propargyl	Fenbuconazole
Alachlor	Clofencet	Fenbutatin-oxide
Aldicarb	Clofentezine	Fenitrothion
Aldrin	Clothianidin	Fenoxycarb
Allethrin	Coconut diethanolamide	Fenpropathrin
alpha-BHC	Coumaphos	Fenthion
Alpha-chlorohydrin	Coumatetralyl	Fentin acetate
Aluminum phosphide	Creosote	Fentin hydroxide
Aminopyralid	Cumyluron	Fenvalerate
Amitraz	Cyanamide	Fipronil
Amitrole	Cyanazine	Flocoumafen
Aniline	Cyfluthrin	Flonicamid
anthracene oil	Cyhexatin	Fluazifop-butyl
Arsenic acid	Cypermethrin	Fluazinam
Arsenic pentoxide	Cypermethrin, alpha	Flucythrinate
Asulam	Cyproconazole	Fludioxonil
Atrazine	Cyromazine	Flumioxazin
Azafenidin	Daminozide	Fuometuron
Azamethiphos	DDT	Fuopicolide
Azinphos-ethyl	Deltamethrin	Fluoroacetamide
Azinphos-methyl	Demeton-S-methyl	Flusilazole
Azobenzene	Diazinon	Fluthiacet-methyl
Azocyclotin	Dichlobenil	Flutolanil
Azoxystrobin	Dichloro acetic acid	Folpet
Bacillus subtilis GBO3	Dichlorophene	Forchlorfenuron
Bendiocarb	Dichlorprop-P	Formaldehyde
Benfluralin	Dichlorvos	Formetanate
Benomyl	Diclofop-methyl	Fosthiazate
Bentazone	Dicofol	Furathiocarb
Benthiavalicarb-isopropyl	Dicrotophos	Furfural
Beta-cyfluthrin	Dieldrin	Furilazole
Bifenthrin	Difenacoum	Glyphosate trimesium
Binapacryl	Difenoconazole	Haloxypop-methyl
Bis(chloroethyl) ether	Difethialone	(unstated stereochemistry)
Boscalid	Dimethenamid	Heptachlor
Brodifacoum	Dimethipin	Heptachlor epoxide
Bromacil	Dimethoate	Heptenophos
Bromadiolone	Dimethoxane	Hexachlorobenzene
Bromethalin	Dinocap	Hexachloroethane
Bromoxynil	Dinoseb	Hexaconazole
Bromuconazole	Dinoterb	Hexaflumuron
Buprofezin	Diphacinone	Hexchlorocyclohexane
Butachlor	Diquat dibromide	Hexythiazox
Butocarboxim	Disulfoton	Hydramethylnon
Butoxycarboxim	Diuron	Hydrazine
Cacodylic acid	DNOC	Imazalil
Cadusafos	DNOC ammonium salt	Imazaquin
Captafol	DNOC potassium salt	Imazethapyr
Captan	DNOC, sodium salt	Imidacloprid
Carbaryl	Doxorubicin	Indoxacarb
Carbendazim	Edifenphos	Iodomethane
Carbofuran	Endosulfan	Ioxynil
Chinomethionat	Endrin	Iprodione
Chlordane	Epichlorohydrin	Iprovalicarb

Isophorone	Oryzalin	S-Metolachlor
Isoproturon	Oxadiazon	Sodium arsenate
Isoxaben	Oxadixyl	Sodium dimethyl dithio carbamate
Isoxaflutole	Oxamyl	Sodium fluoroacetate (1080)
Isoxathion	Oxydemeton-methyl	Spinosad
Ketoconazole	Oxyfluorfen	Spirodiclofen
Kresoxim-methyl	Pacllobutrazol	Strychnine
Lactofen	Para-dichlorobenzene	Sulfosulfuron
Lambda-cyhalothrin	Paraquat dichloride	Sulfotep
Lindane	Parathion	TCMTB
Linuron	Parathion-methyl	Tebuconazole
Lufenuron	P-chloroaniline	Tebufenpyrad
Malathion	PCP	Tebupirimifos
Mancozeb	Pendimethalin	Tefluthrin
Maneb	Penoxsulam	Tembotrione
MCPA	Permethrin	Tepraloxydim
MCPB	Phenothrin	Terbufos
MCPP	Phenthoate	Terbutryn
Mecarbam	Phorate	Terrazole
Mecoprop-P	Phosmet	Tetrachlorvinphos
Mepanipyrim	Phosphamidon	Tetraconazole
Mepronil	Phosphine	Tetramethrin
Mercuric chloride	Picloram	Thiabendazole
Mercuric oxide	Picloram, diethanolamine salt	Thiacloprid
Mercury	Piperonyl butoxid	Thiamethoxam
Merpafol cis isomer	Pirimicarb	Thiazopyr
Meta-cresol	Potasan	Thiodicarb
Metaldehyde	Metam-potassium	Thiofanox
Metam sodium, dihydrate	Polyhexamethylene biguanidine	Thiometon
Metam-sodium	Prochloraz	Thiophanate-methyl
Metconazole	Procymidone	Thiourea
Methabenzthiazuron	Prodiamine	Thiram
Methamidophos	Profoxydim	Tolyfluanid
Methidathion	Prometryn	Topramezone
Methiocarb	Propachlor	Toxaphene
Methomyl	Propanil	Tralkoxydim
Methoxychlor	Propargite	Triadimefon
Methyl bromide	Propazine	Triadimenol
Methyl isothiocyanate	Propetamphos	Tri-allate
Methylene chloride	Propiconazole	Triasulfuron
Metiram	Propoxur	Triazophos
Metolachlor	Propylene oxide	Tribenuron methyl
Metrafenone	Propyzamide	Trichlorfon
Metribuzin	Prosulfocarb	Trichlorophenol
Metronidazole	Pymetrozine	Triclosan
Mevinphos	Pyraflufen-ethyl	Tricyclazole
Mevinphos (stereochemistry unspecified)	Pyrasulfotole	Tridemorph
MGK 326	Pyrazoxon	Trifluralin
Mirex	Pyrethrin I	Triflurosulfuron-methyl
Molinate	Pyrimethanil	Triforine
MON 4660	Pyrithiobac-sodium	Triticonazole
Monocrotophos	Quinalphos	Uniconazole
MSMA	Quinoclamine	Vamidothion
Myclobutanil	Quinoxifen	Vinclozolin
Nicotine	Quintozene	Warfarin
Nitrapyrin	Quizalofop-p-tefuryl	zeta-Cypermethrin
Nonylphenol	Resmethrin	Zineb
Norflurazon	S,S,S-tributyl phosphorotrithioate	Ziram
Omethoate	S-Bioallethrin	Z-Phosphamidon
Orthosulfamuron	Silthiofam	
	Simazine	