

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

CHEMISTRY AND THE ENVIRONMENT DIVISION
COMMISSION ON AGROCHEMICALS AND THE ENVIRONMENT*

IUPAC Reports on Pesticides (36)

GLOSSARY OF TERMS RELATING TO PESTICIDES

(IUPAC Recommendations 1996)

Prepared for publication by

PATRICK T. HOLLAND

HortResearch Institute of New Zealand Ltd, Private Bag 3123, Hamilton, New Zealand

*Membership of the Commission during the preparation of this report (1992–94) was as follows:

Chairman: 1989–94 E. Dorn (FRG); *Secretary:* 1989–94 P. T. Holland (New Zealand); *Titular Members:* S. Z. Cohen (USA; 1991–94); R. M. Hollingworth (USA; 1989–94); N. Kurihara (Japan; 1989–94); G. D. Paulson (USA; 1989–94); R. D. Wauchope (USA; 1991–94); *Associate Members:* B. Donzel (Switzerland; 1987–93); C. V. Eadsforth (UK; 1989–94); R. Graney (USA; 1989–94); J. A. Guth (Switzerland; 1993–94); D. Hamilton (Australia; 1991–94); A. W. Klein (FRG; 1989–94); J. Kovacikova (Slovakia; 1991–94); H. A. Kuiper (Netherlands; 1993–94); W. J. Murray (Canada; 1991–94); B. Ohlin (Sweden; 1989–94); K. D. Racke (USA; 1992–94); M. W. Skidmore (UK; 1991–94); B. W. Zeeh (FRG; 1991–94); *National Representatives:* A. W. B. H. Lara (Brazil; 1992–94); R. Greenhalgh (Canada; 1985–94); Z.-M. Li (China; 1985–94); A. Ambrus (Hungary; 1991–94); A. V. Rama Rao (India; 1989–94); J. Miyamoto (Japan; 1985–94); H. S. Tan (Malaysia; 1987–94); A. M. Silva-Fernandes (Portugal; 1993–94); K. P. Park (Rep. Korea; 1989–94); L. Golovleva (Russia; 1991–94); T. Erk (Turkey; 1989–94); T. R. Roberts (UK; 1989–94); P. C. Kearney (USA; 1989–94).

Correspondence on the report should be addressed to the Secretary of the Commission: Dr. P. T. Holland, at the address given above.

Republication or reproduction of this report or its storage and/or dissemination by electronic means is permitted without the need for formal IUPAC permission on condition that an acknowledgement, with full reference to the source along with use of the copyright symbol ©, the name IUPAC and the year of publication are prominently visible. Publication of a translation into another language is subject to the additional condition of prior approval from the relevant IUPAC National Adhering Organization.

Pesticides report 36. Glossary of terms relating to pesticides (IUPAC Recommendations 1996)

Synopsis. The glossary contains definitions of over 270 terms frequently used in relation to the chemistry, regulation and use of pesticides. A wide range of disciplines are involved in this field and the glossary was developed as a step in facilitating communication between researchers, government regulatory authorities and chemists in associated professional areas. The range of terms includes pesticide residues, sampling for analysis, good laboratory practice, metabolism, environmental fate, effects on ecosystems, computer simulation models, toxicology and risk assessment.

PREFACE

Pesticides are a broad class of bioactive compounds important for food and crop production and for human health. The development, production, use and regulation of pesticides now encompasses a very wide range of disciplines including synthetic chemistry, chemistry of formulations and residues, biochemistry of fate in plants, animals and the environment, toxicology, ecotoxicity and risk assessment. More recently biotechnology, good laboratory practice, and computer simulation modelling also have become important to the field. There is a high degree of activity from national government authorities and from international organisations. Educational institutions, media for mass communication, non-governmental organisations (e.g. consumer unions, environmental groups) and the general public are also concerned with the complex issues surrounding pesticides. The need for good communication between all the groups involved with, or interested in, pesticides is obvious. This glossary on nomenclature, terminology and definitions will assist the process.

The glossary has drawn on a wide variety of sources. Some more general definitions have been put into a pesticide context but in all cases the aim has been to preserve the core meaning. The slightly less generic term 'pesticide' has been retained in most definitions as 'agrochemical' has not become common usage, particularly in residue chemistry. Definitions for a number of formulation terms are inconsistent between different authorities and we have largely followed those of FAO. The definitions and recommended abbreviations for the most commonly used formulations of pesticides are provided. The full list of over 60 formulation types defined by GIFAP is available (GIFAP, 1989). Toxicology definitions are consistent with those recommended by the IUPAC Commission on Toxicology in their very comprehensive glossary (Duffus, 1993). Explanation has been kept to a minimum because of the difficulty in giving adequate expansions of meaning within a limited space.

No separate list of abbreviations is provided. The most widely used abbreviations are given in the body of the glossary and can be readily found through the alphabetically ordered definitions or via cross references. A separate list of national or international bodies with direct relevance to pesticides is provided. Abbreviations for some analytical techniques commonly used in analysis of pesticides are given but an expansion of the glossary into definitions in this area has been avoided.

ALPHABETICAL ENTRIES

abiotic degradation *Degradation* of a pesticide via purely physical or chemical mechanisms. Examples include *hydrolysis* and *photolysis*.

absorption Transfer of a component from one phase to another (Gold, 1987). Movement of a pesticide from the environment (e.g. water, ingested food, leaf surface) across a biological membrane into an organism.

acceptable daily intake (ADI) Estimate of the amount of a pesticide in food and drinking water which can be ingested daily over a lifetime by humans without appreciable health risk. It is usually expressed in milligrams per kilogram of body weight. See also *Tolerable daily intake*. (after Duffus, 1993)

action level (regulatory) 1. For food commodities, an administrative *maximum residue limit* (MRL) used by regulatory authorities to initiate action where no legally defined MRL has been established. 2. For the environment, concentration of a pesticide in air, soil or water at which emergency measures or preventative actions are to be taken. (after Duffus, 1993)

action limits (analytical quality control) Limits for measurements on *reference material* or *spiked samples* which indicate when an analytical procedure is not performing adequately and requires immediate action before data can be reported.

active ingredient (ai) Pesticide present in a formulation as described by the *common name*. The part of a pesticide formulation from which the biological effect is obtained. (FAO, 1995)

accuracy (of measurement) Closeness of agreement between the result of a measurement and the (conventional) true value of the measureand. Note 1. Use of the term *precision* for *accuracy* should be avoided. Note 2. True value is an ideal concept and, in general, cannot be known exactly. (Metrology, 1984)

acute toxicity Ability of a substance to cause adverse effects within a short period following dosing or exposure. (after Duffus, 1993)

adjuvant Formulants designed to enhance the activity or other properties of a pesticide mixture.

adsorption Enrichment of one or more components in an interfacial layer. (Gold 1987)

adverse effect Change in morphology, physiology, growth development or lifespan of an organism which results in impairment of functional capacity or which increases susceptibility to the harmful effects of other environmental influences. (after IPCS, 1978)

aerobic Conditions under which molecular oxygen serves as the terminal electron acceptor in respiration or in metabolic oxygenation. See also *redox potential*. (after Gold, 1987)

aerosol System of fine solid or liquid particles (<30µm diam.) dispersed in a gas. *Aerosol* cans using an inert compressed propellant are a common means of dispensing insecticides for domestic use. See also *nebulisation*.

AFID Alkali flame-ionisation detector or detection for gas chromatography (cf NPD and TID).

aged residue Pesticide and degradates present in an environmental system after application and following a period long enough to allow transport, adsorption, metabolism, and dissipation processes to alter the distribution and chemical nature of some of the applied pesticide.

aggregate sample Sample made up of set proportions of other samples, typically an average by weight. See also *composite sample*.

aglycon Non-sugar part of a *glycoside* or *glucuronide* conjugate derived from the pesticide. See also *exocon*.

agrochemical Agricultural chemical used in crop and food production including *pesticide*, feed additive, veterinary drug and related compounds.

aliquot Known fractional portion of a homogeneous material (Horwitz, 1990). The term is usually applied to volumetric sub-sampling of fluids.

anaerobic Condition under which reductive conditions prevail. See also *redox potential*.

analytical portion See *test portion*.

analytical sample See *test sample*.

analytical range Measurement range of a test method where the performance has been validated and quality standards such as *action limits* have been developed.

analytical standard (pesticide) Pesticide *reference material* of high and defined purity (generally >95%) for preparation of calibration standards.

bait A food or other substance used to attract a pest to a pesticide or trap where it can be destroyed.

batch Quantity of material which is known or assumed to be produced under uniform conditions. (Horwitz, 1990)

benthos Non-planktonic animals (not being suspended in water) associated with freshwater substrata (upper layer of the sediment in rivers and ponds) at the sediment-water interface. (Wetzel, 1983)

bioaccumulation Progressive increase in the amount of a substance in an organism or part of an organism which occurs because the rate of intake exceeds the organisms ability to remove the pesticide from the body. (after Duffus, 1993)

bioactivation Transformation of a pesticide within an organism into a more biochemically active metabolite.

bioconcentration Process leading to a higher concentration of a pesticide in an organism than in environmental media to which it is exposed. (after Duffus, 1993)

bioconcentration factor (BCF) Ratio between the concentration of pesticide in an organism or tissue and the concentration in the environmental matrix (usually water) at apparent equilibrium during the uptake phase. (after Rand and Petrocelli, 1985)

bioavailability Extent to which a pesticide residue can be taken up into an organism from its food and environment, and the rate at which this occurs. (Duffus, 1993)

biodegradation Conversion or breakdown of the chemical structure of a pesticide catalysed by enzymes *in vitro* or *in vivo*, resulting in loss of biological activity. For *hazard assessment*, categories of chemical degradation include:

1. Primary - loss of specific activity.
2. Environmentally acceptable - loss of any undesirable activity (including any toxic metabolites).
3. Ultimate - *mineralisation* to small molecules such as water and carbon dioxide. (after Duffus, 1993)

biological indicator Species or group of species which is representative and typical for a specific status of an ecosystem, which appears frequently enough to serve for monitoring and whose population shows a sensitive response to changes, e.g. the appearance of a pesticide in the ecosystem. (US-EPA, 1992)

biological assessment of exposure Assessment of exposure of a living organism to pesticides using biological specimens (blood, urine etc.) taken in the environment (workplace, field etc.) with analysis either directly by chemical determination of parent or metabolite, or indirectly by measurement of a relevant biochemical parameter (e.g. plasma cholinesterase activity for organophosphorus compounds). (after Duffus, 1993)

biomagnification *Bioaccumulation* of a pesticide through an ecological food chain by transfer of residues from the diet into body tissues. The tissue concentration increases at each trophic level in the food web when there is efficient uptake and slow elimination. (Rand and Petrocelli, 1983)

biomarker Indicator (molecular, biochemical, cellular or organism) signalling an event or condition in a biological system or sample and giving a measure of exposure to, effect of, or susceptibility to, a xenobiotic. (after Duffus, 1993)

biomass The total living mass in a defined segment of an ecosystem expressed as the living weight per unit area or mass. Soil microbial biomass is often used as an indication of potential microbial activity level in soil.

biometer flask Experimental apparatus commonly used in laboratory studies of pesticide degradation in soil. Contains separate compartments for aerobic incubation of soil and for media to trap carbon dioxide and volatile products.

biopesticide Pesticide of biological origin including microorganisms e.g. *Bacillus thuringiensis* and natural products e.g. rotenone, pyrethrins.

biotransformation Conversion of the chemical structure of a pesticide catalysed by enzymes *in vitro* or *in vivo*. See also *biodegradation*.

biotransformation pathway Sequence of the changes occurring in the structure of a pesticide when it is introduced into a specific biological test system.

blank material (sample) Laboratory simulated test material known to be free of the pesticide being analysed. A portion of blank material is used to test the method, apparatus and reagents for interferences or contamination. See also control sample. (after Thompson and Wood, 1995)

bound residue Chemical species in soil, plant or animal tissue originating from a pesticide, (generally radio labelled) that are unextracted by a standard method, such as Soxhlet solvent extraction, which does not significantly change the chemical nature of the residues. These unextractable residues are considered to exclude small fragments recycled through metabolic pathways into natural products. (after Roberts, 1984)

breakdown See *degradation*.

buffer zone Distance for environmental protection between the edge of an area where pesticide application is permitted and a sensitive non-target area e.g. water course.

carrier Solid *formulant* added to a technical material as an absorbent or *diluent*. (FAO, 1995)

carryover (analytical) Unintended contamination of a sample undergoing analysis with material from a previous sample.

carryover (field) Persistence of pesticide residues in soil after use in one crop such that uptake is observed in a succeeding, possibly more sensitive, crop.

catabolism Oxidative *biodegradation* of a pesticide to provide chemically available energy and generate metabolic intermediates. (after IUPAC, 1992)

catchment Land and water confined within a single drainage basin.

certified reference material *Reference material*, accompanied by a certificate, whose pesticide concentrations are certified by procedures which establish their traceability and for which each certified concentration is accompanied by an uncertainty at a stated level of confidence. Storage conditions and period for which the certification remains valid may also be included for unstable materials. (after Thompson and Woods, 1995)

chronic effect Consequence of exposure to a pesticide which arises slowly and has a long-lasting, often irreversible, course. (after Duffus, 1993)

chronic exposure Continued exposures occurring over an extended period of time, or a significant fraction of the lifetime of the exposed individuals or test species. (after Duffus, 1993)

chronic toxicity Capacity for a pesticide to produce injury following chronic exposure or to produce effects which persist whether or not they occur immediately upon exposure or are delayed. (after Duffus, 1993)

co-metabolism Microbial metabolism of a pesticide where the derived energy is not used to support microbial growth. Cf. *catabolism*.

common moiety Molecular sub-unit which is common to the structures of several pesticides or metabolites.

- community** Assembly of *populations* of different species of living organisms (quite often interdependent on and interacting with each other) within a specified location in space and time. See also *ecosystem*. (US-EPA, 1992)
- compartment** Part of an organism or *ecosystem* considered as an independent system for purposes of assessment of uptake, distribution and *dissipation* of a pesticide. (US-EPA, 1992)
- compliance (GLP)** See *GLP compliance statement*.
- compliance (residue)** Meeting of official *maximum residue limit (MRL)* standards by residue levels in food consignments sampled and tested by approved methods.
- composite sample** Combined *increment samples*, or combined replicate samples, or combined samples from replicate trials. Preferred term to bulk sample which is ambiguous. (Horwitz, 1990). See also *aggregate sample, primary sample*.
- concentration-effect relationship** Association between the exposure concentration of the pesticide and the magnitude of the resultant continuously graded change either in an individual organism or in a population. (after Duffus, 1993)
- conjugation** Biosynthetic reaction in which a pesticide or its metabolite is linked to an endogenous compound. See also *endocon, exocon, phase II metabolism*.
- contaminant**
1. Minor impurity in a substance.
 2. Extraneous material added to a sample prior to or during chemical or biological analysis.
 3. Unintended pesticide residue in an agricultural commodity or environmental compartment (e.g. ground water). See also *pollutant*.
- control sample (field)** Sample from a field test plot to which no pesticide was applied (a zero rate sample) or which received chemical treatments identical to the test plots except for the test chemical.
- critical concentration** Lowest concentration of a pesticide in an environmental *compartment* at which adverse effects on organisms are likely to be observed (95% probability).
- critical load** Amount of a pesticide leading to a *critical concentration* when received by an environmental *compartment*. (US-EPA, 1992)
- cumulative effect** Overall adverse change which occurs when repeated doses of a pesticide have biological consequences which are additive. (after Duffus, 1993)
- cut-off value** Numerical value set by regulatory authorities representing the limit of acceptability for a property or behaviour of a compound for the final step in tiered assessment schemes. See also *trigger value*.
- decomposition** See *degradation*.
- degradate** Chemical product resulting from *degradation* of a pesticide.
- degradation** Process by which a pesticide is broken down to simpler structures through biological or *abiotic* mechanisms. Synonyms include *breakdown* and *decomposition*. See also *biodegradation, mineralisation*. (OECD)

- desorption** Depletion of one or more components in an interfacial layer. (Gold, 1993)
- detoxification** Processes of chemical modification which make a pesticide less toxic. (after Duffus, 1993)
- diluent** Liquid or solid material used to dilute a concentrated pesticide formulation prior to application. Most commonly water for spray application.
- dislodgeable residue** Portion of a pesticide residue on treated vegetation that is readily removable and may be used as an index for risk to farm workers. Generally measured by the residue removed when leaf discs are shaken briefly in water.
- dissipation** Loss of pesticide residues from an environmental compartment due to degradation and transfer to another environmental compartment.
- dissipation time 50% (DT₅₀)** Time required for one-half the initial quantity or concentration of a pesticide to dissipate from a system. No assumption as to the rate equation is made. See also *half-life*.
- dispersible granule** See *water-dispersible granule*.
- dose-effect relationship** Graded relationship between the dose of the pesticide to which the organism is exposed and the magnitude of a defined biological effect, either in an individual organism or in a population. See also *concentration-effect relationship*. (after Duffus, 1993)
- dose-response relationship** Association between dose and the incidence of a defined biological effect in an exposed population. (after Duffus, 1993)
- drift control agent** *Formulant* that control the distribution of spray droplet sizes and prevents production of excessive fines.
- dry weight basis** Pesticide residue concentration reported as if the residue were wholly contained in the dry matter of the sample, i.e. analytical results are corrected for the water content of the *test sample*. Residues in soils and feeds, and *maximum residue limits* (MRLs) for feedstuffs are expressed on a dry weight basis.
- dustable powder (DP)** Free flowing powder suitable for dusting. (GIFAP, 1995)
- EC₅₀** See *median effective concentration*.
- ECD** Electron capture detector, used in gas chromatography.
- ecosystem** Assembly of populations of different species (often interdependent on and interacting with each other) interacting with their surroundings within a specified physical location and forming a functional entity. See also *community*. (Rand and Petrocelli, 1985)

ecotoxicologically (environmentally) relevant concentration (ERC)

Concentration of a pesticide (active ingredient, formulations, and relevant metabolites) that is likely to affect a determinable ecological characteristic of an exposed system. It is related to the toxicity characteristics, generally the *no observable effect concentration*, to the most sensitive species or groups of species. (after US-EPA, 1992)

ELISA See *immunoassay*.

emulsifiable concentrate (EC) Liquid homogeneous formulation of a pesticide with *emulsifiers* in an organic solvent which forms a dispersion when added to water as a *diluent*. (GIFAP, 1995)

emulsifier Surfactant used to facilitate the preparation of a colloidal dispersion of one liquid in another liquid with which it is not miscible. (after Gold, 1987)

endocon That portion of a conjugated metabolite which is derived from natural products of the metabolising organism such as sugars and organic acids. See also *exocon*, *phase II metabolism*.

endpoint Measurable ecological or toxicological characteristic or parameter of the test system (usually an organism) that is chosen as the most relevant assessment criterion (e.g. death in an acute test or tumour incidence in a chronic study).

enforcement method See *regulatory method*.

enhanced degradation Increased rate of degradation of a pesticide in soil or other environmental matrix by a population of microorganisms that has adapted to metabolise it through previous exposure to it or a similar chemical. Synonyms include accelerated degradation and enhanced biodegradation.

enterohepatic circulation Cyclical process in which a pesticide residue is absorbed and transported to the liver, metabolised (often including conjugation), transported to the intestine by the bile, reabsorbed (often after deconjugation), and transported to the liver for further metabolism. (after Duffus, 1993)

environmental impact assessment Assessment of the potential releases of a pesticide to the environment and their potential effects upon the environment and its components including man. See *risk assessment*.

environmental risk Probability that an *adverse effect* on humans or the environment will be observed for a given *exposure* to a pesticide based on the frequency of occurrence and the sensitivity of the system. See *risk assessment*.

estimated daily intake (EDI) Prediction of the daily intake of a pesticide residue, based on the most realistic estimation of residues in food items and the best available food consumption data for a specific population. Residue levels are estimated taking into account known uses of the pesticide, the proportion of commodity treated and the quantity of contaminated commodities. The EDI is expressed in milligrams of residues per person. (WHO, 1989)

estimated environmental concentration (EEC) Predicted concentration of a pesticide within an environmental *compartment* based on estimates of quantities released, discharge patterns and inherent disposition of the pesticide (fate and distribution) as well as the nature of the specific receiving ecosystems. (US-EPA, 1992)

estimated maximum daily intake (EMDI) Prediction of the maximum daily intake of a pesticide residue, based on the assumptions of average daily food consumption per person and maximum residues in the edible portion of a commodity, corrected for the reduction or increase in residues resulting from preparation, cooking, or commercial processing. The EMDI is expressed in milligrams of residues per person. (WHO, 1989)

exocon Portion of a conjugated metabolite which is derived from the parent pesticide. See also *aglycon*.

exposure Concentration or amount of a pesticide that reaches the target population, organism, tissue or cell, usually expressed in numerical terms of concentration, duration and frequency. Also the process by which a substance becomes available for absorption by the target population, organism, tissue or cell, by any route. (after Duffus, 1993)

exposure assessment Process of measuring or estimating concentration, duration and frequency of exposures to pesticide present in environment or, if estimating hypothetical exposures, that might arise from the release of the pesticide into the environment. See also *risk assessment*. (after Duffus, 1993)

extractability Degree to which a pesticide residue may be removed from a matrix (e.g. soil) through use of appropriate extraction techniques. See also *bound residue*.

extraneous residue limit (ERL) Maximum concentration of a pesticide residue, arising from environmental sources (including former agricultural uses), other than from the use of a pesticide directly or indirectly on the commodity, that is recommended to be permitted in or on a feed or food commodity. (FAO,)

fat basis Residues and *maximum residue limits* (MRLs) of fat-soluble pesticides in animal commodities may be expressed in terms of their concentration in the fat rather than the whole product.

FID Flame ionisation detector for gas chromatography or HPLC.

field drainage Removal of excess water from soil and transport to surface waters in order to improve soil productivity and trafficability. (Smart & Henderson, 1992)

flowable See *suspension concentrate*.

food chain - primary producers Autotrophic organisms (e.g. algae, higher plants) which convert inorganic compounds during the process of photosynthesis or chemosynthesis into organic compounds (cell material) of higher energy content. These organisms represent the first trophic level of the food chain.

food chain - secondary producers Heterotrophic organisms (e.g. animals) using organic substances as a carbon and energy source.

- food chain - primary consumers** Heterotrophic organisms (e.g. filter feeding invertebrates such as daphnia species) using organic substances directly from *primary producers* (e.g. algae) as a carbon and energy source.
- food chain - secondary consumers** Heterotrophic organisms (e.g. predator animals) feeding on *primary consumers*.
- food chain - primary decomposers** Heterotrophic organisms (e.g. bacteria) using dead organic matter from all trophic levels as a carbon and energy source.
- food chain - secondary decomposers** Heterotrophic organisms (e.g. certain soil fungi, collembola, worms) using already partially decomposed organic matter as a carbon and energy source.
- formulant** Any added material in a pesticide formulation other than the biologically *active ingredient(s)*. This may include *carrier* or other substances which enhance the biological activity or physio-chemical properties of the formulation. See also *adjuvant, diluent, inert, sticker, surfactant, vehicle*. (CIPAC, 1980)
- formulation** See *pesticide formulation*.
- fortified sample** See *spiked sample*.
- FPD** Flame photometric detector for gas chromatography.
- fresh weight basis** Pesticide residues are reported on the laboratory sample as it is received, with no allowance for the moisture content. *Maximum residue limits (MRLs)* and pesticide residues in food commodities are expressed in this way.
- freundlich isotherm** Empirical relationship describing the *adsorption* of a solute from an liquid or gaseous phase to a solid in which the quantity of material adsorbed per unit mass of adsorbent is expressed as a function of the equilibrium concentration of the sorbate. See also K_d .
- frozen storage stability** See *storage stability test*.
- fumigation** Use of a pesticide in gas or vapour form.
- FTIR** Fourier transform infrared spectroscopy.
- GC-EC** Gas chromatography with electron capture detector.
- GC-MS** Gas chromatography-mass spectrometry.
- GC-MSD** Gas chromatography with mass-selective detection (usually low resolution mass spectrometry using selected ions).
- GLC** Gas liquid chromatography.
- GLP** See Good Laboratory Practice.
- GLP Archive** Location (room, filing cabinet etc.) where study plans, raw data, final study reports, laboratory inspection reports, study audit reports, retention samples or specimens are stored. GLP records and material must be retained for the period specified by the appropriate authorities.

- GLP Certificate** Certificate of test facility compliance with a national GLP program.
- GLP Chain of custody** Set of procedures and traceable records that demonstrate an unbroken control over, or custody of, a document, or raw data, or a sample from its collection through to its final disposition.
- GLP Compliance statement** Declaration by study director that the study was conducted in compliance with the principles of GLP and relevant national statutes. Any aspects of non-compliance should be described in this statement.
- GLP Inspection** Check of a test facility, a study or parts of a study by an internal or external authority to ensure compliance with GLP guidelines. Internal inspections are carried out by the *quality assurance unit*. See also *GLP study audit*.
- GLP Principal investigator** Person nominated in the *study plan* who has the delegated responsibility to supervise certain phases of a study where the *study director* cannot exercise direct control.
- GLP Protocol** See *GLP study plan*.
- GLP Quality assurance program** Internal control system containing written procedures to ascertain that studies are in compliance with GLP.
- GLP Quality assurance statement** Statement prepared by the *quality assurance unit* specifying the dates inspections were made and any findings which were reported to management and to the study director. This statement is part of the final report of a study.
- GLP Quality assurance unit (QAU)** Sub-section of the test facility, separate from actual testing, responsible for internal audits of the facility and its *Study Reports* to ensure compliance with GLP. The QAU is also generally responsible for the administration and training in all aspects of the quality assurance system.
- GLP Standard operating procedure (SOP)** Written procedure, authorised by management which describe how to perform a certain routine test or activity normally not specified in detail in study plans or test guidelines, e.g. arrival, identification and storage of samples, standards or reagents; operation, maintenance, and calibration of apparatus; preparation of reagents; quality assurance procedures.
- GLP Study** Experiment or set of experiments conducted under GLP.
- GLP Study audit** Review by the *quality assurance unit* of an interim or final report, including raw data from a study, confirming that the study was carried out in accordance with the study plan and *standard operating procedures* and that it has been accurately and completely reported in compliance with GLP.
- GLP Study director** The person responsible for the overall conduct of a study i.e. ensuring that all phases of the study are conducted under GLP according to the study plan.

GLP Study plan The document which determines the entire scope of a study conducted under GLP. A written study plan must be completed and approved by the *Study Director* before a study starts. It contains information such as the title of study; name or code of test and reference substances; name and address of sponsor, test facility, study director and principal investigators; dates for start and end of study; methods including relevant *standard operating procedures* (SOPs); list of material to be archived.

glucuronides Components resulting from the conjugation of a pesticide or its metabolite with glucuronic acid.

glycosides Mixed acetals (ketals) resulting from the conjugation of a pesticide or its metabolite with a saccharide or saccharide derivative. In plants and insects the saccharide *endocon* is commonly an aldohexose.

good agricultural practice (GAP) Nationally authorised safe uses of pesticides under actual conditions necessary for effective and reliable pest control. It encompasses a range of levels of pesticide applications up to the highest authorised use, applied in a manner that leaves a residue which is the smallest amount practicable. Authorised safe uses include nationally registered or recommended uses, that take into account public and occupational health and environmental safety considerations. Actual conditions include any stage in the production, storage, transport, distribution and processing of food commodities and animal feed. (IPCS, 1989)

good experimental field practice The formalised process for designing and recording the practices used in the performance of field investigations with pesticides, and which assure the reliability and integrity of the data. See *GLP*.

good laboratory practice (GLP) The formalised process and conditions under which laboratory studies on pesticides are planned, performed, monitored, recorded, reported and audited. Studies performed under GLP are based on the national regulations of a country and are designed to assure the reliability and integrity of the studies and associated data. The US-EPA GLP definition also covers field experiments (see *Good experimental field practice*). (After OECD, 1992)

GPC Gel permeation chromatography (cf SEC).

granule Solid *formulation* comprising particles of defined size $>80\mu\text{m}$ diameter, for application without further dilution, usually to soil.

ground water Water present in the saturated subsurface zone of the soil profile, where all open spaces/pores in the sediment and rock are filled with water.

guideline level Maximum concentration of a pesticide residue in or on a feed or food commodity, resulting from a use reflecting *good agricultural practice*, but where an *acceptable daily intake* has not been estimated.

guideline value Maximum recommended pesticide residue in an environmental medium that ensures aesthetically pleasing air, water or food and does not constitute a significant risk to the user. (after Duffus, 1993)

half-life ($t_{0.5}$) Time taken for the concentration of a pesticide in a *compartment* to decline by one half. Usually an estimate based on observed dissipation over several half-lives that can be described by first order kinetics with rate constant k , $t_{0.5} = 0.693/k$. See also *dissipation time 50%*.

- hazard** Set of inherent properties of a pesticide which gives potential for *adverse effects* to man or the environment under conditions of its production, use or disposal, and depending on the degree of *exposure*. (after Duffus, 1993)
- hazard assessment** Determination of factors controlling the likely effects of a *hazard* such as mechanism of toxicity, *dose-effect relationships* and worst case exposure levels. This is the prelude to *risk assessment*. (US-EPA, 1992)
- hazardous distance for the most sensitive effect (HDSE)** Statistically determined safety margin corresponding to a distance from treated areas at which protection of the terrestrial environment can be adequately achieved as measured by the most sensitive non-target species. See also *buffer zone*, *margin of safety*.
- health advisory level (HAL)** Estimate of upper concentration limit for a pesticide in drinking water that can be consumed for a lifetime without *adverse effects*. HALs generally do not have formal legal significance but have been used, particularly in the USA, for preliminary *risk assessment*.
- HPLC** High performance liquid chromatography.
- HPTLC** High performance thin layer chromatography.
- HRGC** High resolution gas chromatography (*GLC* with narrow bore capillary columns).
- hydrolysis** Reaction in which a chemical bond is cleaved and a new bond formed with the oxygen atom of a molecule of water.
- identification** Process of unambiguously determining the chemical identity of a pesticide or metabolite in experimental or analytical situations.
- immobilisation**
1. Process leading to restricted mobility of a pesticide in plant or soil due to strong binding.
 2. Incorporation of terminal pesticide *degradates* into complex organic forms in microbial or plant tissue.
- immunoassay** Ligand-binding assay based on antibodies capable of specific binding to the pesticide analyte. Most commonly used in a competitive binding format where analyte molecules compete with a specific antigen complex labelled for detection using a radioisotope (radio immunoassay - RIA) or enzyme (enzyme-linked immunoassay - ELISA).
- impurity** By-product of the manufacture or storage of a pesticide. Impurities require definition, evaluation and regulation (if toxicologically significant).
- increment sample** An individual portion (unit) of material collected by a single operation of a sampling device from bulk materials or large units. (after Horwitz, 1990)
- incurred residue** Residue in a commodity resulting from specific use of a pesticide, consumption by an animal or environmental contamination in the field, as opposed to residues from laboratory fortification of samples.
- inert ingredient** *Formulant* which by itself does not add materially to effectiveness for the purpose for which the preparation is intended e.g. solvent, *emulsifier*, *diluent*, *carrier*.

in-life phase Phase of a study following treatment in which the test system is alive/growing.

integrated pest management (IPM) Pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilises all suitable techniques and methods in as compatible a manner as possible to maintain the pest populations at levels below those causing economically unacceptable damage or loss. (FAO, 1988)

in-vitro 'In-glass', referring to use of a cell line, microorganisms or biochemically active fraction derived from an organism (e.g. hepatocytes) in laboratory studies of biological activity, or metabolism or toxicity.

in-vivo Use of the whole living organism in studies of biological activity, metabolism or toxicity.

k_d See *soil partition coefficient*.

k_{oc} See *soil organic partition coefficient*.

laboratory sample Sample or subsample(s) sent to or received by the laboratory.

lag phase Period which may precede commencement of rapid degradation of a pesticide by a microbial population. It is the period needed either for induction of microbial enzymes or for growth of the microbial population to adequate size. See also *enhanced degradation*. (after US-EPA, 1992)

LC_{50} See *median lethal concentration*.

LD_{50} See *median lethal dose*.

leaching Process by which a pesticide moves downward through the soil profile in the aqueous phase.

leachate Aqueous phase percolating through a soil profile or a soil column.

limit of detection (LOD) Lowest concentration of a *pesticide residue* in a defined *matrix* where positive identification can be achieved using a specified method.

limit of quantitation (LOQ) Lowest concentration of a *pesticide residue* in a defined *matrix* where positive identification and quantitative measurement can be achieved using a specified method. The term *limit of quantitation* is preferred to *limit of determination* to differentiate it from *LOD*. *LOQ* has been defined as 3 times the *LOD* (Keith, 1991) or as 50% above the lowest fortification level used to validate the method (US-EPA, 1986).

limit of reporting Practical limit of residue quantitation at or above the *LOQ*. The limit of quantitation for a defined *matrix* and method may vary between laboratories or within the one laboratory from time to time because of different equipment, techniques and reagents.

lipophilicity Affinity for fat as described by partitioning behaviour between water and an immiscible organic solvent, favouring the latter, and which correlates with *bioconcentration*. See also *octanol-water partition coefficient*. (after Duffus, 1993)

lot Quantity of material which is assumed to be a single population for sampling purposes. See also *batch*.

lysimeter Device for measuring leaching losses from a column or block of soil. The simplest lysimeters may be devices for sampling a portion of the water *leaching* through a natural sediment or soil (e.g. suction lysimeter), whereas more elaborate lysimeters may involve the confinement of an entire segment of soil from which all *leachate* is collected (e.g. monolithic lysimeter).

macropore Soil pore larger than 1 mm in diameter including interparticle void, earthworm or rodent burrow, drying crack, and decayed root channel. See *preferential flow*.

margin of safety (MOS) Ratio of the highest estimated or actual level of exposure to a pesticide and the toxic threshold level (usually the *NOEC* or *NOEL*). See also *uncertainty factor*. (US-EPA, 1992)

market basket survey *Pesticide residue monitoring* on a wide range of food items collected from consumer points of sale and in proportions approximating consumption patterns in the local population. Samples are prepared for analysis according to Codex guidelines i.e. minimal preparation. See also *total diet study*.

matrix The material or component sampled for *pesticide residue* studies.

maximum residue limit (MRL) Maximum concentration of a residue that is legally permitted or recognised as acceptable in, or on, a food, agricultural commodity or animal feedstuff as set by Codex or a national regulatory authority. The term *tolerance* used in some countries is, in most instances, synonymous with MRL. Normally expressed as mg/kg fresh weight. (after FAO, 1986)

maximum tolerated dose (MTD) Highest dose of a pesticide in chronic toxicity testing that is expected, on the basis of sub-chronic studies, to produce only limited toxicity when administered for the duration of the test period. (Duffus, 1993)

median effective concentration (EC₅₀) Statistically derived concentration of a pesticide in an environmental medium expected to produce a certain effect in 50% of the test organisms in a given population under defined conditions. (Duffus, 1993)

median lethal concentration (LC₅₀) Statistically derived concentration of a pesticide in an environmental medium expected to kill 50% of test organisms in a given population under defined conditions. (Duffus, 1993)

median lethal dose (LD₅₀) Statistically derived dose of a pesticide expected to kill 50% of test organisms in a given population under a defined set of conditions. Normally expressed as mg of test material per kg of body weight of the organism. (Duffus, 1993)

mesocosm See *model ecosystem*.

metabolism Sum total of all physical and chemical processes that take place within an organism; in a narrower sense, the physical and chemical changes that occur for a pesticide within an organism. It includes uptake and distribution within the body, changes (*biodegradation*), and elimination of pesticides and their metabolites.

- metabolites** Any intermediate or product resulting from metabolism. (after Duffus, 1993)
- microcosm** See *model ecosystem*.
- mineralisation** Conversion of an element from an organic form to an inorganic form. Mineralisation of pesticides most commonly refers to the microbial degradation to carbon dioxide as a terminal metabolite. See also *immobilisation*.
- model** Experimental or mathematical simulation of chemical behaviour in a specific environment. (ASTM, 1984)
- model calibration** Testing of a model with known input and output information for adjustment or estimation of factors for which data are not available. (ASTM, 1984)
- model, computer** Assembly of numerical techniques (algorithms), bookkeeping, and control language (i.e. the computer program) comprising a mathematical model and which carries out acceptance of input data and instructions through to delivery of output. (after ASTM, 1984)
- model, conceptual** Qualitative depiction of a specific environment that describes the linkages between the different compartments. A conceptual model is required before a quantitative simulation model can be developed. (Cohen *et al.*, in press)
- model ecosystem** Man-made study system containing associated organism and abiotic components that is large enough to be representative of a natural *ecosystem*, yet small enough to be experimentally manipulated. There is some subjective differentiation between larger, outdoor model ecosystems (mesocosms) and smaller, generally indoor model ecosystems (microcosms).
- model validation** Comparison of model results with numerical data independently derived from experiments or observations of the environment. (ASTM, 1984)
- model verification** Examination of the numerical technique in the computer code to ascertain that it truly represents the conceptual model and that there are no inherent numerical problems with obtaining a solution. (ASTM, 1984)
- multiresidue method** Analytical method which measures a number of pesticide residues simultaneously.
- nebulisation** Formation of an aerosol of very small liquid particles (fog) or solid particles (smoke) from a pesticide formulation, generally for fumigation of an enclosed space such as a glass-house.
- NMR** Nuclear magnetic resonance spectroscopy.
- non-target organism** Organism affected by a pesticide although not an intended object of its use.
- no-observable effect concentration/ level (NOEC/NOEL)** Highest concentration or amount of pesticide in the test system that causes no observable biological effect to the target organism. (after US-EPA, 1992) See also *Ecotoxicologically relevant concentration, PNEL*.

NPD Nitrogen-phosphorus detector or detection for gas chromatography (cf *AFID* and *TID*).

OC Organochlorine pesticide. Generic term for pesticides containing chlorine but commonly used to refer to older persistent materials including aldrin, BHC, chlordane, DDT, dieldrin, heptachlor, lindane and toxaphene.

octanol/water partition coefficient (P_{OW}) *Partition coefficient* for a pesticide in the two-phase system octan-1-ol/water. The P_{OW} is a distribution coefficient reflecting the relative *lipophilicity* of a pesticide and its potential for *bioconcentration*. For convenience, the value is often expressed in logarithmic (base 10) form ($\log P_{OW}$).

OP Organophosphorus pesticide. Generic term for pesticides containing phosphorus but commonly used to refer to insecticides consisting of cholinesterase inhibiting esters of phosphate or thiophosphate.

partition coefficient Ratio of the concentrations of a substance in solution in two phases which are in equilibrium. See K_{OC} , P_{OW}

parts per billion (ppb) Ratio of amounts expressed as parts pesticide per 10^9 sample. Strictly the quantities should be the same i.e. weight to weight (solids) or volume to volume (liquids or gases) e.g. 1ppb = $1\mu\text{g}/\text{kg}$. A common usage is for weight to volume but to avoid confusion it is recommended that the SI units are used rather than ppb; e.g. $\mu\text{g}/\text{L}$ (Mills et al., 1993)

parts per million (ppm) Ratio of amounts expressed as parts pesticide per 10^6 sample e.g. 1ppm = $1\text{mg}/\text{kg}$. As with *ppb* it is recommended that SI units are used rather than ppm, particularly for weights to volume.

PED Plasma emission detector.

pellet Solid formulation of pesticide, larger than granule, often used for molluscicide formulations.

persistence Residence time of a chemical species (pesticide and/or metabolites) subjected to degradation or physical removal in a soil, crop, animal or other defined environmental *compartment*.

pest Organism that attacks food and other materials essential to mankind, or otherwise affect human beings adversely. (after Duffus, 1993)

pesticide Substance or mixture of substances intended for preventing, destroying or controlling any *pest*, including vectors of human or animal disease, unwanted species of plants or animals causing harm or otherwise interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood, wood products or animal feedstuffs, or which may be administered to animals for the control of insects, mites/spider mites or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant, or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage or transport. See also *agrochemical*, *plant protection agent*. (FAO, 1986)

pesticide chemical name Scientific name of a pesticide following the recommendations of IUPAC for naming of chemical compounds or other accepted naming convention (e.g. Chemical Abstracts).

- pesticide common name** Simple name assigned to a pesticide active ingredient by the International Organisation for Standardisation (ISO) to be used as a generic or non-proprietary name. (after FAO, 1986)
- pesticide formulation** Pesticide product offered for sale. It generally comprises *active ingredient(s)*, *adjuvant(s)* and other *formulants* combined to render the product useful and effective for the purpose claimed. (after FAO, 1986)
- pesticide residue** Substance(s) which remains in or on a feed or food commodity, soil, air or water following use of a pesticide. For regulatory purposes it includes the parent compound and any specified derivatives such as degradation and conversion products, metabolites and impurities considered to be of toxicological significance. (FAO, 1986)
- pesticide residue definition** The pesticide, its metabolites, derivatives and related compounds to which the *maximum residue limit* (MRL) applies, as specified by Codex or a national regulatory authority.
- pesticide residue enforcement** *Pesticide residue monitoring* program where the intention is regulatory action against non-complying consignments.
- pesticide residue monitoring** Sampling and analyses of pesticide residues in biological and environmental samples taken according to pre-arranged schedules.
- pesticide trade name** Proprietary name assigned to a pesticide or its formulations by the company manufacturing or selling it.
- phase I metabolism** Initial biotransformation of a pesticide. These are mainly oxidative, reductive and hydrolytic processes.
- phase II metabolism** Biotransformation where the pesticide or phase I metabolite is *conjugated* with a naturally occurring compound (e.g. sugars, glutathione).
- phloem** Part of the plant's vascular system adapted to the transport of photosynthetic products from leaves to the rest of the plant.
- photolysis** Chemical reaction caused by light in which a bond is cleaved. (Calvert, 1990)
- plant growth regulator (PGR)** Naturally occurring or synthetic substance which influences plant development or reproduction but has no nutritive value.
- plant protection agent** Pesticide product intended for use in agriculture to protect crops.
- pollutant** Undesirable substance introduced into a solid, liquid or gaseous environmental medium totally or partially by human activities. See also contaminant. (after Duffus, 1993)
- population** Assemblage of individual organisms of defined ages and growth stages belonging to one species within a specified location in space and time. (US-EPA, 1992)
- post-emergence** Period after a crop or pest has appeared. Herbicide usage can be referred to as post-emergence (weeds) or post-emergence (crop).

- precision** Closeness of agreement between independent test results obtained under prescribed conditions. (Thompson and Wood, 1995)
- predicted environmental concentration (PEC)** See *estimated environmental concentration*.
- predicted no effect concentration (PNEC)** An estimated *no-observable effect concentration* for an aquatic species of ecosystem based on extrapolated experimental exposure/response data.
- pre-emergence** Period before a specified crop or pest has emerged. Generally applied to timing of herbicide applications. Cf *post-emergence*.
- preferential flow** *Leaching* phenomenon whereby water and a dissolved pesticide percolating down through the soil profile move more rapidly through soil macropores or sand/gravel lens than through the network of smaller pores in the bulk soil.
- pre-harvest interval (PHI)** The time interval between the last application of a pesticide to a crop and harvest. See also *withholding period*.
- primary sample** Collection of one or more increments or units initially taken from a population. Note portions may be combined (*composited* or *aggregated sample*) or kept separate. (Horwitz, 1990)
- prior informed consent (PIC)** Agreement of the designated national authority in a participating country required before international shipment can proceed of a chemical which is banned or severely restricted in order to protect human health or the environment. (after FAO, 1986)
- processed food** Product resulting from the application of physical, chemical or biological processes, or combinations of these (e.g. canning), to a primary food commodity, and intended for sale to the consumer, for use as an ingredient in the manufacture of a food product or for further processing.
- quantitative structure-activity relationship (QSAR)** Quantitative association between the physico-chemical properties of a pesticide or the properties of its molecular substructures and its biological properties including its non-target toxicity.
- random sample** Sub-set of a sampling population that is arrived at by selecting units such that each possible unit has a fixed and determinate probability of selection.
- raw agricultural commodity** Part of a crop used as a food or feed commodity directly from the harvested crop without *processing*.
- raw data** All original laboratory records and documentation, or verified copies thereof, including data directly entered in a computer. They are the results from the original activities and observations in a *GLP study*.
- recovery, analytical** Fraction or percentage of a pesticide residue recoverable following extraction and analysis of a matrix containing the pesticide. (after Gold et al, 1987)

- redox potential** Electrical potential indicating the relative activity of oxidised and reduced species. The redox potential of an environmental matrix is a measure of the extent to which oxidising species are present to act as terminal electron acceptors in *respiration*.
- re-entry interval** Minimum time between pesticide application and human re-entry to a treated area. Established by a regulatory authority to assure safety of workers from exposure to residues.
- reference dose** Expected dose resulting from human exposure to a pesticide at the level at which it is regulated in the environment. (US-EPA, 1992). See also *acceptable daily intake, tolerable daily intake*.
- reference material** Material or substance containing pesticide of interest at levels sufficiently homogenous and well characterised to be used for the calibration of an apparatus or assessment of analytical method performance. (after Thompson and Wood, 1995). See also *certified reference material*.
- registration** The process whereby the responsible national government authority approves the sale and use of a pesticide following the evaluation of scientific data demonstrating that the pesticide is effective for the purposes intended and not unduly hazardous to human or animal health or the environment. (FAO, 1986)
- regulatory method** Validated analytical method which can be applied using commonly available laboratory equipment and instrumentation. A regulatory method has the precision, specificity, limit of determination, etc, needed to test compliance with the regulations.
- repeatability** For an analytical method, the closeness of agreement between results of measurements on identical test material subject to the following conditions: same analyst, same instrumentation, same location, same conditions of use, repetition over a short period of time. (after Metrology, 1984)
- reproducibility** For an analytical method, the closeness of agreement between results of measurements on identical test material where individual measurements are carried under changing conditions such as: analyst, instrumentation, location, conditions of use, time. (after Metrology, 1984)
- resistance** Development of tolerance to a pesticide by a target population, generally through natural selection.
- respiration** Energy-generating process in an organism where an organic or inorganic compound serves as the electron donor and an inorganic compound (e.g. oxygen) serves as the electron acceptor.
- retention sample** Sample which is stored for a specified period in case of a need for re-evaluation of data obtained from the main *laboratory samples*.
- risk** Probability of any defined hazard occurring from exposure to a pesticide under specific conditions. Risk is a function of the likelihood of exposure and the likelihood to harm biological or other systems. See also *hazard*.

risk assessment Process of defining the risk associated with a specified use pattern for a pesticide, usually expressed as a numerical probability or as a *margin of safety*. Quantifying risk ideally requires,

1. identification of *hazard*,
2. establishment of *dose-response relationships* in likely target individuals and populations,
3. *exposure assessment* (using likely exposure patterns as opposed to worst-case estimates).

(after Duffus, 1993)

risk management Decision-making process and procedures used by regulators and others to limit potential risks from use of pesticides. This involves *risk assessment*, emission control, *exposure* control and evaluation of the success of the risk mitigation efforts.

rotational crop Crop grown in sequence of two or more different crops.

run-off

1. Movement of a pesticide from a treated field by surface water and eroding sediment.
2. Loss of formulation off foliage during spray application, particularly at high volume.

safener : A substance added to a pesticide formulation to eliminate or reduce phytotoxic effects of the pesticide to certain crops. See also *adjuvant*.

safety factor See *uncertainty factor*.

sample Portion of material selected from a larger quantity of material so that it is representative of the whole. See also *aggregate sample*, *aliquot*, *composite sample*, *control sample*, *increment sample*, *laboratory sample*, *primary sample*, *random sample*, *retention sample*, *subsample*, *test portion* and *test sample*.

sampling plan Predetermined procedure for the selection, withdrawal, preservation, transportation, and preparation of the portions to be removed from a population as samples. (Horwitz, 1990)

SEC Size exclusion chromatography (cf GPC).

SFC Supercritical fluid chromatography.

SFE Supercritical fluid extraction.

soil partition coefficient (K_d) Experimental ratio of a pesticide's concentration in the soil to that in the aqueous (dissolved) phase at equilibrium. It is valid only for the specific concentration and solid/solution ratio of the test. The K_d is a distribution coefficient reflecting the relative affinity of a pesticide for adsorption by soil solids and its potential for *leaching* movement through soil. See also K_{OC} .

soil incorporation Application of a pesticide to soil by mixing or injection into the soil body.

soil organic partition coefficient (K_{OC}) Ratio of a pesticide concentration sorbed in the organic matter component of soil or sediment to that in the aqueous phase at equilibrium. The K_{OC} is calculated by dividing the K_d value by the fraction organic carbon present in the soil or sediment (see *soil organic matter*).

soil organic matter Organic fraction of the soil, including both fresh and aged residues (e.g. humus) of biological origin. Organic carbon refers to that portion of the soil measured as carbon in organic forms, and the organic matter content of soil is assumed to be approximately 1.72-fold that of the organic carbon content.

sorption Removal of pesticide from solution by soil or sediment via mechanisms of *adsorption* and *absorption*.

SPE Solid phase extraction.

specimens *Samples* collected from a system for examination, analysis, or storage.

spiked sample (fortified sample) *Control sample* with a known amount of pesticide added. Used to test the accuracy (especially the efficiency of *recovery*) of an analytical method. (after Thompson and Wood, 1995). See also *reference material*.

spray drift Movement beyond the target area of airborne droplets or vapour of pesticide formulation originating from aerial or ground-based spraying operations.

spreader See *wetting agent*.

standard solution, primary Standard prepared by dissolving a weighed amount of an *analytical standard pesticide* in a known volume of solvent.

standard solution, secondary Standard prepared by dilution of an aliquot of a *primary standard solution* with a known volume of solvent, or by subsequent serial dilutions; or a standard solution measured by reference to a *primary standard solution*.

sticker *Formulant* which increases the adhesiveness of a formulation applied to a surface. (FAO, 1995). See also *wetting agent*.

storage stability test For a *pesticide formulation*, a test which measures the chemical and physical stability of the product stored under defined, often worst case, conditions. For *pesticide residues*, a test which measures stability of residues in stored analytical samples, usually held under frozen conditions at a specified temperature.

subsample

1. portion of the *sample* obtained by selection or division;
2. individual unit of the lot taken as part of the *sample*;
3. final unit of multistage sampling. (Horwitz, 1990)

surfactant A *formulant* for reducing interfacial tension of two boundary surfaces, thereby increasing the emulsifying, spreading, dispersability or wetting properties of liquids or solids. (FAO, 1995.)

surveillance Systematic sampling and residue analysis of commodities, and collation and interpretation of data, in order to ensure compliance with established MRLs. Surveillance may be directed at domestic, imported or exported commodities.

suspension concentrate (SC) Formulation in which the active ingredient is in the form of a stable dispersion of fine particles in water or organic liquid. (GIFAP, 1989)

- synergist** Substance, which, while formally inactive or weakly active, can significantly enhance the activity of the active ingredient in a formulation.
- systemic** A *systemic* pesticide is capable of being translocated to sites other than where it was absorbed in sufficient quantities to be biologically effective.
- target, biological** Any organism, organ, tissue, cell or cell constituent that is subject to the action of a pesticide or its residue.
- technical material** Commercial grade of the pesticide as it comes from the manufacturing plant comprising the active ingredient and associated impurities. It may also contain small quantities of additives necessary for stability.
- test guideline** Guideline published by an appropriate authority for the order or conduct of certain tests.
- test portion (analytical portion)** *Subsample*, of proper size for a chemical analysis or other test, removed from the *test sample*. (after Horwitz, 1990)
- test sample (analytical sample)** Homogenous sample, prepared from the *laboratory sample* by mixing, grinding, blending, fine-chopping etc., from which *test portions* are removed for analysis with minimal sampling error. (Horwitz, 1990)
- test substance** The pesticide as a chemical substance or mixture which is under investigation in a *GLP Study*.
- test system** Each system (animal, plant, microbial, other cellular, subcellular; chemical, or physical or a combination thereof) used in a study.
- theoretical maximum daily intake (TMDI)** A prediction of the maximum daily intake of a pesticide residue, based on the assumption of levels of residues in food at *maximum residue limits* and average daily consumption of food per person. The *TMDI* is expressed in milligrams of residue per person. (WHO, 1989)
- threshold** Concentration of a pesticide in an organism or environmental compartment below which an adverse effect is not expected.
- TID** Thermionic detector (cf NPD, AFID).
- TLC** Thin layer chromatography.
- tolerable daily intake** Term preferred by the European Commission for *acceptable daily intake* of environmental contaminants. ADI is reserved for pesticides and food additives where extensive toxicological test data is available.
- tolerance, residue** See *maximum residue limit*.
- total diet study** *Pesticide residue monitoring* to establish the pattern of residue intake by a person consuming a defined diet. Primary sampling is as for a *market basket survey* but the samples are further processed as for domestic consumption i.e. further trimming and cooking as appropriate to local practice.
- total terminal residue** Summation of levels of all the compounds comprising residues of a pesticide in a food. See also *pesticide residue*.
- toxification** See *bioactivation*.

transformation product Chemical species resulting from environmental or metabolic processes on a pesticide. See also *degradation product, metabolite*.

translocation Movement of a substance within the *test system* or organism.

transpiration Vaporisation of water from a leaf into the air.

treated solution Test solution that has been subjected to reaction or separation procedures prior to measurement of some property.

trigger value Numerical value for a property of a pesticide, set by regulatory authorities, which determines the sequence and type of tests in a tiered assessment scheme. See also *cut-off value*.

trophic level Functionally similar organisms such as algae and plants as primary producers are grouped into trophic levels based on similarities in the patterns of food production and consumption.

ultra low volume (ULV) spray Signifies that the total volume rate of spray application is very low (5 litres per hectare or less). ULV pesticide formulations are generally specially developed for the purpose and are applied undiluted.

uncertainty factor Factor in toxicological assessment for extrapolation of data from experimental animals to man (assuming that man may be more sensitive) or from selected individuals to the general population. For example an uncertainty factor is generally applied to the *no-observed effect level* to derive an *acceptable daily intake*.

UVD Ultraviolet absorption detection.

validation In pesticide analysis, the process for establishing that an analytical method or equipment will provide reliable and reproducible results.

vehicle See *carrier*.

volatilisation Evaporation of a pesticide into the atmosphere from a solid or liquid form.

watershed See *catchment*.

water dispersible granule (WG) Formulation containing granules which readily disperse in water to form a suspension. (GIFAP, 1989).

water dispersible powder (WP) Pesticide in a dry form with surfactant, often mixed with, or coated on, a fine solid carrier, for dispersion in water to form a suspension. (GIFAP, 1989).

water soluble powder Powder formulation to be applied as a true solution of *active ingredient* after mixing with water, but which may contain insoluble *inert ingredients*. (GIFAP 1989).

wettable powder See *water dispersible powder*.

wetting agent *Surfactant* for use in spray formulations to assist dispersion of a powder in the *diluent* or spreading of spray droplets on surfaces. May also incorporate functions of a *sticker*.

withholding period Minimum permissible time between the last application of a pesticide to a crop (including pasture) and harvesting for human consumption or grazing with livestock. The minimum permissible time between the final application of a pesticide to an animal and the collection of eggs or milk, or slaughter, for human consumption. See also *pre-harvest interval*.

xenobiotic substance Natural or synthetic compound which is present in an organism but is not a natural component of that organism. Common usage is for man-made environmental contaminants in organisms. (Nagel, et al 1992)

xylem Part of the plant's vascular system adapted to the transport of water and solutes from the roots to aerial parts.

zero tolerance Limit for a pesticide residue in food or feed which is assumed to be zero and therefore any detectable residue is deemed illegal. Zero tolerances are used by some regulatory systems, e.g. USA, where no maximum residue limits have been established for particular pesticide/crop combinations.

LIST OF ABBREVIATIONS OF NATIONAL AND INTERNATIONAL BODIES

AOAC	:	Association of Official Analytical Chemists
ASTM	:	American Society for Testing and Materials
CAC	:	Codex Alimentarius Commission
CAS	:	Chemical Abstracts Service
CCPR	:	Codex Committee on Pesticide Residues
CIPAC	:	Collaborative International Pesticide Analytical Council
EPA	:	Environmental Protection Agency (USA)
EPPO	:	European and Mediterranean Plant Protection Organisation
FAO	:	Food and Agriculture Organization of the United Nations
GEMS	:	Global Environmental Monitoring System
GIFAP	:	Groupement International des Associations Nationalies de Frabricants de Produits Agrochimiques
IPCS	:	International Programme on Chemical Safety, World Health Organisation
ISO	:	International Organisation for Standardisation
IUPAC	:	International Union of Pure and Applied Chemistry
JMPR	:	Joint FAO/WHO Meeting on Pesticide Residues
OECD	:	Organisation for Economic Co-operation and Development
PAN	:	Pesticide Action Network
UNEP	:	United Nations Environment Programme
WHO	:	World Health Organization of the United Nations

REFERENCES

- ASTM (1984), *Standard Practice for Evaluating Environmental Fate Models of Chemicals*, American Society for Testing and Materials, Philadelphia.
- Calvert, J.G. (1990), Glossary of atmospheric chemistry terms (IUPAC recommendations). *Pure and Applied Chem.* **62**, 2167-2219.
- CIPAC (1980), Handbook 1A, *Analysis of Technical and Formulated Pesticides*. Collaborative International Pesticides Analytical Council.
- Codex (1989),
- Cohen, S.Z.; Wauchope, R.D.; Klein, A.W.; Eadsforth, C.V. Graney, R. (1996), Offsite Transport of Pesticides in Water - Mathematical Models of Pesticide Leaching and Runoff. *Pure and Applied Chem.*, in press.
- Duffus, J.H. (1993), Glossary for chemists of Terms Used in Toxicology, *Pure & Appl. Chem.* **65**, 2003-2122.
- FAO (1986), *Guide to Codex Recommendations Concerning Pesticide Residues Part 1: General Notes and Guidelines*. Food and Agricultural Organisation, Rome.
- FAO (1986), *International Code of Conduct on the Distribution and Use of Pesticides*. Food and Agricultural Organisation, Rome.
- FAO (1987), *Manual on the Development and Use of FAO Specifications for Plant Protection Products*. Food and Agricultural Organisation, Rome, Publ. 85.
- FAO (1990), *Pesticide Residues in Food*. Plant Prod. and Prot. Paper 102, Food and Agricultural Organisation, Rome.
- GIFAP (1989), Catalogue of Pesticide Formulation Types and International Coding System. GIFAP Technical Monograph No. 2, Brussels.
- Horwitz, W. et al. (1990), Nomenclature for Sampling in Analytical Chemistry. *Pure & Appl. Chem.* **62**, 1193-1208.
- IPCS (1989), *Glossary of terms for use in IPCS publications*, International Programme for Chemical Safety World Health Organisation, Geneva.
- IUPAC (1992), *Glossary of terms used in biotechnology for chemists*. *Pure and Applied Chem.* **64**, 144-168.
- Keith, L.H. (1991), *Environmental sampling and analysis - a practical guide*. Lewis Publishers, Boca Raton, Florida.
- OECD (1992), *The OECD principles of good laboratory practice*. Environment Monograph No. 45 Organisation for Economic Co-operation and Development, Paris, 1992.
- Metrology (1984), *International vocabulary of basic and general terms in metrology*. International Organisation for Standardisation.
- Mills, I; Critas, T.; Homann, K.; Kallay, N.; Kozo, Kuchitsu (1993), *Quantities, units and symbols in physical chemistry*. IUPAC recommendations 2nd ed., Blackwell, Oxford, 1993.
- Rand, G.M. and Petrocelli, S.R. (1985), *Fundamentals of Aquatic Toxicology*. Hemisphere, Washington.
- Roberts, T.R. (1984), Non-extractable pesticide residues in soils and plants. *Pure and Applied Chem.*, **56**, 945-956.
- Thompson, M. and Wood, R. (1995), Harmonised guidelines for internal quality control in analytical chemistry laboratories. *Pure and Applied Chem.* **67**, 649-666.
- US-EPA (1986), *Test methods for evaluating solid waste*. SW-846, 3rd ed., US Environmental Protection Agency, Washington D.C., 20460.
- US-EPA (1992), *Selected Terms and Acronyms*. Environmental Protection Agency, Office of Pesticide Programs, Washington D.C..
- Wetzel, R.G. (1983), *Limnology*, 2nd ed. CBS College, New York.
- WHO (1989), *Guidelines for Predicting Dietary Intake of Pesticide Residues*. World Health Organisation, Geneva.