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IUPAC Reports on Pesticides (6)

**DEFINITIONS AND GUIDELINES FOR
DESCRIBING AND EVALUATING
PESTICIDE RESIDUES**

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DEFINITIONS AND GUIDELINES FOR DESCRIBING AND EVALUATING PESTICIDE RESIDUES

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1. INTRODUCTION

The main purpose of these definitions and guidelines is to secure a proper description and evaluation of pesticide residues within the framework and programmes of the Pesticide Residue Commissions of IUPAC.

However, beyond this immediate purpose, the guidelines are also meant to contribute to the improvement of communication among the various organizations and individuals involved in determining and evaluating pesticide residues (international and national regulatory agencies, industry, government and university laboratories, etc.).

2. A PESTICIDE RESIDUE

A pesticide residue is any substance or mixture of substances in or on any substrate resulting from the use of a pesticide and includes any derivatives, such as degradation and conversion products, metabolites, reactions products and impurities.

This definition of a residue, whilst precise, gives no indication of the significance of that residue.

A detailed listing of those substrates that may contain pesticide residues and that are considered to be food for man or animals is given in Annex I.

3. A SIGNIFICANT PESTICIDE RESIDUE

Whether a pesticide residue is significant or not is a matter of judgement that depends on:

- a) the toxicological properties of the substance or substances in the residue,
- b) the degree of exposure to the residue.

In addition, it is essential before a residue can be called significant that it has occurred under realistic conditions of use of that pesticide and not just under artificial or model conditions.

The determination of the significance of a residue involves consideration of the toxicological properties of the compound. This aspect is outside the terms of reference and competence of the IUPAC Pesticide Commission and as such no attempt is made here to define or describe toxicological significance. A list of other criteria that may assist in determining the significance of a residue is given in Annex II.

4. DESCRIPTION OF A RESIDUE

Residues should be described in both quantitative and qualitative terms.

The amounts should be expressed in mg of the residue(s) per kilogram of the substrate analysed. When the molecular structure of a particular residue cannot be clearly established the amount may be expressed in equivalent terms relative to the molecular weight of the parent molecule.

In qualitative terms, characterisation and chemical identification (including synthesis of the proposed structure) should be conducted on all residue components present in edible crops comprising more than 10% of the total residue at sampling. However, one need not normally pursue residues down to a proportion as low as this if the total residue is below 1 mg/kg. On the other hand, provided specific toxicological reasons exist, components that are present in even smaller concentrations than those indicated above should also be characterised and identified.

Annex IFood for Man and Animals that May Contain Residues

The following substrates and media have to be considered when evaluating the residue situation of a pesticide with regard to potential exposure of human beings and animals:

- agricultural commodities, including processed (or prepared) products derived from them that are used for human consumption,
- agricultural commodities and products derived from them that are used as feed in animal production,
- food products derived or prepared from pesticide-treated animals or from animals kept in pesticide-treated livestock premises,
- stored products that have been treated with or exposed to a pesticide and are then used as food for humans or as feed for animals.

Depending on the amount of a pesticide applied, the size of the areas treated and the particular properties of its residue(s), the following additional substrates have to be considered:

- rotational crops that are cultivated in an area previously treated with a pesticide,
- drinking water and air,
- inadvertently exposed non-target organisms that are used for human consumption or in animal production (fish, shellfish, birds, deer, etc.).

Although not immediately connected with the presence in human food or animal feed, official legislation may ask for the evaluation of residues in the following risk areas:

- potentially adverse biological effects on non-target organisms,
- potentially adverse effects on humans applying pesticides or entering pesticide-treated areas (re-entry).

Annex IICriteria for Determining Significance or Non-Significance of a Pesticide Residue

The following criteria are listed to assist in the evaluation of a pesticide residue beyond that of merely mentioning its concentration, its structure or its physical/chemical properties. The applicability of the criteria has to be considered for each particular residue situation.

The significance of a residue is enhanced when,

- its biological (toxicological) effects have been recognized to be harmful to human health or to specified non-target organisms in concentrations corresponding to those of the residue as observed under conditions of practical application.
- it is persistent*, i.e. its half-life is more than 6 months in a relevant substrate (soil, natural water, etc.),
- its physical/chemical properties (stability, polarity, partitioning behaviour, etc.) indicate the possibility of accumulation by non-target organisms or magnification in the food chain,
- it has been transformed to a more toxic form (mercury to organomercury).

The significance of a residue is reduced when,

- it has been demonstrated to be innocuous to human health or to specified non-target organisms,
- it has been recognized to be unstable or non-persistent under environmental conditions (this includes transitory or intermediate metabolites and reaction products),
- its physical/chemical properties are such that bioaccumulation or biomagnification may be excluded,
- it has been transformed to a less toxic form (ammonia to ammonia in water).

* Whenever possible persistent compounds ought to be qualified with regard to their potential biological (toxicological) effects on non-target organisms.