

## Efficacy evaluation of plant protection products Evaluation biologique des produits phytosanitaires

# Minimum effective dose

### Specific scope

This standard describes the criteria, as well as the experimental procedures, for determining the minimum effective dose of a plant protection product.

### Specific approval and amendment

First approved in 2003–09.

Revision mainly to reflect zonal assessment approved in 2012–09.

### Definition

For the purposes of this standard, the ‘minimum effective dose’ of a plant protection product is the dose that is the minimum necessary to achieve sufficient efficacy against a target pest across the broad range of situations in which the product will be applied.

Where the product is proposed for use under diverse conditions, there may be situations that warrant the use of different doses, for example, in situations with different cropping practices or crop structures, or variation in the inherent sensitivity of the target pest. Thus for a specific target, it may be possible to justify a number of specific ‘minimum effective doses’ under defined conditions, which should be established using the principles in this standard.

### Introduction

In the interests of reducing exposure to plant protection products in the environment, to the person(s) applying the product or to the end-users of the crop (either humans or domestic animals), it is important to ensure that only the minimum dose is applied to achieve the desired effect. In addition, within the European Union, the legislative framework requires that dose rates lower than the recommended one should be included in some trials in order to establish whether the recommended rate is the minimum necessary to achieve the desired effect (EC, 2009).

The objective of this guideline is to give applicants and national registration authorities a basis for considering the determination of the minimum effective dose. The intention is to detail the minimum requirements necessary to ensure consistency of decision making.

### Determination of minimum effective dose

To establish that the recommended dose of a plant protection product is the minimum necessary for effective control of a particular pest, it is necessary to establish in trials that the recommended dose provide one or more of the following:

- A higher level of effectiveness compared to the lower dose;
- A longer persistence of action compared to the lower dose.

It is recognized that the selection of the recommended dose, and thus the justification that this is a minimum effective dose for a given pest, may be a compromise based on expert judgement and on the results from a number of trials. In addition, the potential for resistance, the safety of the product to the crop, and other aspects of efficacy should be considered (see EPPO Standard PP 1/214 *Principles of acceptable efficacy*). Appropriate explanation of the reasoning for the choice of the intended dose may assist the evaluation of the data and should be provided.

Where more than one active substance is included in a product, justification of both the ratio of active substances and the rate of the product is normally required. Particular attention should also be paid to the rationale behind the inclusion of each active substance in the product. It may be necessary, for example, to explain the benefit over the individual active substances (e.g. resistance management) in addition to a justification of the product dose. EPPO Standard PP 1/277 *Insecticide co-formulated mixtures* is particularly relevant when considering mixtures of insecticides.

With a change in formulation, no further work to demonstrate the minimum effective dose is required where formulation does not markedly increase efficacy. Where a formulation change has been shown to markedly affect efficacy, then one or more additional doses, lower than that to be recommended should be included in the effectiveness trials to provide justification that the proposed dose is the minimum effective dose (guidance under development).

## Efficacy testing to establish the minimum effective dose

### Preliminary tests

During the early development of a plant protection product, initial dose-ranging trials, possibly in laboratory or semi-field situations, provide an indication of the likely recommended dose. Data from such trials can then be used in refining the doses to be applied in subsequent field trials to test the effectiveness of the product. These trials focus on doses around the dose necessary to deliver the required level of effectiveness and enable a recommended dose to be proposed.

### Direct efficacy trials

To provide sufficient information to substantiate the direct efficacy (effectiveness) of a product, a number of trials, making up a trial series, would normally be conducted in which at least the proposed recommended dose is tested. This trial series will include a relevant range of climatic, agricultural, epidemiological and edaphic conditions and appropriate standards as reference products (preferably the same if available in all countries). EPPO Standards PP 1 *Efficacy evaluation of plant protection products* provide more detailed instructions on the design and conduct of efficacy trials for individual host/pest combinations. For further guidance, refer to EPPO Standards PP 1/181 *Conduct and reporting of efficacy evaluation trials, including good experimental practice*, and PP 1/152 *Design and analysis of efficacy evaluation trials*.

To provide information to establish the minimum effective dose, some of the trials conducted to demonstrate efficacy should include at least one lower dose(s) (for example 60–80% of the recommended dose) to that which would be recommended. Preliminary data may also be used to support the justification of the minimum effective dose. The number of trials in which a lower dose is included should be sufficient to cover the range of situations in which use is

proposed, and demonstrate differences in control (or effect for growth regulators) between the lower dose and the recommended dose. Where the recommended dose can be identified as the minimum effective dose from preliminary tests and efficacy trials, with lower doses meeting the criteria, no additional trials are necessary to establish that the dose recommended is the minimum necessary for efficacy.

Where situations have been identified that allow reduced rates to be employed without compromising the desired effect, they should appear as recommendations on the label, e.g. where reduced rates are giving satisfactory control of specific weed species or pathogens, or where reduced persistence is acceptable, or on particular soil types where a lower dose is fully effective and gives no danger of reduced sensitivity or resistance.

## Multiple target pests and multiple dose recommendations

Many plant protection products are used to control a range of target pests. In such situations, it would be impractical and unnecessary to provide evidence for the minimum effective dose for all recommendations. Information is required for a range of targets which are considered to be the most important, and for which control provides the major agricultural benefit. It should be noted that where the proposed use is across a substantive geographical area such as an authorization zone (as defined in PP 1/278 *Principles of zonal data production and evaluation*), the major target species and/or the major crop may vary and there may be differences in population pressures. Therefore particular consideration should be given to trials location.

Similarly, where different doses are recommended for different target pests, it is not necessary to produce data for every dose or for every target on the label. For example, where lower doses are recommended (e.g. for the control of less significant or susceptible target organisms, for situations of low incidence or for use with resistant cultivars), information from a dose or doses other than that recommended is usually not needed. Data is required for the main targets or some representatives of them.

## Reference

EC (2009) Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directive 79/117/EEC and 91/414/EEC. *Official Journal of the European Union L 309*, 1–50.