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EPPO STANDARD

EPPO Standard on Efficacy evaluation of plant protection products

PP 1/207 (3) Effects on succeeding crops

Specific scope: This Standard describes methods used to examine whether a plant protection product, in particular a herbicide or a plant growth regulator (PGR), causes negative effects on crops grown as rotational or replacement crops after a crop treated with that product.

Specific approval and amendment:
First approved in 1998–09.
Revision approved in 2007–09.
Revision approved in 2026–09.

1 | INTRODUCTION

This Standard describes the methods used to examine whether a plant protection product can cause negative effects on crops grown after a crop treated with that product. These crops can be grown as normal rotational crops as well as replacement crops in case of crop failure.

The Standard is not only intended to give information on the design of particular trials. It is also intended as a stepwise guide to the different types of examination that can be carried out, taking into account information from trials conducted for other purposes, such as information on the persistence of the active substance(s). Whenever efficacy and selectivity trials are carried out, effects on the succeeding crop can usefully be noted if the trial site can remain marked out until the following year, and/or be accurately re-marked out in the succeeding crop.

The extent and type of field tests that need to be conducted depend on the fate and behaviour of the active substances in soil and on their biological activity. These properties can be investigated in preliminary laboratory, glasshouse or field trials, and the results will determine whether, according to the interval between applications of the plant protection product and planting of any sensitive succeeding crop, field trials are required. The information gained from the preliminary trials can be used to design the field trials. For many plant protection products, particularly for those with only fungicidal or insecticidal activity, further testing will not be required.

Field trials can also be conducted in stages. Where effects are predicted from preliminary laboratory, greenhouse or field trials, observational trials on large plots can be carried out to examine how much residual activity can be expected under field conditions. If effects are seen on succeeding crops in field trials, a risk management strategy will be required to minimize risks. This may include label restrictions on the intervals between the use of the plant protection product and the planting of certain crops as succeeding crops, or specific cultivation recommendations (e.g. ploughing after crop failure).

2 | DECISION-SUPPORT SCHEME FOR THE RISK ASSESSMENT FOR SUCCEEDING CROPS

Appendix 1 presents the decision-support scheme described in this section.

2.1 | Step 0 – Absence of exposure

If exposure of succeeding crops is unlikely (e.g., non-soil-bound crops, indoor applications, perennial crops, pheromone/attract-and-kill traps), no testing is necessary.

2.2 | Step 1 – Relevant data available from the test product, other product(s) and the active substance(s)

- Relevant data from active substance(s)

If the active substance(s) in the test product are unlikely to have any effect on succeeding crops (e.g., aluminium silicate, potassium hydrogen carbonate) or if the active substance(s) are degraded very quickly once in the soil (i.e. a short DT_{90}[1]), no testing is necessary.

- Relevant data from the test product

For products other than herbicides and PGRs, if non-target plant data generated with the test product (ecotoxicological studies) do not show any significant negative

[1] DT_{90}: disappearance time in the soil of 90 % of the active substance.

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impact of the product on the emergence and growth of sensitive plant species, that is, if NOER[2] and/or ER_{10}[3] values from seedling emergence tests are higher than the maximum dose for the intended use, then no effect on succeeding crops is expected and no further testing is necessary.

- *Relevant data available from other products*

It is generally accepted that once a formulation is present in the soil, then the co-formulants have no significant effect on the properties of the active substance. Results from other products are normally applicable to different formulations of the active substance. Therefore, tests conducted with a specific plant protection product may not be necessary and it may be possible to extrapolate between products in terms of the risks to succeeding crops.

This depends on the products applying the same amount(s) of active substance(s), application at the same timing and the availability of a risk assessment in line with this Standard. If extrapolation from an existing product appears agronomically relevant, it must be verified that:

(i) The reference product is authorized in the countries for which registration of the test product is claimed.
(ii) The risk assessment for the reference product has been conducted according to the current requirements of this Standard.
(iii) The existing authorized formulation should have a full underlying supporting data package.[4] The risk assessment for the reference product is available and can be used for the test product. All the corresponding data as well as the analysis performed by competent authorities should be included in the application for the registration of the test product.

If the data described above are not available or are unable to safely exclude a risk to succeeding crops, further testing with the test product should be conducted (see step 2).

2.3 | Step 2 – Determine the biological activity of the active substance(s) in soil

A bioassay on a range of representative rotational and replacement crop types should be conducted to examine whether germination or growth is affected when the active substance(s) are present in soil. The bioassay should be done even if the active substance(s) are mainly effective via the foliage of plants, as some uptake from the soil may take place.

This test is best conducted in controlled conditions (growth chamber or glasshouse, with plants grown in pots). At least 5 representative species should be tested. The range of crop species tested should take into account the intended use of the tested product and the usual succeeding crops in the rotation or likely replacement in the region of use. If the substance is known to be selective in its biological activity, the crops tested should be relevant to this activity, for example, mostly dicotyledonous crops if the substance is active against dicotyledonous plants. The more species and plant families that are tested the better the understanding of the safety of the product to succeeding crops. This may reduce the requirement for field trials and/or label restrictions (see step 5).

The plant protection product must be incorporated into the soil in which seeds will be sown. In general, seeds sown into treated soil are more sensitive than plants translocated into treated soil. Therefore, tests on transplanted plants may be less relevant for demonstrating safety to crops sown as seeds. A dose should be applied that is equivalent to the concentration of active substance(s) that would be expected in soil just after application of the maximum dose of product for the intended use (see Equation 1 under step 3).

A range of decreasing doses should be applied to determine the dose that gives no significant effects on the most sensitive plant species tested. This may in practice mean that more than one trial should be conducted for active substances with high herbicidal activity, if the 'no effect' level is not found in the first trial. It may also be useful to screen higher doses, if the active substance is persistent and likely to accumulate in the soil. An EC_{10}[5] value [mg/kg] should be determined for each tested crop. If necessary, further tests may be performed on a wider range of species in small-scale field trials.

Ecotoxicological tests conducted on non-target plants (seedling emergence tests, OECD (2006)) do not usually include soil incorporation and therefore may not be acceptable for herbicides and PGRs. Furthermore, plant species tested in these trials (model species) may not be suitable as succeeding crops.

It must be noted that, for products containing 2 or more active substances, an analysis can be conducted for each individual active substance. In this case,

[2]NOER (No Observed Effect Rate): highest dose rate of the test product at which no effect was observed.

[3]ER_{10} (Effect Rate 10): dose rate of the test product that results in 10% phytotoxicity relative to the control.

[4]In this circumstance, the guidance provided within this Standard is based on the premise that there is appropriate data access to the existing formulation. Any consideration of the regulatory basis and procedures in individual member countries concerning data protection and access to unprotected data is outside its scope. Within the European Union, for zonal authorisations involving more than one Member State, the zonal rapporteur Member State will assess the relevance of the data and whether comparability to an authorised product has been demonstrated. However, only individual concerned Member States can determine the data protection status and data access to that authorised product and are able to make a detailed comparison of the relevant formulation details.

[5]EC_{10} (Effective Concentration 10): Concentration of the formulated product in the soil that results in a 10% effect (e.g. phytotoxicity, emergence).

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a bioassay must be carried out for each active substance incorporated alone. However, it is important to note that this method does not take into account any potential cumulative or synergistic effects from having multiple active substances present in the soil simultaneously.

2.4 | Step 3 – Determine fate and behaviour of the active substance in soil (PEC values)

The persistence and availability of the active substance in soil should be examined in a specifically designed set of trials, the conduct of which is outside the scope of this Standard.

The calculation of the Predicted Environmental Concentrations (PEC) for the active substance and their relevant metabolites in the compartment soil can be performed according to the following principles (Kloskowski et al., 1999). Equations are presented here for reference, however, expert judgement is required in selecting the relevant values to use and other issues to be considered.

2.4.1 | $PEC_{initial}$

Initial PEC value represents actual concentrations of the active substance [mg/kg], where bulk density of soil is 1.5 g/cm^3 dry weight and thickness of the soil layer is 5 cm for applications at the soil surface and 15–20 cm for application with incorporation to the soil. PEC values can take into account interception by plants covering the ground. This is 0% for pre-emergence applications and interception post-emergence depends on the crop and its growth stage at application (see Appendix 2). Even if the product is intended to be applied post-emergence, $PEC_{initial}$ for no crop interception can be used as a worst-case.

$$PEC_{ini} = \frac{A \cdot (1 - f_{int})}{100 \cdot d \cdot bd} \quad (1)$$

where A=application rate [g/ha], f_{int}=fraction intercepted by plant cover, d=depth of the soil layer [cm], bd=bulk soil density [g/cm^3].

It is important that different soil depths are used in Equation 1 to calculate additional PEC values to account for different cultivation methods (e.g. ploughing to 15 cm).

2.4.2 | PEC_{actual}

For calculating the concentration in soil at the time relevant for growing the succeeding crop ($PEC_{actual}(t)$), the degradation kinetics of the active substance(s) should be taken into account. The degradation rate of an active substance is usually modelled by a single first order (SFO) or biphasic kinetics. The corresponding equation, as well as the reference DT_{50}[6] of the active substance, are determined from environmental fate studies. The DT_{50} provided is meant to represent a worst case based on laboratory or field dissipation studies conducted on different soil types.

For instance, $PEC_{actual}(t)$ for an active substance following a single first order degradation kinetics can be calculated as follows:

$$PEC_{act}(t) = PEC_{ini} \cdot e^{-kt} = PEC_{ini} \cdot e^{-\frac{t \cdot \ln 2}{DT\,50}} \quad (2)$$

For active substances related to biphasic degradation kinetics, it is possible to approximate their fate in the soil by a SFO kinetics and use Equation 2, under certain conditions:

- For an active with DFOP[7] or HS[8] kinetics, the DT_{50} corresponding to the slower degradation phase (slower DT_{50}) should be used;
- For an active with FOMC[9] kinetics, a pseudo-SFO DT_{50} corresponding to the DT_{90}/3.32[10] should be used;

It is therefore recommended to refer to environmental fate studies conducted with the test product and/or data used in the framework of the active substance's approval in order to confirm the degradation kinetics and reference DT_{50} of the active substance for correct $PEC_{actual}(t)$ calculation.

2.5 | Cases of formulated products with 2 or more active substances

Where the proposed product includes more than one active substance there are 2 possible methods for calculating $PEC_{initial}$ and PEC_{actual} values. These are as follows:

- Method 1 – Formulated product risk assessment

It is possible to determine a $PEC_{initial}$ value representing the total amount of active substance in the soil (mg Σ a.s./kg soil) just after application. As a worst-case, PEC_{actual} values (also in mg Σ a.s./kg soil) are then calculated using Equation 2 and the highest DT_{50} of the active substances in the product. The highest DT_{50} value should be confirmed based on environmental fate data,

[6] DT_{50}: the time taken for an active substance to degrade by 50 per cent once in the soil.
[7] DFOP: Double First Order in Parallel.
[8] HS: First-Order Sequential Bi-phasic (Hockey-Stick Model).
[9] FOMC: First-Order Multi-Compartment.
[10] For FOMC kinetics, the DT_{90} value is divided by 3.32 for conversion to a half-life (for first-order kinetics, DT_{50} is 3.32 times shorter than the DT_{90} value).

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according to the degradation kinetics of each active substance (SFO, DFOP, HS, FOMC). This method takes into account the fact that each active substance will have a different biological activity, but also that when multiple active substances are present in the soil simultaneously, they may have a cumulative or even synergistic effect.

- Method 2 – Individual active substance(s) risk assessment

It is possible to calculate $PEC_{initial}$ and PEC_{actual} values for each individual active substance in the product. However, it is important to note that this method does not take into account any potential cumulative or synergistic effects from multiple active substances being present in the soil simultaneously.

2.6 | Step 4 – Predicting the risk to succeeding crops (i.e. TER calculation)

The results of soil behaviour tests and screens of biological activity should be taken together to determine whether the active substance poses a risk to succeeding crops (Appendix 1) by calculating Toxicity-Exposure Ratio (TER) values. The nature of succeeding crops and the likely interval between application and planting of these crops should be considered. The TER values are calculated using the PEC_{actual} values, that is, the assessment is based on the likely level of active substance at the time of planting the succeeding crop, taking into account any cultivation methods and the interval after application.

$$TER = \frac{EC_{10}}{PEC_{actual}}$$

If the TER values are >1, then no further testing is necessary.

If the TER values are ≤1, damage to the relevant succeeding crops is possible and further field-testing is necessary as described under step 5.

The effects on replacement crops that might be planted in the case of failure of the treated crop should be examined, and the same general principles apply. The level of the active substance likely to be present at intervals after application should be compared with the sensitivity in soil of likely replacement crops to determine whether field trials are required.

If cultivation methods or specific time intervals are required to achieve a safe use for a succeeding crop, they must be included in the management practices on the product label.

Cases of formulated products with 2 or more active substances:

Where the proposed product includes more than one active substance there are 2 possible methods for calculating TER values. These are as follows:

- Method 1 – Formulated product risk assessment

If bioassays were conducted with the test product, the EC_{10} values in mg Σ a.s./kg soil for each crop are compared with the PEC_{actual} values in mg Σ a.s./kg soil, which are calculated using Equation 2 and the highest DT50 of the active substances in the product. Therefore, only one TER value is calculated for each succeeding crop.

- Method 2 – Individual active substance(s) risk assessment

If EC_{10} values are only available for the individual active substances, TER values are then calculated for each active substance and each succeeding crop. It may be safe to sow a succeeding crop at the interval after application when the TER values for all of the active substances are >1. However, it is important to note that this method does not take into account any potential cumulative or synergistic effects from multiple active substances being present in the soil simultaneously.

2.7 | Step 5 – Conduct field trials

See Section 3 below.

3 | FIELD TRIALS

In trials addressing the risk to rotational crops treatments are applied to plots of the initial crop for which the plant protection product is requested, and this is referred to as the "treated crop." After harvest of the treated crop, rotational test crops are sown into these plots to examine whether their growth is affected. For the replacement crop trials, or as a worst case for rotational crop trials, treatments are applied to plots on bare soil after a normal seed bed preparation. The most sensitive replacement crops are sown at defined intervals after the application. The first sowing date should be immediately after the treatment. Sequential planting of sensitive crops over a period of time can provide information on how long it takes for an active substance to decline to a non-damaging level. Trials may also test different cultivation techniques, for example shallow non-inversion tillage versus ploughing based cultivation, as ploughing can dilute the residue of active substance.

A range of usual and/or representative succeeding crops should be considered. The following factors may need to be taken into account:

- Not only crops that are planted soonest after harvest should be considered. Very sensitive crops planted a long time after harvest may be at greater risk
- In horticulture, short rotations may be practised

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- Active substances applied immediately pre or post-harvest pose a particular risk if they are active in soil, as the interval before planting the succeeding crop is shorter
- Persistence may vary with certain soil types, which may or may not be suitable for growing sensitive succeeding crops
- Green manure crops, or crops grown between or under another crop may be sensitive and should be considered if they represent normal field practice
- If sufficient crops are tested there may be scope for extrapolation to other crops (see the recommendations in relation to crop safety in EPPO Standards PP 1/257 *Efficacy and crop safety extrapolations for minor uses* and PP 1/331 *Principles of efficacy extrapolations for major uses*).

3.1 | Experimental conditions

3.1.1 | Selection of treated crop and cultivar

The trial should be performed on the crop(s) specified for the intended use or on bare soil.

3.1.2 | Trial conditions

The trial should be set up in the field. Cultural conditions (e.g. soil type, fertilization, tillage) should be uniform for all plots of the trial and should conform with local agricultural/horticultural practice. The crop treatments should be recorded as well as any plant protection products used on or after it. Sites treated with plant protection products known to have phytotoxic effects on the succeeding crop should be avoided.

The trial should form part of a series carried out in different regions with distinct environmental conditions and preferably in different growing seasons (see EPPO Standard PP 1/181 *Conduct and reporting of efficacy evaluation trials, including good experimental practice*). The trial sites should be selected to cover the range of soil types to which the product could be applied. If data examined under Step 3 suggests that carry-over may be greater on certain soil types, trial(s) should include site(s) with these soil types (unless application on these soil types is not permitted for the intended use).

3.1.3 | Design and lay-out of the trial

3.1.3.1 | *Rotational crop trials*

Two types of trials may be carried out with large or small plots. Large-plot trials are conducted to examine visual effects on a range of crops. Small-plot trials are conducted to examine the effects on yield of specific succeeding crop(s). The assessments described in Section 3.4.2 are carried out in both types of trials; qualitative and quantitative recording of yield (Section 3.4.5) is only conducted in the second type of trial.

Treatments: test product(s), untreated control and reference product (if available), arranged in a suitable statistical design.

Plot size (net): at least 40 m^2 (large-plot trials) or at least 20 m^2 (small-plot trials). Depending on the crop, plots may need to be larger to allow yield assessment.

Replicates: at least 4 (small-plot trials). For large-plot trials, replication may be reduced or non-replicated trials may be conducted on several sites.

Markers should be placed in the ground in the treated crop so that plots can be distinguished before the succeeding test crops are planted. The initial plots should be sufficiently large for the required soil cultivation to be carried out after harvest of the treated crop. Remains from the treated crop, for example, straw, should be evenly distributed over the plot or removed from the trial before planting the test crops, depending on local practice. If there is a risk to succeeding crops from residues in the crop debris, these should be managed so that the succeeding crop is subject to the maximum exposure likely to arise under local practice. The effects of both shallow non-inversion tillage operations and inversion tillage (ploughing) on rotational crops can be studied.

For further information on trial design, see EPPO Standard PP 1/152 *Design and analysis of efficacy evaluation trials*.

3.1.3.2 | *Replacement trials*

A special design was developed to test and assess the effects of herbicide residues in the soil under conditions in the field simulating crop failure (Callens et al., 1997; Eelen et al., 2001; Krauskopf et al., 1991).

Treatments: test product(s), reference product(s), untreated control.

Plot size (net): at least 20 m^2 (small-plot trials).

Replicates: at least 4.

At given intervals after application to bare soil, likely replacement crops are planted across treated and untreated strips. The effects of both shallow non-inversion tillage operations and inversion tillage (ploughing) on replacement crops can be studied. Sequential planting of crops should be carried out to attempt to determine when the decline of the active substance reaches a non-damaging level. If a non-damaging level is not reached within the maximum realistic interval (e.g. 30 days) that a particular replacement crop can be sown, management practices or restrictions will be necessary.

For further information on trial design, see EPPO Standard PP 1/152 *Design and analysis of efficacy evaluation trials*.

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3.2 | Application of treatments

3.2.1 | Test product(s)

The product(s) containing the active substance under investigation should usually be the named formulated product(s). However, it is generally accepted that once a formulation is present in the soil, then the co-formulants have no significant effect on the properties of the active substance, therefore other products containing the same active substance(s) may also be used if tested at relevant doses. The exception to this is where products that have been formulated in ways that are likely to affect the persistence of an active substance (e.g. slow-release formulations).

3.2.2 | Reference product(s)

If available, a product known to have similar persistence in the soil and similar activity against the same crops as the test product should be applied. In general, mode of action, route of uptake, and fate and behaviour should be similar to that of the test product.

3.2.3 | Mode of application

Applications should comply with good standard practice.

3.2.3.1 | *Type of application*
The type of application should be as specified for the intended use.

3.2.3.2 | *Type of equipment*
Application(s) should be made with suitable equipment, which provides an even distribution of product on the whole plot or accurate directional application where appropriate.

3.2.3.3 | *Time and frequency of application*
The number of applications and the date of each application should be as specified for the intended use. The state (emergence, growth stage) of the crop and the number and date of the applications should be recorded. If crop types or cultivars can be treated at a range of timings in the year, then application on the treated crop(s) should be done at representative timings, including those which leave the shortest time between treatment and harvest and the least microbial activity in the soil, that is, autumn/winter in northern Europe. Applications to bare soil can be used to represent a worst-case scenario.

3.2.3.4 | *Doses and volumes*
The product should normally be applied at the maximum dosage specified for the intended use and, where appropriate (particularly for herbicides and PGRs), at least one higher dose (normally the double dose) is tested. If an active substance may accumulate to a high level when applied in successive years, the dose applied should be chosen to represent the level likely to be reached. Similarly, spray interception by the crop can be considered.

The dosage applied should normally be expressed in kg (or L) of formulated product per ha and the volume of water per ha should also be recorded for sprays. It may also be useful to record the dose in g of active substance per ha. In certain circumstances, the dose may be expressed as a concentration (e.g. % or g/hL), if possible combined with a volume (L/ha) appropriate to specific use. It may be useful to record information on water quality (e.g. pH, hardness).

Deviations from the intended dosage should be noted.

3.2.3.5 | *Data on other plant protection products*
If other plant protection products (or any biocontrol agents) have to be used, they should be applied uniformly to all plots separately from the test product and reference product. Possible interference with these should be avoided. Other residual active substances that might affect succeeding crops should not be used.

3.3 | Test crops

3.3.1 | Selection of test crops and cultivar

If adverse effects (TER <1) are expected on succeeding crops from the bioassays conducted under step 2, they should be included as a priority in the field trials.

A selection of succeeding test crops with at least three of the most sensitive rotational crops or most sensitive replacement crops should be planted or sown into the previously treated plots. These should include at least three representative crops shown to be most sensitive to the active substance in tests described in 2.2 and which are likely to be grown after the treated crop according to local practice or after crop failure. More crops may be required if the range of species tested under Step 2 is limited.

Rotational crops should be planted after harvest of the treated crop, at the shortest interval likely under normal practice. If crops planted in the spring following an autumn harvest are found to be sensitive to the active substance under investigation, then these should be included in the trial.

For the replacement trials, sequential planting of the crops at intervals over a period should be done to identify when the decline of the active substance reaches a non-damaging level.

3.3.2 | Trial conditions

The test crops for both trial types should be established using normal agricultural practice. If different cultural

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operations are used before planting the test crop, plots may be subdivided and these different cultivation regimes performed on the sub-plots.

3.4 | Mode of assessment, recording and measurements

3.4.1 | Meteorological and edaphic data

3.4.1.1 | *Meteorological data*

Throughout the trial period, meteorological data should be recorded which is likely to affect the persistence of the active substance. Data on precipitation (type and amount in mm) and temperature (average, maximum, minimum in °C) should be recorded as fully as possible. Any significant change in weather should be noted, and in particular its time relative to the time of treatment. All data should preferably be recorded on the trial site, but may be obtained from a nearby meteorological station. Its location and distance from the trial site should be noted. All data concerning irrigation should be recorded as appropriate. After the test crop has been planted, extreme weather conditions, such as severe or prolonged drought, heavy rain, late frosts, hail, etc., which are likely to influence the growth of the test crop, should also be reported.

3.4.1.2 | *Edaphic data*

The following characteristics of the soil should be recorded: pH, organic matter content, soil type (according to a specified national or international standard), moisture (e.g. dry, wet, waterlogged), seed-bed quality (tilth) and fertilizer regime. It is particularly important to have information on extremes of soil moisture or temperature occurring on the trial site.

3.4.2 | Type, time and frequency of assessment

No assessments are required on the treated crop.

3.4.2.1 | *Type*

The succeeding crops should be examined for phytotoxic effects. In addition, any adverse effects should be noted. The type and extent of such effects should be recorded and, if there are no effects, this fact should also be recorded. Measurements of soil residues of the active substance under investigation may be useful. Phytotoxicity should be scored as follows:

(1) If the effect can be counted or measured, it should be expressed in absolute figures.
(2) In other cases, the frequency and degree of damage should be estimated. This may be done in either of two ways: each plot is scored for phytotoxicity by reference to a scale, or each treated plot is compared with an untreated plot and % phytotoxicity estimated.

In all cases, adverse effects on the crop should be accurately described (stunting, chlorosis, deformation, delay in emergence, etc.). For further details, see EPPO Standard PP 1/135 *Phytotoxicity assessment* which contains sections on individual crops.

Depending on the findings of the visual estimations in the replacement trials, the biomass of above ground and subterranean (for root and bulb crops) plant parts may additionally be determined.

3.4.2.2 | *Time and frequency*

3.4.2.2.1 | *Rotational crop trials*. 1st assessment: at emergence of the test crop. Special attention should be paid to delay of emergence or thinning, preferably determined by counting the plants.

2nd assessment: 3–4 weeks later. The number of test crop plants present should be estimated.

Further phytotoxicity assessments should be made during the life of the crop. These may be done for example, after the beginning of spring re-growth for autumn-sown crops, at flowering, or at the time of appearance of the harvested part of the plant.

3.4.2.2.2 | *Replacement trials*. Visual estimations of crop emergence and injury should be made at various intervals from emergence of the test crop onwards. Timing should be aligned with the sowing dates. Shorter intervals may provide extra information, if the effects are only temporary.

3.4.3 | Effects on other pests

Any observed effects, positive or negative, on the incidence of other pests should be recorded, especially effects on weed species emerging in the test crop.

3.4.4 | Effects on other non-target organisms

Any observed effects, positive or negative, on naturally occurring or introduced pollinators or natural pests should be recorded. Any other environmental effects should also be recorded, especially effects on wildlife.

3.4.5 | Quantitative and qualitative recording of yield

Yield measurements are only made in the small-plot rotational crop trials (described in 3.1.3) or if significant phytotoxicity levels are recorded in the large-plot rotational trials. The method of recording yield or

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components of yield should be those appropriate for the test crop. For some crops, this is described in EPPO Standard PP 1/135 *Phytotoxicity assessment*. In the replacement trials where yield assessments are not practical, biomass of above ground and subterranean (for root and bulb crops) plant parts may be determined in addition to the visual assessments.

3.5 | Results

The results should be reported in a systematic form and the report should include an analysis and evaluation. Original (raw) data should be available. Statistical analysis should normally be used by appropriate methods which should be indicated. If statistical analysis is not used, this should be justified. See also EPPO Standard PP 1/152 *Design and analysis of efficacy evaluation trials*.

4 | FINAL CONCLUSIONS

According to the results obtained from field testing, management practices may be needed to reduce or negate the risk to succeeding crops. If so, labelling should include these relevant practices. If adverse effects still occur with management practices in field trials, restrictions have to be implemented for the concerned succeeding crop(s). Extrapolations between crops can be considered but should be duly justified.

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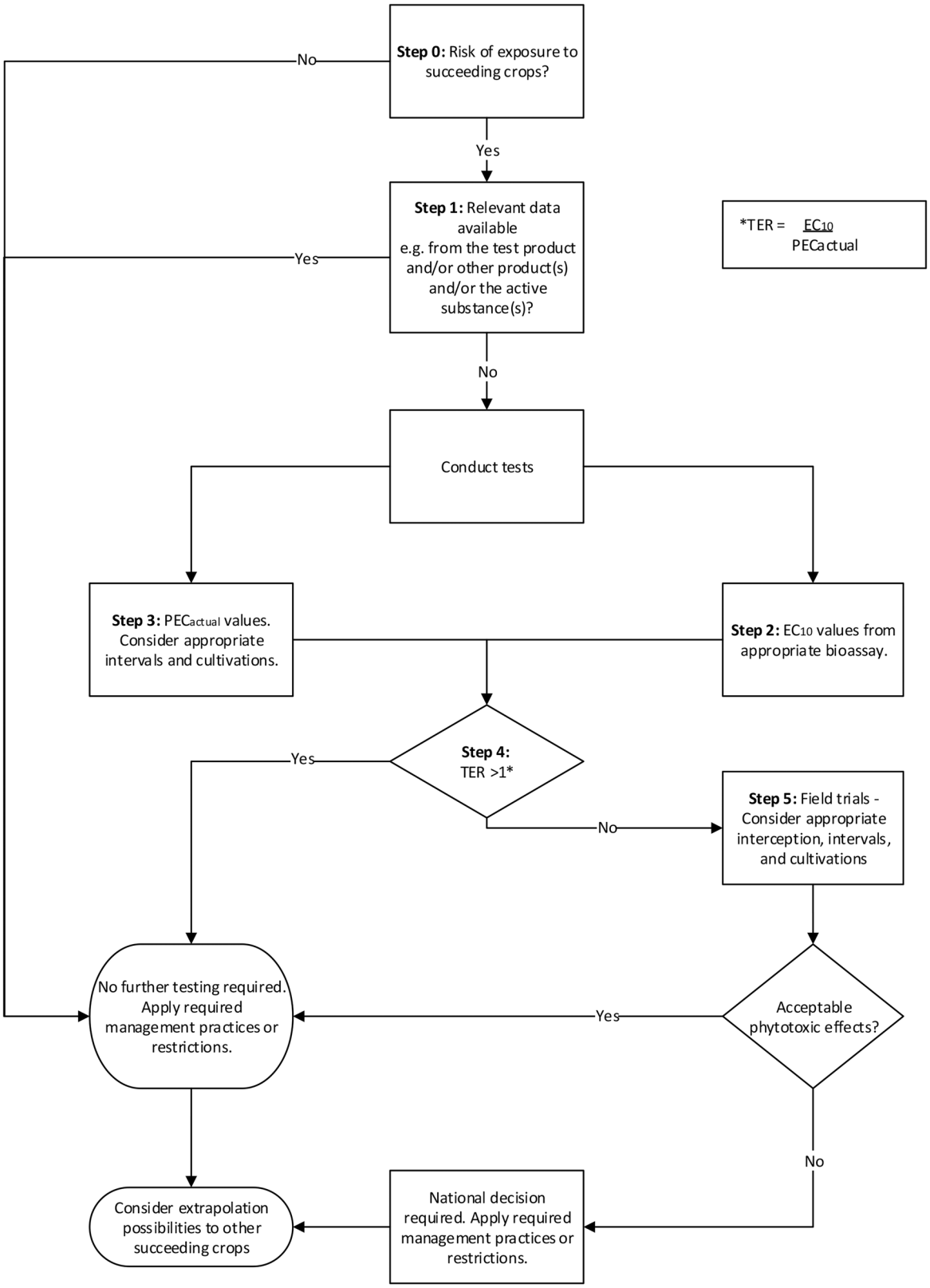
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APPENDIX 1 - DECISION-SUPPORT-SCHEME ON THE EXTENT OF TESTING NEEDED TO EXAMINE EFFECTS ON SUCCEEDING CROPS AND ON THE CONSEQUENT RECOMMENDATIONS



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APPENDIX 2 - CROP INTERCEPTION VALUES FOR CALCULATING PREDICTED ENVIRONMENTAL CONCENTRATIONS (PEC)

Table A1 gives interception data for specific growth stages of different crops. If the proposed crop is not present in the table a comparable crop should be used. Note that the interception data in Table A1 is only valid for applications made directly onto the crop.

TABLE A1 Interception (%) by crops and growth stage.

	BBCH[a]				
Crop	**Bare – emergence (BBCH 00–09)**	**Leaf development (BBCH 10–19)**	**Stem elongation (BBCH 20–39)**	**Flowering (BBCH 40-89)**	**Senescence ripening (BBCH 90-99)**
Bean (field + vegetable)	0	25	40	70	80
Cabbage	0	25	40	70	90
Carrot	0	25	60	80	80
Cereal (spring + winter)	0	0	20 (tillering) 80 (elongation)[b]	90 (BBCH 40-69) 80 (BBCH 70-89)	80
Cotton	0	30	60	75	90
Grass[c]	0	40	60	90	90
Linseed	0	30	60	70	90
Maize	0	25	50	75	90
Oilseed rape (summer + winter)	0	40	80	80	90
Onion	0	10	25	40	60
Pea	0	35	55	85	85
Potato	0	15	60	85	50
Soybean	0	35	55	85	65
Strawberry	0	30	50	60	60
Sugar beet	0	20	70 (rosette)	90	90
Sunflower	0	20	50	75	90
Tobacco	0	50	70	90	90
Tomato	0	50	70	80	50

[a]The BBCH code is indicative (BBCH, 1994).
[b]BBCH code of 20-29 for tillering and 30-39 for elongation.
[c]A value of 90 is used for applications to established turf.

These values and the table are taken from the "*EFSA Guidance Document for evaluating laboratory and field dissipation studies to obtain DegT50 values of active substances of plant protection products and transformation products of these active substances in soil*"
EFSA Guidance Document to obtain DegT50 values | EFSA.