Manual of
Good Experimental Practice

GEP Manual

Official recognition of testing units for efficacy testing in Denmark, According to Regulation (EC) 1107/2009 and Ministerial order no. 1278 dated 9th June 2021 from Danish Ministry of the Environment concerning the marketing of plant protection products

for trials concerning the testing of pesticide efficacy, phytotoxicity, side effects and possible development of resistance in Denmark

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Foreword

Referring to Regulation (EC) 1107/2009 and Ministerial order no. 1278 dated 9th June 2021 from Danish Ministry of the Environment specific demands are made on the execution of trials underlying the efficacy evaluation of plant protection products.

According to Ministerial Order no. 1278, studies of the efficacy of plant protection products in preparation for registration must be conducted by testing organisations that are recognised for this purpose by Department of Agroecology, Aarhus University (GEP recognition).

Good Experimental Practice (GEP) is meant to ensure that trials are conducted according to uniform principles guaranteeing a high quality and mutual approval of the trial documentation among the EU countries. The recognition concerns trials and analyses of:

* 6.2. Efficacy trials;
* 6.3 Information about development or possible development of resistance;
* 6.4 Effect on the yield of treated plants or plant products with regard to quantity and/or quality;
* 6.5 Phytotoxicity on the target group of plants or for the target group of plant products;
* 6.6 Observations of undesirable or unintended side effects on the non-target group, e.g. subsequent crops, adjacent crops, vegetable matter used for propagation or on beneficial organisms and other non-target organisms;
* 6.7 Summary and evaluation of the data in sections 6.2-6.6.

Demands on testing units that conduct efficacy testing appear from the GEP Manual and from subsequent decisions from the GEP Recognition and Reference groups. Revisions in this third version are based on the experience from the first years of the GEP system, decisions in the GEP Recognition and Reference groups and regulatory amendments. Reported and recognised testing units are informed about changed demands through publication of a revised manual and/or decision minutes from the GEP Recognition and Reference groups.

Version 5: 2022

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Section I / Definitions

1. Good Experimental Practice (GEP)

1. Danish Environmental Protection Agency. The Danish Environmental Protection Agency is the supreme authority to which the authority responsible for recognition and control has to report. Every year a list of approved GEP testing units in Denmark is completed. The list of recognised testing units will be made available to the other EU member states.

2. GEP provides guidelines for requirements on testing units regarding staff, facilities and equipment and for procedures for efficacy testing of pesticides with regard to registration, i.e. how trials should be planned, conducted and reported and how data should be filed.

3. The GEP Recognition Unit at the Department of Agroecology, Aarhus University, which is the authority responsible for recognition and control, consists of one person who administrates the GEP system. The GEP Recognition Unit reports to the Danish Environmental Protection Agency. The authority responsible for recognition and control must advise the testing units submitting applications on the criteria to be fulfilled to achieve GEP recognition.

4. GEP Recognition Group consists of a representative of the Danish Environmental Protection Agency, a lawyer from DCA and of the GEP Recognition Unit. Following submissions from the GEP Recognition Unit the GEP Recognition Group decides on questions concerning GEP recognition of testing units.

5. The GEP Reference Group is an advisory group discussing all relevant topics in connection with GEP and making decisions as to principles, including deciding on differences between a testing unit and the GEP Recognition Unit. The GEP Recognition Group administrates the decisions of the Reference Group in the daily administration of the GEP system. The GEP Reference Group consists of the 3 members of the GEP Recognition Group and of 3 representatives of the testing units. They represent the private testing units, the national testing units and the agro-chemical companies respectively. The present composition of the GEP Recognition and Reference Groups is as follows:

Name	Function/representative	GEP Recognition Group	GEP Reference Group
Henrik Brødsgaard	Danish Environmental Protection Agency	+	+
Hanne Rye Johansen	Lawyer, DCA	+	+
Peter Kryger Jensen	GEP manager	+	+
Martin Gejl	The private testing units		+
Louise Lading	The agro-chemical testing units / Danish Crop Protection Association		+
Peter Hartvig	The national testing units		+

2. Definitions concerning organisation of the biological efficacy trials

1. The testing unit is a company conducting trials with pesticides and consisting of staff, facilities, trial sites, equipment and Standard Operating Procedures.

2. Branches. To some extent the practical execution of efficacy trials can be conducted by another testing unit than the recognised testing unit if the trials are conducted under the management and responsibility of the recognised testing unit. Such branches must be included in the description of the recognised testing unit. However, it is a precondition that a detailed description of the branch organisation, its staff, premises, equipment, trial areas and Standard Operating Procedures and its connection to the recognised testing unit is submitted and approved. There must be unrestricted access to inspection of the branch and the trials, which are located at a branch.

3. The manager of the testing unit has the primary responsibility.

4. The study director is responsible for planning, conducting and reporting the trial.

5. The chief trial technician is responsible for conducting the trials in practice according to the study director's instructions.

6. Other trial staff include other trial technicians, seasonally employed staff, etc.

7. Standard Operating Procedures (SOP) describe facilities, trial equipment and routine procedures that are carried out in connection with planning, conducting, result processing and filing of a trial. Usually, this activity is not described in the trial plan.

8. Self-discipline is to ensure that the trial is conducted in accordance with GEP and EPPO standards.

9. External quality control is to ensure that the testing unit follows the GEP and EPPO procedures.

10. Services. In the cases where a GEP recognised testing unit buys or receives service, e.g. in the form of treated seeds, it is up to the testing unit to ensure and document that the service lives up to well-defined quality requirements. In the case mentioned it is a question of a direct application method where it is important to observe the dosage, as this is very important for the effect. As regards the products used there is no possibility of performing a check analysis of the samples. The testing units must make sure that batch numbers or production numbers are available for all non-approved products in order to make it possible to retrace company information of the products. For all other products, including reference products, the common names of active ingredients and the exact names of each formulated product and its content(s) of active substance(s) must be stated.

3. Definitions concerning testing

1. Testing covers a trial or a series of trials, where a pesticide is tested to obtain data of the biological effect and/or crop sensitivity at one or more geographical sites.

2. The trial plan must describe the trial process. It must give detailed instructions as regards identification, treatments and results etc., especially when these have not been described in the Standard Operating Procedures. Any change or deviation from the trial plan must be documented.

3. The testing system consists of crop and/or pest or combinations of both.

4. Raw data are original field data that are created during the trial and are the result of all original observations and activities during the trial.

4. Definitions concerning pesticides for efficacy testing

1. The pesticide to be tested is a chemical or biological product or a mixture that is to be examined. It must be based on a production process with well-defined quality requirements from which a uniform production may be expected.

2. The reference product (the standard product) is a well-defined and well-known product or a mixture of products, in relation to which it is relevant to test the pesticide.

Section II/Principles of Good Experimental Practice

§ 1. GEP – Recognition

1.1 Procedure for GEP recognition

The testing unit submits a registration form to the recognising and controlling authority to apply for recognition. At the same time, the testing unit submits a complete set of its Standard Operating Procedures. See appendix 2.

The registration form and the Standard Operating Procedures are checked, and the testing unit will receive a report of shortcomings that must be corrected.

A date of inspection is arranged by the controlling authority and the testing unit.

At the inspection the following will be evaluated:

* The organisation of the testing unit and distribution of responsibility;
* The qualifications of the staff in relation to conducting the trials;
* Evaluation of the physical framework, including trial equipment, storage facilities, etc.;
* Evaluation of trial areas, greenhouses, etc.;

* Evaluation of trial protocols and trial reports;
* Supervision of specific trial processes (e.g. trial spraying, assessments, harvest, etc.);
* A general evaluation of observance of GEP regulations.

After the inspection a report will be prepared and forwarded to the testing unit, requiring that issues mentioned must be corrected. The time limit for forwarding the inspection report to the testing unit is 1 month. When the testing unit satisfactorily has complied with issues raised during the inspection a recommendation on recognition of the testing unit will be given. A GEP certificate stating the GEP recognition is issued in Danish and an English version. A copy of the certificate must be enclosed in GEP reports as documentation of the GEP status.

The testing unit can be recognised to conduct trials within the areas described in appendix 3. The classification into trial areas is based on the cropping conditions, trial techniques and trial sites typical of the cultures in question. With the classification chosen some cultures/crops may possibly be classified as belonging to another trial area than the one stated in the appendix. For example, early stages of Christmas tree cultures may be treated with the equipment and the techniques used in “Field trials”. In these cases a testing unit with a GEP recognition of “Field trials” is permitted to conduct trials in Christmas trees in the early growth stages. In cases of doubt the GEP Recognition Unit must be contacted. If a testing unit is commissioned for a trial assignment that is not within a trial area for which the unit is GEP-recognised, an application for GEP recognition of the new trial area can be considered as an urgent case by the GEP Recognition Unit.

In connection with GEP trials a report containing planned trials with unambiguous trial numbers and a descriptive title must be submitted. See appendix 11.

After the recognition has been granted, the GEP Recognition Unit must be kept informed of major changes of the organisation and other important issues at the testing unit. Once a year inspections will be carried out. The recognition is valid for 6 years, and a new application must be submitted not later than 3 months before the end of the period. If more stringent or changed requirements to the GEP system are made within the 6-year period (e.g. because of new or changed EU regulations), the recognised testing unit must comply with these requirements.

If a recognised testing unit does not observe the general requirements or does not make the necessary adjustments that are required by the recognising authority within the period granted, **the recognition will be withdrawn**.

Testing units that have lost their recognition must at a later request for a renewed recognition pay a further basic fee for the recognition.

At the end of the year GEP-recognised units must forward a complete list of trials already conducted to the GEP Recognition Unit. The list must contain unambiguous trial numbers, descriptive titles and site (nearest village), address or another precise description. The reported trials will be part of the list of GEP trials, to be used in connection with the registration of pesticides.

Each year, at the end of the year a GEP trial report must be forwarded for each trial area for which the GEP recognition applies. See appendix 12.

1.2 Confidentiality

The GEP system is covered generally by the Danish Access to Public Administration Files Act. However, within the framework of this act an evaluation is made of which information can be withheld:
* E.g. names of new products to be tested, as this information is of special economic interest to the companies.
* The system of experimental testing of products with non-registered active ingredients is fundamentally covered by the Access to Public Administration Files Act. However, as the area is economically sensitive, information can be kept confidential. Publication requires the sponsor's permission.
* A company is allowed to code a product being tested under the GEP system, so that only the company is able to identify the active ingredient. However, if the company later wants to register the product, the codes must be stated to make it possible, in relation to the efficacy evaluation, to follow the product from the first trial until the application for registration. When the application for experimental testing is submitted to the Danish Environmental Protection Agency, the application must contain information that unambiguously describes the active ingredients, but this information will be treated confidentially.

As regards the duty of information between the EU countries no definitive procedure exists. For the present, lists of GEP recognised testing units are exchanged. The intention is that the companies must present a survey of all trials conducted with a given product complete with trial reports if they apply for approval of the product.

The affairs of the individual testing units, including questions of recognition, inspection reports and trial reports, are treated confidentially by the GEP Recognition Group. Matters of principle can be discussed in the Reference Group without naming the testing unit concerned.

1.3 Fee

The cost of GEP Recognition must be fully recovered. Therefore, a registration fee of DKK 20,000 will be charged plus an annual fee of DKK 10,000 for each trial area for which the testing unit has been recognised. Inspections and directions are paid as contract work (CW), which in 2012 amounted to DKK 1275 per hour. The prices will be index-linked. See appendix 16.

§ 2. Organisation of the staff in a testing unit

2.1 Management responsibility

The management has the primary responsibility for the testing unit and must guarantee that the testing unit:

– has at its disposal scientific and technical staff with the education, training, technical

knowledge and experience necessary to conduct properly the assigned tasks of the efficacy testing. CVs for all staff must be available;

– has at its disposal the facilities and equipment necessary to conduct the trials properly. The equipment must be kept in good condition and measuring equipment must be calibrated before being put into service and afterwards in accordance with a fixed schedule described in the Standard Operating Procedures;

– has at its disposal suitable trial areas and, if necessary, greenhouses, growth cabinets or storage facilities. The surroundings of the areas where the trials are conducted must be chosen to affect the results as uniformly as possible;

– makes sure that there are suitable Standard Operating Procedures and that they are complied with and updated;

– makes sure that all relevant staff have the current Standard Operating Procedures, trial plans and safety regulations at their disposal

– ensures that the quality of the work is consistent with the type, extent and intention of the trials;

– files the calibration schedules, raw data and the final reports, etc. The documents must be filed for at least 10 years;

– is organised in a way that each member of the staff knows the extent and limits of the area of his/her responsibility;

– makes detailed information available to the appropriate authorities.

2.2 The study director's responsibility

The study director is responsible for:

– preparation and maintenance of Standard Operating Procedures;
– planning, testing and reporting;
– ensuring that the trials are conducted in accordance with the procedures specified in the trial plan and the Standard Operating Procedures;
– ensuring that data and changes are well documented in relation to the trial plan;
– filing data.

2.3 The trial technician's responsibility

The trial technician is responsible for:

– the individual trial being taken care of in accordance with the trial plan and the Standard Operating Procedures;
– all the deviations being documented and reported to the study director;

– all products and samples being treated with the necessary care.

A description of the education, training and relevant qualifications of the study director and trial technician must be available.

§ 3. Quality control

In the GEP system the manager of the testing unit is responsible for the internal quality control. As a basis for the efficacy testing a high level of quality as well as self-discipline are expected. This is necessary to ensure the value of the results.

3.1 Collecting and recording data

It is a prerequisite for the evaluation of trial results that these are available in a written form. The study director is responsible for the availability of this documentation.

3.2 Data processing and data spot-checking

This is a part of the quality control. The study director must be able to evaluate situations arising during the trial process (unforeseen incidents) and take the necessary precautions as well as take care that they are being documented.

3.3 External quality control

As described in Directive 93/71/EEC external quality control (GEP Recognition Unit) supervises the testing unit, and the latter must collaborate with the authorities to make the recognition of the testing unit and spot checks proceed in an acceptable manner.

§ 4. Efficacy testing unit

The testing unit must have storage capacity for equipment and test products. The testing unit must also form the basis for mobile field units, working at other trial sites.

Chemicals must be stored in locked-up chemical rooms marked for example“Chemicals”. The trial technician is responsible for maintaining lists of chemicals, stating the name of the product, the content(s) of active ingredient(s) and batch or production number. Further, the date of supplies and reductions as well as the quantities in stock must be stated.

Handling, storing and destruction of test products must follow the Standard Operating Procedures of the area and legal regulations. Chemicals must be locked up if they are not under surveillance in the field.

The testing unit must have at its disposal appropriate trial areas and, if necessary, greenhouses, growth cabinets and storage facilities. The trials must be carried out in crops sufficiently attacked/infested by the relevant pests or where these can be applied.

Storage facilities for calibration schedules, Standard Operating Procedures, raw data and reports, etc. must be available. The material must be filed for at least 10 years.

Personal protection equipment must not be stored together with chemicals.

§ 5. Procedures

5.1 Guidelines for trials

In areas for which EPPO guidelines exist trials must be conducted in accordance with these guidelines or in accordance with national guidelines that live up to EPPO guidelines as a minimum. In areas that are not covered by EPPO guidelines the testing unit is responsible for using internationally recognised methods in the cases where such methods exist. See appendix 14.

5.2 Growth scales

At the description of plant development during the trial period BBCH growth scales are used. See appendix 15.

5.3 Plot distribution

GEP requires that trials should be conducted according to EPPO guidelines. If more than one trial is conducted according to the same trial plan, there must be different random plot distributions in all trials.

5.4 Trial equipment

The trial equipment to be used at field trials must be appropriately designed and have a suitable capacity. As regards trial sprayers well-documented procedures are required for calibration and cleaning when products are changed. For sprayers designed to carry several treatments the time interval from mixing to application is extended to such a degree that stirring is necessary. For these sprayers it is required that a stirring system should be installed and that a description and documentation of the effectiveness of the stirring system should be available. A procedure (e.g. as a spot check) should be built in to control whether the correct amount of liquid and thus the correct dosage was used at spraying. This may be in the form of a control of the residual amount in the spray tank after application, by only mixing up to/have liquid for one plot or the like.

The trial equipment could in principle be identical to the material used by agriculture, horticulture or forestry but usually special trial equipment more appropriate to the specific trials is used.

Measuring equipment must be calibrated before use and subsequently according to a fixed schedule described in the Standard Operating Procedures.

Equipment and materials, e.g. other pesticides used in the trials, must not interfere with the trial system. Only the trial products must give effect.

The Standard Operating Procedures, instructions and manuals of all measuring equipment

and application equipment, etc. must be available.

§ 6. Efficacy testing system

The crop or culture should normally be grown under conditions comparable to common agricultural practice.
If possible, pests should originate from a natural population. Artificial supply of pests (weeds, insects or diseases) could be relevant in certain cases. If that is the case, it must be described and the justification for this must be stated in the report.

At the end of the trial the yield must be treated according to valid authorisations. Depending on existing data on pesticide residues for each test product an authorisation for using the crop will be given or a request for destruction will be made. The trial area must be returned according to the Standard Operating Procedures.

§ 7. Products for testing and reference products

7.1 Receipt and handling

The trial technician is responsible for filing information that identifies the test pesticide and the date of receipt.

Handling, storing and destruction of the trial product must comply with the Standard Operating Procedures of the area and legal regulations.

7.2 Identification

The test pesticide and the reference product must be easy to identify by use of batch number or production number for commodities.

The marking of substances must correspond to the nomenclature used in the trial plan.

7.3 Weighing or measuring

Generally, the chemicals must be weighed out, but measuring is accepted. A precisely described procedure and calibration documentation for the measuring units used must be available. It is accepted that the measuring takes place in the field if it is carried out in accordance with well-described Standard Operating Procedures.

Liquid products of less than 10 ml must not be stored for more than 7-10 days, due to photosensitivity and possible evaporation unless the container is made of High Density Polyethylene (HDPE).
Concerning the labelling of weighed-out trial preparations, see appendix 6.

Concerning low-dose pesticides a stock solution can be made in the laboratory and then taken along to the field. The solution must be used within 6 hours. If not, it must be documented that the pesticides do not hydrolyse in aqueous solutions.

7.4 Products in the trial plan

The trial plan must include: 1) an untreated control, 2) a plot treated with a standard pesticide and 3) one or several pesticides tested at various doses. However, under special circumstances an exception can be made, e.g. potato blight, cf. EPPO guideline No. 2.

The test product and the reference product must be identified through a batch number or a production number, content(s) of active ingredient(s) and formulation. The labelling must be the same as the nomenclature in the trial plan.

§ 8. Standard Operating Procedures (SOPs)

8.1 Generally

A testing unit must be equipped with Standard Operating Procedures written by the study director and approved by the recognising authority. The Standard Operating Procedures should ensure that the quality and correctness of the data obtained during the execution of trials are in order.

Each trial technician must have a copy of the relevant Standard Operating Procedures concerning the task he/she is going to conduct. Published directions and instructions may supplement the Standard Operating Procedures. The Standard Operating Procedures must be stored in archives. The Standard Operating Procedures must be adapted as required so that they always reflect the activities of the testing unit. The date of switching to a new Standard Operating Procedure must be noted. Previous versions of Standard Operating Procedures must be stored in archives.

8.2 Specifically

The following areas must be covered by the Standard Operating Procedures: See appendices 7 and 8.

1. Description of the Standard Operating Procedures system with a list of all Standard Operating Procedures and all modification lists;
2. Apparatus (use, maintenance and calibration);
3. Staff, premises, cars;
4. Trial areas or greenhouses;
5. Test methods and trial design with reference to relevant guidelines (EPPO, Danish). See appendix 14;
6. Testing systems (crop/pests), including breeding of experimental animals and propagation of pathogens;
7. Registration of climatic data;
8. Pesticides (receipt, labelling, storing, weighing and removal);
9. Application of pesticides;
10. Methods of assessment (counting, evaluation, sampling, yield);
11. Documents and office functions (treatment, filing);
12. Health and safety measures. These must be in accordance with national and international

legal provisions.

§ 9. Execution of the test

In order to plan and conduct trials rationally, it is recommended to use proposals for making a standard trial file. See appendix 9.

9.1 Trial plan

1. Before the start of a trial, a final trial plan must be present, and signed documentation must be available verifying that the study director has read and understood the plan and that the plan can be executed as described.
2. Deviations from the trial plan (unforeseen incidents) must be described and, if possible, documented.
3. The trial plan and all changes must be approved by the study director.

9.2 The contents of the trial plan

The trial plan must contain all information necessary for conducting the trial (see appendix 4).

9.3 Execution of the trial plan

1. Each trial must have a specific identification number within the series of trials.

2. Each trial must be conducted in accordance with the description of the trial plan, the trial guidelines and the Standard Operating Procedures.

3. If wind speed exceeds 4 metres per second during an experimental application drift reducing equipment must be applied and documented in the report**.**

4. The residual spray liquid must be gathered in a separate tank and taken home for destruction. Wash water from the cleaning may be sprayed onto guard plots.

5. All trial data created during the testing must be documented directly, precisely and clearly. Data can be collected on an electronic medium or on paper. A security copy must be kept.

6. Establishment and execution of the trial, assessments and countings in individual plots must follow the directions of the trial plan and relevant Standard Operating Procedures. All data related to the trials must be updated, dated, signed and available in case of inspection. Electronic dating and signing by initials are acceptable.

7. In connection with each trial the following data must be collected:

- The stage of development of the crop and the level of pest attack/infestation are to be recorded at relevant points of time;

- Type of infection (natural or artificial);
- Variety;
- Date of seeding or planting;
- Previous crop;
- Type of soil and soil conditions (if relevant);
- Climatic data (e.g. wind speed, humidity and temperature);
- Information about other relevant treatments (spraying/fertilisation) both in and outside the trial.

When specifying the type of soil, the Danish JB numbers (valuation of land) may be used or a texture analysis may be stated; however, in the English reports an explanation of JB No. must be given, or the type of soil stated with an international term/a texture analysis.

8. All deviations from the prescribed trial plan and Standard Operating Procedures must be recorded and reported to the study director.

§ 10. Reporting of trial results

10.1 Generally

1. The trial report sums up the results from one or more trials within a test series. See appendix 10.

2. The trial report must be dated and signed by the study director.

10.2 Contents of the trial report

1. Title and trial number (identification of the test);
2. Identification of the testing unit;
3. Identification of the study director;
4. Date of start and termination of the trial;
5. Identification of the test products;
6. Identification of the reference product;
7. Description of the trial site;
8. Methods and materials used;
9. Climatic data from the trial area or regional climate stations;
10. Information about results and statistic processing;
11. Evaluation and discussion of results;
12 Summary of results;
13. Declaration of whether the trial lives up to the GEP regulations and Directive 93/71/EEC.

§ 11. Filing

1. The following data concerning a trial/a trial series must be filed:

- The trial plan;
- Calibration journals (often concerning several trials);
- Raw data;

- Calculation of derived data;
- Results from each trial;
- The trial report.

2. Data must be kept filed for at least 10 years.

List of Appendices for the GEP Manual

Appendix no.	Subject	Valid from
1	Registration Form with Instructions https://eng.mst.dk/media/229788/appendix-1.docx	1 January 1999
2	GEP Trial Areas https://eng.mst.dk/media/229789/appendix-2.pdf	-
3	Requirements for the Contents of the Trial Plan https://eng.mst.dk/media/229790/appendix-3.docx	-
4	Reference Products https://eng.mst.dk/media/229791/appendix-4.pdf	-
5	Weighing or Measuring and Labelling of Test Samples https://eng.mst.dk/media/229793/appendix-5.docx	-
6	Preparing a Standard Operating Procedure (SOP) https://eng.mst.dk/media/229792/appendix-6.pdf	-
7	Modification of a Standard Operating Procedure https://eng.mst.dk/media/229794/appendix-7.docx	-
8	How to Prepare a *Standard Trial File* https://eng.mst.dk/media/229781/appendix-8.pdf	-
9	How to Prepare a Trial Report https://eng.mst.dk/media/229784/appendix-9.docx	-
10	Registration and Reporting of Trials to the GEP Recognition Unit https://eng.mst.dk/media/229783/appendix-10.docx	-
11	Dates to be Observed https://eng.mst.dk/media/229782/appendix-11.pdf	-
12	Checklist for GEP Recognition https://eng.mst.dk/media/229780/appendix-12.pdf	-
13	List of the EPPO Guidelines for Efficacy Evaluation of Plant Protection Products https://eng.mst.dk/media/229785/appendix-13.pdf	-
14	Expenses Related to GEP https://eng.mst.dk/media/229786/appendix-14.pdf	-

15	Certificate, in English https://eng.mst.dk/media/229787/appendix-15.pdf	-