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Crop protection equipment — Spray deposition test for field crop —

Part 2: Measurement in a crop

Matériel de protection des cultures — Essais de dépôt de la pulvérisation sur les grandes cultures —

Partie 2: Mesurage dans une culture

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 6, *Equipment for crop protection*.

ISO 24253 consists of the following parts, under the general title *Crop protection equipment — Spray deposition test for field crop*:

— *Part 1: Measurement in a horizontal plane*

— *Part 2: Measurement in a crop*

Introduction

Efficacy of plant protection products (PPP), their safety to the crop and the environment may be much influenced by spraying efficiency. The dose of the active ingredient and its variation that is retained on target surfaces in a downward directed (boom) spray application such as ground surface need to be measured in a manner that is both accurate and precise.

The location, numbers, and sampling structures used to monitor sprayed depositions need to be defined in a standard manner to enable results from different experiments to be compared.

A test can be set up to quantify or to describe the in-field situation or for machine comparison.

A spray system can be compared with a reference system.

This International Standard does not deal with the deposition of spray outside the treatment zone, in crop canopy nor that lost as airborne spray drift. However, the combination of this part of ISO 24253 with the protocol for field measurements of spray drift as given in ISO 22866[4] when measured at the same time may result in a possible evaluation of spray mass balance. On the other hand, its combination with the measuring of sprayer boom movements in the field (see ISO 14131[2]) can also be used to evaluate the spray deposition and its variation in the field as a result of the boom movement.

Spray deposition from horizontal boom sprayers with downward directed application is affected by nozzle parameters, boom height, boom steadiness, sprayer speed, meteorological conditions, and other sprayer additional devices such as air assistance. These dynamic factors can all be elements of a test to determine the quantity and the variation in spray deposition.

Crop protection equipment — Spray deposition test for field crop —

Part 2: Measurement in a crop

1 Scope

This part of ISO 24253 specifies a method for field measurements to determine the quantity and distribution of spray in a field crop, treated by horizontal boom sprayers with downward directed application. This International Standard can be used for nursery trees and small size bush crops (young currants) when sprayed with boom sprayers.

NOTE When interested in the spray deposition over width of the crop canopy, it is advised to use ISO 22522.

This part of ISO 24253 allows flexibility in the arrangement of field tests, but specifies standardized measurement procedures that are useful to be able to compare the results from different field experiments or to compare with laboratory tests, such as that specified in ISO 5682-2.

This International Standard is not intended for use in or for a regulatory framework.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 24253-1, *Crop protection equipment — Spray deposition tests for field crop — Part 1: Measurement in a horizontal plane*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 24253-1 apply.

4 Test method

4.1 Principle

A spray deposition test comprises the measurement of spray deposition immediately available on all the target surfaces, on the top of such planting structures, at designated points within, and on the ground underneath the vegetation (crop or weed), represented by collectors. This spray deposition measurement can utilize a dye or other readily measurable tracer to simulate a plant protection product.

Spray depositions are assessed quantitatively (such as spray volume in µl/cm^2) and/or qualitatively (such as spray drop distribution, drops/cm^2, coverage, median drop size). The variation in spray deposition is quantified.

Spray deposition values used to quantify mean deposition and deposition variation of the spray liquid applied by the tested sprayer to quantify degree of penetration within, and over plant structures (crop canopy) are assessed using spray deposition collectors [artificial collector (see Annex A) or plant material, e.g. leaf, ear, fruit] at different heights.

4.2 Test area

The test shall be performed in a uniformly developed area of a cropped zone. There shall be a minimum distance of 1,5 m between the sampling place and the edge of the cropped zone. Since there are influences from boom movement (boom ends) and other disturbances such as, air turbulences around the tractor, and the sprayer (centre of the machine), measurements shall be taken on both sides of the sprayer and at different distances along the spray boom (see 5.3).

The length of the test area shall ensure the output of the intended spray volume over the sampling area. The test area shall therefore have a track length before and after the sampling area assuring that the sprayer has reached even intended output flow considering sprayer size and forward speed.

NOTE With rate control in manual mode, a minimum track length of 10 m is suggested for travelling speeds of up to 2 m/s and 20 m for travelling speeds up to 4 m/s. With the rate controller in automatic mode, the track length has to be adapted also considering the system reaction time.

Details of the spraying and sampling layout shall be fully reported with the test results.

In identifying the place of the test area, take notice of surrounding vegetation on the wind profile. The test area should be at least 10 times the height of the vegetation away from the surrounding vegetation or constructions.

Details of the test area and surroundings shall be specified in the test report (Figure 1).

4.3 Monitoring of meteorological conditions

Monitoring of the meteorological conditions shall be made at the time and the place of the test. The maximum error of measurements shall be as follows:

— for wind speed: 0,1 m/s for wind speed up to and including 1 m/s and 0,2 m/s for wind speed over 1 m/s;

— for temperature: 0,5 °C, recorded in the shade;

— for humidity: 5 % of the relative humidity.

Measurements shall be made at (2 ± 0,1) m height above ground surface or at (1 ± 0,1) m above crop canopy when crop canopy is higher than 1 m. Measurements of wind (direction and velocity) shall be made at a frequency of at least 1 Hz (every 1 s) sampling rate.

The instruments should be calibrated prior to their use according to instrument instructions.

4.4 Acceptable meteorological conditions for field measurement of spray deposition

Average wind speed during spraying shall not be higher than local recommendation or practice and preferably below 2 m/s, at the measuring height specified in 4.3. The wind speed shall be stable during the test (the standard deviation shall not exceed ±1 m/s).

For wind speeds above 2 m/s, the wind direction should be within ±30 ° of the mean wind direction.

Temperature shall be between 5 °C and 35 °C.

Temperature inversions affect deposition measurements and need to be reported (preferably by using of 3D anemometer alternatively by cloud cover or measurements of temperature at two heights).

4.5 Tracers

Tracers shall be safe for their intended use. See the environmental and operator safety data sheets for the suitability for this purpose.

NOTE 1 Local Pesticide Regulatory Bodies ought to be able to comment on the use of suitable candidate products and their restrictions for this purpose.

NOTE 2 Spray deposition measurement on plant material is influenced by the outside structure (hairiness, waxy layer, etc.) or the penetration of the spray liquid into the plant tissue.

The tracers shall be stable in field conditions and with a good recovery (at least >90 %; preferably >95 %) from all kind of collectors (see Annex A and 4.6) used in the test.

NOTE 3 For further information on sunlight stability of fluorescent tracers, see Herbst, 2006 and Stallinga et al., 2012.[4][5]

Examples of usable tracers are the following:

— metal ions (recommended for several applications on the same target);

— food dyes:

  — tartrazine (E102);

— fluorescent dyes:

  — brilliant sulfo flavine;

  — sodium fluorescein.

4.6 Collectors

Collectors are used to sample spray deposition on ground surface. The recovery of the sprayed tracer from the collectors shall be determined prior to the experiment.

The artificial collectors used shall provide for a good recovery (at least >90 %; preferably >95 %). Examples of artificial collectors which can be used are given in Annex A. How to quantify tracer recovery from the collector is described in Annex B.

Background emission from the artificial collectors is to be determined (see Annex B). The average reading of the blank artificial collectors should not be higher than 0,1 % of the average reading of the sprayed collectors. Accuracy of the measuring device, artificial collector types, and background emission from artificial collectors shall be recorded and chosen to obtain a coefficient of variation of the background emission lower than 10 % (of at least 10 collectors; see Annex B). This can be determined by analysing with the procedure (diluting volume, shaking time, fluorimeter settings) 10 clean collectors for background value and calculate the mean and the coefficient of variation of the measured values of the collectors.

Care shall be taken to ensure that the sampling collectors used to verify the applied dose and volume rate do not saturate. This shall be checked before the tests.

4.7 Spray liquid

The spray liquid shall be representative of liquids typically used in the application of plant protection products. Tap water or standard tank mix is often used in spray drift measurements (see ISO 22866). A standard tank mix can be achieved by the addition of a water-soluble non-ionic surfactant at rates typically from 0,005 % to 0,5 % v/v, following manufacturers recommendation.

The type and concentration of additives shall be specified in the test report.

5 Test procedure

5.1 General

A test can be set up to quantify or to describe the in-field situation, or it can be a defined situation (specific track) for machine comparison. In a comparison test if mounted or trailed sprayers are used, preferably the same tractor configuration shall be used. Tractor type should be reported in the test report.

The test area for the deposition measurement is to be marked in the field. To quantify the amount and the variation of total spray deposition coming onto crop canopy and ground surface underneath the crop canopy, spray deposition is to be measured

— on top of the canopy (flux coming into the canopy),

— inside the canopy, and

— on ground surface underneath the canopy.

The collectors are placed generally in the centre area at each side of the spray boom between 1,5 m from the end of the boom and the sprayer (vehicle wheel), at least at three places according to Figure 1. For special purposes like sprayer boom movement effect, place collectors underneath the tip of the boom; for the wake effect, place collectors, e.g. close to the sprayer. When placing collectors across the boom, the place of the collectors shall represent both the area “under” the nozzle positions and ‘between’ the nozzle positions.

