
International Standard



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**Cereals and pulses — Determination of hidden insect infestation —
Part 2: Sampling**

Céréales et légumineuses — Détermination de l'infestation cachée par les insectes — Partie 2: Échantillonnage

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6639/2 was prepared by Technical Committee ISO/TC 34, *Agricultural food products*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Cereals and pulses — Determination of hidden insect infestation — Part 2: Sampling

0 Introduction

This International Standard describes methods of determining hidden insect infestation in cereals and pulses. It consists of the following parts:

Part 1: General principles.

Part 2: Sampling.

Part 3: Reference method.

Part 4: Rapid methods.

1 Scope and field of application

This part of ISO 6639 specifies methods of sampling cereals and pulses, in bags or in bulk, for the determination of hidden insect infestation.

The methods are applicable as a routine to grain in any form of store or vehicle at any level of trade from producer to consumer.

2 References

ISO 950, *Cereals — Sampling (as grain)*.

ISO 951, *Pulses in bags — Sampling*.

ISO 6644, *Cereals and milled cereal products — Automatic sampling by mechanical means*.

3 Definitions

See ISO 6639/1. In addition, for the purpose of this part of ISO 6639, the following definitions apply.

3.1 consignment: A quantity of grain delivered at one time and covered by one set of shipping documents. It may be composed of one or more lots (see the notes to 3.2).

3.2 lot: An identified quantity of a consignment, to be sampled using a particular sampling plan.

NOTES

1 There is no need to restrict the size of the lot when sampling for hidden insect infestation. A consignment of the same origin and history may be regarded as one lot or may be split into several lots for

sampling, whichever is the more convenient. If the consignment is received in several barges, railway waggons, lorries, stacks, etc., it is usually more convenient to treat each part as a separate lot for sampling purposes. Any parts of a consignment known to be of different origin and/or history are sampled as separate lots.

2 It should be noted that the definition of "lot" for the purposes of sampling for determination of hidden insect infestation differs from the definition of "lot" in International Standards relating to sampling of grain and pulses for the determination of other characteristics.

3.3 increment: A small quantity of grain taken from a single position in the lot.

3.4 bulk sample: The quantity of grain obtained by combining and mixing the increments taken from a specific lot.

3.5 laboratory sample: The quantity of grain removed from the bulk sample, or an increment (see 10.1), intended for examination.

4 General principles

NOTE — Usually there is little or no prior information on the size or distribution of any insect population that may be present in a lot to be sampled. In these circumstances, it is not possible to adopt a sampling scheme which is soundly based on statistical theory. Therefore, sampling schemes described in this part of ISO 6639 do not necessarily enable insect populations to be measured precisely, but have been designed to give a maximum of information in a practical manner.

4.1 Special care is necessary to ensure that all sampling apparatus is clean and dry before, during, and after the sampling of each lot. Sampling shall be carried out in such a manner as to prevent insects from elsewhere from entering the samples, sampling apparatus and sample containers.

4.2 Laboratory samples shall be enclosed in sample bags (5.5) and shall be protected from extremes of temperature and relative humidity and from direct exposure to sunlight. Airtight containers shall not be used for samples as these may cause any insects present to be asphyxiated.

4.3 If related information about the grain, such as moisture content, is required, separate samples should be taken in accordance with ISO 950 or ISO 951 or other relevant standards and should be packaged accordingly.

5 Apparatus

5.1 Device for sampling from grain flowing in bulk, which will extract samples continuously from the entire cross-section of the grain flow, giving samples of all particle sizes from the lot.

This can be a sophisticated electrically operated automatic sampler (see ISO 6644) or a simple pelican scoop (see ISO 950) operated by hand.

5.2 Device for sampling from the surface of static bulk grain: a hand scoop (see ISO 950).

5.3 Device for sampling bulk grain in depth: a cylindrical sampler (divided bulk probe) (see ISO 950) or an electrically operated suction sampler.

5.4 Device for sampling grain in bags: a cylindrical sampler as described in 5.3 or a sample divider. If the bag to be sampled weighs less than 10 kg, a conical divider or multiple-slot divider (see ISO 950) should be used to obtain the increments. In the case of larger bags, a sample divider such as the produce flow sampler may be used.

NOTE — Sampling spears (open triers) are not suitable for sampling for this purpose.

5.5 Sample bags, of close woven cloth, resistant to insect attack, with tie ribbons, each measuring approximately 40 cm long by 30 cm wide, which have been cleaned and disinfected.

NOTE — Sample bags can be cleaned by thorough brushing inside and out, and, if necessary, by washing and drying. They may be disinfected by being left in an oven (5.6) at 103 °C for 2 h. Immediately after being allowed to cool in the oven, the bags should be placed into sterile, hermetically sealable, screw-top jars (5.7) for storage until required.

5.6 Oven capable of being maintained at 103 ± 2 °C for the disinfection of sample bags and jars.

5.7 Jars, hermetically sealable, screw-top, to store the sample bags (5.5).

5.8 Metal seals and sealing equipment for sealing the sample bags (5.5).

6 Sampling times and places

Samples may be taken at any point from farmer to final destination.

NOTE — If samples are to be taken at different points and times in the distribution chain, it is useful to establish standardized sampling operations at all points and to collect the sampling data in order to form a more comprehensive picture.

Sampling is most effectively carried out as the commodity is moved into and out of the storage structure or transit vehicle (railway waggons, lorries, containers, ships, lighters, etc.). During storage in bulk or in bags, sampling becomes more difficult but more important, especially when storage is for long periods. In general, it is not useful to take samples less than 3 weeks after harvesting because of the life cycles of the common species of insects responsible for grain infestation and the time taken for any infestation to migrate to the areas where samples will be taken.

7 Pre-sampling inspection and identification of lots

7.1 The parties concerned shall agree as to what constitutes the lot or lots to be inspected and shall specify the species of insects (live or dead) to be reported on.

NOTES

1 In the case of grain for export, due regard should be paid to any regulations concerning scheduled pests, and tolerances for such pests, in the importing country. Internal trade may also be affected by such regulations.

2 It should be borne in mind that it is possible for a hidden infestation to mature and produce large numbers of free-living adults shortly after a lot has been reported to be free from infestation or only lightly infested. Rapid changes in insect population density or distribution can result from variations in ambient temperature, cross-infestation or some other reason.

7.2 Inspection of bags, buildings, structures and transport and taking of temperatures shall be carried out before sampling of the commodity. Information recorded during this inspection may help in the assessment of samples.

Any free-living insects found in the samples being taken should be collected and forwarded in a separate sample bag to the laboratory for identification. It is considered unnecessary to test for hidden infestation if visible infestation exists, except in cases of dispute when there is a need to know exactly the state of infestation.

8 Sampling of bulk grain

8.1 Extracting samples from moving bulks

At flow rates of 100 t/h, or less, the lot to be sampled shall be not greater than 5 000 kg (5 t) or smaller than 1 000 kg (1 t) and the increments should be equivalent to a minimum of 1 kg per 1 000 kg. Higher rates of flow may require the designation of larger lot sizes, to allow the sampling equipment to cope. An automatic sampling device or pelican scoop (see 5.1) shall be used for collecting samples from free-falling grain. If there is no point of free fall, alternative mechanical sampling equipment or hand scoops may be used.

NOTE — Samples obtained from conveyor belts are less representative than those extracted from a point of free fall.

8.2 Extracting samples from static bulks¹⁾

NOTES

1 Not all points within static bulk grain are normally accessible using commonly available sampling equipment such as cylindrical samplers, suction samplers, etc., particularly in vertical bulk storage bins. A serious bias is therefore introduced in sampling static bulk grain only at points accessible to the sampling equipment. In such cases, the samples are not representative of the entire lot of grain and do not give an exact indication of the average population density of insects within the lot.

2 The most easily accessible regions within bulk stored grain (the upper part of the bulk to a depth of a few metres, and near outlet spouts or ventilation openings) are those where the risks of insect infestation are greatest if the bulk is undisturbed.

Insects are sought only in regions where they most commonly occur :

- a) in the immediate proximity of the surface and, when possible, near aerated points (outlet spouts and ventilation and aeration openings), where adult insects most often concentrate ;
- b) at shallow depths, down to 2 or 3 m, to detect hidden forms of certain species capable of burrowing into the grain to these levels, such as weevils of the genus *Sitophilus*.

8.2.1 Surface sampling

When the air temperature above the grain is above 15 °C, a surface layer 100 mm deep shall be sampled. An increment of at least 1 kg shall be taken for each 1 000 kg of grain in the surface layer, using a hand scoop (5.2). See formula a).

When the air temperature above the grain is not above 15 °C, a surface layer 250 mm deep shall be sampled. An increment of at least 1 kg shall be taken for each 1 000 kg of grain in the surface layer, using a hand scoop (5.2). See formula b).

The increments shall be taken from different positions in the surface layer, their number, *n*, being given by the formulae :

a) $n = \frac{A\rho}{1\ 000}$

b) $n = \frac{A\rho}{400}$

where

A is the surface area, in square metres ;

ρ is the bulk density of the grain, called "mass per hecto-litre", in kilograms per hectolitre.

Round the value of *n* to the next highest integer.

Increments of at least 1 kg shall be taken from the bottom of the bin at the rate appropriate to the temperature and the surface area, as given above, by running grain out of the outlet spout where one is provided.

1) Bulks that have been static for 3 weeks or more (see clause 6).

8.2.2 Shallow depth sampling

Increments of at least 1 kg shall be taken from below the surface layer using a cylindrical or suction sampler (5.3) inserted at selected points. The increments shall be taken at regular intervals.

9 Sampling of grain in bags

9.1 Selection of bags to be sampled

For a stack about to be dismantled, or a lot about to be unloaded from a railway waggon, lorry, ship or lighter, the number of bags to be sampled shall be as specified in the table.

Table — Number of bags to be sampled

Number of bags in the lot	Number of bags to be sampled
Less than 10	Each bag
10 to 100	10, drawn at random
More than 100	Square root (approximately) of total number, taken at random

In a stack of bags which is to remain in position, it is only possible to sample the outer layer. Since most insects are found in the outer bags, including the top layer, no serious disadvantage is incurred. The scheme for selecting sample units described above may be used, substituting the expression "(in the lot)" by "in the outer layer". The selected sample units shall always include the four corner bags since these are especially prone to infestation. Bags needed to make up the required number to be sampled shall be selected at random.

9.2 Extraction of increments from bags

A device (see 5.4) capable of taking a representative sample of the contents of a bag shall be used, because of the non-random distribution of insects.

10 Preparation of laboratory samples

10.1 All samples to be submitted for laboratory examination shall be referred to as laboratory samples, whether they are original increments or samples obtained by the reduction of bulk samples. If information on the distribution of insects within a lot is required, the increments shall not be combined, and each shall be considered as a laboratory sample.

10.2 Unless the increments are submitted as laboratory samples, they shall be combined and thoroughly mixed to form a bulk sample. The bulk sample shall then be reduced, by the method described in ISO 950 or ISO 951 or any other relevant standard, to a laboratory sample that shall weigh not less than 1 kg.

11 Packaging and labelling of laboratory samples

11.1 Packaging

Laboratory samples shall be packed in sample bags (5.5) which have been cleaned and disinfected.

Sample bags containing laboratory samples shall be closed by knotting the tie ribbons tightly around the bag necks, and shall be secured by attaching metal seals (5.8) to the tie ribbons after closure. Seals shall be attached in such a way as to guarantee the inviolability of the samples.

11.2 Labelling

If paper labels are used for labelling the samples, they shall be of a suitably high quality for the purpose and, if they are to be attached to the outside of sample bags, the eyelet holes shall be reinforced.

External labels shall be attached by the tie ribbons at the time of closing the sample bags and shall be secured by the metal seals. Alternatively, labels may be placed inside sample bags before they are closed and sealed, and the bags marked indelibly with simple identification marks. Each label shall bear the information required by the terms of the contract.

NOTES

1 It is important to indicate that the samples are intended for the determination of hidden insect infestation and not for the determination of other characteristics of the lot.

2 For examples of the type of information required for the label, see ISO 950 or ISO 951.

12 Despatch of laboratory samples

Laboratory samples shall be despatched as soon as possible, and only in exceptional circumstances more than 48 h after sampling has been completed. Samples shall be packed for transit in such a manner as to protect them from the hazards of the journey.

13 Sampling and inspection reports

A sampling report shall be prepared, giving the usual information and making reference to the condition of the grain sampled, including signs of insect infestation visible in the warehouse or silo, or during working the vessel or other carrier. The report shall also refer to the technique applied, if this is other than that described in this part of ISO 6639, and to all the circumstances that may have influenced sampling.

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