

# norm

# NEN-EN 16378

Cereals - Determination of Besatz in maize (*Zea mays*, L.) and sorghum (*Sorghum bicolor*, L.)

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Voorbeeld  
Preview

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English Version

## Cereals - Determination of Besatz in maize (*Zea mays*, L.) and sorghum (*Sorghum bicolor*, L.)

Céréales - Détermination de la teneur en impuretés dans le maïs (*Zea mays*, L.) et le sorgho (*Sorghum bicolor*, L.)

Getreide - Bestimmung von Besatz in Mais (*Zea mays*, L.) und Hirse (*Sorghum bicolor*, L.)

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Draft  
 Review  
 prEN

## Foreword

This document (prEN 16378:2012) has been prepared by Technical Committee CEN/TC 338 "Cereals and cereal products", the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

Forbiede  
Preview

**prEN 16378:2012 (E)****1 Scope**

This European Standard defines the term *Besatz* (impurities) and describes methods for the determination of its components. The term *Besatz* is used as a parameter for certain quality aspects in maize (*Zea mays* L.) and sorghum (*Sorghum bicolor* L.).

This method has been validated in an interlaboratory study via the analysis of samples containing natural amount of impurities, ranging from:

- 0,0 to 2,7 % for broken grains
- 0,2 to 3,5 % for grain impurities
- 0,5 to 3,3 % for miscellaneous impurities
- 1,8 to 8,7 % for total impurities

For further information on the validation, see Annex D.

**2 Normative references**

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

ISO 5223, *Test sieves for cereals*.

EN ISO 24333, *Cereals and cereal products — Sampling*.

**3 Terms and definitions**

For the purposes of this European Standard, the following terms and definitions apply.

**3.1****Besatz**

all matters of a sample of grain other than the basic cereal of unimpaired quality.

NOTE 1 It comprises the four fractions: broken grains (3.2), grain impurities (3.3), sprouted grains (3.4) and miscellaneous impurities (3.5).

NOTE 2 The sum of the four fractions is also called Total *Besatz*.

NOTE 3 Live pests are not considered as *Besatz*. They are specified as a separate criterion.

NOTE 4 A schematic summary on *Besatz* is given in Annex A.

**3.2****broken grains**

grains or pieces of grains which pass through a sieve with a circular mesh of :

- 4,5 mm in diameter for maize;
- 1,8 mm in diameter for sorghum.

**3.3****grain impurities**

elements consisting of other cereals, grains damaged by pests, grains overheated during drying

**4**

**3.3.1****other cereals**

grains and their impurities consisting of grains which do not belong to the species of grain sampled

**3.3.2****grains damaged by pests**

grains which show visible damage owing to attack by insects, rodents, mites or other pests

**3.3.3****grains overheated by drying**

grains showing signs of scorching but which are not unsound grains

**NOTE**

For determination of such grains it is recommended to use the colour standard (5.8) to compare with the colour of the section of the cut germ.

**3.4****sprouted grains**

grains in which the radical or plumule is clearly visible to the naked eye

**3.5****miscellaneous impurities**

elements consisting of extraneous seeds, unsound grains, extraneous matter and impurities of animal origin

**3.5.1****extraneous seeds**

seeds of plants, whether or not cultivated, other than cereals

**NOTE 1**

They comprise noxious and not noxious seeds. The term "noxious seeds" means seeds which are toxic to humans and animals. This group also includes seeds hampering or complicating the cleaning and milling of cereals and seeds affecting the quality of products processed from cereals.

**NOTE 2**

In some cases it may be necessary to distinguish between noxious seeds and not noxious seeds. An indicative list of noxious seeds is given in Annex A of ISO 7970 [4].

**3.5.2****unsound grains**

unsound grains rendered unfit for human consumption and, as regards feed grain, for feed consumption, owing to putrefaction, mildew, grains affected with fusariosis, or bacterial or other causes

**NOTE 1**

unsound grains also include grains damaged by spontaneous heat generation or too extreme heating during drying which are fully grown grains in which the tegument is coloured greyish-brown to black while the cross-section of the kernel is coloured-yellowish grey to brownish-black.

**3.5.3****extraneous matter**

all matters in a sample of grains that passing through a sieve with apertures of 1,0 mm shall be considered extraneous matter. Also included are stones, sand, fragments of straw, cob fragments and similar impurities in the samples which are retained by a sieve with apertures of 1,0 mm.

**3.5.4****impurities of animal origin**

impurities originating from animals such as feathers, hairs, excrements, dead insects and fragment of insects

**4 Principle**

The principle of this method is to separate all the groups of impurities defined under 3.1, from the normal basic grains by sieving and manual selection.

## prEN 16378:2012 (E)

## 5 Apparatus and equipment

### 5.1 Sample divider

5.2 **Balance**, with a reading accuracy of 0,001 g and capable to weighing to the nearest 0.01 g

5.3 **Sieves**, circular holes of 4,5 mm and 1,8 mm in diameter and slot-widths 1,0 mm × 20,0 mm, in accordance with the specifications of ISO 5223

5.4 **Sieving machine**, e.g. vibrator base with mounted sieves, or a shaking sieve

5.5 **Magnifying glass**, illuminated

5.6 **Forceps or horn spatula**

5.7 **Pots**, for retaining components

5.8 **Colour standard**, as reference S 3030-Y30R in the Natural Colour System (NCS) <sup>1)</sup>

## 6 Sampling

It is important that the laboratory receive a sample which is truly representative and has not been damaged or changed during transport and storage.

According to EN ISO 24333 with regard to uniformly and non uniformly distributed samples.

## 7 Procedure

Prepare by division a representative sample of at least (but near) 500 g for maize and 250 g for sorghum. Weigh it to the nearest 0,1 g (a). Pass the sample through the slotted sieve with an aperture of 1,0 mm (5.3), for half a minute. For constant sieving, a sieving machine (5.4) is recommended. If sieving is performed by hand, it must consist of horizontal movements parallel to the length of the slots.

The matter passed through the sieves (5.3) shall be regarded as extraneous matter. Stones, mud balls, straws, chaff, cob fragments and similar impurities from the over tail of the 1,0 mm slotted sieve have to be picked out. Both fractions are combined and are regarded as extraneous matter (3.5.3). Weigh them to the nearest 0,1 g (b). Impurities of animal origin should be counted, including those which passed through the sieve of 1,00 mm slot-width (5.3). If necessary, a magnifying glass should be used.

NOTE The count should be quoted separately in numbers per kg of maize or sorghum, as appropriate.

From the over tails of the 1,0 mm sieve (5.3), prepare, with the aid of a sample divider (5.1), a sample of between 100 g and 200 g for maize and between 25 g and 50 g for sorghum, weighed to the nearest 0,01 g (c).

Subsequently spread out this partial sample in a thin layer on a table, and pick out by means of forceps or a horn spatula the groups of other cereals (3.3.1), grains damaged by pests (3.3.2), sprouted grains (3.4), extraneous seeds (3.5.1), unsound grains (3.5.2) and remained extraneous matters (3.5.3).

Grains whose tegument shows abnormal colour shall be cut longitudinally through the germ. If a major part or the totality of the section of the germ is identical or darker than the colour standard (5.8) then the two halves of the initial grain have to be accounted as grains overheated by drying (3.3.3).

1) The Natural Colour System is defined by the Scandinavian Colour Institute AB, Stockholm (SE). For further explanation see [http://en.wikipedia.org/wiki/Natural\\_Color\\_System](http://en.wikipedia.org/wiki/Natural_Color_System)



In the case of multiple kinds of damages are observed, the damaged grain shall be added to the fraction with the highest importance for the overall quality.

Subsequently sieve the same partial sample through a sieve of 4,5 mm circular holes in diameter for maize or 1,8 mm circular holes in diameter for sorghum for half a minute. The through of this sieve belong to the group broken grains (3.2).

Weigh the Besatz-free fraction ( $d$ ) and all the groups of Besatz to the nearest 0,01 g. If, for a partial sample, the sum of weights for broken grains (3.2), other cereals (3.3.1), grains damaged by pests (3.3.2), grains overheated during drying (3.3.3), sprouted grains (3.4), extraneous seeds (3.5.1), unsound grains (3.5.2) and extraneous matters (3.5.3) and ( $d$ ) differs by more than 1 % from ( $c$ ), the determination shall be invalidated and a new partial sample must be analysed.

## 8 Expression of results

The mass fraction in percent of the Besatz fractions (3.2, 3.3.1, 3.3.2, 3.3.3, 3.4, 3.5.1 and 3.5.2) are calculated as follows:

$$B = x \times \frac{a - b}{c} \times \frac{100}{a}$$

Where

- $B$  mass fraction of Besatz fractions (%)
- $x$  weight of the Besatz group concerned (g)
- $a$  weight of the average sample (g)
- $b$  weight of the extraneous matter on average sample (g)
- $c$  weight of subsample from which Besatz will be removed (g)

The mass fraction in percent of extraneous matter (3.5.3) is calculated as follows:

$$A = \left( \left( y \times \frac{a - b}{c} \right) + b \right) \times \frac{100}{a}$$

Where

- $A$  percentage of extraneous matter (%)
- $y$  weight of extraneous matter of subsample from which Besatz was removed (g)
- $a$  weight of the average sample (g)
- $b$  weight of the extraneous matter of average sample (g)
- $c$  weight of subsample from which Besatz will be removed (g)

The percentage of grains impurities (3.3) is calculated by adding percentages of other cereals (3.3.1), grains damaged by pests (3.3.2) and grains overheated by drying (3.3.3).

The percentage of miscellaneous impurities (3.5) is calculated by adding percentages of extraneous seeds (3.5.1), unsound grains (3.5.2) and extraneous matters (3.5.3).

The percentage of Besatz (3.1) is calculated by adding percentages of broken grains (3.2), grains impurities (3.3), sprouted grains (3.4) and miscellaneous impurities (3.5).

The calculation should be carried out to the nearest 0,01 %.

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