



**THAI AGRICULTURAL STANDARD**

**TAS 4002-2009**

**MAIZE**

**National Bureau of Agricultural Commodity and Food Standards**

**Ministry of Agriculture and Cooperatives**

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**TAS 4002-2009**

## **MAIZE**

**National Bureau of Agricultural Commodity and Food Standards**

**Ministry of Agriculture and Cooperatives**

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**NOTIFICATION OF THE MINISTRY OF AGRICULTURE AND COOPERATIVES**

**SUBJECT: THAI AGRICULTURAL STANDARD:**

**MAIZE**

**UNDER THE AGRICULTURAL STANDARDS ACT B.E. 2551 (2008)**

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Whereas the Agricultural Standards Committee deems necessary to establish an agricultural standard on Maize as voluntary standard in accordance with the Agricultural Standards Act B.E. 2551 (2008) to promote such agricultural commodity standard to meet its quality standard and safety.

By virtue of Section 5, Section 15 and Section 16 of the Agricultural Standards Act B.E. 2551(2008), the Minister of Agriculture and Cooperatives hereby issues this Notification on Establishment of Agricultural Standard: Maize (TAS 4002-2009) is established as voluntary standard, details of which are attached herewith.

Notified on 29 September B.E. 2552 (2009)

(Mr. Theera Wongsamut)

Minister of Agriculture and Cooperatives

# THAI AGRICULTURAL STANDARD

## MAIZE

### 1 SCOPE

This Thai Agricultural Standard applies to maize or corn from *Zea mays* L., of the *Gramineae* family including maize ear and shelled grains intended for human consumption, feed, food and feed raw materials.

### 2 TYPES

There are two types of commercial maize as follows:

2.1 Maize (corn) ear means maize that is harvested at full maturity, de-husked but un-shelled.

2.2 Maize (corn) kernel means whole shelled grain excluded seed.

### 3. QUALITY

#### 3.1 GENERAL REQUIREMENTS

##### 3.1.1 Maize ears shall be

(1) free from abnormal colours and odours.

(2) free from living insect pests.

##### 3.1.2 Maize kernels

(1) shall be free from abnormal colours and odours.

(2) Maximum moisture content shall not exceed 14.5% by weight.

(3) shall not contain other-coloured grain more than 5% by weight.

(4) shall be free from living insect pests.

## 3.2 DEFECTS

### 3.2.1 DEFINITIONS

(1) Damaged ear means maize ear that contains kernels which are germinated, broken, obviously damaged by fungi, insect and other pests, or maize ear with abnormal colours and odours (Figure A.1).

(2) Moldy ear means maize ear that obviously infested by fungi upon visual inspection (Figure A.2).

(3) Damaged kernel means maize kernel that damaged and/or becomes abnormal e.g. germinated, rotten, burnt, infested by fungi, weevils, and other insect pests including abnormal colours and odours of kernel (Figure A. 4).

(4) Moldy kernel means maize kernel that obviously infested by fungi or fungal strain upon visual inspection (Figure A.5).

(5) Weevil damaged kernel means maize kernel with traces of storage insect pest e.g. maize weevil (Figure A.6).

(6) Broken kernel means parts of kernel that have been broken off from the whole kernel excluding undeveloped kernel, and damaged kernels (Figure A.7).

(7) Undeveloped kernel means maize kernel that has not developed normally and is abnormal in shape and size (Figure 8).

(8) Foreign matters mean any substances other than maize ear or kernels e.g. parts of stem, leaves, and cobs or other foreign seeds or plant debris and/or soil, gravel and sand.

### 3.2.2 CLASSIFICATION

3.2.2.1 Defects of maize ears at each quality class shall not exceed the criteria as shown in Table 1.

**Table 1 Classification of maize ears**

(Section 3.2.2.1)

Defects	Percentage by weight (%)		
	Class 1	Class 2	Class 3
Damaged ears	3	7	10
Moldy ears	0	1	2
Foreign matters	1	2	3

3.2.2.2 Defects of maize kernels at each quality class shall not exceed the criteria as shown in Table 2

**Table 2 Classification of maize kernels**

(Section 3.2.2.2)

Defects	Percentage by weight (%)			
	Class 1	Class 2	Class 3	Class 4
Damaged kernels	3	6	8	10
Moldy kernels	0	2	3	3
Weevil damaged kernels	0	1	1.5	2
Broken kernels and undeveloped kernels	3	6	8	10
Foreign matters	0.5	1	2	3

Maize kernels for food or food raw material shall not be lower than class 2

#### 4 CONTAMINANTS

Maximum level of total aflatoxins in maize of all classes shall be in compliance with relevant regulations. The total aflatoxins in classes 1, 2 and 3 shall not exceed 15, 20, and 50 µg/kg, respectively.

## **5 PESTICIDE RESIDUES**

This provision shall be in compliance with the relevant laws and the requirements under the Thai Agricultural Standard on Pesticide Residues: Maximum Residue Limits (TAS 9002) and Pesticide Residues: Extraneous Maximum Residue Limits (TAS 9003).

## **6 HYGIENE**

Maize shall be harvested, handled, stored and transported with hygienic practices so as to prevent contaminations that may be harmful to consumers.

### **6.1 STORAGE**

The packaging materials for maize ears and grain e.g. gunny bag and/or storage house including silo and/or container shall be clean and hygienic. The materials shall prevent contamination from hazardous substances and dangerous foreign matters including carriers such as insects, mice, birds and any other animals.

Storage house and practices shall be provided with good ventilation in order to prevent accumulation of humidity and heat. Storage house shall be cleaned and fumigated before storage. Maize in gunny bags shall be placed on pallet that can prevent absorption of moisture from the floor. The bags shall be piled up in stack with enough space between stacks, wall and ceiling. This practice will provide good ventilation and convenience for cleaning and inspection. Maize shall be periodically examined for losses that may occur and surveyed harbouring place of carriers for corrective action. In case where maize is stored for more than one month, the required moisture content of grain shall not be more than 13% by weight and fumigation is applied according to appropriate practices.

### **6.2 TRANSPORTATION**

6.2.1 Vehicle for maize transportation shall be clean, covered in order to prevent contamination and dampness.

6.2.2 Tools used shall be clean and not contaminated with hazardous substances.



## 7. LABELLING

Labelling shall be complied with the relevant regulations and, at least, shall bear legible without false or deceptive information as follows:

7.1 Retail containers for direct consumers shall bear the following statements:

7.1.1 Name of the produce that clearly identify Intention for use as food or feed

- (1) Quality class
- (2) Net weight (metric system)
- (3) Name and address of producer/manufacturer, packer or distributor
- (4) Date of production or packing

7.2 For non-retail or bulk containers, the information shall be shown in the accompanying documents or on the labels.

## 8. OFFICIAL INSPECTION MARK OR CERTIFICATION MARK

This provision shall be complied with the requirements and conditions notified by the Agricultural Standards Committee or by the requirements and conditions of the recognised inspection or certification bodies.

## 9. METHODS OF ANALYSIS AND SAMPLING

### 9.1 METHODS OF ANALYSIS

The analytical methods shall be applied according to Table 3.

**Table 3 Methods of Analysis for Maize**

(Section 9.1)

Criteria	Methods of Analysis <sup>1/</sup>	Principles
1. Defects of maize ears (damaged ears, moldy ears, foreign matters) (Section 3.2.2.1)	Take at least 30 kg of maize ears. Examine and separate the damaged ears and foreign matters, then weigh and calculate the percentage by weight.	Visual inspection and sensory evaluation
2. Defect of maize kernels ( damaged kernels, moldy kernels, weevil damaged kernels) (Section 3.2.2.2)	Take at least 100 g of maize kernels. Examine and separate defect kernels and foreign matters, then weigh and calculate the percentage by weight.	Visual inspection and sensory evaluation
3. Broken kernels, undeveloped kernels and foreign matters) (Section 3.2.2.2)	(1) Take at least 500 g of maize kernels. Sieve through screen of 4.8 mm and 2.4 mm diameter, respectively. (2) Weigh maize kernels that pass through 4.8 mm screen but left over on 2.4 mm screen. Then, calculate percentage of broken and undeveloped kernels per total sample weight. (3) Weigh maize kernels that pass through 2.4 mm screen together with other materials that left over on 4.8 mm and 2.4 mm screen. Then, calculate percentage of foreign matters per total sample weight.	Visual inspection and sensory evaluation
4. Moisture content	ISO 6540 or other equivalent method.	Gravimetry by Hot Air Oven <sup>2/</sup>
5. Aflatoxins	AOAC 991.31	Immunoaffinity Column (Aflatest)
	AOAC 993.17	TLC
	ISO 16050	HPLC

Criteria	Methods of Analysis <sup>1/</sup>	Principles
	AOAC 975.36	Romer minicolumn
	AOAC 979.18	Holaday-Velaseo minicolumn
	Or other methods that are accurate, precise and well recognised with the limit of detection specified in the standard. <sup>3/</sup>	

*Remarks:*1/referring to the latest edition of the international standards

2/In case other analytical methods of moisture content are applied such as moisture meter, an accuracy of the devices shall be verified with hot air oven method. The frequency of verification depends on frequency of activity, number of samples and deviation of the measuring instruments.

3/ Guidelines for choosing other analytical methods

3.1 The analytical method is notified by national organizations or international standard organizations or published in the internationally accepted handbooks or publication.

3.2 The method is validated by collaborative laboratories according to criteria of those recognised international organizations.

3.3 In case where the methods in 1 or 2 are not available, the analytical method validated by a single laboratory according to the internationally recognised criteria can be used.

## 9.2 Methods of sampling

As prescribed in Annex B

# Annex A

## PHOTOS

(Section 3)



Figure A.1 Damaged ears



Figure A.2 Moldy ears



Figure A.3 Normal kernels



Figure A.4 Damaged kernels



Figure A.5 Moldy kernels



Figure A.6 Weevil damaged kernels



Figure A.7 Broken kernels

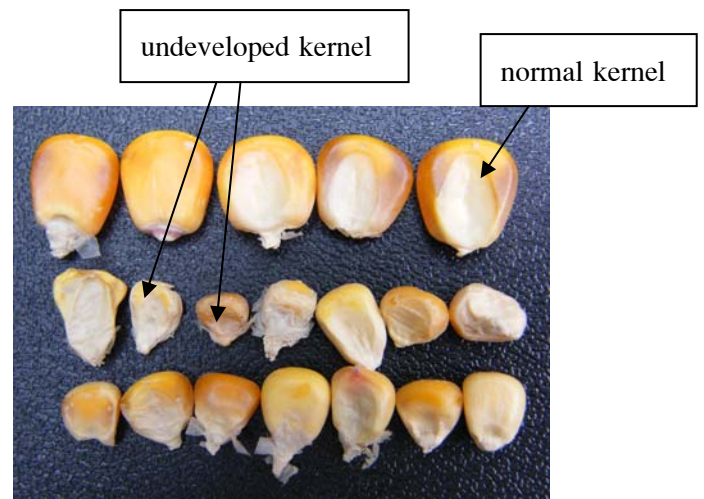


Figure A.8 Comparison between -normal kernels and undeveloped kernels

# Annex B

## Sampling of Maize Kernels

(Section 9)

### B.1 Definitions

The terms used in sampling method are as follows:

B.1.1 Lot means a definite quantity of maize delivered in one shipment supposed to be known by the official to have uniformity such as origin, producer, variety, packer, and type of packaging, consignor logo.

B.1.2 Increment means a quantity of maize samples drawn from the lot as specified in Table B.1, Table B.2 or Table B.3.

B.1.3 Bulk sample means the combined total of all increments taken from the lot.

B.1.4 Laboratory sample means a quantity of at least 1 kg of comingled maize from homogenized bulk sample in each lot.

### B.2 Sampling procedure

Method of sampling shall provide the most representative sample of the lot by randomly sampling increments throughout the lot. Then, to get homogenized bulk sample, all of the increments shall be thoroughly comingled. After that, at least 1 kg of the samples shall be sent to the laboratory for further analysis. Another set of samples shall be kept for traceability when there is a question.

Number of increments that sampled from various points of each lot shall be in compliance with Table B.1, B.2 and B.3.

**Table B.1 Number of increments for maize in sack or bag**

Number of sack/bag in a lot	Number of sacks and bags sampling
1 to 10	Every sack/bag
11 to 100	10
> 100	calculate from square root of quantity of sacks / bags in a lot

**Table B.2 Number of increments for maize transported by vehicles (e.g. truck, barge)**

Quantity (metric ton)	Number of increments
<15	5
15 – 30	8
>30 – 500	11
>500	See Table B.3

**Table B.3 Number of increments for bulk maize from 500 ton or more**

Quantity (metric ton)	Number of increments
500	12
1,000	16
2,000	23
4,000	32
6,000	39
8,000	45
10,000	50

**Remark:** In case of bulk consignment of maize rather than Table B.1, Table B.2 and Table B.3, the number of increments are calculated from a half of the square root of the quantity in ton of maize. The decimal number is rounded up to obtain integer.

$$\text{Number of increments} = \frac{\sqrt{\text{Maize quantity (ton)}}}{2}$$

Guidance on using sampling devices, sampling methods and sample preparation and reduction to get laboratory representative samples for aflatoxin analysis shall refer to ISO 13690:1999 Cereal, Pulses and Milled Products Sampling of Static Batches.

Methods of sampling to determine aflatoxin level shall refer to the sampling methods specified in the Annex of CODEX STAN 193-1995 Codex General Standard for Contaminants and Toxins in Foods.



# Annex C

## Unit

The units and symbols used in this standard and the units recognized by the International System of Units (*le Système International d'Unités*) or SI are as follows:

Measurement	Unit	Sumbol
Mass	kilogram	kg
	gram	g
Length	millimeter	mm
Temperature	degree celsius	°C
Concentration	microgram/ kilogram	µg/kg