USDA Foreign Agricultural Service
GAIN Report
Global Agricultural Information Network

Voluntary _ Public

Date: 4/14/2017
GAIN Report Number: CH17027

China - Peoples Republic of

Post: Beijing

China Releases Revised National Food Safety Standard for Grains (GB 2715-2016)

Report Categories:

FAIRS Subject Report

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Report Highlights:

On December 23, 2016, the National Health and Family Planning Commission (NHFPC) and the China Food and Drug Administration (CFDA) released the National Food Safety Standard for Grains (GB2715-2016), which will be implemented on June 23, 2017. This standard applies to unprocessed and processed grains for human consumption, which includes cereals, beans and tubers. The standard does not apply to raw materials for the processing of edible oils. A draft of this standard was notified to the WTO as SPS CHN 525 in June 2012. Please note that the comment process has ended and that this standard is considered final.

This report provides an unofficial translation of the standard.

General Information:

BEGIN TRANSLATION

National Food Safety Standard for Grains

Foreword

This standard supersedes GB 2715 - 2005 *Hygienic Standard for Grain*.

Compared with GB 2715 - 2005, the main changes in this standard are as follows:

- changed the name of the standard to *National Food Safety Standard - Grains*;
- revised the terms and definitions;
- revised the sensory requirements;
- revised the indexes for hazardous and noxious fungi and plant seeds;
- revised the physical and chemical indexes;
- revised the requirements for storage and transportation; and
- revised the annexes.

National Food Safety Standard for Grain

1 Scope

This standard applies to unprocessed and processed grains for human consumption, including cereals, beans and tubers.

This standard is not applicable to raw materials for the processing of edible oils.

2 Terms and definitions

2.1 Unprocessed grains

Unprocessed grain is a generic name of unprocessed cereals, beans, and tubers, etc.

2.2 Processed grain

Processed grain is the primary product produced from unprocessed grains by mechanical processing, including rice and wheat flour, etc.

2.3 Heat-damaged kernels

Grain kernels discoloured or damaged by the heat caused by micro-organisms or other causes.

2.4 Ergot

Sclerotia of ergot fungus (*Claviceps purpurea* (Fr.) Tul.) growing parasitically in the ovaries of gramineous plants, e.g. rye, wheat, barley and oats.

2.5 Darnel

A herbaceous plant of Lolium genus in Poaceae family, which often grows together with wheat, has an appearance similar to wheat, and the seeds contain temuline.

2.6 Mouldy kernels

Grain kernels that have mould, and the mould damages the embryo, or endosperm (or cotyledon), and the kernels no longer have food value.

3 Technical requirements

3.1 Sensory requirements

The sensory requirements should comply with provisions in Table 1.

Table 1 Sensory requirements

Item	Requirement	Inspection method
Colour, lustre and smell	The kernels should have the colour, lustre and smell as it should have in normal conditions.	GB/T 5492
Heat-damaged kernels (%) Wheat	≤ 0.5	Follow the provisions in GB/T 5494 concerning inspection on imperfect kernels, pick out the heat-damaged kernels, weigh them and calculate their content.
Mouldy kernels (%) Soybeans ≤ Grain other than soybeans ≤	1.0 2.0	Follow the provisions in GB/T 5494 concerning inspection on imperfect kernels, pick out the mouldy kernels, weigh them and calculate their content.

3.2 Physical and chemical indexes

The physical and chemical indexes should comply with provisions in Table 2.

Table 2 Physical and Chemical Indexes

Item	Index	Inspection method

Total hydrocyanic acid (mg/kg) Tapioca	≤ 10	GB/T 5009.36
Tannin (on dry basis %) Sorghum rice, sorghum flour	≤ 0.3	GB/T 15686

3.3 Upper limits of hazardous and noxious fungi and plant seeds

The maximum levels of hazardous and noxious fungi and plant seeds should comply with provisions in Table 3.

Table 3 Maximum levels of hazardous and noxious fungi and plant seeds

Item	Upper limits	Inspection method
Ergot (%) Rice, corn, beans Wheat, oats, hull-less oats, barley, hull-less barley	Should not be detected 0.01	Annex A
Darnel (kernels/kg) Wheat, barley	≤ 1	SN/T 1154
Seeds of plants of the genus Datura and other poisonous plants [a] (grains/kg) Corn, sorghum rice, beans, wheat, oats, hull-less oats, barley, hull-less barley	≤ 1	Annex B
[a] Seeds of Crotalaria spp., Agrostemma githago L. and Ricinus communis L., and other harmful seeds to health.		

3.4 Maximum limits of contaminants and mycotoxins

3.4.1 The maximum contaminant level should comply with the provisions of GB 2762[1].

3.4.2 The maximum level of mycotoxins should comply with the limits in GB 2761[2], wherein the unprocessed grain should comply with the limits of the cereals, beans and tubers in GB 2761, respectively; the processed grain should comply with the limits of cereal products processed by grinding, beans and dried tubers in GB 2761, respectively.

3.5 Maximum residue limits of pesticides

The maximum residue limits of pesticides should comply with the limits inGB 2763[3].

3.6 Food Additives and Nutritional Fortification Substances in Foods

[1] National Food Safety Standard of Maximum Levels of Contaminants in Foods (GB2762)
[2] National Food Safety Standard of Maximum Levels of Mycotoxins in Foods (GB2761)
[3] National Food Safety Standard of Maximum Residue Limits for Pesticides in Food (GB2763)

3.6.1 The use of food additives should comply with the provisions of GB 2760[4].

3.6.2 The use of nutrition enhancers should comply with the provisions of GB 14880[5].

4 Others

4.3 Storage requirements

The grains should be stored and transported with dedicated warehouses and vehicles. The warehouses should be kept clean, dry, rain/moisture-proof as well as insect/rat-proof, and without foreign odours. The grains should be stored separately from noxious/hazardous substances or the substances of high moisture. Different technologies and measures should be adopted at different ecological areas for grain storage so as to ensure safe storage of the grain, reduce losses of and prevent contamination of the grain. The vehicles in line with sanitary requirements should be used, and in transportation, the grain should be protected against the rain and contamination.

Annex A Ergot Test Method

A.1 Identification

A.1.1 Morphological characteristics

Ergot is elongated strip- or banana-shaped, and sometimes slightly fat. It is 3 mm - 10 mm in long and 1 mm - 7 mm in thick. Its surface is black or purple black in color, and with longitudinal furrows and transverse cracks. It is brittle and easy-to-get-broken, and with flat, blunt polygonal or oval sections as well as a white, greyish white or pink white center. Sclerotia may germinate to produce stroma after over wintering. Sterile stroma has a slender stalk and a flat spherical head, with 1 mm – 2 mm in diameter, which is red-brown in color and grows perithecium at outer edge.

[4] National Food Safety Standard for Use of Additives (GB2760)
[5] National Food Safety Standard for Nutritional Fortification Substances in Foods (GB 14880)

A.1.2 Tissue section

Soak ergots in water for 24 h to expand, select an expanded ergot to secure in the middle of a potato or a carrot; cut with a scalpel into slices and dye the slices with methylene blue solution (1g/L); then observe with healthy wheat as negative control whether its tissues are well organized under microscope.

A.2 Qualitative analysis of clavirubin and ergot alkaloids

A.2.1 Principle

Colorimetric test was adopted here onto clavirubin and ergot alkaloids. The clavirubin in statured sodium bicarbonate solution will show up in red. The chloroform extract of the ergot alkaloids after contacting with para-dimethylaminobenzaldehyde appears a ring of bluish violet color and then blue at the layer of chloroform several minutes later, and in a 365 nm ultraviolet lamp, its ethanol solution gives off blue-fluorescence.

A.2.2 Reagents

A.2.2.1 Tartaric acid solution (20 g/l)

A.2.2.2 Anhydrous ether

A.2.2.3 Statured sodium bicarbonate solution

A.2.2.4 Aqueous ammonia (1 + 1)

A.2.2.5 Chloroform

A.2.2.6 Para-dimethylaminobenzaldehyde solution: weight 0.125 g para-dimethylaminobenzaldehyde, add 100 ml sulfuric acid solution in the weighted para-dimethylaminobenzaldehyde to dissolve and then add 0.1 ml ferric chloride solution (50 g/l) in the solution and mix it evenly, wherein the sulfuric acid solution was prepared by slowly pouring 65 ml sulfuric acid into 35 ml water and then the solution can be obtained after evenly mixing and cooling.

A.2.2.7 Anhydrous ethanol: no fluorescence was observed under the irradiation of an ultraviolet lamp at a wavelength of 365 nm.

A.2.3 Operation steps

Place several grains of ergots into a mortar to grind, add tartaric acid solution (20g/L) in the ground ergots to grind till in viscous state; add anhydrous ethanol to grind 2 to 3 times, 5 ml to 10 ml in each dosage, merge the ethanol layer and then place in a test tube. The residues were remained in the mortar for standby. Add 0.5 ml saturated sodium bicarbonate solution into a test tube containing ethanol to shake and then put the test tube into standstill. If the layer of the sodium bicarbonate solution turns red, it indicates that clavirubin is detected. Healthy wheat was used as negative control.

Add aqueous ammonia (1 + 1) in the mortar containing residues, grind the solution till it presents alkaline, extract for 2 to 3 times with chloroform, 5 ml to 10 ml in each time, merge the chloroform layer and then divide it into 2 parts after evenly mixing and place into two test tubes. Take one of the test tubes to slowly add 2 ml para-dimethylaminobenzaldehyde solution along the wall thereof; the contract surface of the two tubes of solution appears a ring of bluish violet color and sever minutes later, the chloroform layer shows blue, which indicates that ergot alkaloids have been detected. Then heat another test tube with hot bath to evaporate chloroform off, add anhydrous ethanol to dissolve the residues, and observe the solution in a 365 nm ultraviolet lamp; if the solution shows strong blue fluorescence, ergot alkaloids have been detected. Healthy wheat has used as negative control.

A.3 Determination

Based on ergot identification, if the clavirubin and ergot alkaloids show positive in quantitative analysis, it can be determined that the sample contains ergot.

A.4 Calculation of detectable amounts in an ergot sample

Ergot content in 1000 g (m_1) samples should be expressed in mass fraction w, and calculated according to the formula (A.1):

$$W = m_2 / m_1 \times 100\% \qquad (A.1)$$

Where:

w - ergot content in sample, %;

m_2 - ergot mass in samples in grams (g);

m_1 - sample mass (1000 g) in grams (g).

The calculated result should have three significant figures.

Annex B Test Method of Datura Seeds

B.1 Identification

B.1.1 Morphological characteristics

Datura seed is round, oblong, kidney-shaped, triangular kidney-shaped or oval-shaped broad ovate, and are 3 mm to 5 mm long and 2.5 mm to 4.0 mm wide. It is flat at both sides and thick (or thicker) in back as well as with smooth edges or sinuous ridges. It has leathery seed capsule. The seed capsule is pale yellow, yellowish-brown or brown to dark brown, and has a slightly wrinkled or slightly (apparently) concave surface on which coarse texture and recesses may (or may not) exist. Its Hila is long and triangular, deltoid or T-shaped, and sometimes it is covered with remnant white suspensor on surface. The seed is rich in white endosperm, and the embryo is often annular or campylotropous, and few are straight. Figure B.1 shows various species of datura seeds.

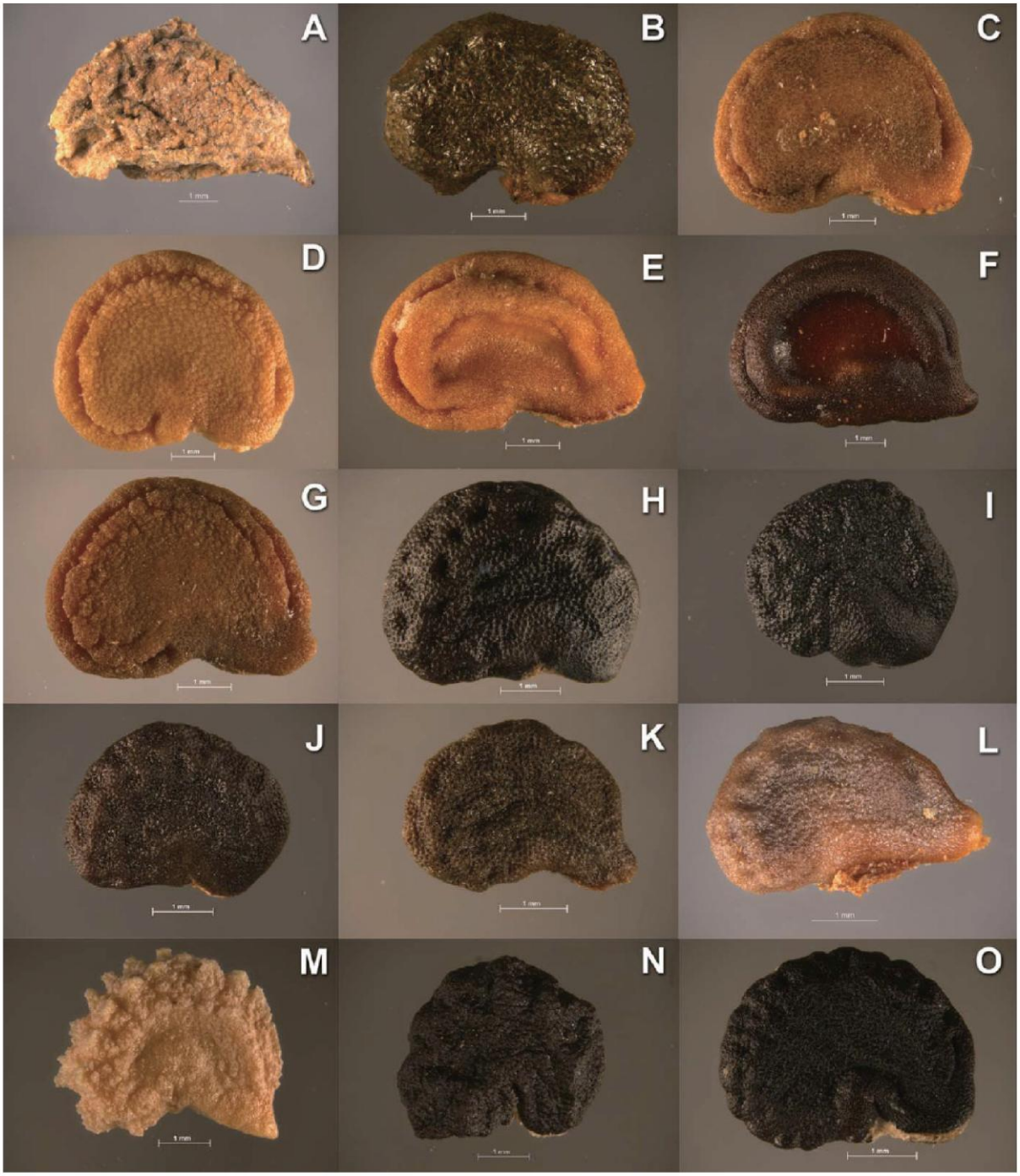

Fig. B.1 Photo of datura seeds

B.1.2 Determination

Those in line with the morphological characteristics described in B.1.1 should be identified as Datura.

B.2 Qualitative and colorimetric analysis of alkaloids

B.2.1 Principle

Atropine and other alkaloids containing in the samples, after being extracted, will have color reaction with fuming nitric acid and potassium hydroxide solution.

B.2.2 Reagent

B.2.2.1 Aqueous ammonia (1 + 1)

B.2.2.2 Ether

B.2.2.3 Hydrochloric acid solution (1 + 5)

B.2.2.4 Chloroform

B.2.2.5 Anhydrous sodium sulfate

B.2.2.6 Nitric acid

B.2.2.7 Potassium hydroxide solution in ethanol (100 g/l)

B.2.3 Operation steps

Place approximately 30 datura seeds in a mortar, add aqueous ammonia (1 + 1) to wet and then grind into a viscous state after soaking for a moment; add ether and grind for three times, 10 mL in each time, combine ether in a separating funnel, add 10 mL hydrochloric acid (1 + 5), shake and extract for 1 min to separate hydrochloric acid layer to another separating funnel; add aqueous ammonia (1 + 1) and adjust to alkalinity, shake and extract for 1 min with 10 mL chloroform, and repeat this step one more time; combine the obtained chloroform layers and concentrate with anhydrous sodium sulfate to 0.5 mL for standby.

Take 0.2 mL sample solution to a small evaporating dish, evaporate the solvent to dry, add 4 drops of fuming nitric acid to dissolve the residue, evaporate to dry on a water bath till the residue become yellow, add a few drops of potassium hydroxide - ethanol solution (100 g/L) after its cooling, its color turns purple blue and then red. Atropine, hyoscyamine and scopolamine have all this reaction.

B.3 Qualitative thin-layer chromatography

B.3.1 Principle

Atropine and other alkaloids contained in the sample, after being extracted, were separated by thin layer and then reacted with chromogenic reagent to color development and finally compared with the standard solution.

B.3.2 Reagent

B.3.2.1 Silica G TLC plate: 0.3 mm to 0.5 mm in thickness; activate at 105 °C for 1 h and set aside in a dryer for use.

B.3.2.2 Developing solvent: methanol - aqueous ammonia (200 + 3).

B.3.2.3 Color developing agent: weigh 0.85 g bismuth subnitrate, add 10 mL glacial acetic acid and add 40 mL water to dissolve; take 5 mL of the solution, add 5 mL potassium iodide solution (4 g potassium iodide dissolved in 5mL water), and add 20 mL glacial acetic acid and then dilute with water to 100 mL.

B.3.2.4 Standard solution of atropine: weigh 120.0 mg atropine sulfate, dissolve in 10 mL water, and add aqueous ammonia (1 + 1) to alkaline; extract twice with chloroform, 8 mL in each time; dehydrate chloroform extract with a small amount of anhydrous sodium sulphate and then filter into a 20 mL colorimetric tube that has a stopper; wash the filter with a small amount of chloroform, mix the washing liquor into the colorimetric tube and add chloroform in the tube up to 20 mL; each milliliter of this solution is equivalent to 5.0 mg atropine.

B.3.2.5 Standard solution of scopolamine: weigh 145.0 mg scopolamine hydrobromide to dissolve in 10 mL water, add aqueous ammonia (1 + 1) to present alkaline, and extract twice with chloroform, 8 mL in each time; dehydrate chloroform extract with a small amount of anhydrous sodium sulphate, filter into 20 mL colorimetric tube that has a stopper, and then wash the filter with a small amount of chloroform, and mix washing liquor into the colorimetric tube, add chloroform in the tube up to 20 mL; each milliliter of this solution is equivalent to 5.0 mg scopolamine.

B.3.3 Operation steps

At 2 cm of the lower end of TLC plate, drop 10 μL of atropine and scopolamine standard solution and 30 μL to 100 μL concentrate extract of sample, at a spacing distance of 1.5 cm, which is placed in a developing slot that is pre-saturated with the developing agent; when the solvent front develops up to 10 cm to 15 cm, remove and evaporate the developing agent to dry and spray color developing agent; when it shows orange - red spots, it is a positive reaction.

Bibliography

[1] BYER, SOSAV. Molecular Phylogeny of the Jimsonweed Genus Datura (Solanaceae) [J]. Systematic Botany, 2013, 38 (3) : 818 - 829.

END OF TRANSLATION