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Professional Standard of the
People's Republic of China for

NY/T 494—2002 **e**

Konjac flour

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Preface

Appendices A and B of this Standard are authorization appendices.

This Standard is proposed and centralized by the Ministry of Agriculture of the People's Republic of China.

This Standard is drafted by Southwest Agricultural University, Food Quality Supervision, Inspection and Test Center (Chengdu) of the Ministry of Agriculture, Product Quality Supervision and Inspection Institute of Sichuan Province, Shengtemeng Konjac Particulate Flour Liability Co. Ltd. of Chengdu City, and Anxian Dule Konjac Product Factory of Sichuan Province.

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This Standard is published for the first time.

Introduction

Since the mid 80's of the last century, when a konjac industry appeared in China, the production of konjac flour has experienced a steady growth in the country. About 60 percent of the products are exported to the markets in Europe, North America, Japan, Southeastern Asia and other regions in the world. It is true that local standards and National Standard for konjac fine flour were promulgated in different years, but the products of konjac flour have developed from a single product of konjac fine flour to a variety of products including common konjac fine flour, purified konjac fine flour and purified konjac particulate flour. Purified konjac fine flour and purified konjac particulate flour, in particular, show a tendency of expanding their production scope year after year. Therefore, this Professional Standard is formulated in order to normalize the existing standards for konjac products in a comprehensive way.

At the present time, no unified international standard for konjac flour is available. In working out the major technological items and quality indicators of this Standard, we consulted a great amount of domestic and foreign technological data and performed a great amount of sampling and testing of various konjac flour products. Therefore, the quality specifications in it reflect the present actual situation in China, and most of the products are in line with those on the international markets.

The indicators for viscosity and glucomannan content of konjac flour and their definitions specified in the present Standard are mandatory. Each of them is mainly applied in its specific field. Therefore, either one can be used as the main indicator for evaluating the quality of konjac flour.

Konjac Flour

7.5 Scope

This standard specifies the definitions, classification, requirements, test methods, inspection rules, markings and labels, packaging, shipment and storage of konjac flour (or konjac gum) products

This standard is applicable to various konjac flour products which are used as food or medicinal raw material.

7.6 Authorization documents quoted

The clauses in the following documents, once quoted in this Standard, are the clauses of this Standard. If the date of a document is indicated, any revising list, with the exception of errata, or its revision edition that appeared at a later date is not applicable to this Standard. However, the relevant parties, which have agreed upon this Standard, are encouraged to discuss among themselves whether the latest version of any of these documents can be adopted. The latest version of any document quoted herein is applicable to this Standard if no indication of date is given.

GB 191	Graphic Marks for Packing, Storage and Transportation
GB/T 5009.3	Determination Methods for Water Content in Foods
GB/T 5009.4	Determination Methods for Ashes in Foods
GB/T 5009.11	Determination Methods for Total Arsenic in Foods
GB/T 5009.12	Determination Methods for Lead in Foods
GB/T 5009.34	Determination Methods for Sulfite in Foods
GB/T 5508	Determination Methods for Silty Sand Content in Food Grains and Oils
GB 7718	General Standards for Food Labels

3 Definitions

3.1 Common konjac fine flour

“Common konjac fine flour” is defined as the kind of konjac flour which is basically free from starch and other impurities when konjac tuber slices or chips have been dry-processed with physical procedures or when fresh konjac tuber has been wet-processed with edible alcohol and more than 90% of whose particles have a size in the range of 0.125 mm~0.335 mm.

3.2 Common konjac particulate flour

“Common konjac particulate flour” is defined as the kind of konjac flour which is basically free from starch and other impurities when konjac tuber slices or chips have been dry-processed with physical procedures or when fresh konjac tuber has been wet-processed with edible alcohol and more than 90% of whose particles have a size of ≤ 0.125 mm.

3.3 Purified konjac fine flour

“Purified konjac fine flour” is defined as the kind of konjac flour which has a glucomannan content of more than 85% when fresh konjac tuber has been wet-processed with edible alcohol or when konjac fine flour has been purified with edible alcohol and more than 90% of whose particles have a size in the range of 0.125 mm~0.335 mm.

3.4 Purified konjac particulate flour

“Purified konjac particulate flour” is defined as the kind of konjac flour which has a glucomannan content of more than 85% when fresh konjac tuber has been wet-processed with edible alcohol or when konjac fine flour has been purified with edible alcohol and more than 90% of whose particles have a size of ≤ 0.125 mm.

4 Classification

Based on its processing depth, konjac flour is divided into two major classes, each of which is sub-divided into two sub-classes.

4.1 Common konjac flour

Based on its defined particle size, common konjac flour is divided into common konjac fine flour and common konjac particulate flour.

4.2 Purified konjac flour

Based on its defined particle size, purified konjac flour is divided into purified konjac fine flour and purified konjac particulate flour.

5 Requirements

5.1 Organoleptic indicators

The organoleptic indicators should comply to the requirements listed in Table 1.

Table 1 Organoleptic indicators

Class		grade	color	shape	smell
common konjac flour	common konjac fine flour	Top grade	White	Granulate, without lumping or molding	The fishy smell innate to konjac and a slight SO ₂ smell are allowable,
	common konjac particulate flour	First grade Second grade	White, with a trace of brown permitted White or yellow, with a little brown or dark permitted		
purified konjac flour	purified konjac fine flour	Top grade	White	Granulate, without lumping or molding	A slight fishy smell innate to konjac and a slight alcohol smell are allowable.
	purified konjac particulate flour	First grade			

5.2 Physico-chemical and hygiene indicators

Physico-chemical and hygiene indicators should comply with the requirement in table 2.

Table 2 Physico-chemical and hygiene indicators

Items	common konjac flour			purified konjac flour	
	Top grade	First grade	Second grade	Top grade	First grade
Viscosity (#4 rotator, 12r/min,30°C) mPa · s ≥	22 000	18 000	14 000	32 000	28 000
Glucomannan (on dry basis) % ≥	70	65	60	90	85
Sulfur dioxide g/kg ≤	1.6	1.8	2.0	0.3	0.5
water % ≤	11.0	12.0	13.0	10.0	
ashes % ≤	4.5	4.5	5.0	3.0	
Sand content % ≤	0.04			0.04	
Arsenic (based on As) mg/kg ≤	3.0			2.0	
Lead (based on Pb) mg/kg ≤	1.0			1.0	
Particle size (as defined) % ≥	90				

6 Test methods

6.1 Organoleptic inspection

Color and shape are inspected with the naked eye and smell is inspected with the nose.

6.2 Physico-chemical and hygiene indicator inspection

6.2.1 viscosity

6.2.1.1 instruments and tools

NDJ-1 type or NDJ-5S type rotation viscometer, constant-temperature water bath, analytical balance sensitive to 0.01 g, beakers with a volume of 500ml and direct current speed-adjustable wing-shaped agitator.

6.2.1.2 Steps of determination

Put 495 ml of distilled water (30°C) or deionized water into a 500 ml beaker, which is then placed in a constant-temperature water bath. Put the direct-current speed-adjustable wing-shaped agitator into the beaker and start agitation at 150 r/min after proper adjustment. Weigh 5.00 g of the sample to be tested with the analytical balance sensitive to 0.01 g and add it slowly into the beaker. Uninterrupted agitation at constant temperature is made for 1 h for common konjac fine flour and purified konjac fine flour and for 10 min for common konjac particulate flour and purified konjac particulate flour. Right after the beaker is taken out after agitation is stopped, make the first determination of viscosity with the #4 rotator at 12 r/min. After the first determination, put the beaker back into the constant temperature water bath and repeat the agitation operation at 30°C ± 1°C. Determinations are made at 0.5 h-intervals for common or purified konjac fine flour and at 10 minute-intervals for common and purified konjac particulate flour and the operations are repeated until the maximum reading on the viscometer shows a marked drop. In each determination, three successive reading should be made and averaged and viscosity is calculated based on the maximum average value.

6.2.1.3 Calculation of result

Viscosity of the sample η is calculated with

$$\eta = K \theta$$

where η represents the viscosity of the sample (mPa · s);

K is a coefficient (when #4 rotator is used at 12 r/min, K=500);

θ is the maximum average value of the readings on the viscometer.

The allowable error of the repeated determinations must be lower than 250 mPa · s.

6.2.2 Glucomannan

The operation is made as directed in Appendix A (an appendix of standardization).

6.2.3 Sulfur

The operation is made as directed in GB/T 5009.34—Distillation Method.

6.2.4 Water

The operation is made as directed in GB/T 5009.3.

6.2.5 Ashes

The operation is made as directed in GB/T 5009.4.

6.2.6 Sand content

The operation is made as directed in GB/T 5008.

6.2.7 Arsenic

The operation is made as directed in GB/T 5009.11.

6.2.8 Lead

The operation is made as directed in GB/T 5009.12.

6.2.9 Inspection of particle size

Accurately weigh 50.00 g of evenly mixed sample to be tested and put it onto the sample splitter with a mesh size as specified in the definition. Put on the cover and fasten it. Weigh the samples separately according to different grades after 10 minutes' continuous screen sizing and calculate their percentage of the sample. The percentage of the particles passing the screen with specific mesh is:

$$\text{Content (\%)} = \frac{W_1}{W} \times 100$$

Here, W_1 represents the mass of the sample up to the requirement of the sample splitter (g)

W is the mass of the whole sample (g)

The allowable error of the repeated determinations must be lower than 0.5%.

7 Inspection rules

7.1 Group/Lot

The products with the same specifications produced by the same shift of workers with the same raw material constitute a lot.

7.2 Sampling

Randomly sample 1000 g of the products from each lot, reduce it to 500 g, and take 250 g for inspection and use the other 250 g as the reserves sample.

7.3 Ex-factory inspection

Before the products are dispatched from the factory, the quality inspection department of the manufacturer should inspect them lot by lot and grant a certificate if their quality has been confirmed. No products should be allowed to leave the factory unless a certificate of being qualified is attached to the packing case. The items of delivery inspection include organoleptic inspection, viscosity, sulfur dioxide, water content and particle size.

7.4 Type inspection

7.4.1 Type inspection is normally performed once every half a year. In addition, type inspection is required

under any of the following conditions: change in crucial technology; resumption of production after a long period of suspension, and as required by the national quality supervision agency.

7.4.2 Items for type inspection

Items for type inspection should include all the inspection items required in this Standard.

7.5 Rules for judgment

7.5.1 When organoleptic indicators, water content, viscosity, sulfur dioxide or particle size is found not consistent with the requirements specified in this Standard in the ex-factory inspection, sampling should be re-made from the same lot with doubled amount and repeat the inspection of the relevant items. If there is one or more item remains unqualified in the re-inspection, the whole lot should be considered to be under-qualified and its grade may be reduced accordingly.

7.5.2 If any item in the type inspection is found to be inconsistent with the requirements of this Standard, the products of the whole lot are considered to be unqualified.

8 Markings and Labels

8.1 Indication should be made on the product label according to GB7718: product name, class, grade, net content, the name of the manufacturer (or distributor) and its address, production date, freshness-insuring period and standard code of the product should be indicated on the label.

8.2 On the outer package, the name, class, grade, net content of the product and the name of the manufacturer (or distributor) and its address should be indicated.

8.3 The shipping markings should comply with the stipulations in GB191.

9 Packaging, shipping and storage

9.1 Packaging

9.1.1 Polyethylene film bags are used for inner package of the product and braided fabric sacks, paper cases or bags made of composite material are used for its outer package. All the package materials should be in consistence with the requirements of the hygienic standard.

9.1.2 The specification for package may be 25 kg/bag (or kg/case), or 20 kg/bag (or kg/case). The error in net weight should be within the range of $\pm 0.4\%$.

9.2 Shipping

9.2.1 Proper care should be taken in the shipping and handling of the product. No shock, squeezing or compression or direct exposure to sun and rain is allowed.

9.2.2 The shipping conveyance should be kept clean and sanitary, and the product should not be shipped together with any toxic, harmful, caustic or volatile substances.

9.3 storage

9.3.1 The products should be kept in dry and moisture-proof storage-houses. Direct radiation of sunshine should be avoided. The optimum temperature and humidity is $<25^{\circ}\text{C}$ and $<65\%$.

9.3.2 The products should not be stored in the same storage house with any toxic, harmful, caustic or volatile substances.

9.3.3 Common konjac flour should keep good in quality for no less than one year and purified konjac flour should keep good in quality for no less than two years.

Appendix A

(an appendix of standardization)

DETERMIANTIONOF GLUCOMANNAN CONTENT IN KONJAC FLOUR

A1 Principle

Acid hydrolysis of glucomannan will produce two kinds of reducing sugar: D-mannan and D-glucose. Reducing sugars will be reduced to a brownish red amino-compound when co-boiled with 3,5-dinitro salicylic acid in an alkali medium. To some extent, the amount of the reducing sugars is in positive correlation with the color strength and, therefore, glucomannan can be determined with spectrophotometry.

A2 Instruments

Spectrophotometer, electromagnetic agitator, centrifuge (>4000 r/min), analytical balance, constant temperature bath, measuring flask and graduated pipettes (5 and 2 ml).

A3 Reagents

A3.1 color-developing agent: 3,5-dinitro salicylic acid

Solution A: Dissolve 6.9 g of re-distilled phenol in 15.2 ml of sodium hydroxide (10%) and dilute it to 69 ml. Add 69 ml of sodium hydrogen sulfite to the solution.

Solution B: Weigh 225 g of potassium sodium tartrate and add it to 300 ml of sodium hydroxide (10%). Then add 880 ml 3,5-dinitro salicylic acid to the solution.

Mix solution A with solution B and store it in a brown reagent flask at room temperature to be used 7-10 days later.

A3.2 sulfuric acid solution (30 mol/L)

A3.3 sodium hydroxide solution (60 mol/L)

A3.4 Formic acid-sodium hydroxide buffer (0.1 mol/L): Place 1 ml of formic acid into a 250-ml measuring flask before adding 60 ml of distilled water to it. Weigh 0.25 g of dissolved sodium hydroxide, add it to the solution and dilute it to the volume of 250 ml.

A3.5 Glucose standard solution (1.0 mg/ml): Accurately weigh 0.1000 g of analytical-grade glucose, which has been pre-dried to constant weight at 105°C, with an analytical balance and dissolve it in distilled water. Dilute the solution to the volume of 100 ml.

A4 Procedures of operation:

A4.1 Calibration curve for glucose

Transfer in sequence 0.4, 0.8, 1.2, 1.6 and 2.0 ml standard glucose working solution and 2.0 ml distilled water into six 25-ml measuring flasks. Add distilled water to the volume of 2 ml. Add 1.5 ml 3,5-dinitro salicylic acid (reagent) to the solution, homogenize it by shaking and heat the flasks in boiling water bath for 5 min

before prompt cooling. Add distilled water to the definite volume and homogenize the solution by shaking. Determine its absorbance at 550 nm with a 1-cm colorimetric disk. Use distilled water as the color reaction solution in blank test and set it at zero. Record the absorbance of the glucose working solutions of different concentrations. Plot the standard working curve with glucose content (mg) as the abscissa (X) and absorbance as the ordinate (Y), or establish the regression equation with absorbance as Y and glucose (mg) as X.

A4.2 Determination of konjac glucomannan

A4.2.1 Preparation of the konjac glucomannan extract: Weigh 0.1900-0.2000g of the sample with a dry and smooth weigh-paper and add it into the measuring flask, which contains 50 ml of formic acid-sodium hydroxide buffer which is being agitated electro-magnetically. Let it agitation-swelled at 30°C for 4 h or at room temperature overnight. Then dilute the solution with the formic acid-sodium hydroxide buffer to the volume of 100 ml. (First, add distilled water into an empty measuring flask to a definite volume; then place in the china rod and record the scale mark of the rise of the solution surface; and that mark will be the mark for the required volume of the test solution.) When the solution is homogenized with agitation, it is centrifuged at 4000 r/m for 20 min. The supernatant of the solution is the konjac glucomannan extract.

A4.2.2 Preparation of the hydrolysate of konjac glucomannan: Accurately pipet 5.0 ml of the konjac glucomannan extract into a 25-ml measuring flask. (The pipette is repeatedly flushed until all the viscose sample solution sticking to the inner wall of the pipette is dissolved and added into the measuring flask.) Accurately add 2.5 ml of sulfuric acid (3 mol/L) to the solution, mix them thoroughly by shaking and then hydrolyze it in a sealed boiling water bath with stopper for 1.5 h. before cooling. Add to it 2.5 ml of sodium hydroxide (6 mol/L) and mixed them thoroughly by shaking and then dilute the solution with distilled water to the volume of 2.0 ml.

A4.2.3 Determination of the content of konjac glucomannan: Pipet the konjac glucomannan extract and the hydrolysate of konjac glucomannan thus prepared and distilled water, 2.0 ml for each, into three 25-ml measuring flasks, add 1.5 ml of 3,5-dinitro salicylic acid, the reagent, and heat it in a boiling water bath for 5 min. When it is cooled, add distilled water to dilute it to the volume of 25 ml. Match the color at 550 nm with the spectrophotometer. Distill water is used in the blank test and its color reaction is set as zero. The absorbance of the extract and the hydrolysate is recorded. The content of glucose (mg) corresponding to its absorbance can be obtained on the standard curve or calculated with the regression equation.

A4.3 calculation of result

glucomannan in the konjac flour (calculated on dry basis, %)

$$= \frac{\epsilon (5T - T_0) \times 50}{m \times (1 - w) \times 1000} \times 100 \dots \dots \dots (1)$$

Here, ϵ is the ratio of the molecular weight of the glucose and mannan residues in the glucomannan to the molecular weight of the glucose and mannan produced after hydrolysis, $\epsilon = 0.9$;

T is the number of mg of glucose in the glucomannan hydrolysate obtained from the standard curve;

T₀ is the number of mg of glucose in the glucomannan extract obtained from the standard curve;

M is the mass of the konjac sample (g);

W is the water content of the sample (5).

The allowable error in the repeated determination should be no more than 5%.