
**Pao cai (salted fermented
vegetables) — Specification and test
methods**

*Pao cai (légumes fermentés salés) — Spécification et méthodes
d'essais*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 3, *Fruits and vegetables and their derived products*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Pao cai (salted fermented vegetables) is a traditional fermented vegetable product, rich in organic acids, amino acids and other nutrients. It is recognized as being conducive to human health and has become one of the world's recognized healthy fermented vegetable products.

Pao cai has a long history of production. It was introduced into Europe in the 17th century. Nowadays, it sells well all over the world, especially in countries and regions where it is regularly consumed, such as in China, Japan, Korea and Europe. Accordingly, an industry to supply pao cai has rapidly developed. The market demand is enormous and the industry is experiencing a dramatic capacity expansion. However, as a result of the rapid development, there is a lack of unified and explicit product quality and safety guarantees, which greatly limits the international trade and circulation of pao cai products.

This document specifies the properties of pao cai. It has been developed to help prevent barriers to trade and communication.

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Pao cai (salted fermented vegetables) — Specification and test methods

1 Scope

This document specifies the categories of pao cai (salted fermented vegetables) and its requirements, including sensory, physical and chemical, safety, labelling, transport and storage. It also describes the corresponding test methods.

This document does not apply to kimchi.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 750, *Fruit and vegetable products — Determination of titratable acidity*

ISO 2447, *Fruit and vegetable products — Determination of tin content*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3634, *Vegetable products — Determination of chloride content*

ISO 4832, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coliforms — Colony-count technique*

ISO 6633, *Fruits, vegetables and derived products — Determination of lead content — Flameless atomic absorption spectrometric method*

ISO 6888-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 1: Technique using Baird-Parker agar medium*

AOAC 968.30, *Canned Vegetables-Drained Weight Procedure*

CXG 90-2017, *Guidelines on Performance Criteria for Methods of Analysis for the Determination of Pesticide Residues in Food and Feed*

EN 15662, *Foods of plant origin — Multimethod for the determination of pesticide residues using GC- and LC-based analysis following acetonitrile extraction/partitioning and clean-up by dispersive SPE — Modular QuEChERS-method*

CXS 1-1985, *General Standard for the Labelling of Prepacked Foods*

CXS 192-1995, *General Standard for Food Additives*

CXS 193-1995, *General Standard for Contaminants and Toxins in Food and Feed*

Codex Pesticides Residues in Food Online Database. Available at: <http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/en/>

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1
pao cai
salted fermented vegetable product made of vegetables such as cabbage, mustard stems, long beans, peppers, daikon, carrots and other kinds, through *soaking fermentation* (3.2) with added salt or saline solution before sterilization or non-sterilization, with seasoning or not seasoned

3.2
soaking fermentation
process of generating the inherent flavour of pao cai formed through lactic acid bacteria-based fermentation, which is carried out by immersing vegetables into a saline solution

Note 1 to entry: The saline solution can be directly made with salt and water or with the leaching water of salted vegetables.

3.3
salinity
content of sodium chloride when the salt in vegetables is balanced with that in a saline solution in the process of *soaking fermentation* (3.2)

4 Classification

According to the process and technology, pao cai are classified into sterilized and non-sterilized. The temperature and duration of the sterilization process depend on the content of the products and the limits of the target microorganisms.

5 Product requirements

5.1 Sensory requirements

5.1.1 Colour

Pao cai products shall be of the inherent colour of this kind of product.

5.1.2 Flavour

Pao cai products shall be of the inherent flavour and smell of this kind of product, without an unpleasant smell.

5.1.3 Texture

Pao cai products shall be crisp, tender, hard and brittle, without having the signs of deterioration and becoming rotten.

5.1.4 Appearance

Pao cai vegetables shall be used as whole or cut into various patterns such as a strip, sheet, diced or irregular shape, without a mildew white film layer.

5.1.5 Impurities

No external impurities shall be seen with the naked eye.

5.2 Physical and chemical requirements

Pao cai products shall meet the physical and chemical requirements given in [Table 1](#).

Table 1 — Physical and chemical requirements

Indicator	Limit
Ratio of filtration mass to net mass ^a	≥ 50 %
Titration acidity (measured with lactic acid) (in g/100 g)	0,2 to 2,5
Salinity (calculated as sodium chloride) (in g/100 g)	0,5 to 10,0
^a Solid liquid two phase.	

5.3 Limits of microorganisms

The specification will specify the limits for coliform bacteria and *Staphylococcus aureus* in pao cai products. The requirements for microbial limits in pao cai products shall be in accordance with [Table 2](#).

Table 2 — Microbial limits requirements

Index	Sampling inspection plan		Limits			
	n	c	Sterilized		Non-sterilized	
			m (CFU/g)	M (CFU/g)	m (CFU/g)	M (CFU/g)
Coliform bacteria	≤ 5	≤ 2	0	—	≤ 1 000	≤ 10 000
<i>Staphylococcus aureus</i>	≤ 5	≤ 2	0	—	≤ 1 000	≤ 10 000
Key n: number of sample units c: maximum allowable number of defective sample units in a 2-class plan or marginally acceptable sample units in a 3-class plan m: microbiological limit, which, in a 2-class plan, separates good quality from defective quality or, in a 3-class plan, separates good quality from marginally acceptable quality M: microbiological limit, which, in a 3-class plan, separates marginally acceptable quality from defective quality						

5.4 Limits of food additives

If added, the limits of food additives in pao cai products shall conform to the requirements in CXS 192-1995.

5.5 Limits of heavy metals

The limits of heavy metals in pao cai products shall be tested in accordance with the test methods in ISO 6633 and ISO 2447. They shall conform to the requirements in CXS 193-1995.

5.6 Limits of pesticide residue

The limits of pesticide residue shall be tested in accordance with the method in CXG 90-2017 and EN 15662. They shall conform to the maximum residue limits of pesticide specified in the Codex Pesticides Residues in Food Online Database.