



Types of khoa, standards methods of manufacture and preservation



- **Khoa is a concentrated whole milk product obtained by open pan condensing of milk under atmospheric pressure.**
- **According to Food Safety and Standard Regulations 2011, Khoya sold as Pindi, Danedar, Dhap, Mawa or Kava, means the product obtained from cow or buffalo or goat or sheep milk or milk solids or a combination thereof by rapid drying.**
- **Milk fat content shall not be $<30\%$ on dry weight basis of finished product.**
- **May contain citric acid not $>0.1\%$ by weight.**
- **Shall be free from added starch, added sugar and added colouring matter.**



Microbial Standards of Khoa (FSSAI)

Characteristics	Khoa
Total plate count	Not more than 50000/g
Coliform count	Not more than 90/g
<i>E.coli</i>	Absent in 1 g
<i>Salmonella</i>	Absent in 25 g
<i>Shigella</i>	Absent in 25 g
<i>Staphylococcus aureus</i>	Not more than 100/g
Yeast and mold count	Not more than 250/g
Anaerobic spore count	Absent in 1 g
<i>Listeria monocytogens</i>	Absent in 1 g

Microbial Standards of Khoa (BIS)

Characteristic	Variety of khoa		
	<i>Pindi</i>	<i>Danedar</i>	<i>Dhap</i>
Total solids % by mass (min)	65.0	60.0	55.0
Fat % by mass (on dry matter basis) min	37.0	37.0	37.0
Total ash (% on dry matter basis)	6.0	6.0	6.0
Titratable acidity % (max)	0.8	0.9	0.6
Coli form count /g (max)	90	90	90
Yeast and mould count /g (max)	50	50	50

Varieties of Khoa



Pindi

1. This variety is identified as a circular ball of hemispherical pat with compact mass, homogenous and smooth texture.
2. Shall not show any sign of fat leakage or presence of free water.
3. Possesses pleasant cooked flavour and devoid of objectionable tastes like burnt, acidic, etc.
4. Manufacture of burfi, peda and other varieties of sweets.

Dhap

1. It is a raw (katcha) khoa characterized by loose but smooth texture, soft grains and sticky body.
2. Dhap carries highest percentage of moisture over other varieties of khoa thereby; providing adequate free water for soaking of maida (refined wheat flour) and semolina (suji) and for homogenous distribution of other ingredients in the preparation of smooth gulabjamun balls.
3. Manufacture of gulabjamun, kalajamun, pantooa, carrot halwa.





Danedar

1. Characterized by granular texture with hard grains of different sizes and shapes embedded in viscous serum.
2. Slightly sour milk is preferred for manufacture as it yields granular texture.
3. Used in the manufacture of kalakand, milk cake, etc.



Khoa can keep well for 2-3 days at room temperature and for a week under refrigerated storage conditions. Shelf life of khoa is mainly dependent on moisture content of khoa, temperature of storage, bacteriological quality of raw milk, hygienic conditions maintained during production, duration of storage, type and method of packaging

Keeping Quality of Khoa (Water activity of khoa is 0.960)

Quality of raw material

Use of poor quality milk particularly sour or neutralized lowers the keeping quality of final product.

Quality of *khoa*

Khoa having high moisture (ideal is 30-50% moisture) content has very poor shelf life. High amount of fat (30-40%) particularly free fat, in presence of copper and iron is very much favorable for oxidized flavour. So, should not be contaminated with these pre-oxidant catalysts (ideal moisture)

Manufacturing Conditions

Sanitary conditions should be adopted at all stages of manufacture of *khoa* and its subsequent handling. Minimum contamination with microorganisms, better will be the keeping quality of *khoa*.

Temperature of storage

Higher temperature of storage, lower is shelf life and vice versa.

Temp. of storage	Shelf life on days	
	Unpacked	Packed in laminates
5°C	≤ 10	> 30
30°C	≈ 5	6-7
37°C	≈ 3	≤ 5

Type of Package

Shelf life of khoa is in increasing order, open tray < parchment paper < LDPE < Food grade HDPE < Laminates < Tins

Methods of Packaging

Method of packaging is very important in relation to keeping quality of khoa. Packaging of khoa under aseptic environment and selection of an appropriate packaging material improves keeping quality of khoa.

Improving Shelf Life of *Khoa*

Packaging

- Hot packaging of khoa in pre-sterilized cans can improve shelf life upto 14 days at room temperature and 75 days under refrigerated temperatures.
- Three times increase in shelf life was claimed by packing khoa in rigid polypropylene containers with lid.
- Vacuum packaging and packing in Cryovac Shrink wrap pouches will prevent growth of aerobic microorganisms in khoa. However, these two packaging methods do not offer protection against bacteria growing inside khoa.

Thermal treatment

- Hot filling of khoa in rigid containers at 85°C is useful in extending shelf life of khoa.
- Packaging of khoa in aluminium cans and steaming them for 15-20 min will prevent spoilage for few weeks.
- Deep freezing of khoa and storing at -10 to -20°C extend shelf life for considerably long periods.
- However, at this temperature of storage, the lactose which is in super saturated state in khoa gets crystallized and gives rise to sandiness defect.

U.V. irradiation

- Irradiation of khoa with U.V. rays will preserve khoa up to 25 days. However, oxidation changes are caused by U.V. irradiation affecting the flavour of khoa.

Chemical preservation

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Under Food Safety and Standards regulations, no preservative should be added to khoa. However, some attempts were made to improve the shelf life of khoa by adding mold inhibitors, nisin and antioxidants.

- Antifungal agents like sorbic acid, propionic acid and their salts can be used to preserve khoa. Addition of 0.2% sorbic acid by weight of khoa during last stage of its manufacture will enhance shelf life up to 20 days at 30°C and 125 days in cold storage.
- Mold inhibitors can be sprayed on surface of product or packaging material can be treated with the chemical agent.
- Addition of Nisin (Nisaplin) will improve shelf life of khoa by 10-11 days at 30°C.

Chemical and Microbial Changes in Khoa During Storage

Chemical Changes

1. Moisture

Loss of moisture takes place resulting into dry and hard surface of khoa. The extent of evaporation however depends on the temperature of storage and packaging material. The higher the storage temperature the higher is the rate of evaporation. More the water vapour transmission rate (WVTR) of package faster the loss of water from khoa. Minimum loss of moisture takes place in case of tins and maximum loss in parchment paper.

2. Acidity

Lactic acidity increases with storage period. Higher percentage increase take place at higher temperature and vice-versa. The pH normally decreases during storage corresponding to increase in acidity.

3. Deterioration in fat

Peroxide value increases due to oxidative spoilage during storage of khoa, particularly at ambient temperature. Hydrolytic rancidity in khoa take place thereby increasing the free fatty acids measured as % oleic acid.

4. Breakdown in milk protein

There is break down of milk protein in khoa as recorded by the increase in tyrosine value.

5. Changes in organoleptic quality:

Changes in organoleptic quality of khoa during storage include development of off flavour (stale, sour, oxidized, etc), hardening of body and texture and increase in intensity of colour.



Microbial changes

- Post manufacture contamination and unhygienic handling makes microbiological quality far from satisfactory on account of moisture content the storage at high ambient temperatures.
- Aerobic spore formers, staphylococci and micrococci are dominant groups and frequent occurrence of coliform and *Staphylococcus aureus*, *Salmonella* and *Bacillus cereus* etc. in indigenous milk products.
- Milk is subjected to boiling temperature for 15-20 min during manufacture of khoa. Therefore except spores all other microorganisms are destroyed during khoa making.
- Khoa manufactured by continuous methods is sterile but by traditional methods contains comparatively high microbial load.
- **Aerobic spore formers** and **molds** are mainly responsible for the microbial spoilage of khoa.

Defects in Khoa

Defects in khoa arise from inferior quality milk, unhygienic conditions during manufacturing and duration of storage.

Defects	Causes	Prevention
a) Flavour		
Smoky	Smoky fire used for boiling and dehydration of milk	Using non-smoky fire for boiling and dehydration of milk
Sour/ Acid	Excessively high acidity in milk used	Using fresh sweet milk
Rancid	Fat hydrolysis due to lipase action in <i>khoa</i> during storage (at room temperature and above)	Storage of <i>khoa</i> at low temperature (5-10°C)
Stale	Excessively long period of storage of <i>khoa</i> at low temperature (5-10°C)	Early disposal/ marketing of <i>khoa</i>

b) Body and texture		
Hard body	<p>Excessively low fat content of milk used</p> <p>Excessively low moisture content of <i>khoa</i>, due to faulty production technique</p>	<p>Using milk of optimum fat content</p> <p>Optimum moisture content of <i>khoa</i> by adopting correct production technique</p>
Coarse texture	<p>Excessively high acidity in milk used</p> <p>Excessively low fat content of</p> <p>Excessively low moisture content of <i>khoa</i>, due to faulty production technique</p>	<p>Using fresh sweet milk</p> <p>Using milk of optimum fat content</p> <p>Optimum moisture content of <i>khoa</i> by adopting correct production technique</p>
Coarse texture	<p>Excessively high acidity in milk used</p> <p>Excessively low fat content of milk used</p> <p>Excessively high temperature of dehydration, especially in the last stages</p> <p>Excessively low speed when stirring milk/ pan-contents.</p>	<p>Using fresh sweet milk</p> <p>Using milk of optimum fat content</p> <p>Optimum temperature of dehydration, especially in the last stages</p> <p>Optimum speed when stirring milk/ pan-content</p>
Gritty texture	<p>Presence of sand-like particles due to incorrect straining of milk</p> <p>Presence of large crystals of lactose due to incorrect method of manufacture.</p>	<p>i) Correct straining of milk</p> <p>ii) Correct method of manufacture</p>

c) Colour and appearance of dry surface		
Visible Dent/ foreign matter	Excessively low fat content of milk used i) Incorrect or no straining of milk used ii) Heating-pan and/or stirrer not cleaned iii) Dirty/windy surroundings during manufacture and/or handling of <i>khoa</i>	Using milk of optimum fat content i) Correct straining of milk ii) Heating-pan and/or stirrer well cleaned iii) Clean surroundings during manufacture and/ or handling of <i>khoa</i> iv) Transport of properly packed <i>khoa</i> .
Browning/ Burnt particles	i) Excessively high heating-temperature, especially in the last	i) Optimum heating temperature, especially in the

Uses of Khoa



- Manufacture of a variety of khoa based sweets like gulabjamun, peda, burfi, kalakand, milk cake etc.
- Preparation of carrot halwa, laddoo etc.
- Direct consumption after mixing with sugar.
- Used as a topping for payasam, kaddu ka kheer, other sweets etc