A photograph of paneer cheese. On the left is a large, rectangular block of paneer. In the center, a single slice of paneer is shown. On the right, there is a pile of small, cubed pieces of paneer. The cheese is a light cream color with a slightly textured surface. The background is plain white.

**Paneer: Product
description, standards,
method of manufacture,
packaging and
preservation**

- ❖ **Paneer** is a heat-acid coagulated milk product obtained by coagulating standardized milk with permitted acids at specified temperature.
- ❖ Resultant coagulum is filtered and pressed to get sliceable curd mass.
- ❖ Firm, close, cohesive, spongy body, smooth texture.
- ❖ Mainly prepared from buffalo milk
- ❖ Though localized in Northern part of India but now it is preferred almost all parts of country.
- ❖ Sold as blocks or slices (Indian fresh cheese).
- ❖ Reported: 5% of milk produced in India is converted into paneer and paneer production is growing annually at rate of 13%.



Chemistry of milk coagulation during paneer production

- ❖ Phenomenon of coagulation involves formation of large structural aggregates and network of protein in which milk fat globules gets embedded.
- ❖ Acid and heat treatment causes the physical and chemical changes in casein.
- ❖ Heating causes interaction of β -lactoglobulin with κ -casein and the complex formed between β -lactoglobulin and α -lactalbumin.
- ❖ Acidification initiates progressive removal of tri-calcium phosphate from surface of casein and it gets converted into mono-calcium phosphate.
- ❖ Further calcium is progressively removed from calcium hydrogen caseinate to form soluble calcium salt and casein.
- ❖ Colloidal dispersion of discrete casein micelles changes into large structural aggregates of casein.
- ❖ Under such circumstance dispersion is no longer stable, casein gets precipitated and forms coagulum.
- ❖ Fat is embedded in casein network.



FSSR-2011 standards of paneer:

Total Plate Count	NMT 5,00,000/g
Coliforms	NMT 90/g
<i>E.coli</i>	Less than 10 /g
<i>Salmonella</i>	Absent in 1g
<i>Staphylococcus aureus</i>	NMT 100/g
Yeast and Mold count	NMT 250/g
<i>Listeria monocytogens</i>	Absent in 1 g

Characteristics	BIS(IS:10484-1983, Reaffirmed 1999)
Moisture % Max	60
Milk fat % by mass (dry matter basis) min.	50
Titratable acidity(as lactic acid), % by mass, max,	0.5
Total Plate Count	NMT 50,000/g
Coliform count, per g, Max	90
Yeast and Mould count per g, Max	250

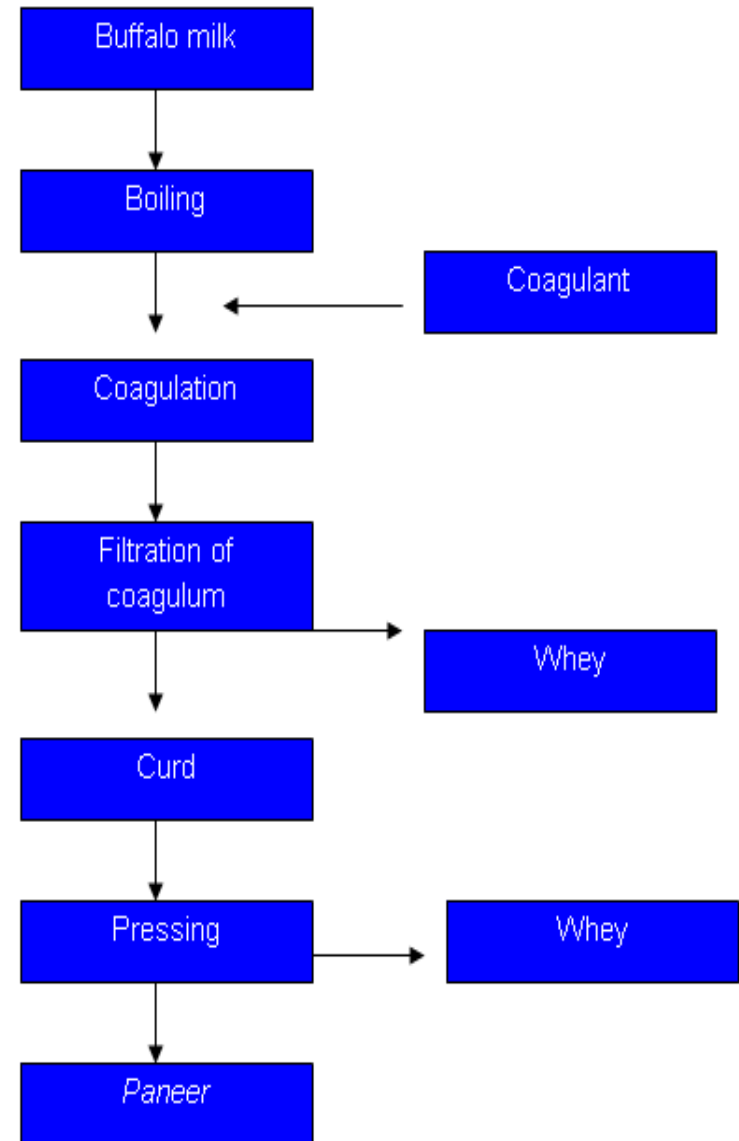
BIS Standards for paneer

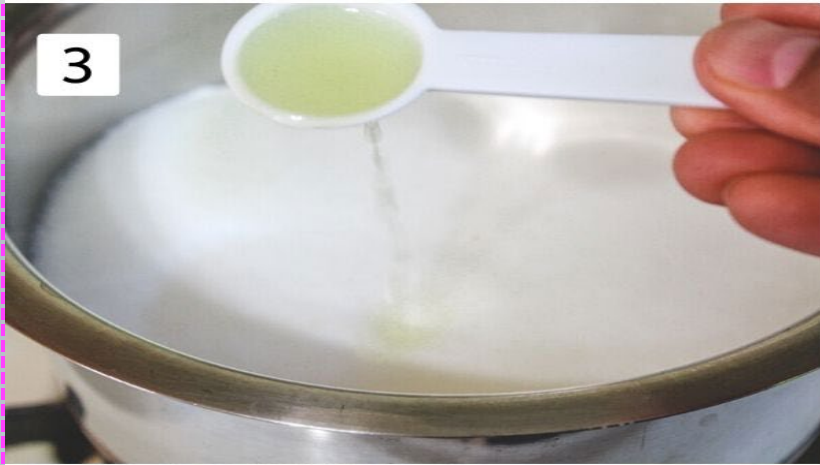
Product obtained from cow or buffalo milk or a combination thereof by precipitation with sour milk, lactic acid, or citric acid. Shall not contain more than 70% moisture and milk fat content shall not be less than 50% of dry matter. Milk solids may also be used in preparation of paneer. Low fat paneer shall contain not more than 70% moisture and not more than 15% milk fat on dry matter basis.

FSSR

Preparation:

- Buffalo milk is boiled in a bigger iron vessel and a small portion of this is transferred to a smaller vessel.
- Coagulant (usually sour whey) is added to hot milk and stirred with a ladle till coagulation is completed.
- Contents of vessel are emptied over a piece of coarse cloth to drain off whey.
- Whole process is repeated till all milk is coagulated.
- Curd is collected after draining whey and pressed to remove more whey.
- Product is then dipped in chilled water.

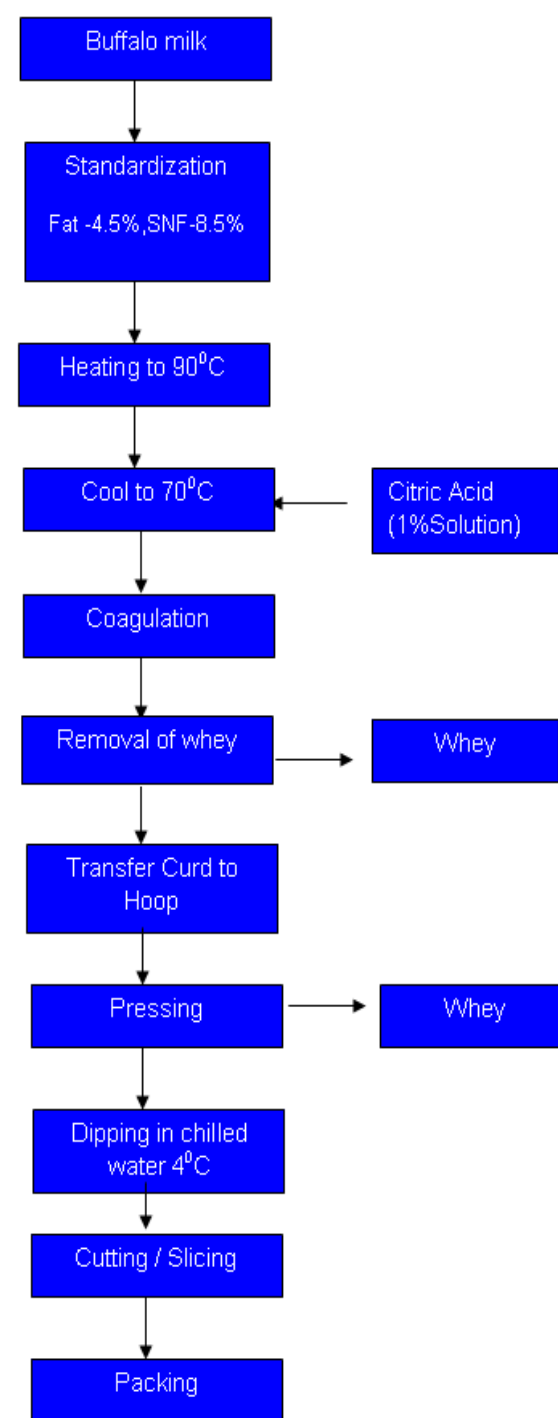






Industrial Method of Preparation

- Buffalo milk is standardized to 4.5% fat and 8.5% SNF.
- Milk is heated to 90°C without holding (or 82°C with 5 min holding) in a jacketed vat and cooled down to 70°C.
- Coagulation is done at about 70°C by slowly adding 1% citric acid solution(70°C) with constant stirring till a clean whey is separated at (pH 5.30 to 5.35) and coagulum is allowed to settle for 5 min and drained off the whey.
- Curd so obtained is filled into hoops lined with muslin or cheese cloth.
- Pressure is applied on top of hoop at rate of 0.5-1 kg/cm².
- Pressed blocks of paneer are removed from the hoops and immersed in pasteurized chilled water for 2-3 hr.
- Chilled paneer is then removed from water to drain out.
- Finally paneer blocks are wrapped in parchment paper / polyethylene bags and placed in cold room at about 5 to 10°C.



Paneer from Cow Milk

Cow milk yields an inferior product in terms of body and texture. It is too soft, weak and fragile and unsuitable for frying and cooking. Buffalo milk contains considerably higher level of casein and minerals particularly calcium and phosphorous, which tends to produce hard and rubbery body while cow milk produces soft and mellow characteristics.

By replacing one third of buffalo milk with cow milk, a good quality paneer can be made. Buffalo milk paneer retains higher fat, protein and ash content and lactose as compared to cow milk paneer. To make paneer exclusively from cow milk, addition of calcium chloride at the rate of 0.08 to 0.1% to milk helps in getting a compact, sliceable, firm and cohesive body and closely knit texture. Higher temperature of coagulation (85°-90°C) with coagulation of milk at pH 5.20 to 5.25 helps in producing good quality paneer from cow milk. However, at this pH of coagulation, moisture, yield and solids recovery are less.



COW MILK VS BUFFALO MILK



SID'S FARM

100% PURE

Natural Paneer

As good as homemade

No Antibiotics | No Hormones | No Preservatives

Made with
Just Milk, Curd & Lime

200g



Ananda

Net Quantity
200g

Paneer made from Cow Milk

INGREDIENTS: Milk, Soda
BEST BEFORE: FIFTEEN DAYS FROM THE PACKAGING
Store in a cool, dry place. Store continuously under refrigeration below 4°C
Free From: Antibiotics, Preservatives, Nutrients

NUTRITIONAL INFORMATION PER 100g (APPROX.)	
Energy (kcal)	275
Energy (kcal per 100g)	275
Total Fat (g)	18.0
Total Fat (g) (Saturated)	12.0
Total Fat (g) (Trans)	0.0
Protein (g)	18.0
Total Carbohydrates (g)	2.0
Sodium (mg)	200
Calcium (mg)	200

Don't purchase if tempered with
cool and warm
strong food grade plastic

Manufactured by: Ananda Food Products
100% Pure Paneer (Cottage Cheese)
E.C. No. 100/120/1004228
E.C. No. 100/120/1004229
E.C. No. 100/120/1004230
E.C. No. 100/120/1004231
E.C. No. 100/120/1004232
E.C. No. 100/120/1004233
E.C. No. 100/120/1004234
E.C. No. 100/120/1004235
E.C. No. 100/120/1004236
E.C. No. 100/120/1004237
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E.C. No. 100/120/1004246
E.C. No. 100/120/1004247
E.C. No. 100/120/1004248
E.C. No. 100/120/1004249
E.C. No. 100/120/1004250

MRP ₹ (incl. of all taxes)
Date of Packaging:
Batch No. Please see stamp



1st CLASS PANEEER
40

Use of Ultra filtration in Paneer manufacturing

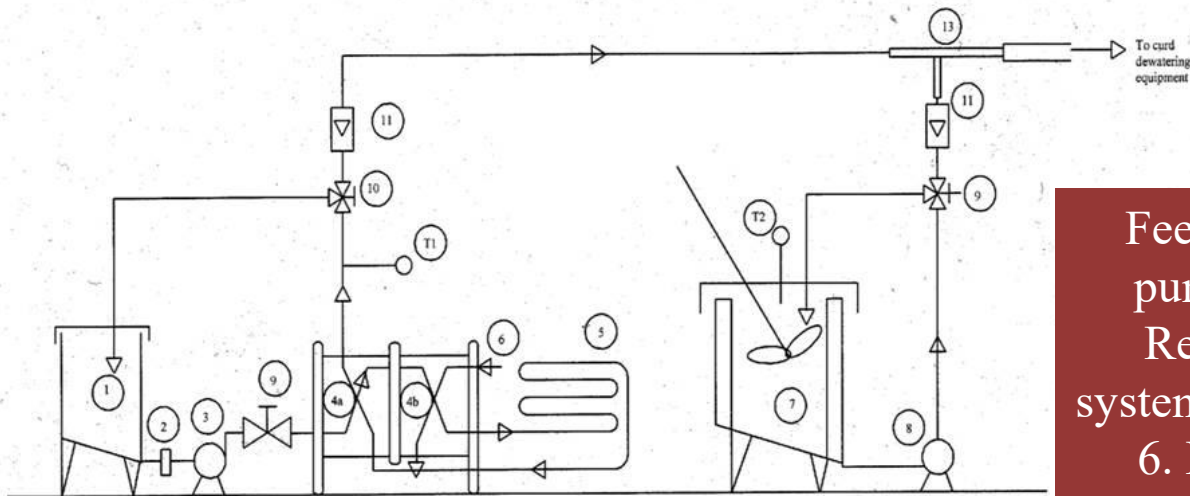
- **Advantages:** adaptation to mechanization, uniform quality, improved shelf-life, increased yield and nutritionally superior product.
- In this process milk after standardization and heating is passed through UF membrane where lactose, water and some minerals are removed as permeate.
- Concentrated mass which has about 40% total solids is cold acidified to get the desired pH.
- Upto this point the product is flowable and can be easily dispersed into containers with automatic dispersing machines.
- Filled containers can then be subjected to texturization by passing through microwave tunnels.
- Resulting product has typical characteristics of normal paneer.
- Yields increase by about 25% which is due to retention of good quality whey proteins and slight increase in moisture content (moisture about 70%) yield is about 25%.

- ❑ Fully mechanized process developed to yield a long shelf-life paneer like product.
- ❑ In this process, standardized buffalo milk is concentrated partly by vacuum concentration and partly by UF to a T.S. content of 30%.
- ❑ Acidified using GDL – Glucono Delta Lactone.
- ❑ After packaging in metallized polyester pouches, product is formed by texturizing process at 115°C for 5 min which permits concomitant sterilization.
- ❑ Yield of paneer is more due to retention of whey solids and shelf life is 110, 80 and 47 days at 25, 35 and 45°C respectively.

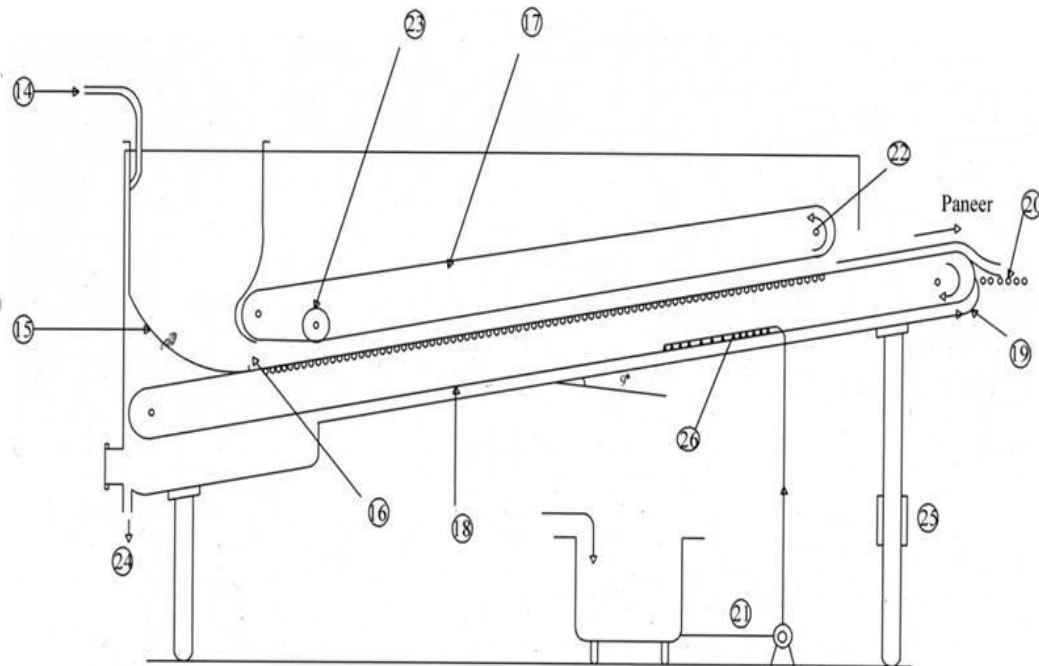
In-package long life paneer like product

Continuous Manufacture of Paneer:

- **Continuous paneer-making system was developed at NDRI, Karnal.**
- **In this system, unit operations involved in paneer making have been mechanized.**
- **Continuous paneer making machine is designed to manufacture 80 kg paneer per hour by employing twin-flanged apron conveyor cum filtering system for obtaining desired moisture content and texture attributes.**
- **Milk heating unit consists of a plate heat exchanger with provision of heat regeneration, heating of milk from 25 C to 90 C holding for two minutes and cooling to 70 C. Other accessories in this unit are balance tank, pump, flow meter, temperature indicator and auto thermal control unit, etc.**
- **Continuous dewatering and matting unit consists of twin apron conveyer to carry out primary and secondary filtration in same machine.**
- **Lower conveyor is flanged type while the upper one is unflanged type.**
- **Flanged unit has perforations for drainage.**
- **Additional fine filter of appropriate size is placed over conveyor to prevent solids loss.**
- **Linear speed of conveyor is designed to provide optimum residence time required for adequate dewatering.**
- **Flexibility in motion is incorporated through a variable speed drive, giving 5-8 min of residence time.**
- **Increasing width of conveyor can increase capacity of this unit.**



Feed tank, 2. On-line filter, 3. Feed pump, 4. Plate heat exchanger, 4a. Regeneration system 4b. Heating system, 5. Holding tube for heated milk, 6. Hot water, 7. Acidulant tank, 8. Acidulant pump, 9. Flow control, 10. Flow diversion valve, 11. Rotameters, 12. Temperature indicators (T1 and T2), 13. Transverse jet mixer-reactor, 14. From TJM-R, 15. Primary whey drainage. 16. Entrance of curd pressing zone, 17. Upper conveyor, 18. Lower apron conveyor, 19. Scrapper, 20. Paneer outlet, 21. Wet scrubber, 22. Fixed conveyor shaft, 23. Adjustable conveyor shaft, 24. Whey outlet, 25. Adjustable support, 26. Spray nozzles



Schematic diagram of continuous paneer manufacturing unit

Frozen Paneer

Paneer slabs are cut into small cubes of about 1cm^3 or 1.5 cm^3 and then cubes are kept in deep freezer or pass through freezing tunnel to freeze them to -18 C or below. These frozen cubes are packed in a metalized laminates and vacuum packed.

Advantages of this method:

Less time consumption while thawing

After thawing one can directly use for preparation of various dishes

Quickly freeze to -18 C or below



Factors affecting quality and yield of paneer:

Type of milk:

- Paneer prepared from buffalo milk possess desirable frying properties, body and texture as compared to cow milk.
- Cow milk paneer is soft, weak and fragile and during cooking it tends to disintegrate.
- Cow milk and buffalo milk mixed in equal quantity yields better product than cow milk.
- Paneer made from skim milk has chewy, rubbery texture and hard body.

Quality of milk:

- Milk must be fresh and free from off flavour.
- Growth of psychrotrophic organisms should be minimized to restrict the off-flavour development.
- Acidic milk having a titratable acidity of more than 0.20% lactic acid yields a product of inferior quality.
- Milk with COB positive and low acidity (sweet curdling) is not suitable for paneer making.
- Paneer made from such milk has weak body and texture, more moisture, acidic smell and not safe for human consumption.

Type, strength and temperature of coagulant:

- Product yield and moisture retention are directly influenced by the type and concentration of the acid and the mode of delivery and blending into the hot milk.
- Citric acid is generally used as a coagulant.
- Lemon or lime juice or vinegar imparts a typical flavour to the product.
- 1% solution of citric acid yields good quality of paneer.
- Sufficient acid is added gently but quickly blended with milk (within one min) to reach optimum pH of coagulation.
- Normally 1.8-2.0 kg citric acid is required for coagulating 1000 lit of milk.
- High acid concentration imparts acidic flavour, hardness and causes greater solids loss.
- Whey cultured with *Lactobacillus acidophilus* at a level of 2% and incubated overnight at 37°C can be used as a substitute for citric acid.
- However acidic whey must be heat treated to destroy these lactic organisms before use to prevent loss of shelf life of paneer.
- Coagulation temperature influences moisture content of paneer.
- Increase in temperature from 60 C-86 C decreases moisture content from 59-49%.
- Optimum coagulation temperature for best organoleptic and frying quality product is 76 C.

Heat treatment of milk:

- Objective of heating milk is to prepare it for rapid iso-electric precipitation, control the moisture content, develop typical body and texture, create conditions conducive to the destruction of pathogenic and other microflora present in milk and ensure safety as well as keeping quality of final product.
- Milk is heated to 90 C without holding or 82°C for 5 min in order to maximize the total solids recovery.
- Whey proteins especially β -lactoglobulin and α -lactalbumin form a complex with κ -casein and retained with curd thus increasing yield of product.
- High heat treatment imparts desirable cooked flavour by controlled liberation of sulphhydryl compounds.

Coagulation temperature:

- Influences moisture content of paneer.
- Increase in temperature from 60 C-86 C decreases the moisture in paneer from 59 to 49%.
- At 70 C, paneer made from buffalo milk has the best organoleptic and frying quality in terms of shape retention, softness and integrity.

pH of coagulation:

- The optimum pH of coagulation of milk at 70 C is 5.30-5.35 for better product quality and maximum recovery of solids when made from buffalo milk.
- Moisture retention in paneer decreases with reduction in pH and consequently yield also decreases.
- At pH more than 5.35, paneer is very soft with fragile and crumbly body.
- Optimum pH for paneer preparation from cow milk is 5.2.



Parameter	Percentage
Fat	23.41(50.84 on dry matter basis)
Protein	18.23
Lactose	2.40
Ash	1.90
Total solids	46.04



Proximal chemical composition of paneer

Yield of *paneer* is dependent on fat and solid not fat content of raw milk, moisture, fat and protein retained in paneer. Co precipitation of casein and whey proteins is the simplest way of recovering whey proteins and thus increasing yield of paneer. Heat treatment of milk to 90°C is necessary to achieve good yield. Yield of 20-22 kg is obtained from buffalo milk and 16-18 kg from cow milk.

Packaging and Shelf-life

- Polyethylene pouches, cryovac films and retort pouches are used for paneer packing.
- Vacuum packaging of paneer in laminated pouches increases the shelf life to about 30 days at 6°C.
- Paneer packaged in laminate (EVA/EVA/PVDC/EVA) under vacuum and heat treated at 90°C for one minute increases shelf life upto 90 days under refrigeration.
- Paneer packed in tins along with water/ brine and sterilized in an autoclave at 15 PSI for 15 min lasts for 4 months.
- Product can be stored under frozen conditions (below -18°C) for more than one year without any deterioration in its quality.
- Paneer dipped in 5% brine solution lasts for about 22 days at 8-10°C.
- Salting at time of dipping into chilled water can be used in extending shelf life of paneer.
- Dipping in benzoic acid (1200 ppm) increases the shelf life of paneer to 40 days at refrigerated temperature and 20 days at 37°C.
- By adding sorbic acid to milk (0.15%) and subsequent wrapping of paneer in sorbic acid coated waxed paper, shelf life of paneer can be increased to 36 days at room temperature.