Ministry of Food Processing Industries
Government of India

GHEE PROCESSING

AATMANIRBHAR BHARAT

PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)

Ministry of Food Processing Industries
Government of India

NIFTEM
KNOWLEDGE • INNOVATION • OUTREACH

INTRODUCTION

- ✓ The word Ghee comes from old Sanskrit word “ghr”, which mean bright or to make bright.
- ✓ Ghee has a religious significance in the communities of Hindus starting from the birth ceremony to the last funeral rite.
- ✓ About 60-70% of total ghee produced in India is used for direct consumption, dressing, and almost 15-20% for the cooking and frying of foods.
- ✓ India exports Rs 550 crore dairy items during Covid-19, Ghee tops the list with Rs 1,521 crore.

INTRODUCTION

As per FSSR-2011, ghee means the pure heat clarified fat derived solely from milk or curd or from desi (cooking) butter or from cream to which no coloring matter or preservative has been added.

- Generally Ghee has a long keeping quality; it can be stored for 6 to 12 months under ambient temperature provided proper packaging and filling.
- Exposure of ghee to light, air, water vapor and metals causes deterioration of ghee which resulted into off flavor and rancidity.

Ministry of Food Processing Industries
Government of India

CHEMICAL COMPOSITION OF GHEE

Constituents	Cow milk ghee	Buffalo milk ghee
Fat (%)	99 – 99.5	99 – 99.5
Moisture (%)	<0.5	<0.5
Carotene(mg/g)	3.2-7.4	-
Vitamin A(IU/g)	19-34	17-38
Cholesterol (mg/100g)	302 – 362	209 – 312
Tocopherol(mg/g)	26 – 48	18 – 31
Free fatty acid (%)	2.8	2.8

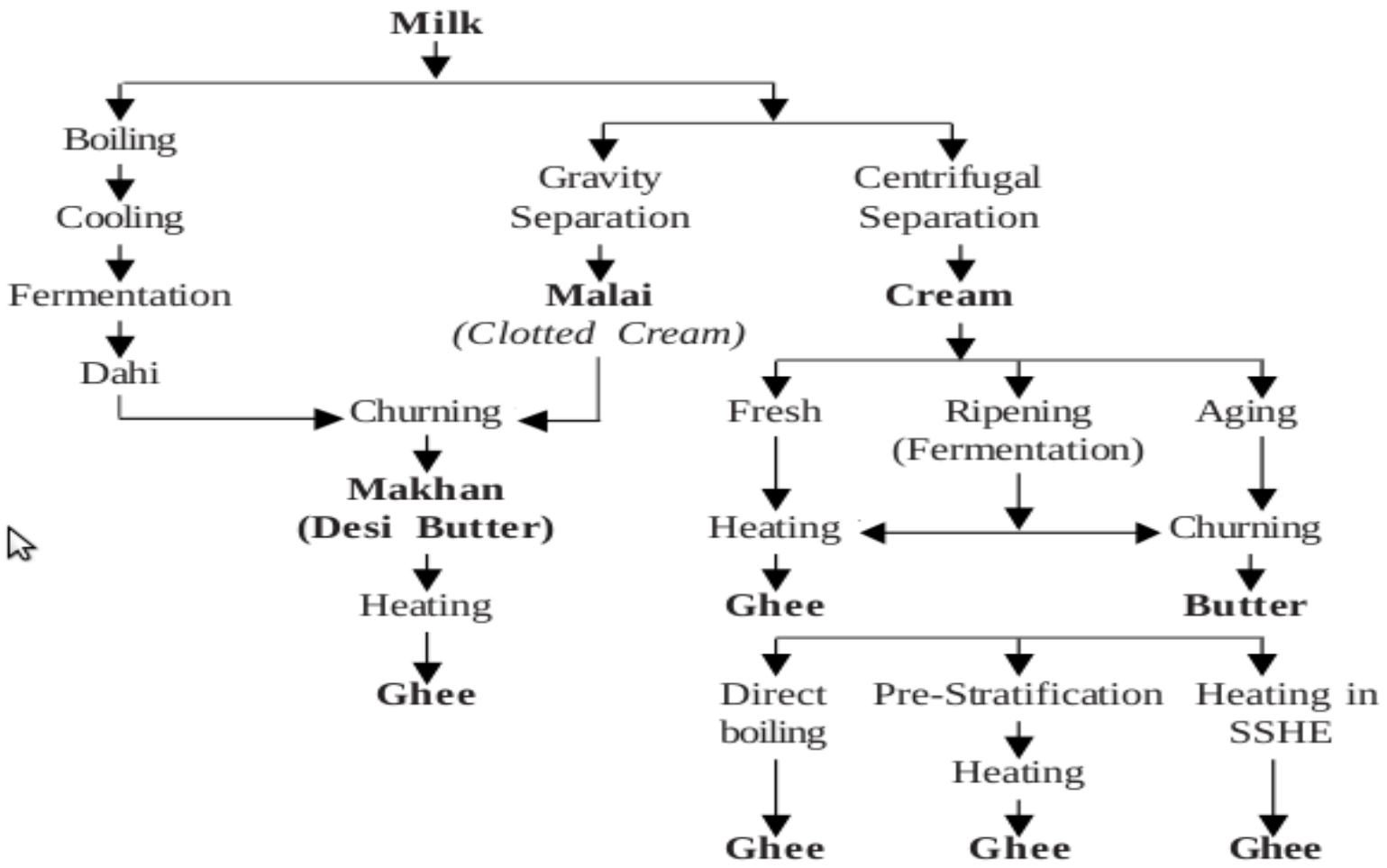
Source: (R.P.Aneja et al., Technology of Indian milk products, Dairy India publication. Section 3.4: Fat rich dairy products, page 187.)

Ministry of Food Processing Industries
Government of India

ANALYTICAL CONSTANT OF BUFFALO & COW GHEE

Constants	Buffalo Ghee	Cow Ghee
Butyro-refractometer (BR) reading	42.0	42.3
Sponification value	230.1	227.3
Reichert-Miessel (RM) value	32.3	26.7
Polenske value	1.41	1.76
Iodine value	29.4	33.7
Kirschner value	28.52	22.16
Solidifying point (°C)	16 – 28	15 – 23.5
Melting point (°C)	32 – 43.5	28 – 41
Colour(yellow unit/g) (Tintometer)	0.8	8.8

GHEE MANUFACTURING PROCESS



(source: http://egyankosh.ac.in)

Ministry of Food Processing Industries
Government of India

AGMARK STANDARDS OF GHEE

Parameters	Special Grade	General Grade	Standard Grade
Baudouin Test	Negative	Negative	Negative
Butyro - refractomer reading at 40^0C	40.0- 43.0	40.0- 43.0	40.0- 43.0
Reichert Meissl value	Not less than 28.0	Not less than 28.0	Not less than 28.0
Polenske value	1.0 - 2.0	1.0 - 2.0	1.0 - 2.0
Moisture content	Not more than 0.3%	Not more than 0.3%	Not more than 0.3%
Percentage of Free Fatty Acid (as oleic acid)	Not more than 1.4	Not more than 2.5	Not more than 3.0

Ministry of Food Processing Industries
Government of India

NIFTEM
KNOWLEDGE • INNOVATION • OUTREACH

PREPARATIONS METHOD OF GHEE

There are different preparations method prevail in our country and mostly depends on the scale of production.

1. Indigenous (Desi) method
2. Direct cream method
3. Creamery butter method
4. Pre-stratification method
5. Continuous Method

Indigenous (Desi) method for Ghee preparation

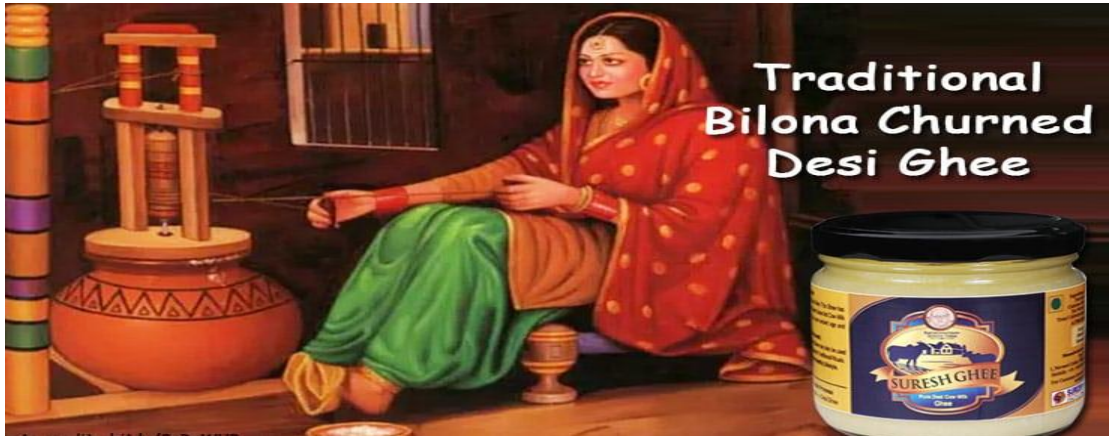
- ✓ Age-old process and largely adopted in rural areas/villages
- ✓ It usually involves two routes,

a) Lactic acid fermentation of raw or heated milk is followed by churning of curd into makkhan (butter)

b) Separation of malai (clotted cream) from the boiled milk and its churning into butter.

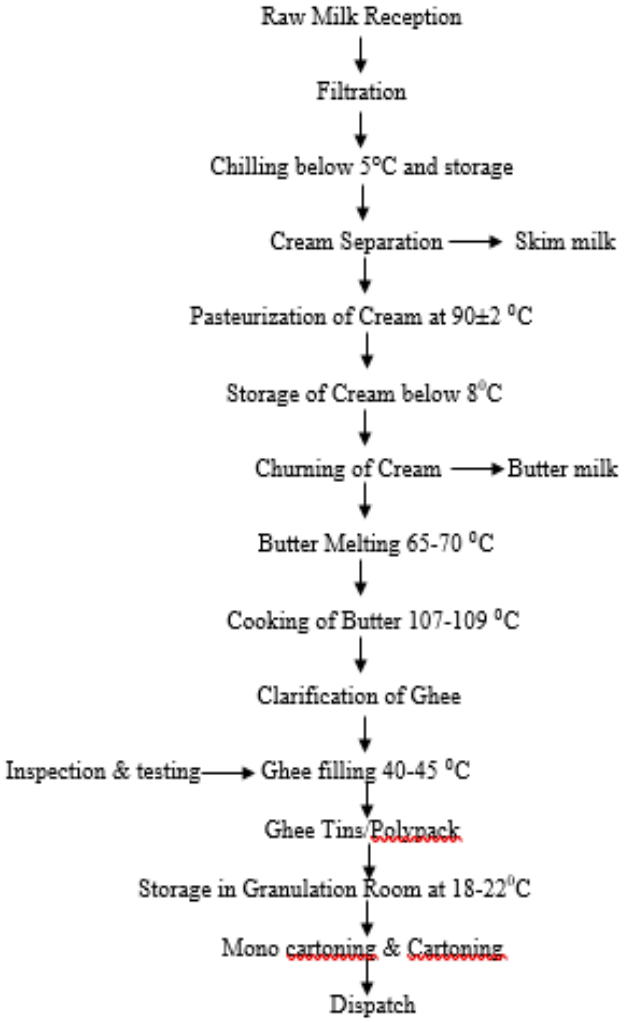
Indigenous (Desi) Method for Ghee preparation

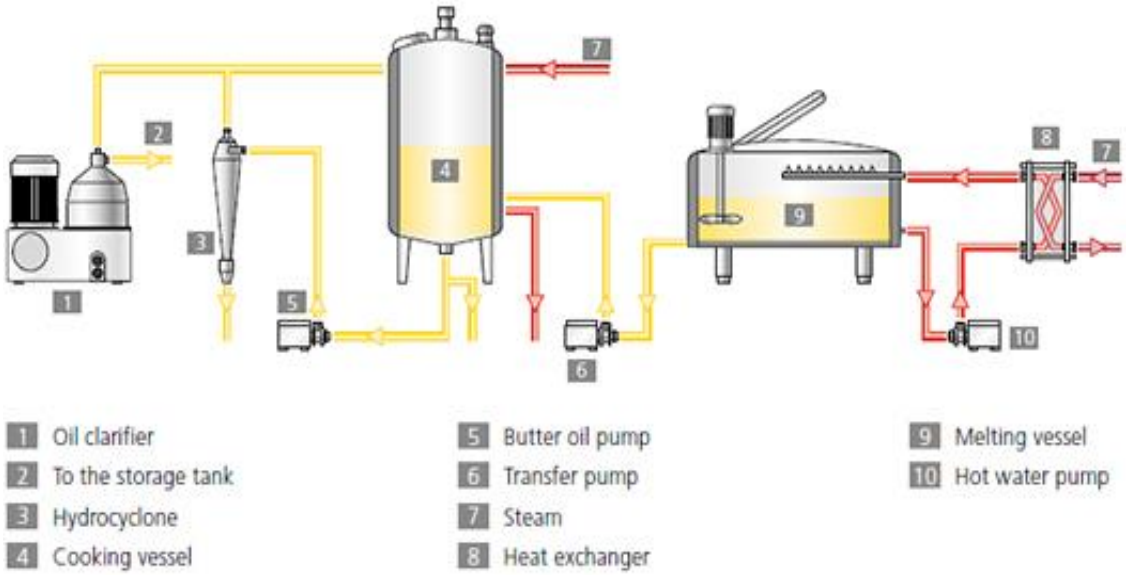
- ✓ contributes about 80% of the total ghee produced in the country
- ✓ Dahi or buttermilk of previous day is used as starter culture for fermentation of milk.
- ✓ Churning of curd or malai is done with hand wooden churn.



https://sureshfoods.com/vedic-ghee/

Flow diagram of industrial method for Ghee manufacturing





Picture source: https://www.gea.com/en/solutions/AMF-production-line.jsp

Standard Operating Procedures (SOP's) of Ghee

i) **Raw Milk Reception**: Raw Milk tankers/ cans is weighed either in weighbridge or in weighing bowl, Batch wise sampling & testing need to be done as per defined procedures.

ii) **Filtration and Chilling:** The accepted milk is unloaded in the Dump Tank and Pumped through a chiller (milk temperature not more than 5 deg.) after properly filtering; such milk is stored in the raw milk silos.

Standard Operating Procedures (SOP's) of Ghee

iii. **Cream Separation and Pasteurization:** Milk Pasteurization and cream separation is operated for 5-6 hrs. Cream separation and cream pasteurization is carried out simultaneously. Pasteurization of cream is done at 90±2^{o}C

iv. **Churning of Cream and removal of Butter Milk:** Butter- churn was used for the butter making batch wise. The Butter-chum operation includes rotating of the chum at various speeds from higher to lower and collecting or draining off butter milk for reprocessing.

Standard Operating Procedures (SOP's) of Ghee

v. **Butter Melting:** The Butter produced from the butter churn is further put into a melting vat for melting at 65ºC, with the help of hot water circulated in jacketed vat. The Melted butter is pumped to pre-stratification vat and retained un-disturbed for stratification.

vi. **Cooking of Butter:** Melted butter (pre-stratified) is further boiled (107ºC-109ºC) in Ghee Kettle. Ghee along with residue is allowed to remain undisturbed for approximately, 15-20 minutes in ghee kettle before filtration. It is then pumped into settling Vats, where it is further subjected to settle down for another 2 hrs.

Standard Operating Procedures (SOP's) of Ghee

vii. **Clarification of Ghee:** is carried out through ghee clarifier at approx 70ºC to clarify all the ghee residue particles from ghee.

viii. **Ghee Inspection and Testing:** The samples of clarified ghee at specified intervals are drawn from the sanitized double jacketed ghee storage tank as per specified procedure to monitor and control the optimum quality of ghee as per specified standards.

Standard Operating Procedures (SOP's) of Ghee

ix) Ghee filling and dispatch: After the clearance from Quality control deptt. ghee is usually filled in tins, glass/PET jars or CEKA pack. Ghee tins are further transferred to ghee granulation room at 18ºC to 22ºC and stored for dispatch. A identified vehicle covering inside body & surface, sides, planks, dust/dirt free is used for the dispatch.

Major equipment require for Ghee manufacturing

1. Ghee Kettle:

- ✓ jacketed and fabricated from SS 304 material.
- ✓ plate thickness is selected to suit pressure.
- ✓ outer jacket is steam jacket.
- ✓ Fitted with accessories like: Scrapper type ghee agitator. Plug type ghee outlet valve, temperature indicator. Steam inlet valve and pressure indicator.

Major equipment require for Ghee manufacturing

2. Ghee Sieve Tank:

- ✓ The ghee sieve tank is used for filtering and separating the solids in the ghee and the melted ghee.
- ✓ fabricated from SS 304 material.
- ✓ has SS strainer at the top to filter ghee.
- ✓ Fitted with accessories like: SS strainer Plug type ghee outlet valve.

Major equipment require for Ghee manufacturing

3. Ghee pump.

- ✓ Centrifugal pump, made of SS 304
- ✓ Lobe pump, made of SS 304 is used to pump granule ghee
- ✓ Shall be kept near the ghee kettle.

Centrifugal pump

Lobe pump

Major equipment require for Ghee manufacturing

4. Ghee Clarifier:

A high speed centrifuge, used to clarify ghee. This will remove all material from the ghee and clarified ghee will be dispensed in the balance tank.

Major equipment require for Ghee manufacturing

5.Ghee Storage Tank

- ✓ fabricated tank (SS 304) having water jacket.
- ✓ samples of clarified ghee at specified intervals are drawn from the sanitized double jacketed ghee storage tank as per specified procedure to monitor and control the optimum quality of ghee as per specified standards.

STORAGE OF GHEE

- Ghee has a long keeping quality; it can be stored for 6 to 12 months under ambient temperature provided proper packaging and filling.

- Glass bottles Food grade plastic containers such as high density polyethylene pouches, laminates with metallic layer support (aluminum) and tin cans are in use for packaging of ghee.

- Ghee is more tend to oxidation induced changes during storage.

Ministry of Food Processing Industries
Government of India

NIFTEM
KNOWLEDGE • INNOVATION • OUTREACH

SHELF LIFE AND YIELD OF GHEE

Shelf life: Ghee can be stored up to 12 months at 21°C which is a recommended temperature of storage.

Yield: The fat recovery in indigenous method is lowest in range of 80-85% in creamery butter method it ranges from 88-92% and highest in direct cream method ranging from 90-95%.

ADULTERANTS IN GHEE

1) Vanaspati (Hydrogenated vegetable oil). Because of close resemblance in its texture most commonly used this as adulterant to ghee.

2) Refined (de-odorized) vegetable oil.

3) Animal body fat.

QUALITY OF GHEE

The quality of ghee depends on the following factors

a) Method of preparation

b) Quality of cream or butter used

c) Boiling Temperature

d) The other ingredients and flavors if added

e) The Storage conditions of finished product

Ministry of Food Processing Industries
Government of India

NIFTEM
KNOWLEDGE • INNOVATION • OUTREACH

PACKAGING MATERIAL FOR GHEE

Packaging of ghee is mainly done to protect the products from outside environment especially after the completion of process so that products can retain moisture, flavor, freshness for a longer period of time.

For More details Contact:

National Institute of Food Technology and Entrepreneurship and Management
Ministry of Food Processing Industries
Plot No. 97, Sector-56, HSIIDC, Industrial Estate, Kundli, Sonipat, Haryana-131028

Website: http:www.niftem.ac.in

Email: pmfmecell@niftem.ac.in
Call: 0130-2281089