



TOFU PROCESSING

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1. Introduction

- A versatile traditional product made up of bean curd (esp., soyabean).
- First existence was found in China but now commercially demandable and manufactured by Americas, Australia, Cambodia, China, Europe, India, etc.
- A customary component in the cuisines of Japan, Korea, Indonesia, Singapore, Thailand, and Vietnam.
- Due to its **affordability** and an **abundance** of protein, iron, calcium, and other minerals, it takes the position of dairy products



1.1 Source of Tofu

- Tofu is manufactured using acid coagulated **soymilk**.
- Another tofu variety i.e., Burmese tofu is made by coagulating and pressing **chickpea milk**.
- The Burmese tofu is food of Shan origin of Myanmar and of Chinese from Yunnan Province. The Burmese tofu is allergen free, dairy free and gluten free alternative for sensitive consumer.
- Tofu's quality fluctuates based on the **process, types of coagulant added, and bean variety**.



1.2 Nutritional Profile

- According to a research article written by Pal et al. (2019), a block of hard cheese containing 122g tofu constitute nutrients as mentioned in the table.
- In addition, it also contains vitamin such as niacin, riboflavin, thiamine, vitamin B-6, choline, manganese, and selenium in traces.

#	Nutrients	Value
1.	Energy	177 calories
2.	Carbohydrates	5.36 g
3.	Protein	15.57 g
4.	Fat	12.59 g
5.	Calcium	421 mg
6.	Phosphorus	282 mg
7.	Potassium	178 mg
8.	Magnesium	65 mg
9.	Iron	3.35 mg
10.	Zinc	2 mg

2. Raw Material

1. Mostly Milk of soybeans.
2. Other options includes, chickpea, Quinoa, Kidney beans, Seitan, lupin etc.
3. Water, and
4. Coagulating agents: Typically salts such as calcium and magnesium chlorides and sulfates or acids such as citric acid or glucono delta-lactone



3. Types of Tofu



Fermented Tofu

- Briny, creamy variety
- Used as a dip

Silken Tofu

- Japanese-style tofu;
- Egg substitute in baking

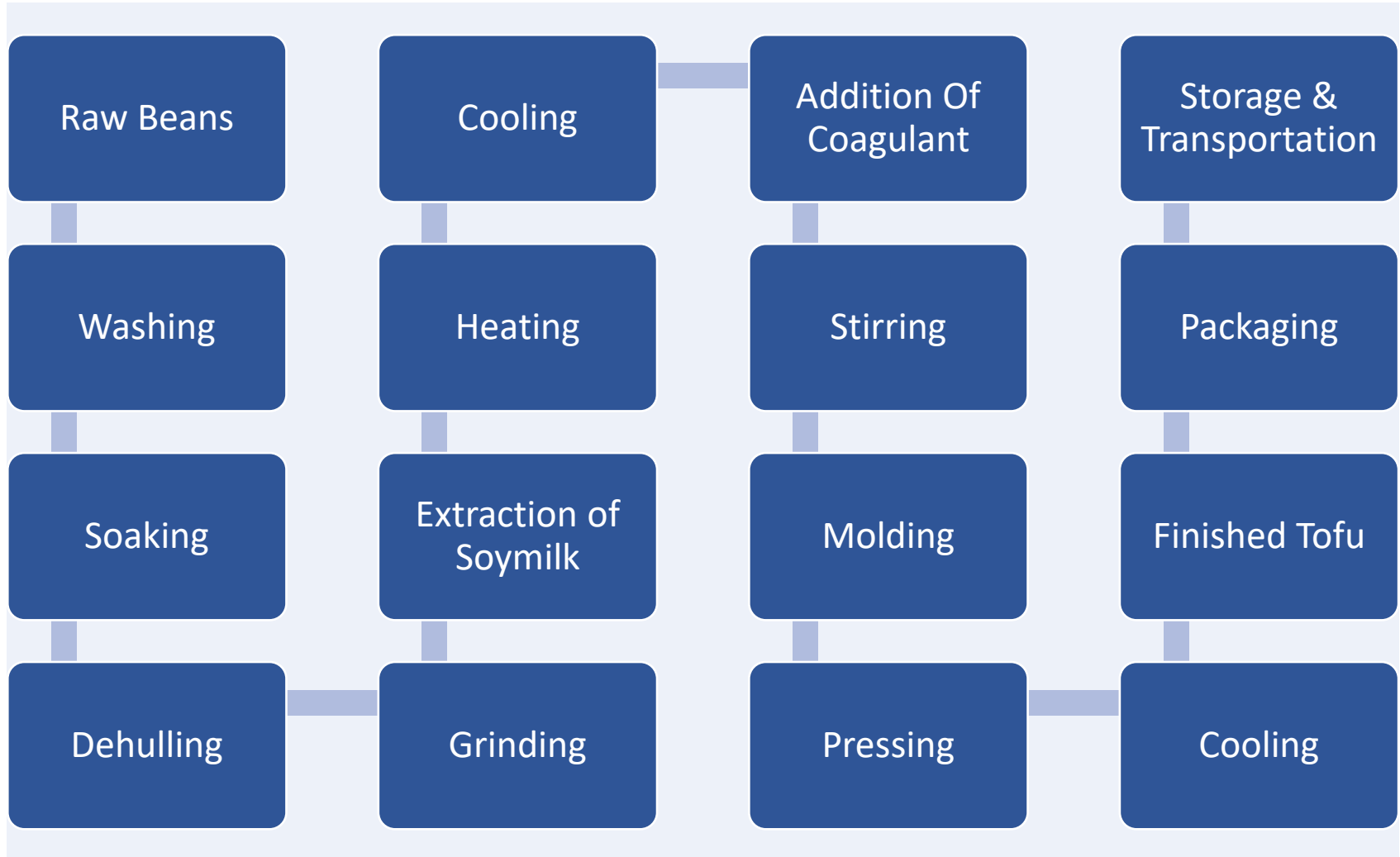
Regular Tofu

- Soft, spongy texture, medium to super firm
- Extra firm used as meat substitute

Smoked Tofu

- Rich deep flavour, smoked on beech wood
- Can be eaten raw

4. Tofu Processing



4(a). Soaking

- Soaking soybeans before dehulling improves structural properties and crushing efficiency, expediting protein extraction and increasing protein content in tofu.
- The pre-cleaned soyabeans kept either at
 - **22°C for 8-10 hrs.**
 - **32°C for 4 -6 hrs.**
- Soaked bean absorb water and get double in size.
- Factors, affecting soaking are,
 - Soybean particle size and variety,
 - Soaking water quality,
 - Water temperature,
 - Pressure, and
 - Soaking method and time.



4(b). Dehulling and Grinding

- **Dehulling** is done to remove the hulls. It improves the color and reduces the beany flavor of the final tofu.
- Two types of dehulling can be used
 1. Manual dehulling
 2. Mechanical dehulling using soft, rotating rubber rollers.
- **Grinding** can be performed using a variety of types of equipment, including
 - Micro-cutters,
 - hammer mills, and
 - other similar devices.
- The yield improves, and more protein is extracted as the slurry is finely powdered.



4(c). Extraction of soymilk)

- For better extraction of soymilk, the soyabean slurry processed using

1. Cooking

- At 100-110°C for 3–10 min
- Heat denatured soy protein and eliminate volatile beany flavour arising due to **oxidation of PUFA** in the presence of enzyme **lipxygenase** and their further degradation.

2. Straining

- Done using a fine cloth to separate milk from residue (okara) or using industrial strainer and pressing machine.



4(d). Pasteurization and Cooling

- To pasteurize soymilk, heating is done at 71°C for 15 seconds or 63°C for 30 minutes by immediate cooling at 4°C in similar manner as dairy-milk.
- In addition, heating soymilk
 - Reduces beany flavor and
 - Improves nutritional quality, and
 - Denaturize proteins to enable soymilk to coagulate when a coagulant is added.
 - Increases yield or solids recovery of final tofu.



4(e). Coagulation of Soymilk

- To coagulate soy protein present in soymilk into soy curd
- Coagulants added @0.15 to 0.5% using either
 1. **Acid** such as citric acid and glucono-d-lactone or
 2. **Salts** like CaCl_2 , CaSO_4 , and MgCl_2 , are primarily used.



4(f). Molding/ Pressing

- **For molding**, curd-filled cheesecloth is placed inside the mold.
 - It helps to **shape the tofu** and allows excess liquid (whey) to drain away
 - An adequate molding process must be performed to get the exact texture and look of the finished tofu.
- **Pressing** is done to **remove excess whey** by applying weight on it.
- Pressing can be done using
 - Hand-turned screw presses or simple lever presses
 - Hydraulic presses.



4(g). Cooling/ Packaging & Storage

- The finished tofu to be cooled at refrigeration temperature to maintain optimal freshness.
- For packaging of tofu generally two types of packages are used:
 1. Vacuum-sealed Containers (Have Longer Shelf Life)
 2. Water-filled Packages Or
- To keep it fresh and prevent it from spoilage, it needs to be stored correctly. In addition, appropriate storage helps to preserve the flavor and texture of tofu.
- At industry level, tofu is being stored in cold storage room at below 4°C but at retail level it is recommended to store it in refrigerator.



5. Health Benefits

- Strengthens muscle and bone health.
- Reduces bad cholesterol level (LDH), prevents heart problems.
- Prevents migraine headaches and improves brain health.
- Regulates blood sugar and helps in diabetes.
- Prevents anemia, hair loss and enhances body weight loss.
- Prevents kidney diseases, liver damage and reduces the risk of lung cancer.
- Prevents prostate cancer in men.
- Eases menopause symptoms and prevents endometrial cancer in postmenopausal women.



6. Tofu Vs Traditional Paneer

#	Parameters	Tofu	Traditional Paneer
1.	Raw Material	Mainly Soy milk	Dairy-based Milk
2.	Colour	Slight Yellow	Creamy-white to yellowish,
3.	Suitability	Consumable by lactose intolerant individual	Can't be consumed by lactose intolerant people.
4.	Protein %	8%	18-20%
5.	Fat	Low cholesterol level, rich in omega-3 fatty acids	High cholesterol, rich in omega-3 & 6 fatty acids.
6.	Fiber	Soluble fiber in some amount	Absent
6.	Image		

6. Recent Trends in Tofu Processing

- Utilizing **tofu processing coproducts**, which contain healthy proteins and fats, for better human health.
- Efficient methods for **stabilizing wet okara**, value-added final products, and soy permeate utilization are being explored.
- **Sprouted tofu**, made from germinated soybeans, is gaining popularity due to sustainability needs.



7. References

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