

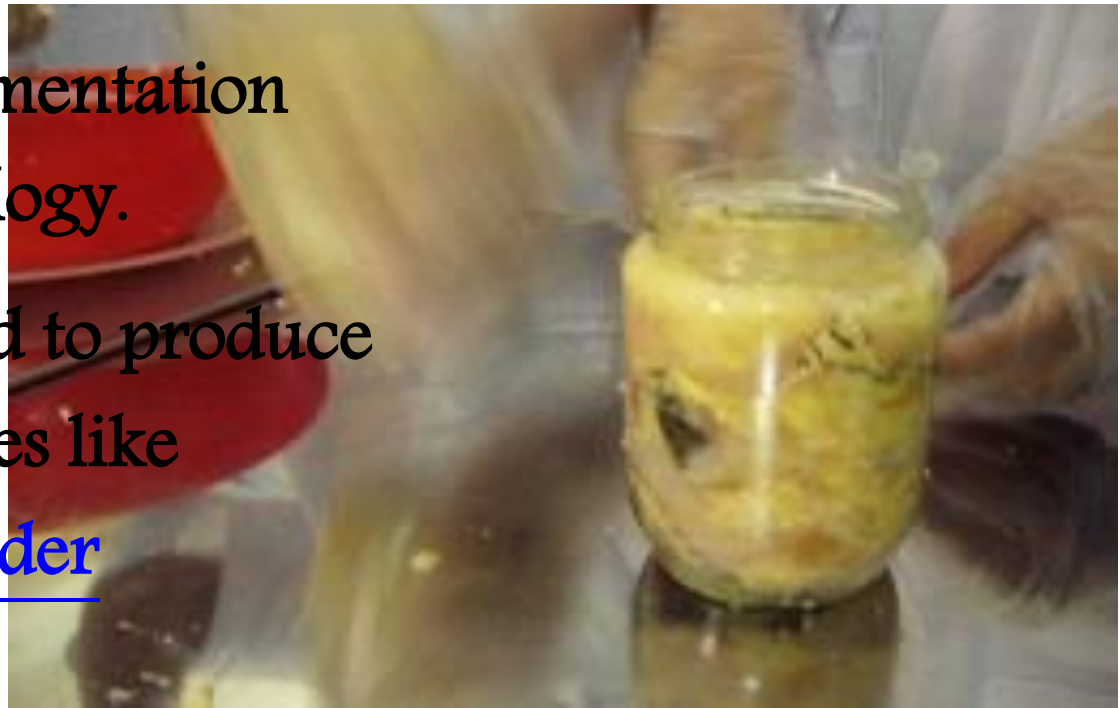


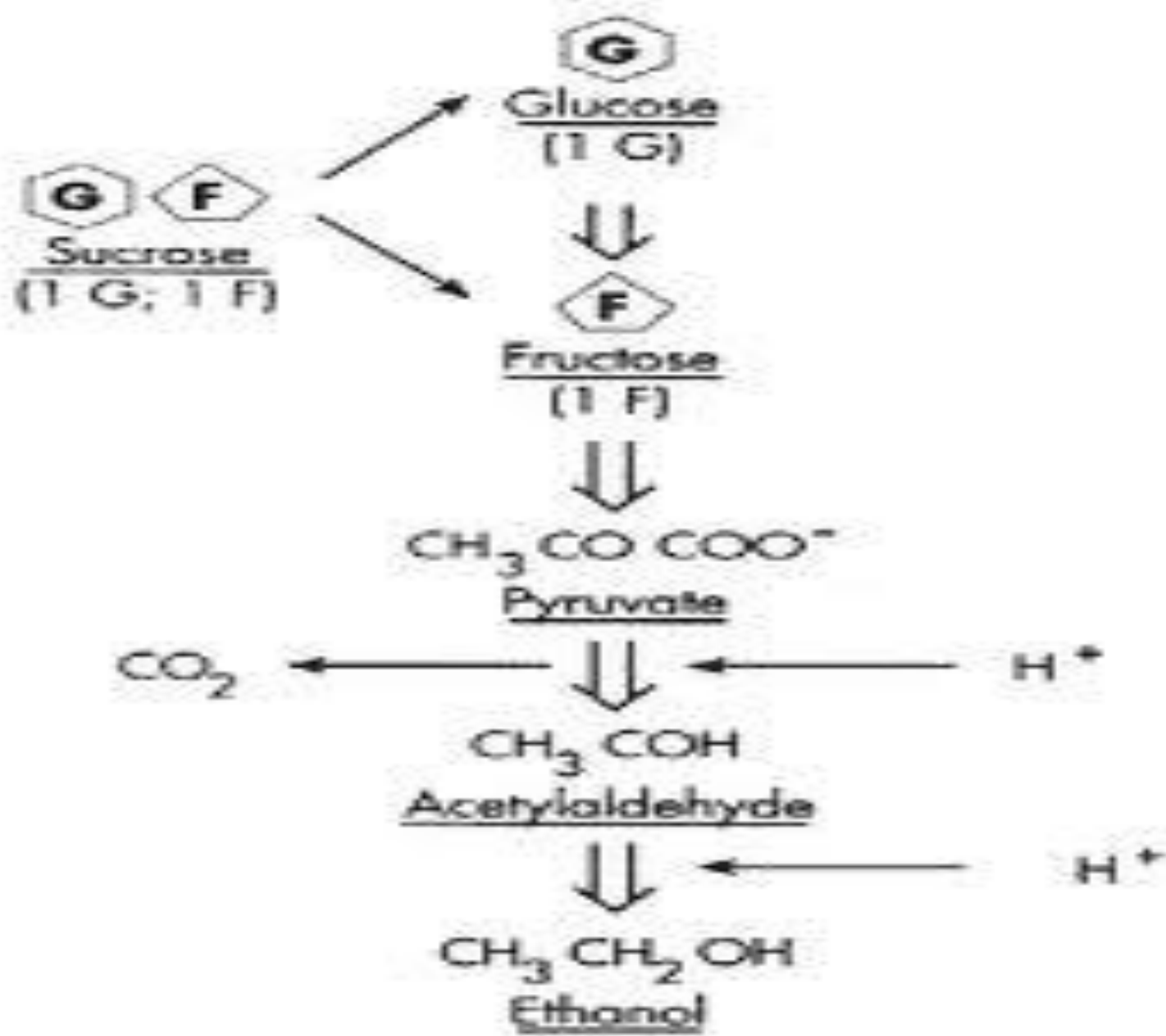
# **FERMENTED FISH PRODUCTS**



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- **FERMENTATION:**
- Fermentation in food processing is the conversion of carbohydrates to alcohols and carbon dioxide or organic acids using yeasts, bacteria, or a combination thereof, under anaerobic conditions.
- Fermentation is the chemical conversion of sugars into ethanol.
- The science of fermentation
- is known as zymology.
- The process is used to produce
- Alcoholic beverages like
- Wine, beer, and cider





- Employed in the leavening of bread.
- Preservation techniques used to create lactic acid in sour foods such as sauerkraut, dry sausages, & yogurt, or vinegar (acetic acid) in pickling foods.

# Uses :

- The primary benefit of fermentation :
- conversion of sugars & other carbohydrates.
- Eg. converting juice into wine, grains into beer, carbohydrates into CO<sub>2</sub> to leaven bread, and sugars in vegetables into preservative organic acids.
- **Food fermentation serve five main purposes:**
  - ❑ Enrichment of the diet through development of a diversity of flavors, aromas, & textures in food substrates.
  - ❑ Preservation of substantial amounts of food through lactic acid, alcohol, acetic acid and alkaline

- ❑ fermentations
- ❑ Biological enrichment of food substrates with protein, essential amino acids, essential fatty acids, & vitamins
- ❑ Elimination of antinutrients
- ❑ A decrease in cooking times and fuel requirements

- **FERMENTATION OF FISH :**

- Age old method of preservation for perishable fresh as well as marine animals.

- Fermented fish products mainly confined to Asian regions.

- Process involves breakdown of complex protein molecules by the action of organic catalysts, enzymes or ferments to simpler substances stable at normal temp.

- Breakdown of protein by exogenic as well as endogenic enzymes present in fish gut & intestine .



- Degradation of proteinaceous material is controlled primarily by salt at sufficient conc. to inhibit growth of putrefactive m.o.
- Fermentation is a method which prevents attacks of microbes to by making the fish muscle more acid; bacteria usually cease multiplying when the pH drops below 4.5.
- A modern approach, biopreservation, adds lactic acid bacteria to the fish to be fermented, produces active antimicrobials such as lactic and acetic acid, hydrogen peroxide, and peptide bacteriocins
- Also produce the antimicrobial nisin, a particularly effective preservative.



- **Fermented fish products :**

- Prepared by first digging a hole about two feet in the ground, placing freshly caught fish in the hole, covering with earth, and letting it stay buried for a couple weeks to a month or longer.
- After desired fermentation, unearth it, immediately frozen. Tastes best when raw & frozen.
- Most popular in South East Asian countries.

- Diff process employed for fermentation yield 3 distinct types of products.
  - a. Products where fish retains its original form.
  - b. Products where original fish is reduced to form a paste
  - c. Fish sauces where fish meat is reduced to a liquid

- Fermented fish products are classified into 3 :
- **(i) High salt :**
- 20% or more salt conc.
- All protein matter broken down to simple water soluble substances.
- Resultant liquid separated → fish sauce.
- Residue treated with salt → cured fish
- Mincing & partial drying → fish paste.

- **(ii) Low salt :**
- 6–18% salt.
- Fish may undergo spoilage due to action of m.o.
- Lactic acid fermentation with added source of carbohydrate(rice, milk, flour, syrup/sugar).
- Carbohyd. & salt control extent of fermentation & keeping quality.
- Acid pickling at low temp. keeps low salt fermented fish with added vinegar.

- **(iii) No salt :**
- Dried bonito fermentation
- Alkaline fermentation.
- Half spoiled fish fermented using leafy plant ash as source of alkali.
- Most mammalian enzymes are highly proteolytic & active at low pH.
- Visceral & digestive enzymes at neutral pH.
- ✓ Various cereal & plants are added so that digestive enzymes from these aid in fermentation.

- ✓ Degree of fermentation depend on proportion of salt used, fat content of fish, dressing style, nature of additives added & temp at which fish is marinated.
- ✓ Another imp classification is based on processing technique involved :
  - ✓ 1) products involving hydrolysis by enzymes
  - ✓ 2) product preserved by microbial fermentation.
  - ✓

- **A. FERMENTED FISH :**

- Differ from fish sauce, it's a prdt in which fish identity is maintained to large extent.
- Fermented herring & anchovy popular in West. Locally called makasar(Indonesia), buro (philippines) or pekasam (Malaysia) are imp.
- Colombo cured fish is popular in India.
- **Methods of Processing :**
- **1. Pickled herring :**
- *Clupea harengus* – dry salted with 15 to 36% salt.
- Self brine covers the fish → barrels topped up with fish & brine after sometimes → sugar added → aids

- in fermentation → spices like pepper, ginger, mace, coriander, cinnamon, cardamom etc added  
→ benzoic acid as preservative → this pickled fish can be kept for 1 yr./more at normal temp.
- **2. Cured anchovies :**
- *Engraulis encrasicolus* – anchovy with high fat content most suited.
- Fish nobbed, gut pulled out along head → Salted in layers with 5–6 kg salt/10 kg fish → fish topped with salt layer & wt is placed at top → maintained under pressure → additional salt & fish added → fish kept under self brine for 6 to 7 months.



- During this water & fat pressed out of fish forms a layer of brine with fat.
- Process done in sterile container under sterile cond. So, no m.o involved.

- **3. Colombo curing :**

- Pickling process practiced in South Canara & Malabar region along west coast of India

- Processed mostly out of mackerel.

- Fish gutted → washed free of dirt &

slime → rubbed with salt ( 3:1 – fish : salt) → kept in

cement tank → pieces of smoke-dried *Garcinia cambogea* fruit mixed @ 8 kg/ tonnes of fish



- → sour fruit imparts acidity to pickle → product sour → fish remains in tank for 3-4 months.

- **TRADITIONAL FERMENTED FISH PRODUCTS OF INDIA :**

- Shidal is commonly consumed in all Northeastern states of India.
- Also known as seppa, hidal & shidal in Assam, Tripura & Mizoram.
- Principle involved is moistened fish are packed into an oil processed pot & sealed airtight.
- Fish allowed to get fermented anaerobically by some resident bacteria for about 6 months,,
- Fish protein & lipid are broken down to peptides, amino acids, fatty acid, indole, sketole etc.
- Produce a strong characteristic odour .

- **Raw materials :**

- **(i) Fish :**

- Dry *Puntius sp* is used.

- Fish should be bigger & uniform

- in size, no insect infestation.

- **(ii) Mutka (vat) :**

- Round bottom & narrow necked earthen vats.

- Capacity 8 to 40 kg.

- **(iii) Fish oil/veg oil :**

- Fish oil extracted from entrails of fish or other edible oil used for mutka processing.



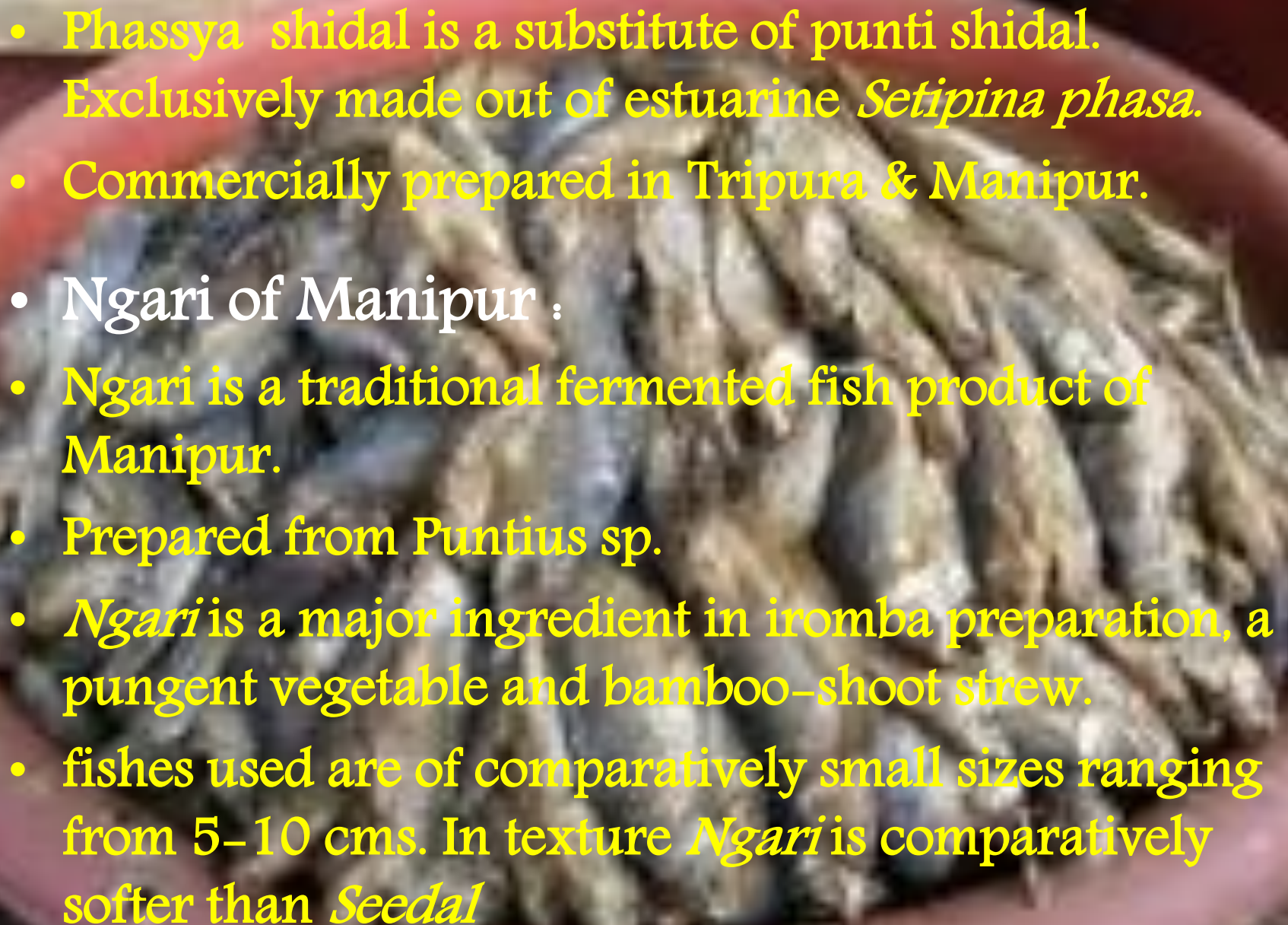
- **(iv) Cover paste :**
- A soft dough prepared from semi-dried or fully dried fish (broken or smaller puntius sp. & waste of other dry fish).
- After grinding them into powder & by adding water
- **(v) Cover-leaf :**
- Broad plant leaf eg. Catesu or banana leaves or creepers like bottle-guard leaves commonly used.
- Used to cover the cover paste temporarily to restrict fly infestation.
- A piece of newspaper may also serve the purpose if leaves are not available.

- **(vi) Mud/Clay-seal :**
- Humas rich & fine coarse soil is ground into powder & thick mud is prepared from it.
- Cover leaf removed from mouth & a layer of mud is applied on surface.
- This acts as permanent seal to ensure anaerobic condition inside pot & also to prevent insect infestation.
- **PROCEDURE (shidal from raw fish) :**
- Gutting, descaling & washing of raw fish (*Puntius* sp.) → drying under sun (to reduce moisture content by half) → repeated oil smearing & drying of mutkas under sun.

- Packing of fish in mutkas layer by layer → tight packing so that no air gap in between layers → filling upto neck of mutka → rest part is filled with cover paste (from neck to rim of mutka) → paste covered with cover leaf → mutkas kept in sheltered place undisturbed for 3-4 days.
- Cover leaf removed & clay-seal is put in 2-3 layers keeping no air gap → kept under dry & sheltered place → if crack appears on mud seal, put another layer of mud till a crackless seal obtained.
- Mutkas are kept for fermentation under ground for 5-6 months → after required period mutkas taken out from ground.

- Mouth not opened.
- While retailing mouth is opened by removing clay-seal & putrefied paste.
- Ready shidal is taken out.
- **SHIDAL PREPARATION FROM DRY FISH :**
- Fully dried puntius sp. procured from market → drying under sun upto 15% moisture → washing → dipping in water for 10-15 min → spreading on floor & drying overnight under shade → smearing this with edible oil → packing semi-dried fish in oil processed mutkas → rest is same as the other process



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- Phassya shidal is a substitute of punti shidal. Exclusively made out of estuarine *Setipina phasa*.
  - Commercially prepared in Tripura & Manipur.
  - Ngari of Manipur :
  - Ngari is a traditional fermented fish product of Manipur.
  - Prepared from *Puntius* sp.
  - *Ngari* is a major ingredient in *iromba* preparation, a pungent vegetable and bamboo-shoot stew.
  - fishes used are of comparatively small sizes ranging from 5–10 cms. In texture *Ngari* is comparatively softer than *Seedal*

- *Puntius sophore* (locally known as *Phabou nga*) is exclusively used for Ngari preparation
- *Tungtap* is another fermented fish paste, commonly consumed by the Khasi tribes of Meghalaya in Northeast state of India
- **Lona ilish :**
- *Lona ilish* is a traditional salt fermented fish product widely consumed in Bangladesh and Northeast parts of India. It is prepared exclusively from *Hilsa*, *Tenualosa ilisha*
- widely consumed in Bangladesh and the adjoining region of N.E. India

- Fish washed, descaled & beheaded without removing gut → cut diagonally into chunks (STEAKS) → rubbed with dry salt → heaped on floor & covered with polythene sheet.



- After 24–48 hrs fish chunks are packed compactly in steel container with tin coating → container filled with previously boiled & cooled saturated brine → container closed with lid & stacked in a dark room for ripening .
- Period of ripening varies from 5–7 months.

