Fermented beverages
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• Fermented fruit beverage is a fruit juice which has undergone alcoholic fermentation by yeast like \textit{(Saccharomyces cerevisiae)}.

• Examples: wine, champagne, port, sherry, tokay, muscat, perry, orange wine, berry wine, nira and cider.
Why are they prepared?

- Lightly fermented drinks are an excellent source of beneficial bacteria and yeast that help to support digestive system health.
- Benefits depend upon the bacteria and yeast used to culture them.
History.

• Lavoisier (1789) - analyzed the chemical composition of sugar and its components like ethanol, carbon dioxide and traces of acetic acid.

• Louis Pasteur - demonstrated the existence of other compounds like glycerol and succinic acids.

• Grape wine is the oldest example.
Wine.

• Wine is a beverage resulting from the fermentation by yeasts of the grape juice with proper processing and addition.

• Light wine - 7 to 9% alcohol

• Medium wine - 9 to 16% alcohol

• Strong wine - 16 to 21% alcohol
Why grape?

- Rich in natural sugar.
- Natural association of fermentative yeasts with berries.
- Nitrogenous matters promotes growth of yeast.
- High juice acidity favourable for yeast.
- High alcohol and acid content.
Wine preparation

- Ripe grapes
- Removal of stems
- Crushing (Basket press)
- Filling jar up to three – fourths
- Addition of sugar (20-24% TSS)
- Adjustment of pH (0.6 to 0.8% acid)
- Addition of preservative (KMS 1.5 g /10 kg grapes)
- Keeping for an hour
- Addition of wine yeast (S.E. 20 ml/5 kg grapes)
- Fermentation (for 2 days)
- Filtration
- Fermentation (for 10 days)
- Racking (Syphoning off clear liquid)
- Fining and filtration (Bentonite)
- Aging (maturation) (6-8 months)
- Pasteurization at 82°C (for 2 min.)
- Bottling
- Crown corking
- Pasteurization at 82°C (for 20 min)
- Cooling
- Storage
Cider

- Fermentation of special grade of apples which have a high tannin content of 0.1-0.3%.
- Cider apples are so chosen that their juice contain higher percentage of sugar (i.e., 12.5%) than normal apple juice (10.5%).
Apple Cider preparation

1. Washing
2. Crushing and pressing
3. Extraction of juice
4. Addition of sugar (to raise TSS to 22%)
5. Addition of preservative (sulphur dioxide 100 ppm or KMS 0.22 g/kg material)
6. Addition of pure culture of wine yeast, e.g., Saccharomyces carlsbergensis (add 0.02-0.05% ammonium hydrogen phosphate as food for yeast)
7. Fermentation (as in case of grape wine)
8. Racking
9. Filtration
10. Aging (in oak wood barrels)
11. Heating at 82°C
12. Filtration
13. Bottling
14. Crown corking
15. Pasteurization (at 60°C for 30 minutes)
16. Cooling
17. Storage
Champagne.

- It is a sparkling wine, made chiefly in France, from certain varieties of grapes such as Chardonnay and Pinot Noir.

- Fermentation completes in the bottle.
Port

- It is a fortified, sweet red wine made originally in Portugal, but now in other countries also.
Sherry

- A Spanish wine, matured by placing the barrels for 3 to 4 months in sunlight, where the temperature is as high as 54 to 60°C.
Tokay

This is a very famous fortified wine made in Hungary.
Muscat

- It is prepared from Muscat grapes in Italy, California, Spain and Australia.
• Wine made from pears is known as perry.
• Wastes, culled fruits and trimmings left over from canning may also be used for making perry.
Orange wine

- Orange juice is sweetened by adding sugar and then allowed to ferment.
- Orange oil should not be added as it may hinder fermentation.
Berry wine

- Wines prepared from berries like strawberry, blackberry and elderberries.
Nira

- It is prepared from the juice of the palm tree.
Feni

- This is a fermented wine made from cashew apple in Goa.
Advantages

• support the digestive system.
• support liver health.
• Probiotic-rich foods and drinks also support oral health.
• Probiotic-rich foods helps in combatting illness and in mitigating autoimmune disease
Disadvantages

On excessive consumption it may lead to:

• heart problems
• stroke
• fatty liver disease
• liver damage
• mental health conditions
• certain cancers
• pancreatitis
Unfermented beverages
Unfermented beverages

- Fruit juices which do not undergo alcoholic fermentation are termed as unfermented beverages.
- They include natural fruit juices, sweetened, ready to serve drinks, nectar, cordial, squash, crush, syrup, fruit juice concentrate and fruit juice powder.
Preparation and preservation of unfermented fruit beverages

(i) Selection of fruit
- Only fully ripe fruits are selected.

(ii) Sorting and washing
- Diseased, damaged or decayed fruits are discarded. Dirt and toxins is removed by washing.
iii) **Juice extraction**

- extracted from fresh fruit by crushing and pressing them.
- During extraction juices should not be unnecessarily exposed to air as it will spoil the colour, taste and aroma and also reduce the vitamin content.
Contd..

(iv) Deaeration

• Most of the air as well as other gases are removed by subjecting the fresh juice to a high vacuum.

(v) Straining or filtration

• Seeds and pieces of pulp and skin which adversely affect the quality of juice, are removed by straining through a thick cloth or sieve.

• improves the appearance but often results in disappearance of fruity character and flavour.
(vi) Clarification

• Complete removal of all suspended material from juice.

Different methods of clarification

a) Settling

• Mixed with a chemical preservative to avoid fermentation.
• Colloidal pectin, gums, proteins. Mucilaginous solids settle down.
• The juice is used for further treatment.
(B) Filtration

- Used to remove completely all fine and colloidal suspensions.
- Filter aid is used to reduce clogging. Some of them are supercel, kieselguhr, Spanish clay, and bentonite, which are added to the extent of 0.1-0.2 per cent.
(C) Freezing

• The pasteurized juice kept in a carboy is frozen at -18°C and thereafter stored for 4 to 7 days at room temperature.

(D) Cold storage

• The juice is stored at -2 - -3°C for a month for the residue to settle down.
Contd...

(E) High temperature
• The juice is heated at 82°C for a minute till the material coagulates and settle down.

(F) Chemicals
1. Gelatin.
2. Albumen.
3. Casein.
4. Mixture of tannin and gelatin.
G) Enymes

- Soluble pectins are destroyed by adding pectic enzyme preparations, e.g., Pectinol and Filtragol, it settles down and during this process also carries down other materials.
(vii) Addition of sugar
• It is used as a sweetener and a preservative.
(viii) Fortification
• To enhance nutritive value.
• To improve taste, texture, or colour.
• To replace lost nutrients
Contd…

(ix) Preservation

• process of treating and handling food to stop or greatly slow down spoilage caused or accelerated by micro-organisms.

(x) Bottling

• 1.5 to 2.5cm head space is left after filling.
Fruit juice

• It is a liquid product.
• Contains 85% juice and 15% total soluble solids.
Flow chart for processing of mango juice

1. MANGOES (ripe)
2. WASHING
3. PEELING
4. STONE REMOVAL
5. STRAINING OF PULP
6. ADDITION OF WATER (1 litre pulp : 0.5 litre water)
7. MIXING WITH SYRUP*
8. HOMOGENIZATION
9. HEATING AT 85°C
10. FILLING HOT INTO CANS (A 2 1/2 cans)
11. SEALING
12. PROCESSING AT 100°C for 20 minutes
13. COOLING
14. STORAGE
Squash

- contains at least 25% fruit juice or pulp and 40 to 50% total soluble solids.
- commercially It also contains about 1.0 percent acid and 350 ppm sulphur dioxide or 600 ppm sodium benzoate.
FLOWCHART FOR PROCESSING OF SQUASH

Fruits
↓
Washing
↓
Trimming
↓
Cutting or grating
↓
Juice extraction
↓
Straining
↓
Juice measuring
↓
Preparation of syrup
(Sugar + water + acid, heating just to dissolve)
↓
Straining
↓
Mixing with juice
↓
Addition of preservative
(0.6 g KMS or 1.0 g sodium Benzoate / litre squash)
↓
Bottling
↓
Capping
↓
Storage
Ready to serve

• contains at least 10% fruit juice and 10% total soluble solids besides about 0.3 per cent acid.

• Not diluted before serving.
Flow-sheet for processing of RTS beverages

1. **Fruit**
   - (Pulp / juice)
   - Mixing with strained syrup solution
   - (Sugar + water + acid, heated just to dissolve) according to recipe
   - Homogenization
   - Bottling
   - Crown corksing
   - Pasteurization
   - (at about 90°C) for 25 minutes
   - Cooling
   - Storage
Cordial

- sparkling, clear, sweetened fruit juice (no pulp).
- contains at least 25% juice and 30% TSS.
- contains about 1.5% acid and 350 ppm of sulphur dioxide.
Flowchart For Processing Of Cordial

1. Fruits ↓ Washing
2. Cutting into halves ↓
3. Juice extraction ↓
4. Straining ↓
5. Addition of preservative (KMS 1g/litre juice) ↓
6. Storing in glass container for 10-15 days
   For clarification (suspended material settles down) ↓
7. Symphonizing off the supernatant clear juice ↓
8. Straining and measuring ↓
9. Preparation of syrup ↓
10. Straining ↓
11. Mixing of juice with syrup ↓
12. Addition of preservative (KMS 0.6 g/litre product) ↓
13. Bottling ↓
14. Capping ↓
15. Storing in cool and dry place
Synthetic syrup

- Contains 75% sugar syrup and 25% artificial fruit essence.
- Fruit-based syrups do not need preservatives.
- For longer shelflife, 350 ppm sulphur dioxide or 600 ppm benzoic acid (as required) may be added before bottling.
Flowchart Synthetic syrup processing

1. Mixing with strained syrup solution (sugar + water + acid, heating just to dissolve)
2. Bottling
3. Capping
4. Storage
Barley water

- contains at least 25% fruit juice, 30% total soluble solids and 0.25% barley starch and 1.0% acid.
Flow chart for processing of barley water

1. Barley flour
2. Addition of a little water
3. Making thin paste
4. Addition of remaining water
5. Heating to gelatinize
6. Cooling
7. Filtering
8. Addition to juice
9. Addition of sugar
10. Heating just to dissolve sugar
11. Straining
12. Addition of essence and preservative (KMS 0.6 g/litre product)
13. Bottling
14. Capping
15. Storage
# Fruit Products Order (FPO) specifications for fruit beverages

<table>
<thead>
<tr>
<th>Product</th>
<th>Minimum % of total soluble solids in final product (w/w)</th>
<th>Minimum % of fruit juice in final product (w/w)</th>
<th>Maximum acidity expressed as citric acid (%)</th>
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<tbody>
<tr>
<td>Unsweetened juice</td>
<td>Natural</td>
<td>100</td>
<td>3.5</td>
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<tr>
<td>Fruit syrup</td>
<td>65</td>
<td>25</td>
<td>3.5</td>
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<tr>
<td>Crush</td>
<td>55</td>
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<tr>
<td>Squash</td>
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<td>1.5</td>
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<tr>
<td>Fruit nectar (excluding orange and pineapple)</td>
<td>15</td>
<td>20</td>
<td>1.5</td>
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<tr>
<td>Orange and pineapple nectars</td>
<td>15</td>
<td>40</td>
<td>1.5</td>
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<tr>
<td>Cordial</td>
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<tr>
<td>Sweetened juice</td>
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<td>85</td>
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<tr>
<td>Lime/lemon Ready to serve beverage</td>
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<td>5</td>
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<tr>
<td>Ready-to-serve beverage/drink</td>
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<tr>
<td>Fruit juice concentrate</td>
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<tr>
<td>Synthetic syrup/sherbet</td>
<td>65</td>
<td>-</td>
<td>-</td>
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THANK YOU