**3rd Year, 2nd Semester**

**Post-Harvest Management and Value Addition of Fruits and Vegetables**

**Credit: 2(1+1)**

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**LECTURE – 7**

**Fermented Beverages**

Fermented beverages are complex solutions of thousands of chemical compounds originating from the fruit itself, from the fermentation process, from the yeast and other microbial metabolism during fermentation, and from postfermentation steps (including secondary fermentations and chemical reactions during aging) Fermented beverages such as beer require 6–7 days of fermentation time with large-scale fermentation and a large storage capacity.

**Fruit beverages**

* Fruit beverages are easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally far superior to many synthetic and aerated drinks.
* Fruit juices which have undergone alcoholic fermentation by yeasts include wine, champaigne, port, sherry, tokay, muscat, perry, orange wine, berry wine, nira and cider.
* Development of biochemical principles of fermentation was originated by Lavoisier (1789) in France.
* Wine is a beverage resulting from the fermentation of grape juice by yeasts.
* Wines prepared from Fruits: Perry- Pears, Berry- Strawberry, Blackberry, Elderberry, Nira- Palmyarah, Feni- Cashew, Cider- Apple, Champaigne- Grapes.
* **Alcohal content of wine ranges from 7 to 20%**

|  |  |
| --- | --- |
| **Types of wine** | **Alcohal (%)** |
| Light wine | 7-9 |
| Medium wine | 9-16 |
| Strong wine | 16-21 |
| Sparkling wine | CO2 |
| Still wine | No. CO2 |
| Fortified wine | Addition of alcohol in the form of brandy |
| Red wine | From coloured grapes (skin intact) |
| White wine | From white/green grapes (skin removed) |
| Dry wines | Very little/no sugar is detected |
| Sweet wines | High sugar content can be detected |

* Suitable fining agent for wine is bentonite.
* Acid content in grapes for wine: 0.6 to 0.8%.
* Optimum temperature for fermentation of grapes wine is 22-280C.
* Aging or maturation time for wine: 6-8 months.
* Common yeast used in wine*: Saccharomyces cerevisiasae* Var. *ellipsoideus* (20 ml/Kg of grapes).
* Common yeast used in cider: *saccharomyces carlbergensis.*
* Generally wines are pasteurized at 82-880C for 1-2 months.
* Wine made from pears is known as perry.
* Feni is a fermented wine made from cashew apple in Goa.
* In USA, Apple cider: non-clarified apple juice.
* In India, Apple cider: fermented apple juice.
* Cider apples contain higher percentage of sugar 12.5% (i.e. Fructose).
* Bael, jamun, phalsa and aonla are most widely used for preparation of cider.
* Common preservation used in cider: SO2 @ 100ppm or KMS (0.22g/kg).
* Cider is mostly prepared from fermentation of special grades of apples.
* For cider preparation of apple should have 0.1-0.3%.
* Port is a fortified sweet red wine made originally in Portugal.
* Champaigne is a sparkling wine made from France.
* Suitable grapes varieties for Champaigne: Chardonay and pinot Noir.
* Nira is prepared from the Palmyrah juice.
* Wines prepared from berries like strawberry, blackberry and elderberry are known as berry wines.
* Famous fortified wine in Hungary: Tokay.
* Syphoning off the fermented wine to separate it from the solid deposits is known as “raking”.

**Beverage industry**

* Most fermented beverage industries that employ distillation to produce a concentrated alcoholic product (e.g., whisky, gin, cognac) generate large volumes of low-alcohol ‘waste’ streams, i.e., the remaining fraction after the alcohol has been removed by distillation.
* The Scotch whisky industry produces two effluent streams: ‘pot ale’ from malt distilleries and ‘spent wash’ from grain distilleries. Although these materials closely resemble each other, spent wash is normally more difficult to evaporate to high solids due to a higher level of suspended solids and a greater degree of fouling.
* The neutral spirits industry (gin, vodka, etc.) generates byproducts of a related composition, albeit higher in inorganic salts (e.g., calcium sulfate), which have inverse solubility curves, leading to increased levels of fouling at higher concentrations. Again a forced-circulation layout will be the preferred design for the finisher.

**Unfermented beverages**

* Fruit juices which do not undergo alcoholic fermentation are termed as unfermented beverages. They include natural and sweetened juices, RTS, nectar, cordial, squash, crush, syrup, fruit juice concentrate and fruit juice powder. Barley waters and carbonated beverages are also included in this group.
* Synthetic drinks contain only water (88%) and total carbohydrates (12%).
* Synthetic drinks provides 48Kcal.
* Tannin-gelatin method is most widely used for clarifying fruit juices.
* Most important filter aids are supercel, kieselguhr and spanish clay.
* Fining agent: Gelatin, albumen and casein.
* Gelatin is mostly used for apple and cashew apple juices.
* Commonly used pectic enzymes for destroying the pectin in fruit juices: Pectinol and Filtragol.
* Fruit juice, RTS and nectars are preserved by pasteurization.
* Cordial: Sparkling clear, sweetened fruit juice from pulp.
* Cordial is most suitable for blending with wines.
* Squashes, crushes and cordials are preserved by only by chemicals.
* General head space for bottled fruit juice beverage 1.5 to 2.5cm.
* To stop the enzymatic action in fruit juices is heated by 770c for 30 min.
* All juices are sweetened by adding sugar except grape and apple.
* Recommended acid for cola type beverages: phosphoric acid.
* Citric acid commonly used in all types of beverages.
* Mango, orange and pineapple are used for squash commercially.
* Phalsa, aonla, jamun, pomegranate, grape, lemon orange and ginger are used for the preparation of syrup.
* Synthetic syrup contains 70-75% of sugar syrup.
* Barley water is prepared from citrus fruits such as lime, lemon, grapefruit and orange.
* Mostly widely used citrus fruits in barley water: Lime and Lemon.
* In carbonated beverages 0.05% of sodium benzoate must be added.
* **Preservation by fermentation:**
* Wines, beers, vinegar, fermented drinks and fermented pickle are preserved by fermentation process.
* Production of vinegar: Acetic acid fermentation.
* Production of wine: Alcoholic fermentation.
* Production of pickles and saurkraut: Lactic acid fermentation.
* **List of lactic acid fermentation:**

|  |  |
| --- | --- |
| Lettucekraut | Lettuce |
| Saurkraut | Cabbage |
| Saurruben | Turnip |
| Tarhana | Vegetables+milk |
| Sajurasin | Vegetables+rice |
| Paw Tsay | Mixed vegetables+cabbage+turnip+radish |
| Kimchi | Mixed vegetables+ Chinese cabbage |

**Objective type question:**

1. Dibbia is a prepared from:
2. Datepalm (b) Oilpalm (c) Palmirah palm (d) peach
3. Nira is a product from Palmyra palm contains………% of sugar.
4. 12.16 (b) 10 (c) 20 (d) 18
5. Fermentation imparts ………….. in tea.
6. Colour (b) Aroma (c) Stimulant (d) None
7. Wine is preserved by:
8. Acetic acid fermentation (b) Alcohalic fermentation

(c)Lactic acid fermentation (d) none

5. Cabbage fermented product;

(a) Saurruben (b) Lettucekraut (c) Saurkraut (d) Sajurasin

6. Carbonated product;

(a) Tokay (b) Perry (c) Nira (d) Cider

7. Wines prepared from fruits;

(a) Berry- strawberry (b) Feni- Apple (c) Cider- Cashew (d) Nira- Grapes

8. Synthetic syrup contains……… of sugar syrup.

(a) 20-25% (b) 50-55% (c) 60-65% (d) 70-75%

9. Wines made from peras is known as;

(a) Nira (b) Fenny (c) Cider (d) perry

**Answer key:**

1. (a) 2. (a) 3. (a) 4. (b) 5. (c) 6. (d) 7. (a) 8. (d) 9.(d)