**Alcoholic beverages fermentation**

Yeasts are of major use in the industrial production of alcoholic beverages in which ethyl alcohol is an important end product. Some important alcoholic beverages are beer, wine, whisky, rum, gin, brandy etc.

**Beer Fermentation**

Beer is undistilled product of grain-mash fermentation brought about by yeast. Beer fermentation involves the conversion of starchy raw materials into sugars and then into alcohol. It is generally prepared from malted barley but other starchy grains, e.g., maize, rice are also used as raw materials. Yeasts especially *Saccharomyces cerevisiae* or *S. carisbergensis* are used in the fermentation process.

**Commercial production**. Five major steps are involved in the manufacture of beer. They are

1. **Malting**. The starchy grains are first malted. The malt is prepared by first soaking the grains in water then allowing it to germinate at 17°C. during germination, large amount of amalyses, an enzyme, are produced which are subsequently involve in hydrolysing the starch into fermentable sugars. After the germination is completed, the grains are dried at 65°C.
2. **Mashing**. After malting, the pure barley malt is invariably mixed with other grains such as corn, rye, sorghum, wheat etc. it is called ‘ground malt’. The latter is first mixed with warm water at about 70°C and 5.0pH. Mashing brings about partial hydrolysis resulting in the digestion of starch and protein, the partially hydrolysed solution of mash is filtered and this filtrate is called ‘beer wort’. Bber wort serves as a rich nutrient medium for the microorganisms. Beer wort is now boiled with hops which are the papery scales of the female flowers of the hop vine, Humulus lupulus. The hops are added for flavour, aroma and mild antibacterial activity to prevent the growth of spoilage bacteria.
3. **Fermenting**. The beer is now inoculated with a pure culture of Saccharomuces cerevisiae or S. carisbergensis and allowed to ferment at low temperature (5-14°C) for longer period (5-10 days).
4. **Maturing**. The fermented beet wort is refrigerated at 0°C for several months (usually 6-8) to remove the harsh flavour and other undesirable characteristics.
5. **Finishing**. This is the final step in which the matured beer is carbonated, filtered and finally bottled, canned or barrelled. Bottled or canned beer is usually pasteurized at 60°C for about 20 minutes to prevent microbial spoilage.

**Wine fermentation**

Wine is an undistilled product of fruit juice fermentation brought about by yeast. Wine is produced by the normal alcoholic fermentation of fruit juices, especially the grape juice. The microorganisms used in the grape juice. The microorganisms used in the wine fermentation are the various strains of *Saccharomuces cerevisiae*.

**Commercial Production.** Five major steps are involved in commercial production of wines. They are

1. **Crushing.** Grapes are harvested and ripened to a stage they contain highest sugar percentage. These fruits are crushed fruits with juice are called ‘must’. The must is generally treated with SO2 to prevent microbial spoilage.
2. **Fermenting.** The ‘must’ is now inoculated with the starter culture of selected strain of the yeast and is aerated slightly to promote vigorous yeast growth. Once the fermentation starts, the rapid production of CO2 maintains anaerobic condition. The temperature is kept usually at 25-30°C during fermentation period ranging from 5-11 days in order to inhibit multiplication of wild yeast and undesirable bacteria that live high temperature.
3. **Tanking.** When most of the sugar is fermented the juice is separated from solid parts of fruits by allowing it to pass into tanks. These tanks, provided with valves to let the CO2 escape, are completely filled with juice. The anaerobic condition for alcoholic fermentation is allowed to continue for about 12 days to increase the percentage of alcoholic concentration.
4. **Maturing.** The wine is then allowed to mature in wooden tanks for 2-5 or more years. During maturing period the wine clears and develops the desired flavour due to formation of volatile ester.
5. **Finishing.** The wine may be finally cleared with the addition of gelatine, casein or Spanish clay. The cleared wine is filtered, bottled and pasteurized to prevent microbial spoilage.