

Beverages and Foods from Fungi: Distillation, Fungi as Food

Distillation

Distillation is the process by which a mixture of substances is separated by their different boiling points

A distilled spirit is made by boiling a beer or wine to leave the water behind and concentrate the alcohol

Alcohol has a lower boiling point than water, so heating an alcoholic beverage above the boiling point of alcohol, but below the boiling point of water, will vaporize all of the alcohol and some of the water

The vapors are collected in a pipe; cool water running over the pipe condenses the alcohol vapors, creating a liquid with a higher alcoholic content than is possible through fermentation

The still

In the column, or continuous, still, the beer or wine is introduced near the top of a column and percolates downward; differential temperatures along the column allow for separation of undesirable higher and lower alcohols from the ethanol

In the pot-still, or batch, method of distillation, the beer or wine is heated in what is essentially a huge, covered copper kettle until the alcohol vaporizes; the vapors are passed on to cooling coils where they condense to liquid (see fig. 24.12)

With the pot-still method, the alcoholic mixture is heated for a certain amount of time to allow the higher alcohols to vaporize and escape

The separation is not as fine as in a continuous still; some of the higher and lower alcohols are invariably mixed with the ethanol, producing a harsher and more potent product

Distilled spirits

The alcoholic content of distilled spirits ranges from 40% to 50%, or 80 to 100 proof (proof number is equal to twice the alcoholic percentage)

A grain spirit or neutral spirit is produced when the fermented beverage is highly distilled above 190 proof and is almost pure ethanol; it is colorless and tasteless and is used in the making of gin and vodka

Vodka is the distillation of a grain or potato beer and can be either flavored or unflavored with herbs

Gin is the distillate of a grain or cane beer (made from fermenting molasses); the characteristic taste of gin comes from juniper “berries” and other herbs

Both vodka and gin are classified as unaged spirits, because they age for only a few weeks

Most other distilled spirits are aged for some time in wooden barrels

Bandy, including cognac, is a twice-distilled grape wine that has been aged in oak casks; the color, aroma, and flavor are derived from components of the oak wood during aging

The designation V.S.O.P. stands for *very special old pale* and indicates that the color of the brandy is not from adding caramel coloring but the result of aging in oak for at least 20 years

Some brandies are aged up to 50 years; the most distinctive are produced in the Cognac region in southwestern France

Any whiskey is a distillate of a grain beer

The grain in Scotch whiskey is malted barley, kilned over a peat fire; the smoke from the peat gives this whiskey its distinctive flavor; it is aged in oak for at least 3 years

The principal grain in bourbon whiskey is corn, from 70% to 90%, with small amounts of rye or wheat; the distinctive flavor comes from being aged in new, charred oak barrels for at least 4 years

The Whisky Rebellion

A fun read, but I will not be covering this in lecture or on the next exam

A Victorian Drink Revisited

Absinthe

Absinthe is a liqueur infused with oil of wormwood, which is extracted from the leaves, flowers, and stems of *Artemisia absinthium* or Roman wormwood, *Artemisia pontica*

Popular in the 19th century, absinthe was banned by the second decade of the 20th century in the U.S. and most European countries when its toxicity was realized

In addition to wormwood oil, several other herbs were used for flavoring; e.g., anise, fennel, hyssop, lemon balm, angelica, juniper, nutmeg, star anise

Absinthe was made by macerating wormwood and other herbs and steeping them in a concentrated ethanol solution for at least half a day

An equal amount of water was then added and the mixture was distilled; to the distillate, more wormwood and some of the other herbs were added, heated, and then filtered

An alternative method was to add the essential oils of wormwood and other herbs directly to grain alcohol

The end product was an emerald green, tart-tasting liqueur with an alcoholic content of about 75%

The green hour

Absinthe became so popular in France (and in New Orleans in the U.S.) that a daily ritual of unwinding with a glass of absinthe became known as *l'heure verte* (the green hour)

A shot of absinthe would be poured into a glass, and a sugar cube on a slotted spoon would be placed atop the glass; cold water was then poured over the sugar, and the sugary water would dilute the absinthe, making it less bitter, and transform the color from crystal green to milky yellow

Many famous artists and poets of the period embraced the absinthe habit (e.g., Oscar Wilde, Edouard Manet, Edgar Degas, Henri de Toulouse-Lautrec, Pablo Picasso)

Active principles

The bitter taste of absinthe is due to absinthin in oil of wormwood

Thujone, a terpene that is the primary component of wormwood oil, is a potent psychoactive compound; it is soluble in the alcohol of absinthe, but precipitates out when water is added, forming a milky yellow suspension

Absinthism

Addiction to absinthe was associated with neurological symptoms including auditory and visual hallucinations, psychoses, sleeplessness, tremors, convulsions, and paralysis

Eventually it was learned that wormwood oil alone could cause these symptoms in experimental animals, and that absinthism was due to the activity of thujone

Pernod is a wormwood-free substitute that is still available today

Fungi as Food

Fungi are eaten directly as a type of vegetable or are used as fermentative agents to convert foods into alternative forms

Edible mushrooms (see table 24.2)

Nutritionally, fresh mushrooms are 85% to 92% water, but they are sources of complete protein and have appreciable amounts of vitamins C, D, and some of the Bs; they are low in calories and high in fiber

Most commonly eaten mushrooms are true mushrooms, members of subdivision Basidiomycotina, but a few are actually sac fungi, members of subdivision Ascomycotina

Ascomycotina (sac fungi)

Morels are among the most prized of wild mushrooms; the surface of a morel is covered with distinct pits and ridges, and the bottom edge of the cap is attached directly to the stem; thus, if you cut one lengthwise it is hollow from top to bottom, with no division between the cap and stem

Truffles are the most costly of fungal delicacies, often bringing \$250 to \$450 per pound; they form mycorrhizal associations with the roots of specific trees, and their fruiting bodies develop underground; in France, pigs are trained to sniff out the underground fruiting bodies

Basidiomycotina (true mushrooms and others)

The button, or field, mushroom is the common white mushroom sold in Western produce departments; it is first in worldwide production

The shiitake mushroom is one of the most widely eaten mushrooms in the Orient, having been cultivated in China and Japan for several hundred years; it has recently become popular in U.S. markets as well

In addition to its culinary uses, it is widely prescribed in Japan in cancer therapy, and in the U.S. it is claimed that shiitake tea boosts the immune system, lowers blood cholesterol, and promotes weight loss

The paddy straw mushroom and the oyster mushroom are examples of other cultivated mushrooms that are gaining in popularity in the U.S. and elsewhere

It is also popular to pick wild mushrooms; an example from the U.S. is the pine mushroom found in forests of the Pacific Northwest; wild morels are also found in forests in many areas of the U.S.

Fermented foods (see table 24.3)

Fungi, as well as bacteria, have been used to modify foods through fermentations

Some commonly fermented foods well known in the U.S. are cheese, yogurt, sausage, pickles, sauerkraut, soy sauce, and bread

In eastern Asian countries, soybeans sometimes mixed with cereals have been fermented by various bacteria and fungi to yield flavoring agents and protein sources such as soy sauce, miso, and tempeh

In southern Asia, the Middle East, and Africa, the traditional fermented foods are the result of bacterial and yeast action on cereals to which a protein source has been added; in the Middle East, the protein source is usually milk; in the Indian subcontinent it is legumes

Quorn mycoprotein

Textured vegetable protein from soybeans has been used to produce meat substitutes

Another meatless alternative is Quorn mycoprotein, a food material produced from the mycelium of the fungus *Fusarium venenatum*

The mycelium provides a texture that is similar to muscle fiber found in meats

Main Points of A Closer Look 24.2 – Alcohol and Health

Alcohol is a depressant of the central nervous system, inhibiting the centers of the brain that deal with speech, vision, balance, and judgment

There is some evidence to indicate that moderate consumption of alcohol, particularly red wine, can reduce the risk of coronary artery disease by 40%

Two possibilities are that alcohol can increase the level of HDL (good cholesterol) and inhibit the aggregation of platelets (associated with the formation of blood clots)

Flavonoids from grape skins have been identified as the ingredients in red wine that inhibit platelet aggregation; they are also powerful antioxidants and it has been suggested that they prevent the oxidation of LDLs and thus prevent the onset of changes leading to atherosclerosis

Alcoholism, however, can cause cirrhosis of the liver, atrophy of the brain due to the death of nerve cells, scarring of the heart muscle with associated arrhythmia and high blood pressure, immune system depression, and malnutrition; alcohol consumption during pregnancy can lead to fetal alcohol syndrome and children with mental retardation, learning disabilities, or behavioral problems

This lecture outline was prepared mainly from *Plants and Society*, by Levetin and McMahon, 2003 (3rd edition), and may contain phrases or entire sentences taken verbatim from that source.