

PRODUCTION OF ALCOHOLIC BEVERAGES

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Summary

Alcoholic beverages are drunk in all societies of the world, and are based on the substrates which are locally available. Alcoholic beverages described in this article are those made from grapes, including natural, sparkling and fortified wines, beers made from sorghum, maize and wines made from the cacti and other plant saps. Spirit beverages which are distillates of primary alcoholic beverages were also described.

1. Alcoholic Beverages from Cereals

1.1 Introduction

Alcoholic beverages have been known to man from time immemorial. Like food, the alcoholic beverages indigenous to any part of the world depend on the crops which can grow in the climate of the region as well as on the culture of the people. Alcoholic beverages have assumed an international character and are now produced in corners of the earth no where near their original home.

1.2 Barley Beers

The word beer derives from the Latin word *bibere* meaning to drink. The process of producing beer is known as brewing. Beer brewing from barley was practiced by the ancient Egyptians as far back as 4000 years ago, but investigations suggest Egyptians learnt the art from the people of the Tigris and Euphrates where human civilization is said to have originated. The use of hops is, however, much more recent and can be traced back to a few hundred years ago.

Barley beers can be divided into two broad groups: top-fermented beers and bottom-fermented beers. This distinction is based on whether the yeast remains at the top of the brew (top-fermented beers) or sediments to the bottom (bottom-fermented beers) at the end of the fermentation.

1.2.1 Bottom-fermented beers

These are also known as lager beers because they were stored or “lagered” (from German *lagern* = to store) in cold cellars after fermentation for clarification and maturation. Yeasts used in bottom-fermented beers are strains of *Saccharomyces uvarum* (formerly *Saccharomyces carlsbergensis*). Several types of lager beers are known. They are Pilsener, Dortmund and Munich, and named after Pilsen (Czech) and Dortmund and

Munich (Germany), the cities where they originated. Most of the lager (70-80 per cent) beers drunk in the world are of the Pilsener type. Bottom-fermentation was a closely guarded secret in the Bavarian region of Germany, which has Munich as its capital. Legend has it that in 1842 a monk passed the technique and the yeasts to Pilsen. Three years later they found their way to Copenhagen, Denmark. Shortly after, German immigrants transported bottom brewing to the United States.

Pilsener beer: This is a pale beer with a medium hop taste. Its alcohol content is 3.0-3.8 per cent by weight. Classically it is lagered for 2-3 months, but modern breweries have substantially reduced the lagering time, which has been cut down to about 2 weeks in many breweries in Europe and elsewhere. The water for Pilsener brew is soft, containing comparatively little calcium and magnesium ions.

Dortmund beer: This is a pale beer, but it contains less hops (and therefore is less bitter) than Pilsener. However it has more body (i.e. it is thicker) and aroma. The alcohol content is also 3.0-3.8 per cent, and is classically lagered for slightly longer: 3-4 months. The brewing water is hard, containing large amounts of carbonates, sulfates and chlorides.

Munich beer: This is a dark, aromatic and full-bodied beer with a slightly sweet taste, because it is only slightly hopped. The alcohol content could be quite high, varying from 2 to 5 per cent alcohol. The brewing water is high in carbonates but low in other ions.

Weiss beer: Weiss beer of Germany is made from wheat and *steam* beer of California, U.S.A. are both bottom fermented beers which are characterized by being highly effervescent.

1.2.2 Top fermented beers

Top fermented beers are brewed with strains of *Saccharomyces cerevisiae*.

Ale: Whereas lager beer can be said to be of German or continental European origin, ale (Pale ale) is England's own beer. Unless the term 'lager' is specifically used, beer always refers to ale in England. It is a pale, highly hopped beer with an alcohol content of 4.0 to 5.0 per cent (w/v) and sometimes as high as 8.0 per cent hops is added during and sometimes after fermentation. It is therefore very bitter and has a sharp acid taste and an aroma of wine because of its high ester content *Mild ale* is sweeter because it is less strongly hopped than the standard Pale ale. In Burton-on-Trent where the best ales are made, the water is rich in gypsum (calcium sulphate). When ale is produced in places with less suitable water, such water may be 'burtonized' by the addition of calcium sulphate.

Porter: This is a dark-brown, heavy bodied, strongly foaming beer produced from dark malts. It contains fewer hops than ale and consequently is sweeter. It has an alcohol content of about 5.0 per cent.

Stout: Stout is a very dark heavily bodied and highly hopped beer with a strong malt aroma. It is produced from dark or caramelized malt; sometimes caramel may be added. It has comparatively high alcohol content, 5.0-6.5 per cent (w/v) and is stored for up to six months, fermentation is sometimes proceeding in the bottle. Some stout are sweet, being

less hopped than usual.

1.2.3 Raw materials for brewing

The raw materials used in brewing are: barley malt, adjuncts, yeasts, hops and water. They will be discussed along with brewing processes.

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Biographical Sketch

Prof. Nduka Okafor was educated at Government College, Ibadan, Nigeria. He obtained his first degree from the University of London, England (at the then University College, Ibadan), and his Ph D degree from the University of Cambridge, England. A chartered biologist of the UK, he is a Fellow of several academic bodies including the Nigerian Academy of Science, the World Academy of Art and Science, the Institute of Food Science and Technology, the Institute of Biology.

He has taught and researched in various aspects of microbiology in universities in Nigeria, England, the Netherlands, Austria, Australia and the United States. He has acted as consultant to various United Nations bodies including the United Nations Industrial Development Organization (UNIDO), the World Health Organization (WHO) and the International Atomic Energy Agency (IAEA).

He has published numerous scientific papers, patents and books, including *Industrial Microbiology*, and *Waste and Aquatic Microbiology* and *the Development of Universities in Nigeria*.