

IMPORTANCE OF FUNGI IN HUMAN LIFE

Although we often think of fungi as organisms that cause disease and rot food, fungi are important to human life on many levels. They influence the well-being of human populations on a large scale because they are part of the nutrient cycle in ecosystems. They also have other ecosystem uses, such as pesticides.

Biological Insecticides

As animal pathogens, fungi help to control the population of damaging pests. These fungi are very specific to the insects they attack. They do not infect other animals or plants. Fungi are currently under investigation as potential microbial insecticides, with several already on the market. For example, the fungus *Beauveria bassiana* is being tested as a possible biological control agent for the recent spread of Emerald Ash Borer (*Agrilus planipennis*).

Farming

The mycorrhizal relationship between fungi and plant roots is essential for the productivity of farm land. Without the fungal partner in root systems, 80–90 percent of trees and grasses would not survive. Mycorrhizal fungal inoculants are available as soil additives from gardening supply stores and supporters of organic agriculture.

Food

Fungi figure prominently in the human diet. Morels, shiitake mushrooms, chanterelles, and truffles are considered delicacies. The Meadow Mushroom (*Agaricus campestris*) appears in many dishes. Molds of the genus *Penicillium* ripen many cheeses. They originate in the natural environment such as the caves of Roquefort, France, where wheels of sheep milk cheese are stacked to capture the molds responsible for the blue veins and pungent taste of the cheese.

Fermentation of grains to produce beer and of fruits to produce wine is an ancient art that humans in most cultures have practiced for millennia. Ancient humans acquired wild yeasts from the environment and used them to ferment sugars into carbon dioxide and ethanol under anaerobic conditions.

It is now possible to purchase isolated strains of wild yeasts from different wine-making regions. Louis Pasteur was instrumental in developing a reliable strain of Brewer's Yeast (*Saccharomyces cerevisiae*) for the French brewing industry in the late 1850s.

Saccharomyces cerevisiae, also known as baker's yeast, is an important ingredient in bread, a food that has been considered a staple of human life for thousands of years. Before isolated yeast became available in modern times, humans simply let the dough collect yeast from the air and rise over a period of hours or days. A small piece of this leavened dough was saved and used as a starter (source of the same yeast) for the next batch, much in the same way sourdough bread is made today.

Medicine

Many secondary metabolites of fungi are of great commercial importance. Fungi naturally produce antibiotics to kill or inhibit the growth of bacteria, limiting their competition in the natural environment. Important antibiotics, such as penicillin and the cephalosporins, can be isolated from fungi.

Valuable drugs isolated from fungi include the immunosuppressant drug cyclosporine (which reduces the risk of rejection after organ transplant), the precursors of steroid hormones, and ergot alkaloids used to stop bleeding.

Psilocybin is a compound found in fungi such as *Psilocybe semilanceata* and *Gymnopilus junonius*, which have been used for their hallucinogenic properties by various cultures for thousands of years.

As simple eukaryotic organisms, fungi are important model research organisms. Many advances in modern genetics were achieved by the use of the Red Bread Mold *Neurospora crassa*. Additionally, many important genes originally discovered in *S. cerevisiae* served as a starting point in discovering analogous human genes. As a eukaryotic organism, the yeast cell produces and modifies proteins in a manner similar to human cells. This makes yeast a much better organism for use in recombinant DNA technology experiments.

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