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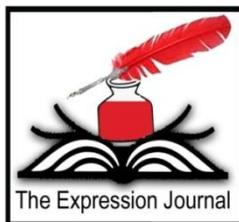
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ROLE OF FUNGI AND YEAST: IMPACT ON HUMANS, SOIL AND FOOD

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Abstract

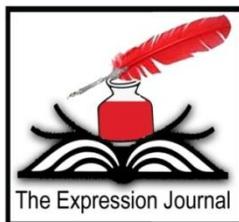
Human life is depended on umpteen factors, species and things which are generally found on earth in different forms. Among these, there are few things which are harmful to us and many things in the biosphere and world may be dangerous to us. Among them, there are two things fungi and yeasts which are also important to us. Fungi also play an important role not only for the human beings but other animals and biosphere also because these are required in the recycling of nutrient in the terrestrial habitats because fungi play the role of dominant decomposers of the complex components of plant debris such as lignin and cellulose. It has also been noticed that fungi are opportunistic heterotrophs and these dispose and recycle organic substrates particularly plant origins. Mushrooms are used in China as medicine. Fungi spoil food, cause diseases to humans, crops and livestock. Fungi spoil timber and other household things also. Apart from it, a few types of mushrooms, a type of fungi, are edible and these are used in soups and salads. These are also used to produce chemicals such as lactic, citric and malic acid. Apart from it, yeast is also beneficial for human beings as it is used in food ingredients for baking and making alcohol beverages. That's why it is known of two types: Brewer yeast and baker's yeast. It is used in bread-making also. Yeast may leave bad impact on digestive system; it can trigger migraine attacks and headache, facial flushing and inflammatory bowel disease. It can cause skin rashes, allergic reactions and diarrhea also. If yeast overgrows, it may get into blood and can cause impaction in the whole body. The present paper is an attempt to analyse the benefits and adverse impacts of Fungi and Yeast for human beings, biosphere, soil and nutrient food.

Keywords

Fungi, Yeast, Sustainable Bio-Economy, Fungal Diversity, Fungal Plant Pathogens, Soil Biology, Soil Health, Soil Ecosystem, Microbial Communities, Benefits, Harms.

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The earth is a very big planet and different types of flora and fauna can be seen on it. They have their own requirements for their living. Among all the animals, human beings are the most developed species of animals and they have to survive depending upon their climate and the surroundings. On this planet, there are many things which are beneficial to us and many things are dangerous to us. Among these, fungi and yeasts are also important for us as these are used in different human activities. As opportunistic heterotrophs, they have evolved hyphae to penetrate solid substrates, and spores for long-range dispersal. Fungi are the member of the group of eukaryotic organisms which include few microorganisms such as molds, mushrooms and yeasts. These organisms are qualified as a kingdom and are quite different from other eukaryotic kingdoms, which by one traditional classification include Animalia, Protozoa, Plantae and Chromista.

There is one characteristic that places fungi in a different category from other bacteria and protists, is chitin in their cell walls. Fungi, like animals, are heterotrophs and they get their food by absorbing dissolved molecules secreting digestive enzymes in the environment. Photosynthesis does not take place in them and their mobility is their growth.

There are many harmful effects of fungi also because man diseases are caused in animals and plants due to various fungi but they also have established mutualistic symbioses with a high range of organisms: green algae and cyanobacteria (in lichens), gymnosperms, bryophytes, pteridophytes and angiosperms (in mycorrhizae), and homopteran, hymenopteran, coleopteran, dipteran and isopteran insects. Fungi are very penetrating and active and several types of fungi live as parasites or pathogens due to which they penetrate host organisms and liberate spores. These are easily transmitted from one host to another and some species of fungi also produce toxic compounds (mycotoxins) also.

Fungi are the single or multi-celled organisms which are nonmotile. Fungi include different microorganisms such as yeasts, mushrooms and molds. Among these, many types of fungi can cause diseases in human beings. These fungi are dangerous for their crops and livestock. But some

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varieties of fungi are essential for the growth of their crop and livestock. These fungi feed generally on the dead organic matter such as dead animals, leaf litter, soil, dung, etc. These recycle 85% of the carbon from the dead organic matter. In fact, human life would have been badly affected without the presence of fungi in the environment. Fungi release locked-up nutrients due to which they are used by other organisms. After that, fungi become essential for the health of soil and ecosystem on the earth.

Fungi play a vital role in addressing various global challenges. The usage of fungal products and processes leads to increased sustainability. When Fungal inoculums is introduced into soil with seed, it produces more roust plants due to proper water and nutrients. Fungal enzymes also lead to produce food ingredients with prebiotic effects for a healthier human gut biota and hence greater resilience towards life-style diseases. Likewise, if the fungi are used for animal diet also, these can be a better option for their health.

Fungi can be called the most promising hotspots for finding new drug candidates and antimicrobials. They have wonderful potential in the manufacturing of biological medicines and a wide spectrum of new values added bio-based products. Such uses of fungi, fungal products and fungal processes reflect the efforts of mycologists over generations. Fungi can also be used to control mycotoxin contaminations, to cure and prevent life threatening human mycoses, and to counteract fungal spoilage of materials and 'sick building' syndrome. Fungi forms lichens by establishing mutualistic symbioses with cyanobacteria and chlorophycota. At times, fungal spores can become the cause of allergic reactions. A few varieties of fungi lead to a disease mycoses in humans. It may excrete toxic compounds such as mycotoxins also.

There are some species of mushrooms which are therapeutically used. Among these cordyceps sinensis, agaricus subrufescens and ganoderma lucidum are used as medicinal plants. It is generally accepted notion that different sort of mushrooms contain few nutrients which are very effective against viruses and it was also published in the *Journal of Natural Products* in 2008 also. There is a clinical drug named Lentinan in which shiitake mushroom is used. This is not the only example. There are many other drugs in clinical science which are the products of different types of fungi. There is world famous antibiotic drug penicillin which is made from a fungus named Penicillium.

Fungi have several usages in the chemical industry also. Different acids such as citric, lactic and malic acids are used in the production of different chemicals. Apart from it, different types of enzymes such as cellulsem lipage and amylase are also produced by the fungi. The use of lipase can be easily seen in detergents used in laundry. These are also used as insect biocontrol agents. Insecticidal toxins produced by fungi are also used to kill insects at a low concentration.

Fungi also play an important role in the maintaining the fertility of the soil. The soil health depends on various factors and it is the result of interaction between various processes and properties. The health of soil depends on the biological, physical and chemical properties. Fungi are very useful for the soil also due to their high plasticity and their capacity to adopt various forms in response to adverse or unfavorable conditions (Sun et al., 2005). Without the presence of fungi, organic matter cannot be broken down and the decomposition of soil components is not possible and the balance of nutrients and carbon is not possible. Due to fungi dead organic matter

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converts into biomass, organic acids and carbon dioxide. Several species of it act as an effective biosorbent of toxic metals such as copper, lead, cadmium, zinc, mercury by accumulating them in their fruiting bodies.

The presence of fungi can be noticed in almost every soil and they can live in wide range of temperature and pH value. The soil fungi are found in there functional groups such as ecosystem regulators, biological controllers, and organic matter decomposers and compound transformers. Magdalena Frac et al. postulate:

The soil fungal diversity and methods of increasing it, particularly the populations of beneficial fungi within ecosystems should be used in practice for more sustainable plant production, decrease of chemical applications and protection of the soil environment. (Frac et al. 2018, 4)

The effects of the plant pathogenic fungi can be seen in the grasslands by limiting the abundance of their hosts. Fungal pathogens can affect nutrient cycles also in grasslands and it can reduce the growth of legumes and the abundance of dominant grasses. Soil fungal communities in grasslands are influenced by human activities also.

Fungi are edible also and these have some culinary benefits also for us. Shiitakes, straw mushrooms, truffles, oyster mushrooms, button mushrooms, black trumpets, portobello mushrooms and milk mushrooms are edible. Among these portobello mushrooms and button mushrooms are generally used in soups and salads. These mushrooms help add a special flavour in the dishes theses are added. Apart from it, these mushrooms are very beneficial for us because they have Vitamin D 2 also when these are exposed in ultraviolet light. It was revealed in a recent study in Pennsylvania State University that only one hour of ultraviolet light exposure right before the mushrooms emanates Vitamin D 2 content in mushrooms.

In modern world, fungi are generally used as an essential component in food making products. Here the food making process includes all those food products in which fungi are added. For an illustration, the baked bread is its better example. The yeast is used to rise the dough so that bread may come out fluffy and light. If yeast is not used, then bread will be quite harder and dense which will also impact on its taste. Blue cheese is also made through this process. There is a large variety of food that is used in Asia.

There are various varieties of human beings and many of them are vegetarian in Asian countries. The production of grain has made it possible. In the 21th century, people are focusing more on the standards and tastes. Earlier there was a practice of eating the entire grain after cooking as it was not possible to eat raw brain. It is believed that the flat bread was made prior to 8000 B.C. It is also believed that flat bread was in practice since thousands of years even much before the discovery of the leavened bread. It is believed that the first baked leavened bread was made around 3000 B.C.by the Egyptians. The presence of the yeast in the dough was responsible for the bread rise.

It is a common belief that the presence of the mold in the food is a sign that food is contaminated and it cannot be eaten. Such food is generally thrown away or it is left for the stray animals. Still there are some varieties of food in which the presence of visible fungal mycelium is essential. It can be generally seen in some varieties of cheeses. Among all these, two varieties of

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cheese are Roquefort and Camembert. These two types of cheese are liked by the gourmets. These cheeses are made from two species of *Penicillium*, *P. camemberti*, in Camembert cheese and *P. roqueforti* in Roquefort cheese. It is generally thought that this sort of cheeses was made around 400 years ago.

The formation of the cheese, as a folklore narrates, was accidental. The story is about an Arabian merchant who was carrying milk with him in a pouch and this milk due to rennet changed into whey and curd. When the merchant drank it, he found it quite tasty and he was feeling quite satisfied also. After that, cheese was made deliberately as it became the part of their habit because it is tasty also.

Thus, fungi and yeasts have been used in different sectors in human life. The cell wall of brewing yeasts has some active ingredients also that help in the growth of the plants. Brewing yeast is used for the fermentation of beer and when the process is completed, this yeast is removed so that it may not do any harm to us.

Yeasts are also used to improve the tone and health of our skin. It may be surprising fact that yeast is used in the skincare products. In fact, it is used in different sort of high-end facial masks, creams, shampoos, moisturizers and other products. Such products reduce inflammation and are used in hydration. These are used to prevent skin from any radical damage. It is used in skin repair and to retain moisturizer in the skin.

Yeast helps to retain the integrity of our skin when it gets affected due to pollution. The products in which yeast is used help in rebalancing the skin, combating seborrhea, acne, pimple and other skin problems. Yeast has fine anti-oxidant properties and it promotes cell turnover through phagocytosis. It helps in detoxification process and improves the radiation of the skin. It contains lipids which act as biosurfactants due to which skin remains moisturized. A healthy skin is usually identified by its good level of moisturizer. However, doctors suggest that we must be careful while using skincare products in which yeast is used.

Fungi are used in different industries apart from pharmaceutical industries. Ethyl Alcohol is made by fungi. Apart from it, several types of yeasts such as *Saccharomyces cerevisiae* are in the production of different sorts of wine, rum, beer and whiskey. Several acids such as kojic acid, lactic acid, gallic acid, gluconic acid, itaconic acid and fumaric acid are also made by different fungi. These are also used as scavengers in the decomposition of the animals and plants. The slow decomposition of plants keeps the soil fertile. Some fungi such as *Penicillium*, *Cladosporium*, *Aspergillus*, and *Rhizopus* work to bind the soil. Fungi are also useful in the study of biological process. A number of antibiotics are also made by fungi. These are also many medicines such as cortisone, vitamins, penicillin and ergots which are produced with the help of fungi. Lene Lange remarks about the uses of fungi.:

This range of new uses of fungi all stand on the shoulders of the efforts of mycologists over generations: the scientific discipline mycology has built comprehensive understanding within fungal biodiversity, classification, evolution, genetics, physiology, ecology, pathogenesis, and nutrition. Applied mycology could not make progress without this platform. To unfold the full potentials of what fungi can do for both environment and man we need to strengthen the field of mycology on a global scale. (Lange 463)

References

- Arnolds, E. (2001). "The future of fungi in Europe: threats, conservation and management." *Fungal Conservation: Issues and Solutions*. Edited by D. Moore, M. M. Nauta, S. E. Evans, and M. Rotheroe. Cambridge U P, 2001, pp. 64–80.
- Bálint, M., Schmidt, P. A., Sharma, R., Thines, M., and Schmitt, I. *An Illumina Metabarcoding Pipeline for Fungi*. *Ecol. Evol.* 4, 2014, pp. 2642–2653.
- Bold, H.C., Alexopoulos, C., and Delevoryas, T. *Morphology of Plants & Fungi*. Harper International Edition (4th Ed.). Harper & Row, Publishers, 1980.
- Cai, X. B., Peng, Y. L., Yang, M. N., Zhang, T., and Zhang, Q. *Grassland Degradation Decrease the Diversity of Arbuscular Mycorrhizal Fungi Species in Tibet Plateau*. *Not. Bot. Horti Agrobot.* 42, 2014, pp. 333–339.
- Frac Magdalena, Hannula SE, Bełka M and Jedryczka M. "Fungal Biodiversity and Their Role in Soil Health." *Mini Review*, vol. 9, 2018, pp. 1-9.
- Gustavo, N. and Mendes, E. *Pathogenic Potential of Fungi in the Genus Aspergillus*. *Arq Inst Bacteriol* cam pestana, vol. 14, 1986, pp. 27-40.
- Hossain, I. and Michael, S.L. *Translation of Homologous and Heterologous Messenger RNA in a Yeast Cell-Free System*. *Gene (Amst)*, vol. no. 1, 1986, pp. 13-24.
- Kurakov, A. V., Kharin, S. A., and Byzov, B. A. *Changes in the Composition and Physiological and Biochemical Properties of Fungi during Passage through the Digestive Tract of Earthworms*. *Biol. Bull.* 43, 2016, pp. 290–299.
- Lange, Lene. "The Importance of Fungi and Mycology for Addressing Major Global Challenges." *IMA Fungus*, vol. 5, no. 2, 2014, pp. 463-71.
- Manna, G.K. 1987. "Mutagenic Potentiality of Four Species of Fungi Imperfecti in Treated Mice." *Advances in Cytology and Genetics*. Edited by V. S. Bhatnagar, pp.135-155.
- Manna, G.K. and Banerjee, M. The Yeast, *Saccharomyces Cerevisiae* as Mutagen to Experimentally Treated Mice. *Nat. Acad. Sci. Letters*, 1989.
- Pal, A., Ghosh, S., and Paul, A. K. *Biosorption of Cobalt by Fungi from Serpentine Soil of Andaman*. *Bioresour. Technol.* 97, 2006, pp. 1253–1258.
- Santos-González, J. C. *Diversity of Arbuscular Mycorrhizal Fungi in Grasslands and Arable Fields*. Doctor's dissertation, Swedish University of Agricultural Sciences, 2007.