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Yeast a magical microorganism in the wastewater treatment

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Abstract
Yeast, as a very valuable microbial resource, has a good enzyme system in the body and can adapt to a variety of special environments. Therefore, it plays an important role in the biological treatment of wastewater. The classification and basic characteristics of yeast were introduced, and the application of yeast in the field of wastewater treatment such as high concentration organic wastewater, heavy metal ion wastewater and domestic sewage were summarized. With the mature of yeast technology and the development of science and technology, more techniques such as gene engineering and immobilization technology will be used to treat with yeast, so that it will have a wider application prospect in wastewater treatment.

Keywords: Magical microorganism, wastewater

Introduction
Yeast is a kind of widely distributed eukaryotic microorganism. Because of its fast growth and high metabolic efficiency, it has attracted much attention. In the early 1990s, the Japanese Research Institute realized the application of yeast wastewater treatment technology for the first time in the world. With the deepening of research, the new technologies with yeast as the core have been more and more widely applied in water treatment in recent years and showed great potential and broad prospects. At present, yeasts have been applied in many kinds of industrial wastewater treatment, domestic sewage purification and other fields

The classification and characteristics of yeast
Yeasts are unicellular fungi, which are usually ovoid, circular or cylindrical. It can be divided into two categories: (1) fermented yeast: a kind of yeast that can only use six-carbon sugar to ferment into alcohol and carbon dioxide mainly used in making bread, steamed bread, and wine-making industry; (2) oxidized yeast: a kind of yeast with strong oxidation ability, weak fermentation ability or no fermentation ability, such as Candida and hansenula polymorpha, mainly used in petroleum processing industry and wastewater treatment process, which is the key target for water treatment. They can utilize many kinds of organic compounds or complex compounds to metabolize. Yeasts usually grow in the acidic environment that pH is 5.0~6.0, and the optimum growth temperature is 25~30°C. They have the characteristics of acid resistance, osmotic pressure resistance, high temperature resistance and high metabolic efficiency. Besides, they have good enzyme system in the body and can adapt to a variety of special environment and are widely distributed in soil, light water, marine and the surface and body of organism. Different populations of yeast are distributed in the different environments, and the changes of community reflect the changes of environmental conditions. Dynowska thought that Trichosporon sp., Rhodotorula sp., Candida sp. and Cryptococcus sp. can be used as indicator fungi for water pollution. In addition, yeasts have strong degradability to some refractory substances and organic poisons. Studies have shown that yeasts can degrade a variety of macromolecular substances, such as phenol and glyceride.

Application of yeast in water treatment
At the end of the 1970s, Yoshizawa designed a yeast wastewater treatment system. Since then, the unique efficiency of yeast in the treatment of various wastewater has attracted wide attention. With the development of yeast wastewater treatment technology, yeast has been found to produce lipids, glycolipids and enzymes. Therefore, it is widely used in the treatment of high concentration organic wastewater, heavy metal ions wastewater and domestic sewage, which has high utilization value.

Treatment of high concentration organic wastewater by yeast.

Yeast can convert most of the organic matter into nontoxic and nutritious single cell protein, which has a high efficiency of wastewater treatment. The source of oily wastewater is wide, and the concentrations of COD and BOD are relatively high. If wastewater without treatment enters the water body, it will cause serious environmental pollution. Yeast treatment technology can reduce the oil content in the wastewater from 10000 mg/L to 100 mg/L, which is not realized by other biological treatment methods at present. It can make the high concentration organic wastewater clean quickly and save the pretreatment process. Therefore, it is widely used in the treatment of high concentration oil containing wastewater. Chigusa *et al* studied that nine mixed yeast strains isolated from industrial wastewater are used for biological treatment of soybean oil processing wastewater. The device has been running steadily for more than one year. When the influent concentration of COD, BOD5 and oil are 39300 mg/L, 18200 mg/L, and 11900 mg/L, respectively, the removal rate of COD, BOD5 and oil by the wastewater treatment process of yeast was all more than 93%. In recent years, researchers in world have carried out the research work in this field. Zheng's group treated high concentration salad oil processing wastewater by yeasts which were separated and screened from the environment. The yeasts removed more than 98% of oils and 94% of COD when the concentrations of oil and COD in the raw wastewater were 1500~1700 mg/L and 6000~7000mg/L respectively. But because of the existence of fungi silk, the sludge bulking was caused, and the removal rate decreased obviously. When the C/N was kept at value of 20/1 in the continuous test, settling ability of sludge has been improved to a certain extent.

The treatment of heavy metal ion wastewater.

The food and water we consume are often contaminated with a range of chemicals and heavy metals, such as lead, cadmium, arsenic, chromium, and mercury that are associated with numerous diseases. Although heavymetal exposure and contamination are not a recent phenomenon, the concentration of metals and the exposure to populations remain major issues despite efforts at remediation. The ability to prevent and manage this problem is still a subject of much debate, with many technologies ineffective and others too expensive for practical large scale use, especially for developing nations where major pollution occurs. This has led researchers to seek alternative solutions for decontaminating environmental sites and humans themselves. A number of environmental microorganisms have long been known for their ability to bind metals, but less well appreciated are human gastrointestinal bacteria. Species such as Lactobacillus, present in the human mouth, gut, and vagina and in fermented foods, have the ability to bind and detoxify some of these substances. This review examines the current understanding of detoxication mechanisms of lactobacilli and how, in the future, humans and animals might benefit from these organisms in remediation environmental contamination of food. (Gregor Reid 2012) Sewage treatment is one of the major problems faced by municipalities. Sewage is the wastewater comprising 99.9% water and 0.1% solid particles. The domestic sewage has high amount of organic and inorganic pollutants. The untreated sewage causes foul smell (bad odor). The improper disposal of sewage causes pollution and destroys the aquatic organisms due to high organic content and biological oxygen demand (BOD) concentration. So, the sewage has to be treated to reduce the environmental impact. The chemically treated water causes harmful effects due to toxic chemicals than the organisms which are originally present in the sewage. The organisms present in wastewater degrade organic matter and helps for further treatment. In conventional treatment method, bacteria remove the organic content of wastewater but the solid particle remains as sludge. The sludge can be used as fertilizer or incinerated, disposed into ocean or landfill. The conventional sewage treatment processes are expensive to operate and maintain and causes pollution. The Solution contain Microorganism secretes organic acids and enzymes which acts on sewage and degrades complex organic matter into simpler ones Yeast produces antimicrobial substances and their metabolites are used as substrate for lactic acid bacteria.

Conclusions

Through the above researches, it can be seen that yeast can adapt to various kinds of wastewater and bad conditions because of the advantages of acid resistance, osmotic pressure resistance and high metabolic efficiency, so that it can achieve a good removal effect and have a broad prospect. Although the related research started late in China, it has made some progress. In today's world, we should not only consider the great improvement of water quality in wastewater treatment but also maximally recycling resources and realizing energy utilization. In order to make extensive use of yeast wastewater treatment, yeasts should be combined with other more technologies to make it play a greater role.

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