# Application of Microbial Enzyme Technology in Food Processing and Detection

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**Keywords:** Microbial Enzyme Technology, Food Processing, Detection, Application Analysis

**Abstract:** At present, microbial enzyme technology has been widely used in the food industry in China. Enzyme technology refers to the technology of material transformation using the catalytic action of enzyme in a certain bioreactor. Because of the maturity of enzyme technology and its catalytic material conversion and safety, the technology is widely used in food processing and detection. As a mature technology, microbial enzyme technology has been widely used and developed all over the world, and also plays an important role in the process of food production, processing and safety detection. Based on the introduction of microbial enzyme technology, this paper analyzes and expounds the application of food processing, enzyme-linked immunoassay and enzyme-biosensor in food safety detection. Enzyme is a kind of biocatalyst produced by living cells, with the participation of enzymes, the metabolism of organisms can be carried out in an orderly manner, the application of microbial enzyme technology in the food industry has improved the economic benefits of the food industry, but also changed the way people live. This paper mainly analyzes how to apply microbial enzyme technology in food processing and detection.

## 1. Introduction

The most basic foods in people's lives include cereals, vegetables and fruits, and meat such as beef and chicken. Because these foods are essential to human life and have a large daily intake, the processing problem is more important. There are more than 100 kinds of microbial enzymes used in the food industry in China, but the most widely used, the largest yield and the highest economic benefit are all kinds of decomposing enzymes. Moreover, the growth and reproduction of microorganisms, short life cycle, using microorganisms to produce enzyme products, production capacity can be almost unlimited expansion, can meet market demand. The application of microbial enzyme technology in food processing and monitoring can ensure the safety and energy saving of food processing [1].

## 2. Application of Microbial Enzyme Technology in Food Processing

### 2.1. Application of Microbial Enzyme in Baking Food Processing

Baked food is a kind of convenience food, its basic raw materials are flour, water, salt, sugar and so on, and then add appropriate dairy, eggs, grease and so on, and then after a certain process to make the food. And the protease activity in the flour is very low, the bread made from this kind of flour is not good, adding protease to the process of making bread can increase the polypeptide and amino acid in the dough, on the one hand, it can increase the taste of the bread, on the other hand, it can increase the aroma of the bread and make the made bread become pleasant. However, when using protease to make bread, we must pay attention to the amount of protease, too much use will cause the protein of bread to be destroyed, so that the bread made is too small or collapse and so on.

For example Table 1 shows:

Table 1 Protease chemical elements

| Chemical name | chemical literature number (CAS.No. ) | IUB No. | Content (mass fraction,%) |
|---|---|---|---|
| Protease | 9014-01-1 | 3.4.21.62 | ＜15 |

From the above table we can conclude that at PH5.5-7.5, a temperature of 70°C is the best

  DOI: 10.25236/medsbe.2020.030

condition for the use of proteases. therefore, the protease 5.0 bg (50 u/g) with a dosage of 0.1–2 g/100 kg flour depends on the type of baked food and the strength of the required gluten.

### 2.2. Application of Microbial Enzyme Technology in Vegetable and Fruit Food Processing

Because the sources of animals and plants are limited and limited by season, climate and region, and microorganisms are not only not affected by these factors, but also have a wide range of kinds, fast growth rate, easy processing and purification, and relatively low processing cost, which fully shows the superiority of microbial production of enzyme preparations. The microbial enzymes commonly used in vegetable and fruit processing include Lactobacillus plantarum, Lactobacillus cucumber, Lactobacillus brevis, candida enteralis, micrococcus, lactobacilli and so on, which make vegetables and fruits become pickles, pickled vegetables, pickled vegetables, winter vegetables and olives by natural fermentation.[2]. At present, glucose oxidase, lysozyme and so on have been used in the preservation of canned juice, fruit wine, canned fruit, dehydrated vegetables and other foods, and have made great progress.

For example Table 2 shows:

Table 2 Growth temperature of three fungi

| Genus | Animal source lysozyme | Plant source lysozyme | Microbial source lysozyme |
|---|---|---|---|
| Sources | Eggs, humans, mammals | Papaya, figs, turnips, barley, etc | Bacterial cell wall, fungus cell wall |
| Growth temperature | 50℃ | 60℃ | 50℃ |

Through the graph of lysozyme we found that the origin of lysozyme is different, and its activity is different, its nature is that the pure product of lysozyme is white or yellowish, yellow crystalline or amorphous powder; no odor, fine-tuning; soluble in water; easy to be destroyed in case of alkali; stable in acidic PH, at this time the heating of 100°C has only a very small active damage to lysozyme, insoluble in ether. Therefore, the use of lysozyme in food can play a good anticorrosion role on the basis of ensuring food safety.

### 2.3. Application of Microbial Enzyme Technology in Dairy Processing

Lactobacillus, Lactobacillus brevis, Streptococcus thermophilus and Streptococcus butadiene subspecies are the main strains of fermented dairy products, in which lactic acid bacteria are the main strains of fermented dairy products.Many dairy food companies add lactic acid bacteria on the basis of raw milk to process into fermented milk, cheese, yoghurt products, sour milk powder and so on. In this process, the flavor of dairy products will be improved, and its shelf life can also be extended. At the same time, people use dairy products containing lactobacillus, which can regulate the normal flora of the gastrointestinal tract, maintain the balance of microecology, and play a role in improving the function of the stomach and stomach. Lactic acid bacteria can also improve the digestibility of food and biological titer, can effectively reduce serum cholesterol, can also control endotoxin, inhibit the growth of intestinal spoilage bacteria, can improve the body immunity and so on.

For example Table 3 shows:

Table 3 State, Growth temperature and characteristics of the three fungi

| Genus | Lactobacillus | Lactobacillus | Staphylococcus | Streptococcus |
|---|---|---|---|---|
| Form | Streptococcus bacteroides | Double strep | Four pairs | Links |
| Growth temperature | 37℃ | Below 10°C | 30℃ | 20-30℃ |
| Characteristics | Fermentation | Fermentation | Fermentation | Dispersion, fermentation |

By comparing the properties of lactic acid bacteria, we found that the use of lactic acid bacteria in food processing can improve the tissue state of food, adjust the flavor of food, but also inhibit the growth of bad bacteria in food, so as to ensure the safety of food. Therefore, the use of lactic acid bacteria in the processing of dairy products, can let the bacteria in the lactic acid bacteria against the human body cholesterol factor, improve the digestive function of the gastrointestinal tract, reduce the content of cholesterol in the human body. At the same time, it can also affect the change process of human colon epithelial cells, prevent genotype mutation in human body, and achieve the effect of inhibiting the growth of cancer cells in human body [3].

## 3. Application of Microbial Enzyme Technology in Food Testing

In the mid-19th century, enzymes were used in quantitative analysis, and scientists used malt extracts as a peroxidase source to determine hydrogen peroxide. However, the real development of enzymatic analysis is in the clinical laboratory. There are two main microbial enzymes used in food testing: enzyme-linked immunoassay and bacterial contamination monitoring.

### 3.1. Application of Enzyme-linked Immunoassay in Food Testing

The advantages of enzyme-linked immunoassay are high accuracy, high specificity, wide application, fast monitoring speed and low cost, and it is also one of the most important ways to monitor pesticide residues in food. The main pesticide residues in food were herbicide, insecticide and fungicide. Although, the limit of enzyme-linked immunoassay cannot fully meet the requirements of foreign developed countries'technical regulations and limited standards, and antibody preparation is not easy and cannot complete the detection of multiple pesticide residues at the same time and other shortcomings. However, because the technology has the advantages of simple sample pretreatment, few purification steps, short sample analysis time and suitable for on-site screening of the kit, it can be equipped in vegetable producing area, vegetable wholesale market and customs.

### 3.2. Application of Bacterial Contamination Detection in Food Testing

The number of harmful bacteria in food reaches a certain number, which can cause various diseases after consumption. In order to control its propagation effectively, it is necessary to have fast and reliable monitoring methods. At present, there are many methods, among which the enzyme-linked immunoassay for the analysis of bacteria in food by preparing monoclonal antibody is the most studied, and the results are accurate and reliable. For example, the application of Enzyme-linked Immunoassay in the determination of meat food quality mainly includes the determination of heating final temperature and the detection of incorporation of dissimilar meat. The outbreak of intestinal diseases is strongly related to animal foods, and improper cooking of meat food is a major cause of the outbreak. the content of some components will decrease during the heating process, and the concentration of some products will increase. When using protein as an indicator, an antibody can be prepared, which is specific to the natural or denatured state of a single protein, so that it can indicate that the protein changes during the heating process. Therefore, the enzyme-free assay can be used to determine the final temperature of meat quickly. At present, the most used is the detection of lactic acid deoxyase, followed by the detection of incorporation of xenogeneic meat, using polyclonal antibody to the enzyme-linked immunoassay of serum albumin, the detection of adulteration of fresh meat [4].

## 4. Conclusion

To sum up, the application of microbial enzyme technology in food processing and monitoring, on the one hand, can ensure the quality of food on the basis of ensuring food safety, improve the flavor of food; on the other hand, can monitor the residual pesticide, bacterial contamination in food, so that food can be detected before it is used by people to ensure the safety of food use. Therefore, relevant scientific and technological personnel in China should pay attention to the research of

microbial enzyme technology, and constantly apply microbial enzyme technology to process and monitor food to ensure people's food safety.

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