Available online at www.scientiaresearchlibrary.com

Scientia Research Library

ISSN 2348-0416
USA CODEN: JASRHB

Journal of Applied Science And Research, 2020, 8 (6):6-10

(*http://www.scientiaresearchlibrary.com/arhcive.php*)

Research progress of yeast polysaccharides

Shao Yi, Li Xiang*

School of Marine and Biological Engineering, Yancheng Teachers University, Yancheng 224051, China

*Corresponding author: E-mail address: yclixiang@qq.com

ABSTRACT

With the continuous refinement of yeast polysaccharides extraction methods, for many years, it has been widely used in aquaculture, food and other industries. For the safe and efficient production of pollution-free and pollution-free yeast polysaccharide by-products, this paper systematically summarizes the yeast polysaccharide extraction method, summarizes the current the influence of different extraction methods on the activity of yeast polysaccharide, and physiological functions of yeast polysaccharide were summarized, in order to meet the needs of farming and food industries and promote yeast polysaccharide promoting provides technical theory instruction and development.

Keywords : yeast polysaccharide, extraction of yeast polysaccharide, physiological function of yeast polysaccharide, application of yeast polysaccharide

INTRODUCTION

Yeast polysaccharide is a kind of high molecular polysaccharide substance, which is extracted by yeast cell wall, and 40% of the cell wall is yeast polysaccharide. It has the function of storing biological energy and supporting structure. In the process of extracting yeast polysaccharide, biological wall breaking technology should be applied, which has considerable application value in food. Natural yeast polysaccharide has become one of the hot topics in the world of immunology.

MATERIAL AND METHODS

1. Extraction of yeast polysaccharide

Yeast cell wall polysaccharides were extracted mainly around -glucan and mannannan. The extraction methods of -glucan and mannan in the cell wall of yeast mainly include chemical method (hot alkali method, alkali acid method), biological method (enzyme method, enzyme alkali method), water extraction method, physical method (ultrasonic, radiation) and so on.

1.1 Acid extraction

Sun Jianyi[1] is extracted using acid method, centrifugal, first three times with distilled water to wash after repeated centrifugation, and then use acetone dry dry powder, add 0.02 mol/L citric acid

buffer (pH7.2), 120 ℃ hydrolysis 90 min, hydrolysate centrifugal, precipitation, take on a clear liquid, add sodium acetate and triploid of anhydrous ethanol, centrifugal sedimentation and repeat, then precipitate dissolved in distilled water, dialysis with double distilled water for 24 h, so yellow brown consistency solution; Distilled water and 7.2% cedr-TRImethylammonium bromide were added into the concentrated solution, and the solution was centrifuged overnight at room temperature. The precipitation was discarded, the supernatant was taken, and 1% boric acid was added. Under constant agitation, the pH was adjusted to 8.8 with 1 mol/L sodium hydroxide and placed overnight at 4 ℃. Discard the supernatant, take the precipitate, then wash the supernatant with 0.5% pH 8.8 borate, discard the supernatant, add 0.5% pH 8.8 borate, sodium acetate and triploid volume of anhydrous ethanol into the precipitate, centrifuge to precipitate, then add the ethanol solution containing 2% acetic acid, centrifuge, take the precipitate, and finally add anhydrous ethanol centrifuge to get the finished product.

1.2 Alkali extraction

Qu Hui Ge[2] took 3 washed wet yeast pups, added 0.1, 0.2, 0.5 mol/L NaOH in a 1:4 ratio respectively, and then stirred them in a constant temperature water bath (100 ℃), centrifuged them for 1 hour and retained the supernatant. After adding NaOH of the above three concentrations at a ratio of 1:1.5, the precipitates were centrifuged under the same treatment conditions to retain the supernatant and discard the precipitation. The two supernatants were combined to obtain three kinds of extracts. The pH of the extract was adjusted to 7 with appropriate concentration of hydrochloric acid to make it neutral. Then the protein in the polysaccharide extract was repeatedly removed by Sevage method, and the protein content in the extract was determined by Bradford method until the protein content was constant. After the extraction solution was added in the proportion of n-butanol: chloroform: extraction solution = 1:5:25, it was shaken violently for 20 min, centrifuged, and the precipitation was abandoned.

1.3 Enzymatic extraction

The broken wall yeast mother liquor was centrifuged and precipitated by adding phosphate buffer solution according to the ratio of feed water to 1:5 (g∶m L). Types of enzymes (papain, snail, neutral protease, alkaline protease enzyme), enzyme levels (0.1%, 0.2%, 0.3%, 0.4%, 0. 5%), enzymolysis temperature (30 ℃, 40 ℃, 50 ℃, 60 ℃, 70 ℃), enzymolysis time (0.5 h, h, h, h, 2.5 2.0 1.5 1.0 h) and enzyme solution initial p h value (4.0, 5.0, 6.0, 7.0, 8.0), the single factor experiment was carried out. The content of polysaccharides in enzymatic hydrolysate was determined by phenol-sulfuric acid colorimetric method, and the influence of various factors on the extraction efficiency of polysaccharides was investigated.

1.4 Water extraction method

Hou Yabin [3] took 1 g yeast cell wall, dissolved in 30, 45 and 60 mL water respectively, and extracted mannan at high temperature. They investigated the effects of different ratio of material to liquid, extraction temperature and extraction time on the extraction effect, designed an orthogonal experimental table, and determined the optimal extraction conditions through experiments.

2.Physiological functions of yeast polysaccharides

2.1 Anti-aging activity

Yeast polysaccharides can promote the development of immune organs, eliminate free radicals in the body, and prevent the stress caused by free radicals invasion and low immune function in animals. Superoxide dismutase (sod) is an important part of antioxidant enzymes in biological

system is, and yeast polysaccharide can increase the superoxide dismutase (sod) activity, degradation and removal of lipid peroxide malondialdehyde, improve the ability of removal of oxygen free radicals, inhibit autoxidation of oxygen free radicals, and thus play a role of anti-oxidation, anti-aging. Through the determination of serum and liver tissue in mice the super oxide dismutase (sod) activity and the content of lipid peroxide degradation products malondialdehyde incubate in vitro and in vivo changes in aging model in mice to study the antioxidant effect in vivo and in vitro[4], the experimental results showed that yeast polysaccharide can obviously improve the mice liver and serum Chinese super oxide dismutase (sod), and to a certain extent, reduce the content of malondialdehyde.

2.2 Antiviral activity

By exploring the antiviral effect of yeast polysaccharides in vitro and its mechanism [5], it was found that yeast polysaccharides can significantly inhibit the occurrence of cytopathic diseases and protect the cells in tissue culture. Has obvious against polio virus Ⅲ, el virus 6 coxsackie virus 16 A, B3, new type of enterovirus type 71, vesicular stomatitis virus, adenovirus type Ⅲ Ⅰ, herpes simplex virus, type Ⅱ activity. The action of yeast polysaccharide is multi-pathway, not only can directly inactivate, but also can inhibit the virus inside and outside the cell.

2.3 Anti-tumor activity

Yeast polysaccharides have significant antitumor effects. The anti-tumor effect of dextran is mainly realized by activating the body's active immunity, thus killing tumor cells and inhibiting tumor growth. Glucan activates NK cells through the CR3 receptor, killing tumor cells. Yeast polysaccharides also kill tumor cells by stimulating immune cells to secrete superoxide ions. Yeast polysaccharides combined with cytokines showed better anti-tumor effect.

2.4 Enhance immune activity

Studies have demonstrated that -glucan in yeast cell wall polysaccharides stimulates both specific and non-specific immune responses. . Glucan passes through the intestinal epithelium by pinocytosis and enters the lymphatic or blood system. It binds to special receptors in blood cells and produces cytoplasmic mutations that stimulate T lymphocytes and B lymphocytes, thereby producing antibodies that inhibit bacteria and viruses. Under the stimulation of dextran, a large number of macrophages are produced, so as to effectively eliminate their own cells and pathogenic microorganisms that have lost their physiological function in the body. Recent studies have confirmed that cell wall polysaccharides can enhance the body fluid and cellular immune function to produce significant resistance to malignant tumors and bacterial and viral infections. After combining with macrophage, glycan can activate macrophages, absorb, destroy and remove the damaged, aged and dead cells and pathogenic microorganisms in the body through phagocytosis, and induce the body to produce a series of cellular and humoral immune responses.

2.5 Anti-radiation activity

Yeast polysaccharides have significant antitumor effects. The anti-tumor effect of dextran is mainly realized by activating the body's active immunity, thus killing tumor cells and inhibiting tumor growth. It has been reported that glucan activates NK cells and kills tumor cells through the CR3 receptor. Yeast polysaccharides also kill tumor cells by stimulating immune cells to secrete superoxide ions. Yeast polysaccharides combined with cytokines showed better anti-tumor effect.

2.6 Regulate gastrointestinal activity

YPS has a certain regulatory effect on intestinal microecological environment of animals. The main performance is: YPS has the ability of absorbing pathogenic bacteria, it can reduce the number of intestinal pathogenic microorganisms in animals, such as salmonella and Escherichia coli, and promote the proliferation of lactobacillus, the beneficial active bacteria in intestinal flora. So that the imbalance of intestinal flora in a short time to correct, restore balance; (2) Through the immune function of the body to destroy the invasion of the body of e. coli, salmonella and other pathogenic microorganisms; (3) through the regulation of the body's micro-ecological balance, promote the intestinal gram positive beneficial physiological activity of bacteria proliferation, inhibit gram negative rot. The endotoxin in plasma can be reduced effectively by bacteria. The purpose of inhibiting the colonization of the intestinal tract by foreign bacteria and preventing the transfer of intestinal gram-negative bacteria to the outside of the intestinal tract.

2.7 Adsorption of pathogenic bacteria

The main mechanism by which yeast cell wall polysaccharides can absorb pathogenic bacteria is that mannan can interfere with the colonization of intestinal pathogenic bacteria, thus reducing the number of intestinal pathogenic microorganisms in animals, such as salmonella and Escherichia coli. Pathogenic bacteria in the intestine (E. coli, Salmonella, clostridium, etc.) have a protein substance (butyric structure) on the cell surface or villi. By recognizing the specificity of cells in the intestinal wall of animals, they combine with sugars to colonize and grow on the intestinal wall, causing intestinal diseases. The mannan contained in the cell wall of yeast is very similar to the receptors in the intestinal wall of pathogenic bacteria, and has a strong binding ability to Lectin. Thus, mannan can competitively bind to pathogenic bacteria. Yeast cell wall material with acid hydrolysis characteristics, can be intact through the digestive tract and not by gastric acid, digestive enzymes such as the destruction of degradation, so can carry pathogens through the intestinal tract to the body, and effectively reduce the occurrence of intestinal diseases. Yeast cell walls also have a strong adsorption effect on mycotoxin and can effectively resist its toxicity [6]. It was also found that the ability of mannannan to bind aflatoxin, gibberellin and other mycotoxins would be further improved if the mannannan was modified. Therefore, the mannan in yeast cell wall is called as a new adsorbent and has a wide range of application value.

3.Application of yeast polysaccharides

In aquaculture, adding yeast polysaccharide into the feed of Yellow River carp can effectively improve the growth rate of Yellow River carp, and enhance the phagocytosis of white blood cells and lysozyme activity. Adding yeast polysaccharide into the feed of Prawn vanna can effectively increase the content of phenolic oxidase, superoxide dismutase and other substances in the serum of prawn vanna, play its role of scavenging free radicals in the body, and has a good antioxidant capacity. The yeast polysaccharide was added to eel feed at a dose of 100mg/kg. After about a month, the agglutination antibody titer and phagocytosis activity of leucocyte in eel serum could be significantly improved, and the lysozyme activity could also be enhanced. This is because low dose of yeast polysaccharide could improve the immune ability of eel.

In poultry breeding, the consumption of yeast polysaccharides for chicks has an obvious promoting effect on the growth of chicks. Adding 0.5% yeast polysaccharide in the drinking water of chicken can further enhance the immune ability of chicken, kill pathogenic microorganisms such as Escherichia coli, and enhance the immune ability of chicken. By injecting yeast polysaccharides into broiler muscle, it can be found that yeast polysaccharides can greatly increase the growth rate of broiler chicken and have obvious effect of weight gain. Yeast polysaccharides can not only improve the cellular immunity of poultry, but also can be used as an immune enhancer to improve

the level of humoral immune response in poultry[7].

In livestock breeding, replacing antibiotics can effectively improve the growth rate and disease resistance of livestock. Adding yeast polysaccharide to the diet of piglets can reduce the content of alanine aminotransferase and alanine aminotransferase in serum and increase the content of alkaline phosphatase. At the same time, using 1% yeast polysaccharides for piglets can effectively reduce the probability of diarrhea disease of piglets. Due to the weak immune system of piglets, yeast polysaccharides can be used to improve their active immune function, so as to ensure healthy growth of piglets.

Conflicts of interest

The authors declare that there is no conflict of interest.

ACKNOWLEDGMENT

This research is supporeted by the Undergraduate Innovation and Entrepreneurship Training Program in 2020 (202010324024Z)

REFERENCE

[1] Huang Guorong, Zhu Jundong, Mi Quanyin, Lang Haibin. Studies on the extraction technology of saccharomyces cerevisiae polysaccharide [J]. Journal of the Third Military Medical University,**2006**(06):486.

[2] Qu Hui Ge, YU Xiao-fei, ZHANG Yu-xiang, Cheng Xian-hao, Wang Xiao-ling, Yang Jian-zhi. Studies on the extraction technology of white wine waste yeast protein and polysaccharide [J]. Food Science,**2007**(09):315-318.

[3] Hou Yabin, Xu Mengchen, Wu Peixian, Shang Siyu, Gao Lanfang, Wu Wenjing, Li Wanjun, Liu Xueying, Yang Shengyu, Zhang Pengpai. Extraction and purification of mannan from yeast and its effect on fruit preservation [J]. Chemical research,**2019**,30(02):197-201.

[4] Sun Zhengbo. Study on antioxidant activity of Saccharomyces cerevisiae polysaccharides [D]. Master thesis. Wuhan: Hubei University of Technology, **2007**.

[5] Li Fan, Shi Yanchun, Guan Xianzhi, Zhang Shaolun, Tian Tongchun. Studies on the antiviral effect of Saccharomyces cerevisiae Polysaccharides [J]. Chinese Journal of Traditional Chinese Medicine,**1998**(03):3-5.

[6] Newsman K, Jacquea K, Buede R. Effect ofmannan oligosac-charide supplementation on performance and fecalbacteria ofHo-lstein calves [J].JAnim Sc,i **1993**, 71: 270- 271.

[7] Pan Y F. Research and application of yeast polysaccharides in animal nutrition [J]. Animal Husbandry and Veterinary Science and Technology Information,**2020**(07):12-13.