Technological Offer

Saccharomyces cerevisiae strain for production of highly active baker's yeast

Annotation

The invention relates to microbiology, biotechnology and food industry and is relevant to a new strain of baker's yeast - Saccharomyces cerevisiae, which can be used in the yeast, bakeryand other branches of food production as well as in the fields of medicine, perfume/cosmetics and pharmaceutics.

The proposed strain was obtained by successive selection of yeast cultures isolated in laboratory conditions from the spontaneously fermenting national bread leaven (ttkhmor) according to a set of different essential production indicators and by means of a sequential multiple selection in production environment when cultured in the molasses medium with high concentration of dry compounds. Selection was conducted in the laboratory of works of baker's yeast in Abovian city, while in the laboratory of fermenting microorganisms (where the world known culture lactic-acid bacterium Lactobacillus acidophilus "Narine" was isolated) of the Institute of Microbiology of NAS of Armenia the proposed strain was identified and classified as Saccharomyces cerevisiae based on the determinant Kreger-van RiJ.

The resulting new strain of Saccharomyces cerevisiae has improved properties, such as stably high level of biomass output, unique antimicrobial activity against wild microflora when cultured in production stages in non-sterile conditions, as well as high specific growth rate, raising powerand enzymatic activity.The above propertiesof the strain allow usingcommercial yeasts with humidity 75% in quantity of 0.4 % to weight of the flourin the processes of dough and getting high quality bread products.

Description

Culture-morphological characteristics. Vegetative cells of round shape. The size of cells in two-day culture equals 6-9.5 x 6.5-10 micron. The growth of culture is significant on wort agar of light cream color. When growing in malt wort it forms a dense precipitate, but it does not form pellicle and ring.

Reproduction by budding.Smooth-walled round spores by 1-4 in ascus. Does not form pseudomycelium.

Physiological and biochemical characteristics. Ferments and assimilates glucose, galactose, sucrose, maltose, raffinose. It does not assimilate lactose, soluble starch. It assimilates ethanol and does not assimilate inositol. Among the organic acids it assimilates lactic acid. Among the nitrogen compounds it assimilates peptone, ammonium sulphate and asparagine,it does not assimilate potassium nitrate and ethylamine hydrochloride. It does not split arbutin, does not liquefy gelatin. Facultative anaerobe.

The proposed strain enters into symbiosis with lactic-acid bacteria of genus Lactobacillus better than others because it is good at assimilating lactic acid as a sole carbon source. For this reason the strain was proposed for obtaining yeast whey, as it is known that yeast grown on lactic whey is the source of essential amino acids (lysine, tyrosine, arginine), which is important in terms ofbread enrichment. Patent studies showed that a similar method of obtaining yeast whey by means of co-culture of lactic acid bacteria and baker's yeast on lactic whey was proposed by other researchers (particularly Canadians) as well, but yeast strains used bythem did not have simultaneously high enzymatic activity and good assimilation of lactic acid, as opposed to the proposed strain.

When grown on a wort agar the proposed strain, which has antimicrobial characteristics against the agent of "potato" bread disease, forms growth inhibition areas with a diameter of 10 to 20 mm in relation to the tested Bacillus subtilis microbes. Itmakes it possible toconduct the dough process without adding various chemical additives, such as calcium propionate, which are used in breadmaking to suppress the "potato" bread disease. This property of the strain can also be used in the rapidly developing sector of bio-based natural and organic cosmetics production mainly byproducers of skin-care products and curative cosmetics. In particular, it is important to note that interest of cosmetic companies towards the proposed strain was due to its antimicrobial properties.

Productive-valuable characteristics: Production and culture medium, in which the yeastsaregrown, contains a number of substances, which account for its osmotic pressure. Yeasts tend to reduce their enzymatic activity in the presence of substances that increase the osmotic pressure, which is reflected in the index of their osmotic sensitivity. The value of this index in the characteristics of production races of baker's yeast has particularly increased due to the fact that the main direction of technological progress in yeast production is the use of accelerated methods of yeast growing in a highly concentrated molasses medium (at KR = 6-8). However, the impact of harmful substances of raw material on yeast cells is more sharply revealed in a highly concentrated solution of molasses, namely the ability of yeasts to multiply decreases faster. The proposed strain is osmophilic as it has high zimaze (β-fruktofurazidaze)activity (20-25 min.) and maltase (α-glucosidase)activity(25-28 min.) and is characterized by the resistance of the complex of fermenting agents having weak osmotic sensitivity (1-2 min.).

The proposed yeast strains significantly surpass the already known yeast races of Dutch, French and Turkish production by resistance to extraneous harmful microflora and high concentrations of molasses solution. The proposed strain is characterized by an increased resistance to harmful admixtures of molasses bearing 12 and more successive cultivations in molasses solution with 25% concentration of dry compounds, while the norm - 6 successive cultivations in the molasses solution with 15% concentration of dry compounds - is considered to be 100% resistance of yeast strains to molasses solution.

Method for culturing yeasts in non-sterile conditions has been patented on the basis of the presented biological characteristics of the strain (resistance of fermentation enzymes'complex and resistance to high

concentrations of molasses solution), since wild yeast microflora of yeast production cannot develop under an aerobic conditions at a high concentration of molasses solution at the initial production stage.

The proposed yeast strain is able to grow at temperatures from 15 to 45 degrees Celsius with an optimum growth temperature of 28-30 °C and resistance of commercial yeasts of over 120 hours at 35 °C. The increased temperature resistance (upto 42-45 °C) of the strainmeets the requirements of bakery production of countries with hot climate.

The strain is also characterized by a high specific growth rate, even when cultured in yeast production according to a shortened scheme as shown in the table below.

The data of the technological regime of cultivation of yeast strainS. cerevisiae

Stage	ferment ator	Speed of growth, h^{-1}	volume, m^3		Molasse, kg		CD	Inoculum		Production of yeast				Duration,h	Concentration of yeast, g/1
			total	useful	by stage	all		%	kg	by stage		total			
										%	kg				
1	SIN	0.298	1.0	0.250	50	50	5	0.2	0.1	13.0	6.5	13.2	6.6	14	26.0
2	BIN	0.289	7.5	4.0	500	550	7.2	1.2	6.6	32.0	160	30.3	166.6	11	40.0
3	A	0.210	30	18.0	1950	2500	7.2	8.5	166	96.9	1890	82.2	2056.6	12	105.0

Note: CD- coefficient of the dilution of molasses

It should be noted that patent search of Saccharomyces cerevisiae baker's yeast similar to the proposed strain and marketing research of the technological process of bread production have revealed that the registered and used races and strains of yeasts meet the technology requirements to varying degrees both by one and different groups of indicators. Meanwhile, due to a complex ofdifferent characteristics,the proposed strain of Saccharomyces cerevisiae ensures the creation of a final product with better organoleptic and physico-chemical properties and corresponding to a set of high quality standards established in the yeast and bakery production.