Evaluation of the effectiveness of restoration of the lost properties of yeast using bioenergy information technology

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During storage of mushrooms, as well as other microorganisms, spontaneous changes in their properties are often observed. When developing effective methods for storing and preserving crops, the goals are pursued not only to increase their lifespan, but also to minimize spontaneous variability, which leads to the loss of valuable properties of crops and degeneration of strains. The widespread use of specialized equipment of the IMEDIS Center in many fields of science has given rise to the use of methods of bioresonance and resonance-frequency effects of electromagnetic fields to restore the properties of various organisms lost as a result of long-term storage [1, 2].

The task of this work was to study the possibility of restoring the viability and changes as a result of storage of some physiological and biochemical properties of the yeast Candida kefir strain BD2 using bioenergy information methods.

Materials and methods

The object of research was the yeast culture Candida kefir strain BD2, isolated from yogurt, which is still stored in the culture collection of the Department of Microbiology of the Baku State University of Azerbaijan. This culture was selected for research due to strong changes in properties towards deterioration and even loss of most of the studied traits in comparison with other strains when stored in distilled water for 2 years.

Using the methods of bioresonance and resonance-frequency effects, the restoration of the properties of yeast cells changed as a result of long-term storage was carried out [3, 5]. For the experiments, which were carried out in three stages, a three-day culture of C. kefir strain BD2 (original culture) and the same culture that lost some properties as a result of storage for 2 years (damaged culture) were selected. The first stage consisted in preparing a suspension of yeast cells from the original and damaged culture, in determining the frequency spectrum of these cultures and in the selection of the intensity of exposure. As a medium for the cultivation of the biomass of the cultures, we took a physiological solution of 0.5% NaCl, the concentration of which contributed to the preservation of the cell structure without changes.

The second stage of the research consisted of bioresonance and resonance-frequency effects on the culture under study in physiological solution at a concentration of $72x10^4$ CFU / ml (Table 1). The bioresonance method used "direct" exposure from the original culture and inverse exposure from the damaged culture. With the resonance-frequency method, preselected frequencies of cultures were used (initial- 5.5 Hz and damaged - 4.0 and 3.5 Hz).

The third stage of research consisted in studying the viability and some physiological and biochemical characteristics of yeast cells subjected to bioresonance and resonance frequency effects. The obtained results were compared with the control ones (not exposed to bioenergy information methods), i.e. with signs of the original culture and culture after storage.

Table 1

Recovery activities
using bioenergy information technology

Experiment no.	Selected program impact		Time exposition	Applicable equipment	Applicable device
one	Direct + inverse		2 minutes.	"IMEDIS-BRT-PC"	Container apparatus
2	Direct		2 minutes.		
3	Inverse		2 minutes.		
4	5.55 Hz	100 units	10 min.	"MINI-EXPERT-DT "	Inductor
five		30 units			
6	4.0 Hz	80 units	10 min.	"MINI-EXPERT-DT "	- //-
7		30 units			
eight	3.5 Hz	80 units	10 min.	"MINI-EXPERT-DT "	- //-
nine		30 units			

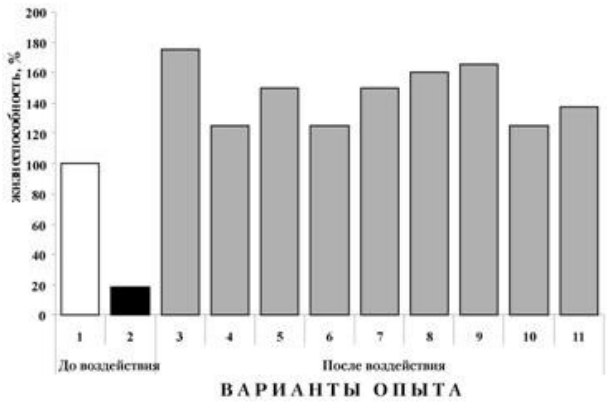
The viability of the yeast culture, expressed as a percentage, was determined by the Lust formula [4]. Of the physiological properties, the lactose-fermenting and fermentative activities of yeast cells were studied according to the well-known method [6]. Of the biochemical signs, urease and protease activity [6].

All experiments were performed in 4 replicates and statistically processed [7].

Results and its discussion

At studying influence bioenergy information methods on the recovery the viability and some physiological and biochemical properties of yeast cells Candida kefir strain BD2 marked changes in comparison with the original and culture after storage, which are shown in the figure and presented in the table.

Fig. 1 shows that after bioresonance and resonance-frequency effects on yeast cells, an increase in viability was observed to varying degrees in comparison with cultures not exposed to electromagnetic signals (experiment 1 - initial culture and experiment 2 - damaged culture). So, in experiment 3 ("direct + inverse" bioresonance effect), the increase in the viability index in comparison with the original culture (experiment 1) was
1.9 times, in experiment 4 (direct bioresonance exposure) - 1.2 times, in experiment 5 (reverse bioresonance exposure) - 1.5 times; in experiments 6 and 7 (resonant-frequency exposure with the frequency of the original culture 5.55 Hz and with an intensity of 100 and 30 units)- 1.2 and 1.5 times, respectively; in experiments 8 and 9 (resonant frequency impact with a frequency of the damaged culture of 4.0 Hz and with an intensity of 80 and 30 units) - 1.6 and 1.7 times, respectively; in experiments 10 and 11 (resonant-frequency impact with a frequency of the damaged culture of 3.5 Hz and an intensity of 80 and 30 units) - 1.2 and 1.4 times, respectively.



Rice. one.Viability of yeast cells Candida kefir strain BD2 after exposure to bioenergy information methods

It follows from the analysis results that restoration of the viability of yeast cells Candida kefir strain BD2 using bioenergy information methods gave positive

results, and in addition to the possibility of restoration to the initial state, there were cases of increased cell viability. This proves the effectiveness of the applied bioenergy information methods.

According to the literature, the transfer of energy-informational signals with desired properties to the culture of lactobacilli using bioenergy-information technology not only restored the viability, but also enhanced the growth properties of the culture after lyophilization [2]. After bioenergy informational influences, fermentation activity was determined in Candida kefir yeast cells, strain BD2, which is reflected in the values of titratable acidity (Table 1).
2). From table. 2 shows that after exposure to bioresonance fluctuations, the titratable acidity in yeast cells in experiments 1 and 3 increased 3.5 and 4.0 times, in experiments 2 and 5- 2 times, in experiments 6, 7, 8 and 9 - 3 times compared to the culture after storage. It should be noted that the values of the titratable acidity of yeast cells obtained in the experiments turned out to be low in comparison with the original culture, but high in comparison with the damaged culture, with the exception of experiment 4. In the latter, no changes in the values of the titratable acidity were observed; have not received any noticeable results.

Consequently, the bioenergy informational methods used by us make it possible to partially restore the fermentation activity of the yeast cells of C. kefir strain BD2, which turned out to be low after long-term storage.

table 2

The results of the actions of bioenergy information methods on the restoration of some physiological and biochemical properties of yeast cells Candida kefir strain BD2

Experiment No.	Culture under restoration			
	Fermentation activity (M ± m)	Lactose-liberated activity	Urease activity	Protease activity
one	0.07 ± 0.02	+ +	+ +	+ +
2	0.05 ± 0.01	+	+	+
3	0.08 ± 0.01	-	-	-
4	0.02 ± 0.01	-	-	+
five	0.04 ± 0.02	+	+	+ +
6	0.06 ± 0.01	-	-	+ +
7	0.06 ± 0.01	+	-	-
eight	0.06 ± 0.01	-	-	-
nine	0.06 ± 0.01	-	-	-
Source culture	1.4 ± 0.4	+ +	+ +	-
Damaged culture	0.02 ± 0.01	-	-	-

Note: "++" strong degree, "+" weak degree, "-" absent

When studying the lactose-fermenting activity of irradiated cultures C. kefir strain BD2 changes are clearly visible (Table 2). From table. 2, it can be seen that only in experiments 1 and 2, where the bioresonance effect was used, as well as in experiments 5 and 7, where the effect of resonant frequency oscillations was used, lactose fermentation was observed to varying degrees. In experiment 1, the lactose-fermenting activity recovered completely, i.e. to the state of the original culture. In experiments 2, 5 and 7, the lactose-fermenting activity of yeast cells was restored by 50%.

From biochemical characteristics of yeast cells Candida kefir strain BD2 after exposure to bioenergy information methods, we studied changes in urease and protease activity (talb. 2). Thus, with bioresonance and resonance-frequency exposure, good results were obtained in experiment 1 ("direct + inverse" bioresonance exposure), in which there was a complete recovery of urease activity and to a weak extent in experiments 2 (direct bioresonance exposure) and 5 (with the frequency of the initial culture 5.5 Hz and intensity 30 units). With respect to protease activity, which was not manifested in the original culture, the acquisition of this trait was observed in some experiments. So, good results were observed after bioresonance exposure in experiments 1 and 2,

Thus, the restoration of vitality and some physiological and biochemical

properties of yeast cells Candida kefir strain BD2, altered or lost as a result of storage, is effectively carried out using bioenergy informational methods. The results obtained give grounds to assert the effectiveness of the methods used, which contribute not only to the restoration of properties to their original state, but also to the enhancement of some of them.

With further research, there may be results confirming the use of other options for the impact of energy-information signals using bioresonant and multiresonant methods.

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