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FERROFLUIDS INFLUENCE ON DEHYDROGENASES ACTIVITY IN CELLULOLYTIC FUNGUS *Chaetomium globosum*

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Abstract. The activity of dehydrogenases was studied after ferrofluids supplying in the culture medium of *Chaetomium globosum*. Spectral measurements were carried out after 7 and, respectively, 11 days of growth. Different results were noticed for different ferrofluids concentrations: 20, 40, 60, 80 and 100 µl/L. Inhibitory or stimulatory ferrofluids effect was obtained depending on the nature of the investigated enzyme.

INTRODUCTION

In several previous scientific papers we reported: the influence of ferrofluids on the growth rate and biomass accumulation (Manoliu et al.,1999), the ferrofluids effect on protein and nucleic acids biosynthesis (Manoliu et al., 2001), as well as the cellulase activity modification after ferrofluids addition (Manoliu et al., 2002). All these issues indicated that ferrofluids may be taken as an external factor the monitor biotechnological processes of this cellulolytic fungus.

THE INVESTIGATIONS AIM

The present paper is focused on the researches concerning the influence of various ferrofluids concentrations on dehydrogenase activity (succinat dehydrogenase, oxoglutarat dehydrogenase (α-cetoglutarat dehydrogenase), izocitrat dehydrogenase) in the *Chaetomium globosum*.

MATERIAL AND METHODS

The species *Chaetomium globosum,* strain MO 96, was cultivated in the presence of ferrofluids prepared from ferrous and ferric salts (Creangă and Cotae, 1996); the structure and properties of the used ferrofluids being presented previously (Manoliu et colab., 1999).

The culture variants, depending on ferrofluids concentrations, supplied in the culture medium Czapek Dox, were ranging between 20 and 100 µl/L were the next ones: V1 –control (no ferrofluids adding), V2 - 20 µl/L, V3 - 40 µl/L, V4 - 60 µl/L, V5 - 80 µl/L, V6 - 100 µl/L. These culture medium variants were inoculated with 8 cm diameter discs from a 7 days old culture of *Chaetomium globosum*. Cultures were incubated at 28 ^{0}C without shaking.

The determination of dehydrogenase activity (succinat dehydrogenase (E.C. 1.3.99.1.), oxoglutarat dehydrogenase (E.C.1.2.4.2), izocitrat dehydrogenase (E.C. 1.1.1.41.)) was accomplished after 7 and, resepctively, 11 days of growth, using the method of Sâsoev and Krasna, partially modified by Artenie, the enzyme activity being expressed in mg of formasan /g biomass (Artenie and Tănase, 1981).

RESULTS AND DISCUTIONS

Data regarding various ferrofluids concentrations effect on dehydrogenases activity in *Chaetomium globosum* are given in figures 1-4.

Figure 1 presents the experimental results concerning ferrofluids influence on succinat dehydrogenase. It is evident that at the 7th day of growth enzyme activity reached a maximum value for the experimental variant V2 - 20.588 mg formasan /g biomass, while in the other variants the values were: 16.176 mg /g (V3), 12.058 mg /g (V4), 5.514 mg /g (V5) and 4.770 mg /g (V6), while, for the control, the value of enzyme activity was 16.150 mg /g .

At the 11th growth day the enzyme activity was increased in control (17.230 mg /g) and V4 (19.117 mg /g), but in the other samples enzyme activity diminutions were observed: 16.544 mg /g in V2, 12.132 mg /g in V3, 4.705 mg /g in V6 and 4.044 mg /g in V5. We mention that the two highest ferrofluids concentrations diminished enzyme activity with more than 50% in comparison to the control variant.

Experimental results corresponding to ferrofluids influence on oxoglutarat dehydrogenase are given in figure 2. All ferrofluids concentrations tested into this experiment led to stimulatory effect on this enzyme activity after 7 days after inoculation. Maximal value was recoreded in V3: 13.125 mg /g, while for the other variants we obtained: V2 – 12.205 mg/g, V4 – 10.294 mg /g, V5 and V6 – 6.250 mg /g , all these meaning more than 200% in comparison to the control (V1 – 2.480 mg /g).

At the 11th day of growth, V1, V2 and V3 presented considerable enhance of enzyme activity in comparison to previous situation: V1 - from 2.480 mg /g to 6.260 mg/g; V2 - from 12.205 mg /g to 17.279 mg /g; V3 from 13.235 mg /g to 15.769 mg /g. In contrast to these relatively small ferrofluids concentrations, to higher ferrofluids concentrations indiferent or inhibitory effect was noticed at the level of this enzyme activity: in V4 from 6.250 mg /g to 6.617 mg /g, V5 from 10.294 mg /g to 9.558 mg /g and V6 from 6.250 mg /g to 3.678 mg /g .

In figure 3 the ferrofluids influence on izocitrat dehydrogenase can be seen. At the 7th day after inoculation the highest enzyme activity was remarked in V3 – 23.076 mg /g, while the minimal value remain that of the control variant – 3.310 mg /g; the other variants were found to range between these mentioned values: V6 – 3.676 mg /g , V5 – 5.210 mg /g , V4 – 10,00 mg /g , V2 – 20.480 mg /g .

At the 11th growth day the enzyme activity enhanced in control variant (V1) from 3.310 mg /g to 4.690 mg /g), and V4 from 10,00 mg /g to 10.661 mg /g , V5 from 5.210 mg /g to 6.617 mg /g and V6 from 3.676 mg /g to 7.058 mg /g, exception from this stimulatory influence was noticed in V2 and V3, where the **enzyme** activity was diminished from 20.480 mg /g to 19.117 mg /g and resepctively from 23.076 mg /g to 10.073 mg /g .

CONCLUSIONS

High ferrofluids concentrations (80 µl/L and 100 µl/L) induced inhibitory effect in succinat dehydrogenase, after 7th and 11th days inoculation.

The activity of oxoglutarat dehydrogenase was stimulated by most of ferrofluids concentrations tested in this study (except that corresponding to V4) either after 7th and 11th days inoculation.

The activity of isocitrat dehydrogenase was also stimulated by ferrofluids adding in the culture medium for all tested variants both after 7 and 11 days of growth. Probably ferrofluids chemical composition is able to determine such modifications in the enzyme biosynthesis in the fungus *Chaetomium globosum*.

Figura 1. Influence of ferrofluids concentration on succinate dehydrogenase

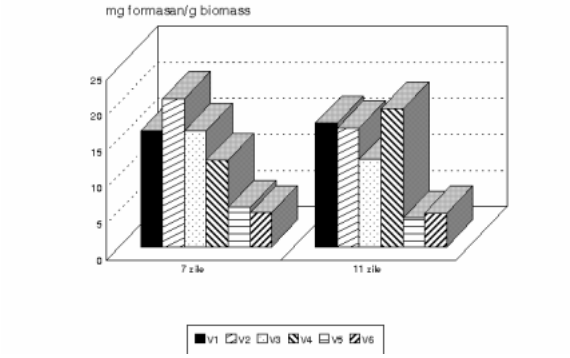


Figura 2. Influence of ferrofluids concentration on oxoglutarate dehydrogenase

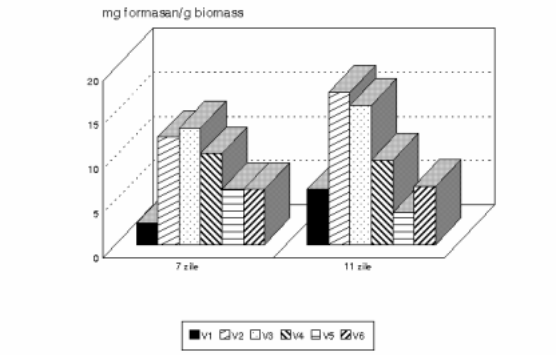
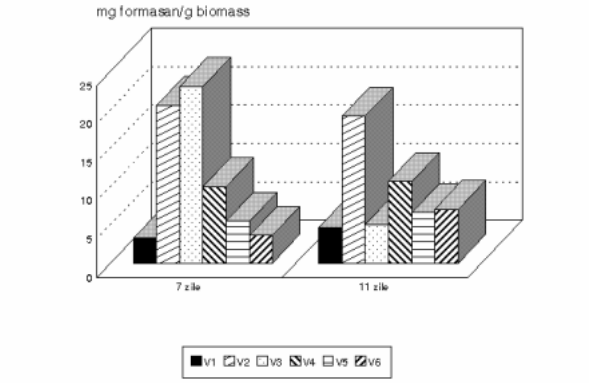


Figura 3. Influence of ferrofluids concentration on isocitrate dehydrogenase



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