THE PROTEIN CONTENT IN CELLULOLYTIC FUNGI *TRICHODERMA VIRIDE* AND *CHAETOMIUM GLOBOSUM* EXPOSED AT STATIC AND ELECTROMAGNETIC FIELDS

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Keywords: protein, cellulolytic fungi, static magnetic and electromagnetic fields.
Abstract: This paper presents the data concerning the influence of the static magnetic field (SMF) and electromagnetic field (EMF) – continuous and pulsed – on soluble protein content in cellulolytic fungi *Chaetomium globosum* and *Trichoderma viride,* cultivated on media with deciduous and coniferous sawdust. The determinations was effectuated in mycelium and culture liquid at 14 and 21 days from seeding and demonstrated that the content of the soluble proteins was influenced by the type of the magnetic field, the quantity of the sawdust introduced in culture media and the culture age.

INTRODUCTION

The cellulose constitutes the major form of stocking of glucose obtained through photosynthesis and in the same time the major component of solar energy conversion to the biomass. The cellulose is also major constituent of all the vegetal materials and that is why it is the most abundant organic material in nature, which is renowed every year. Because of its highly ordered structure, the cellulose is very hard to be degraded and that is why it is unusable and stocked in nature as waste.The capacity to degrade the natural cellulose implies the synthesis of the entire cellulolytic system. So, it was demonstrated that all the microorganisms which can degrade the crystalline cellulose produce systems of cellulases more or less complex which are made of enzymes with specifications and way of action different which act in a cooperate way. They produce some cellulolytic enzymes, but they lack one of the essential enzymes. In Biological Research Institute Iasi, was efectuated a lot of researches regarding the influence of magnetic and electromagnetic fields on the metabolism of cellulolityc fungi (Manoliu et al., 2004, Manoliu et al., 2005, Manoliu et al., 2006). In this paper we carried out the influence of static magnetic field (SMF) and electromagnetic field (EMF) - pulsed and continuous - on the protein content in *Chaetomium globosum* and *Trichoderma viride* cultivated on media supplemented with sawdust.

MATERIAL AND METHODS

The researches were performed with cellulolytic species ***Chaetomium globosum*** and ***Trichoderma viride***, selected within the Department of Microbiology of the Biological Research Institute, Iasi, Romania. For these researches it was used the Czapek modified liquid culture medium (NaNO3 - 0,3 g, KH2PO4 - 0,01 g, MgSO4 7H2O - 0,05 g, KCl - 0,05 g, FeSO4 7H2O - 0,001 g, sucrose – 4 g, distilled water - 100 ml) in which the sucrose was replaced with 2g/100ml and, respectively, 4 g/100ml coniferous and deciduous trees sawdusts.

The Czapek medium was inoculated with 0,8 cm diameter disks from 7 day culture of ***Chaetomium globosum*** and ***Trichoderma viride*** and then was exposed for 14 days and 21 days to the action of the static magnetic field having a magnetic induction with 80 mT. For the study of the electromagnetic field, the flask containing culture media inoculated with *Chaetomium globosum* and ***Trichoderma viride*** was exposed 15 minutes daily on the pulsed and continuous electromagnetic field for all experiment long. It was used control variants in which wasn't exposed to the magnetic and electromagnetic field. The determination of the proteins content was assayed by a spectrophotometric method acording to Bradford (1), in the liquid media at 14 days and, respectively, 21 days from seeding.

RESULTS AND DISCUSSIONS

The results regarding the influence of the static magnetic field on the protein content in *Chaetomium globosum* are presented in figure 1, resulting that at 14 days from seeding the value of this parameter was 0,0428 mg% at V1, following in increasing order by V2 – 0,0539 mg%, V4 – 0,0619 mg%, and V3 – 0,0747mg%. At 21 days from seeding the value of the protein content was: 0,0452 mg% at V1, 0,0501 mg% at V2, 0,0703 mg% at V4, 0,0794 mg% at V3. Analysing the dynamics of the protein content at the two interval studies, it was observed an increasing at V1 from 0,0428 mg% to 0,0452 mg%, V3 from 0,0747 mg% to 0,0794 mg%, at V4 from 0,0619 mg% to 0,0703 mg% and a decreasing at V2 from 0,0539 mg% to 0,0501 mg%.

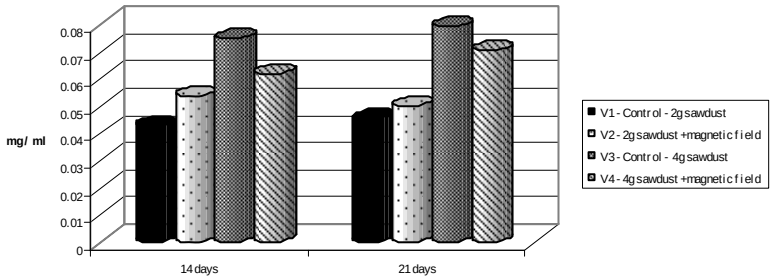

Fig. 1. Influence of magnetic field on the protein content in *Chaetomium globosum*

Figure 2 shows the data regarding the influence of the static magnetic field on the protein content in *Trichoderma viride* where from it shows that at 14 days from seeding the values of the protein content was: 0,0541 mg% at V2, 0,0593 mg% at V1, 0,0783 mg% at V3 and 0,0866 mg% at V4. At 21 days from seeding the value of this parameter was: 0,0654 mg% at V2, 0,0801 mg% at V3, 0,0819 mg% at V1, 0,0886 mg% at V4.

The dynamics of the evolution of this parameter highlights that, the protein content increasing at all variants: V1 from 0,0593 mg% to 0,0819 mg%, at V2 from 0,0783 mg% to 0,0801 mg%, at V3 from 0,0541 mg% to 0,0654 mg%, at V4 from 0,0866 mg% to 0,0886 mg%.

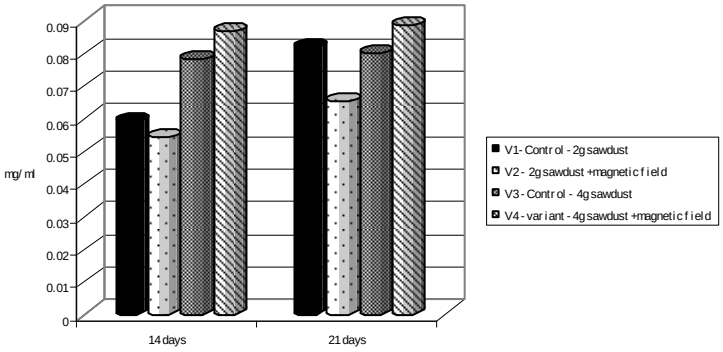

Fig. 2. Influence of magnetic field on the protein content in *Trichoderma viride*

The data regarding the influence of the electromagnetic fields (continuous and pulsed) on the protein content in *Chaetomium globosum* are presented in figure 3, wherefrom it results that at 14 days from seeding the value of this parameter was: 0,0306 mg% at V6, 0,0499 mg% at V5, 0,0510 mg% at V2, 0,0518 mg% at V1, 0,0677 mg% at V4 and 0,0708 mg% at V3. At 21 day from seeding these values obtained were: 0,0348 mg% at V1, 0,0503 mg% at V2, 0,0513 mg% at V5, 0,0658 mg% at V6, 0,0688 mg% at V3 and 0,0754 mg% at V4.

Analysing the dynamics of the protein content at the two interval studies, it was observed an increasing at V4 from 0,0677 mg% to 0,0754 mg%, V5 from 0,0499 mg% to 0,0513

mg%, V6 from 0,0306 mg% to 0,0658 mg% and a decreasing at V1 from 0,0518 mg% to 0,0348 mg%, V2 from 0,0510 mg% to 0,0503 mg% and at V3 from 0,0708 mg% to 0,0688 mg%.

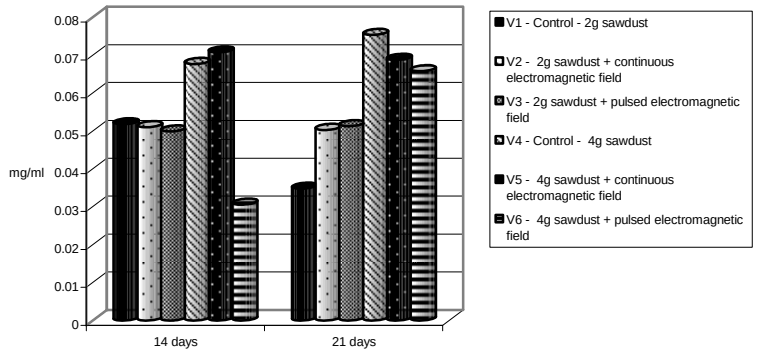

Fig. 3. Influence of electromagnetic fields (continuous and pulsed) on the protein content in *Chaetomium globosum*

The results regarding the influence of the electromagnetic fields (continuous and pulsed) on the protein content in *Trichoderma viride* are presented in figure 4, which shown that at 14 days from seedig the highest value of this parameter was registered at: V4 and V6 – 0,0828 mg% each, followed by: V3 - 0,0694 mg%, V5 - 0,0571 mg%, V2 - 0,0524 mg% and V1- 0,0467 mg%. At 21 day from seeding these values obtained were: 0,0651 mg% at V1, 0,0666 mg% at V5, 0,0684 mg% at V4, 0,0707 mg% at V2, 0,0784 mg% at V6 and 0,0922 mg% at V3.

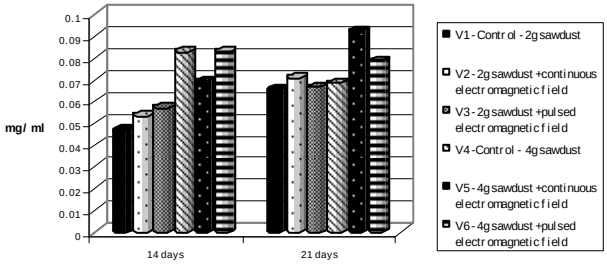

Fig. 4 . Influence of electromagnetic (continuous and pulsed) field on the protein content in *Trichoderma viride*

Analysing the dynamics of the protein content at the two interval studies, it was observed an increasing at V1 from 0,0467 mg% to 0,0651 mg%, V2 from 0,0534 mg% to 0,0707 mg%, V3 from 0,0694 mg% to 0,0922 mg%, V5 from 0,0571 mg% to 0,0666 mg% and a decreasing at V4 from 0,0828 mg% to 0,0684 mg% and at V6 from 0,0828 mg% to 0,0784 mg%.

CONCLUSIONS

- Magnetic field (MF) stimulated the protein content in *Chaetomium globosum* at V2 (2g sawdust + magnetic field) after 14 and 21 days from seeding; in *Trichoderma viride* the protein content was stimulated by magnetic field at V4 (4g sawdust + magnetic field) at two intervals of time from seeding comparatively with control.

- Electromagnetic field (EMF) stimulated the protein content in *Chaetomium globosum* at V5 (4g sawdust + continuous electromagnetic field) after 14 days from seeding and in V2 (2g sawdust + continuous electromagnetic field), V3 (2g sawdust + pulsed electromagnetic field) after 21 days comparatively with control. In *Trichoderma viride* the protein content was stimulated in V2 (2g sawdust + continuous electromagnetic field) and V3 (2g sawdust + pulsed electromagnetic field) after 14 days from seeding and V2 (2g sawdust + continuous electromagnetic field), V3 (2g sawdust + pulsed electromagnetic field), V5 (4g sawdust + continuous electromagnetic field) and V6 (4g sawdust + pulsed electromagnetic field) after 21 days from seeding.

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