Screening of some Cost Effective Media for Submerse Cultivation of Macromycetes Mycelium

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Abstract

The present paper aimed to study the growth and development of two macromycetes, *Flammulina velutipes* and *Ganoderma applanatum* on enriched culture medium as follows: Hwang medium, sorghum deposit and wine yeast. It was found that the influence of culture medium varies depending on the species. The medium containing sorghum lead to increased weight of mycelia biomass for both species, and the yeast wine medium strongly stimulated *G. applanatum* development, but significantly inhibited the species *F. velutipes*. The results demonstrate that the raw materials with less economic value have a significant potential when used in mushrooms submersed cultivation, because the low costs of the cultivation technology and the use of residues from food industry and industrial by-products lead in this case to obtain profitable technologies for bioproducts.

Keywords: *byproducts, mushroom, submerse cultivation, macromycetes, mycelium*

INTRODUCTION

Researches on various species of mushrooms proved their usefulness as sources of bioactive compounds. Submersed cultivation of mushrooms on different cultivation substrates from renewable sources is a cost-effective alternative for efficient production of mycelium and metabolites (Philippoussis *et al.,* 2007; Vladimir, 2012). Most of the lignocellulosic wastes (such as wheat, rice, paddy straw, sawdust, cotton waste, straw, corn residues) are available and can be used as cheap substrates for the production of mushrooms and the use of these wastes in cultivation has a high rate of bioconversion (Gaitán *et al.,* 2006).

AIMS AND OBJECTIVES

The goal of this work was selection of different cultivation substrates from renewable natural sources in order to obtain a mycelium biomass rich in bioactive compounds with antimicrobial and antioxidant properties

MATERIALS AND METHODS

The mushrooms analyzed were natural isolates of *Ganoderma applanatum* and commercial strains of *Flammulina velutipes*. Submersed cultivation was realized on different byproduct as substrates (wine yeast, sorghum deposit resulted from bioethanol production within international project "Biofuels –source of common sustainable development in the cross-border cooperation area"). Both extracts were obtained with distilled water at a ratio of 1: 2. The mixture was sonicated for 10 minutes at of 45°C and an amplitude of 40%, then filtered. For the determination of the dry substance of the two extracts the collected samples were dried at 105°C to constant weight. The biuret method was used for the determination of protein. Total carbohydrate content was determined by the method of Scott and Melvin using anthrone reagent and the reducing carbohydrate by spectrophotometric method described by Nelson Somogy.

Tab. 1. The biochemical determinations

	Dry substance %	Protein concentration (mg/ml)	Total carbohydrates (µg/ml)
Sorghum deposit extract	3.65	1.056 ± 0.043	38.343 ± 2.316
Wine yeast extract	3.72	9.140 ± 0.235	66.421 ± 0.703

Tab. 2. Weight of the mycelial biomass

	medium I (g)	medium II (g)	medium III (g)
G. applanatum	2.3944	7.9584	27.3523
F. velutipes	12.1315	14.1386	4.8439

To obtain stock cultures, pieces of fruition corpus were placed in Petri dishes in culture media prepared from malt extract agar 2% and potato dextrose agar (PDA) and were incubated at 25°C for one week.

After growth, 5 mm mycelium disks cut from growing areas were placed in 500 ml Erlenmeyer flasks each containing 100 ml of liquid medium (I) prepared according to Hwang (II) medium prepared with sorghum deposit extract resulted from bioethanol production (III) medium prepared with wine yeast.

RESULTS AND DISCUSSION

Considering that wine yeast extract shows superior features than the sorghum deposit one (protein concentration, total carbohydrates), it can be noticed that the nutritional requirements of the two macromycetes are very different (*Tab. 1*).

Industrial and food industry byproducts are rich sources of sugar and other useful compounds, easily metabolized by mushrooms, leading to large quantities of fungal biomass. As it can be noticed from *Table 2*, the influence of culture medium varies depending on the species. Thus, *G. applanatum* had the greatest weight in the mycelial biomass culture medium enriched with wine yeast, showing an increase of 24.96 g higher than the basal medium, while *F. velutipes* grew best on bioethanol sorghum deposit medium (5.56 g versus basal medium).

CONCLUSION

The results demonstrate that raw materials with less economic value have a significant potential for mushrooms submersed cultivation. The low costs of the cultivation technology can lead to economic advantage at industrial scale. The use of residues from food industry and industrial by-products led case to obtaining profitable technologies. These results are promising, but require further studies to optimize the growth conditions and extraction methods to recover larger amounts of biologically active compounds.

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REFERENCES

1. Gaitán-Hernández R, Esqueda M, Gutiérrez A, Sánchez A, Beltrán-García M, Mata G (2006). Bioconversion of agrowastes by *Lentinula edodes*: the high potential of viticulture residues, Appl Microbiol Biotechnol 71: 432–439.
2. Philippoussis A, Diamantopoulou P, Israilides C (2007). Productivity of agricultural residues used for the cultivation of the medicinal fungus *Lentinula edodes*. Int Biodeter Biodegr 59: 216–219.
3. Vladimir E (2012). Submerged Cultivation of Medicinal Mushrooms: Bioprocesses and Products (Review), International Journal of Medicinal Mushrooms, 14(3): 211–239.