

INFLUENCE OF PLANT EXTRACTS ON THE BIOSYNTHESIS PROCESS OF CAROTENOIDS YEAST

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Abstract: The largest part of the cost of producing the cell mass of microorganisms, are a valuable raw material for obtaining biologically active substances, namely carotenoids with antioxidant properties, it is necessary for raw materials. It is relevant and appropriate to the search for effective low-cost sources of raw materials to be used as a source of energy and nutrients for receiving the microbial natural carotenoids. The paper presents the results of research on the effect of extracts of vegetable meal-apple, grapes and tomatoes, on the process of carotene-forming and biosynthesis of β -carotene yeast genus *Rhodotorula*.

Keywords: pigments, carotinoids, β -carotene, biosynthesis.

Introduction

Presently, there is an extensive literature on the problem of carotenogenesis microorganisms [7; 8, 20]. In the course of a living cell carotenoid biosynthesis is regulated by a number of external and internal factors. The number of all carotinoid pigments formed in cells of microorganisms is highly dependent on the species. A great influence on the growth of cells and the synthesis of pigments microorganisms has physico-chemical environmental factors: aeration, temperature, light, the reaction of environment, structure of the environment [12; 13; 19].

One of the main factors for the active life of yeast is the presence in the medium of available energy sources, which are carbohydrates. Elucidation of the first metabolic pathways (fermentation of glucose to ethanol and CO_2) made yeast, according to literary data, was the model for all subsequent research on the intermediate metabolism of living organisms [7; 15; 20].

It is known that the enzymatic use of carbon sources yeast is their common characteristic. All yeast is capable of fermenting glucose, and the intensity of fermentation is proportional to the number of cells and their physiological age. The presence of vitamins in yeast cultivation environment also affects the course of fermentation [8; 18; 19].

According to the literature, the largest part of biomass production cost is on raw materials. The search for effective low-cost sources of raw materials, on the one hand, and effective ways of recycling various manufactures, on the other hand, determines the feasibility of using of these wastes and secondary products as sources of energy and substances for receiving carotenoids microbial nature [3; 4; 11; 16].

The aim of this study was to examine the effects of plant extracts derived from waste canning and wine industry-apple, grape and tomato meal, carotenoid biosynthesis and the β -carotene pigment forming yeast genus *Rhodotorula*.

Materials and Methods

The object of research served as yeast strain *Rhodotorula gracilis* –YS–03 from the National Collection of Non–pathogenic Microorganisms of the Republic of Moldova. The yeast was cultivated on a nutrient medium MZ–30 [9] with the use of plant extracts (grape, apple, tomato). Cultivation conditions: +25...+27°C, pH–5.5 –6.5, in a shaker at 180–200 rpm/min., lighting 12–15 thousands erg/cm² for 5 days.

The identification of pigments was conducted by spectrophotometric method [8]. The extraction of carotenoid pigments according to the modified method of Peterson [15].

Results and Discussion

According to studies, the number of carbohydrates in plant extracts products of agro–industrial waste varies from 10 to 43 mg/ml. The highest sugar content of – 43 mg/ml is contained in the grape extract, tomato extract, 10 mg/ml and apple extract–33 mg/ml.

Study of the effect of meal extracts on carotenogenesis yeast showed that the presence of the latter in the composition of the nutrient medium has a positive effect on the accumulation of pigments in biomass.

So, the addition of grape marc extract has increased the amount of carotenoids in biomass at 56 %, equivalent to 684.99 mkg/g dry solids. It should be noted that the process of yeast pigmentation intensified and when incorporated in the nutrient medium of tomato extract and apple bagasse 42 and 25%, respectively, compared with control.

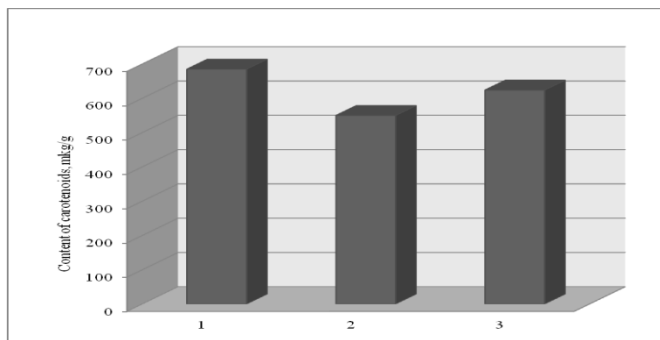


Fig.1. Influence of plant extracts on the content of carotinoids in the yeast *Rhodotorula gracilis* CNMN–YS–03 (1–extract of grape marc distillates, 2 – extract of tomato pomace, 3–extract of apple pomace)

The stimulating effect of the grape marc extract distillates will probably explain not just in sugars, which are an additional source of energy needed for an active life of yeast, but also by the presence in its composition of trace elements and vitamins.

The influence of extracts of vegetable meals on the biosynthesis of β –carotene is shown in figure 2. The results showed that the biosynthesis of β –carotene yeast *Rhodotorula gracilis* CNMN–YS–03 is activated when cultured on nutrient media, containing any of the investigated extracts of vegetable meals.

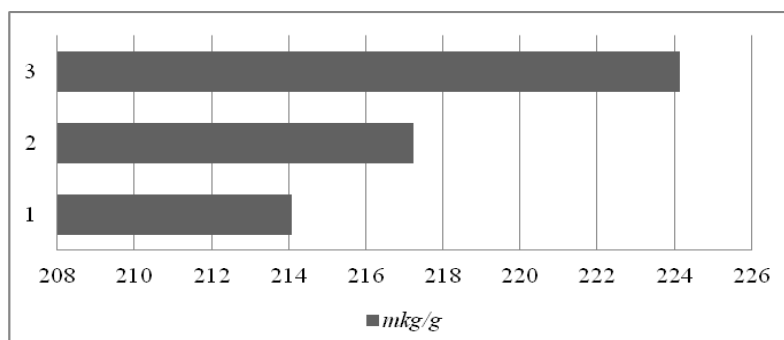


Fig. 2. Influence of vegetable meals extracts on the biosynthesis of β -carotene (1–extract of grape marc distillates, 2 – extract of tomato pomace, 3–extract of apple pomace).

The content of β -carotene in yeast cells, this increases to 21–27% compared with control. It should be noted that the maximum stimulating effect is achieved by the cultivation of pigmented yeast on a nutrient medium with an extract of tomato pomace: the number of β -carotene is this variant experience with 224.14 mkg/g in dry cell mass, or 27% more as compared with the control.

Thus, studies have shown that the waste of agricultural production—extracts of apple, grape and tomato pomace – are of practical interest, as additional sources of carbohydrates, macro and microelements in the composition of nutrient media for the cultivation of pigmented yeast. H – j

Conclusion

The use of plant extracts in the composition of the nutrient medium for cultivation of yeast has a stimulating effect on the formation process of carotene.

The highest amount of carotenoids in the biomass of yeast *Rhodotorula gracilis* CNMN–YS–03 was observed when used as part of the nutrient medium extract of grape marc, which allows to increase the yield of pigments on 55%. The use of tomato pomace extract has a stimulating effect on the biosynthesis of the main pigments of yeast, β -carotene, the number of which increased by 27% compared to the control sample.

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