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Evaluation of the enzymatic activity of immobilized *Lysobacter sp.* microorganisms

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INTRODUCTION & AIM

The specific enzymatic activity of bacterial cultures illustrates the key applications of a studied strain of bacteria and the biological products based on it.

The aim of this study was to determine the enzymatic activity of immobilized *Lysobacter sp.* cells on inorganic matrices.

METHOD

The assessment of proteolytic activity was determined by the spectrophotometric method using a UV/Vis spectrophotometer for studying nano- and microvolumes of liquids NABI NICRODIGITAL. A 1% aqueous solution of casein was used as a substrate.

A unit of β-1,4-glucanase activity was defined as the amount of enzyme that can produce 1 µmol of glucose in 1 minute according to the assay condition.

The Bradford method was used to determine protein concentration. Bovine serum albumin (BSA) was used as a standard. Fractions with the highest β1,4-glucanase activity were pooled and lyophilized.

RESULTS & DISCUSSION

The maximum proteolytic activity of enzymes in the culture liquid of the studied Lysobacter strain is observed at a temperature of 40°C.

Immobilization of cells on carriers generally has a positive effect on enzyme production and activity. In the case of immobilization on sodium carboxymethylcellulose and the sodium form of montmorillonite, the temperature range of enzymatic activity expands from 35°C to 45°C, which will expand the use of biocompositions based on immobilized cells and their enzymes.

The proteolytic activity of extracellular enzymes in the temperature range 20-40 and the activity of β-1,4-glucanase were studied, and the influence of pH and temperature on the activity and stability of the enzyme was revealed.

Optimal cultivation conditions for the Lysobacter strain were selected for the highest production of β-1,4-glucanase: glucose, 1% by weight; yeast extract, 0.2% by weight; CMC, 0.75% by weight; pH 7; amount of inoculum, 3.5% by volume; and optimal temperature for incubation, 30°C (Figure 1).

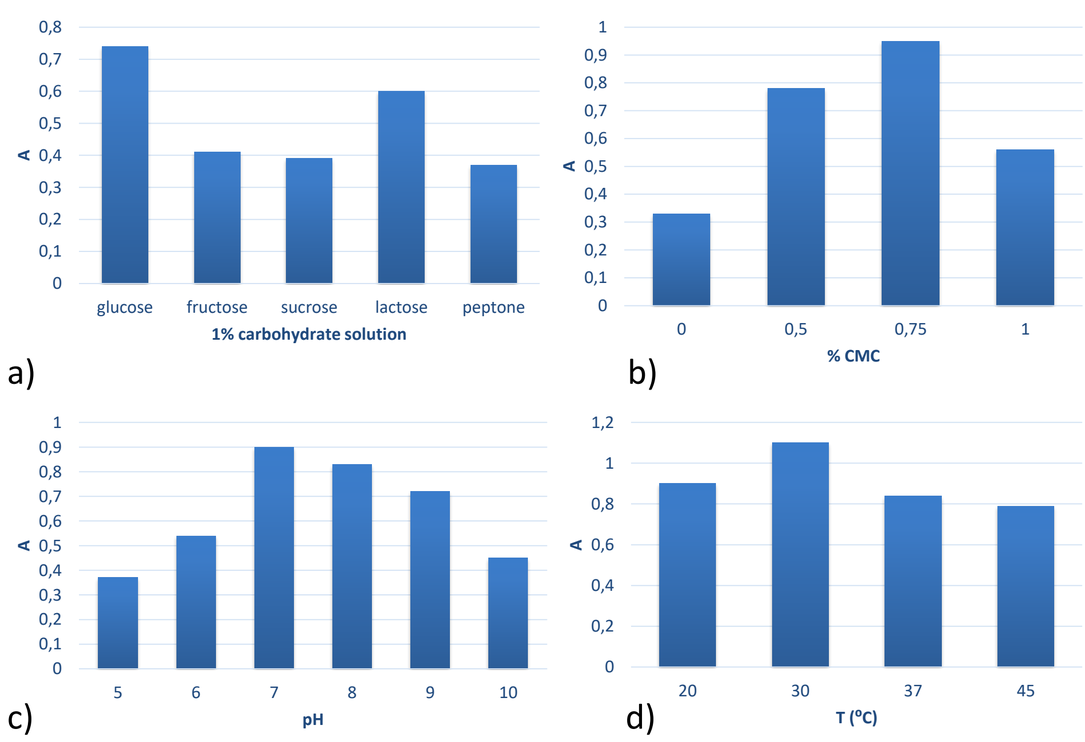

Figure 1. Optimization of the growing medium:
a) percentage of carbohydrate source;
b) b) percentage of carboxymethylcellulose (CMC); c) pH; d) temperature

Enzyme stability results showed that the enzyme retained 90% of its activity after minimal preincubation at pH 5.5 and more than 60% of its maximum activity at pH 4–10, demonstrating stability over a wide pH range. Therefore, it can be considered as an acid/alkali-resistant enzyme. It was found that the greatest activity of the enzyme occurs at 50 °C. When the temperature is increased to 50 °C, the enzyme activity increases and then decreases linearly. More than 60% of β-1,4-glucanase's enzymatic activity is observed in the range of 20-60 °C.

CONCLUSION

Consequently, biocompositions based on *Lysobacter sp.* can be used in a wide range of temperatures and pH, which represents its promising use as a probiotic drug.

The work was carried out within the framework of the state task FZWG-2023-0007. Adaptive reactions of microorganisms: theoretical and applied aspects.

FUTURE WORK / REFERENCES

In the future, it is planned to obtain biocompositions based on *Lysobacter sp.* and other probiotic microorganisms for the purpose of creating veterinary drugs and feed additives for farm animals.

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