Silkworm pupa globulin promoted the liquid fermentation of Cordyceps militaris to produce cordycepin

Hao-Tian Yao[1], Yi-Tong Li [1], Lu-Chan Gong[1, 2], Fu-An Wu[1, 2], Jun Wang [1, 2*]

[1]School of Biotechnology, Jiangsu University of Science and Technology, Zhenjiang 212018, PR China

[2]Sericultural Research Institute, Chinese Academy of Agricultural Sciences, 212018 Zhenjiang, China

E-mail: wangjun@just.edu.cn (Prof. Dr. Jun. Wang)

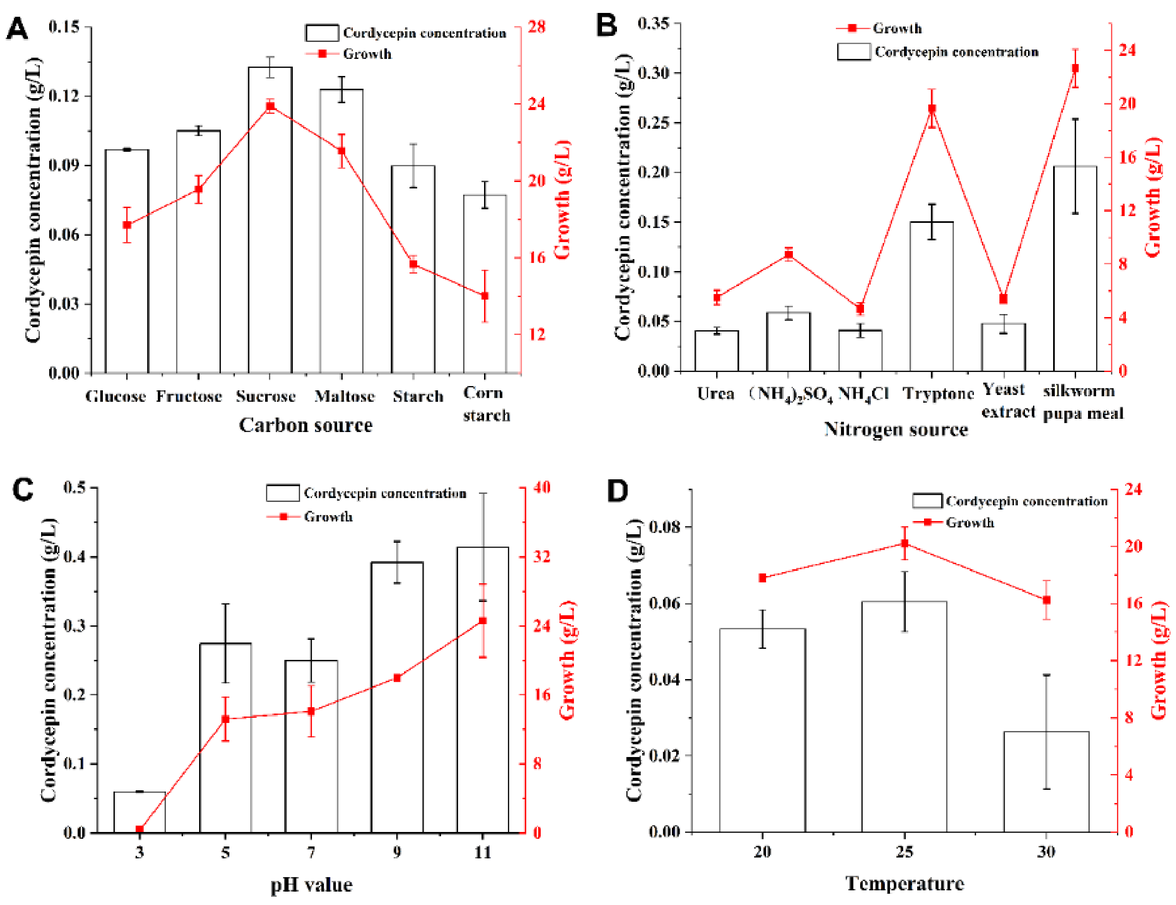
Introduction

Cordycepin was originally found in the fermentation broth of Cordyceps militaris, which is a nucleoside analogue. The structure of cordycepin is similar to adenosine. This unique structure of cordycepin enables it to bind to adenosine receptors and produce a wide range of pharmacological regulation. In order to prepare cordycepin in large quantities, chemical synthesis methods have been studied for a long time. However, there are still problems such as difficulty in purchasing raw materials and low purity of productsTherefore, it is necessary to find an efficient preparation of high purity cordycepin.

Content

In this work, the single factor optimization method was used to screen the carbon source, nitrogen source, temperature and medium PH value suitable for cordycepin production by Cordyceps militaris. According to the polarity difference, five silkworm pupa extracts were isolated and added to the medium, and it was found that the silkworm pupa protein promoted the synthesis of cordycepin. Using osborne, silkworm pupa proteins were divided into four categories and added to the medium as additional nitrogen sources. It was found that globulin played a great role in promoting the production of cordycepin. Fig. 1 indicates that sucrose and peptone were selected as the carbon and nitrogen sources of the medium, and the liquid fermentation of Cordyceps militaris was most suitable at pH 9 and temperature 26 ° C. Fig. 2 reveals that silkworm pupa protein promotes the synthesis of cordycepin. Fig. 3 reveals that globulin protein promotes the synthesis of cordycepin.

Fig. 1 Optimization of liquid fermentation conditions.
(A) Effects of different carbon sources on cordycepin production;
(B) Effects of different nitrogen sources on cordycepin yield;
(C) Effects of different pH values on cordycepin production;
(D) Effects of different temperatures on cordycepin production.



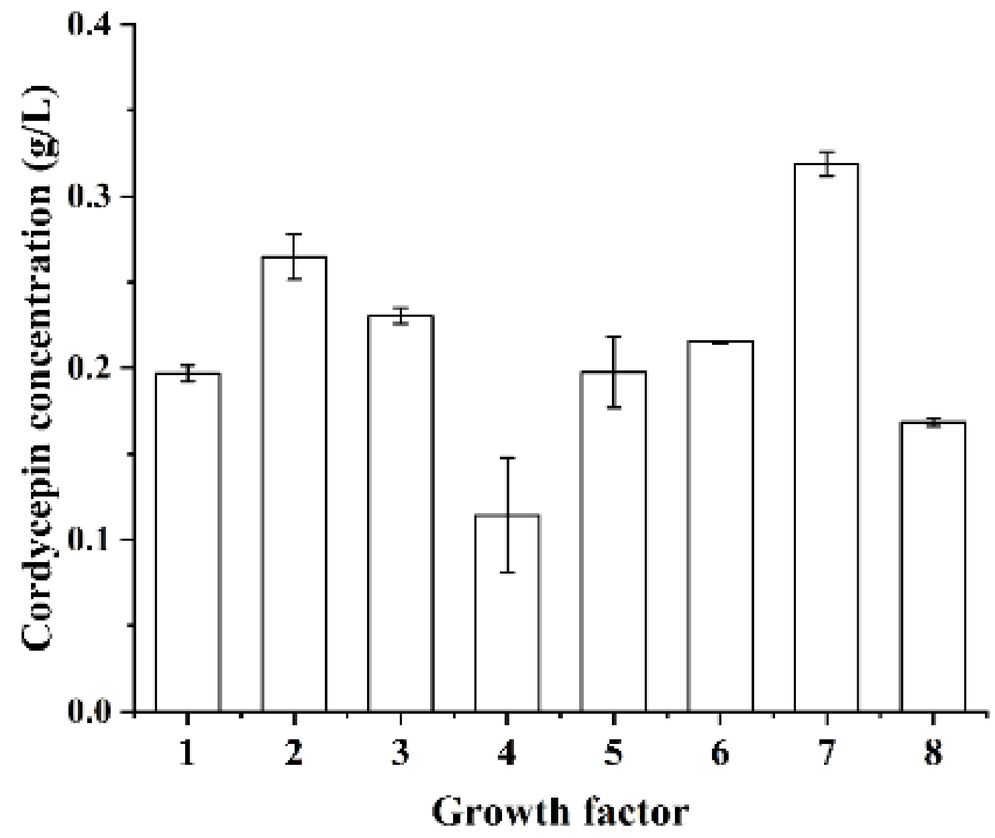


Fig. 2 Effect of silkworm pupa grading products on cordycepin synthesis. (1) additive-free; (2) silkworm pupa meal; (3)petroleum ether extract; (4) ethyl acetate extract; (5) chloroform extract; (6) methanol extract; (7) silkworm pupa protein; (8) silkworm pupa residue

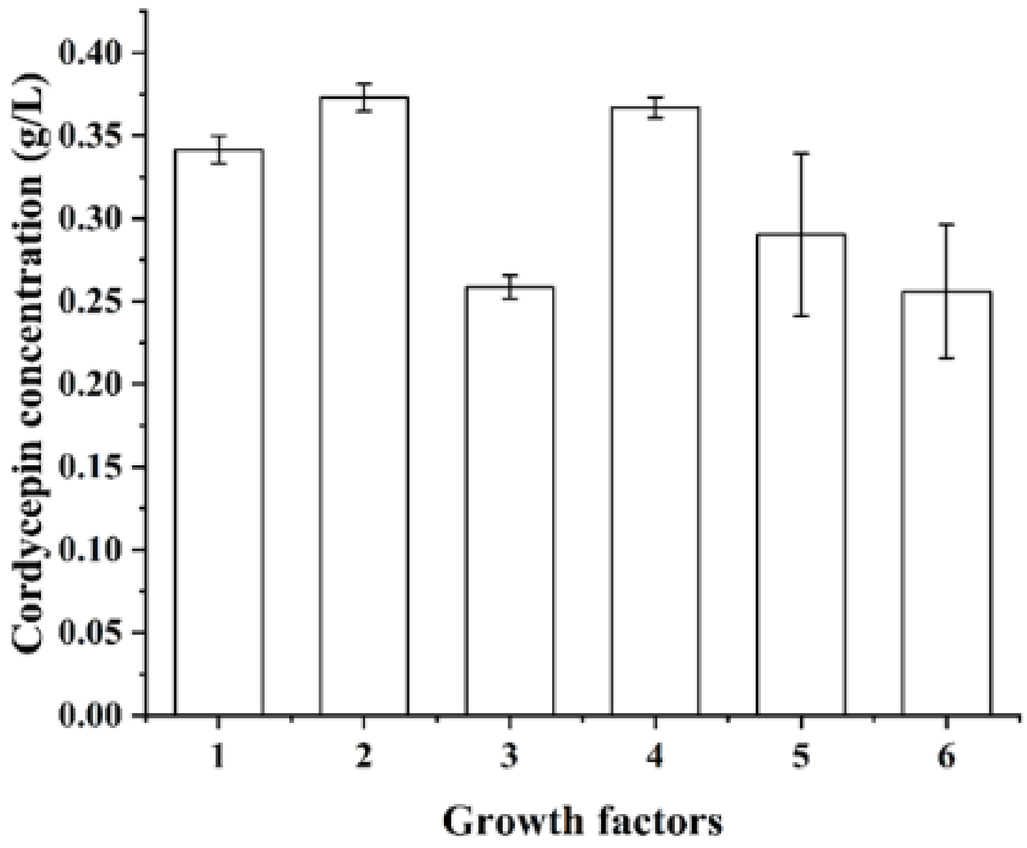


Fig. 3 Effect of silkworm pupa protein grading products on cordycepin synthesis. (1) silkworm pupa meal; (2) silkworm pupa protein; (3) albumin; (4) globulin; (5) gliadin; (6) gluten

Conclusion

Consequently, the use of liquid fermentation to quickly obtain high-purity cordycepin has opened up a new way for the comprehensive utilization of mulberry resources and further solved the market demand for high-quality cordycepin.

Acknowledgementn

This work was supported by the National Natural Science Foundation of China General Project (21676130), Jiangsu University Natural Science Major Project (16KJA530002), Jiangsu Province Fifth Phase ' 333 Project ' Funding Plan (BRA2019281)

References

[1] Yang, L., Li, G., Chai, Z., Gong, Q., Guo, J., 2020. Synthesis of cordycepin: current scenario and future perspectives. Fungal Genetics and Biology, 143, 103431.
[2] Wang, L., Yan, H., Zeng, B., Hu, Z., 2022. Research Progress on Cordycepin Synthesis and Methods forEnhancement of Cordycepin Production in Cordyceps militaris. Bioengineering-Basel, 9(2), 69.
[3] Huang, S., H. Liu, et al., 2017. "An effective and convenient synthesis of cordycepin from adenosine." Chemical Papers, 72(1): 149-160
[4] Das, S. K., M. Masuda, et al., 2008. "A new approach for improving cordycepin productivity in surface liquid culture of Cordyceps militaris using high-energyion beam irradiation." Lett Appl Microbiol, 47(6): 534-538.
[5] Lim, L., C. Lee, et al., 2012. "Optimization of solid state culture conditions for the production of adenosine, cordycepin, and D-mannitol in fruiting bodies of medicinal caterpillar fungus Cordyceps militaris (L.:Fr.) Link (Ascomycetes)." Int J Med Mushrooms, 14(2): 181-187