



Abstract

# Investigation of Antibacterial Activity and Synergistic Antibacterial Potential of Sericin Protein Extracts <sup>†</sup>

Su-Jin Seo <sup>1</sup>, Han-Seung Shin <sup>1</sup>, Gitishree Das <sup>2</sup> and Jayanta Kumar Patra <sup>2,\*</sup> 

<sup>1</sup> Department of Food Science and Biotechnology, Dongguk University-Seoul, Goyang-si 10326, Korea

<sup>2</sup> Research Institute of Integrative Life Sciences, Dongguk University-Seoul, Goyang-si 10326, Korea

\* Correspondence: jkpatra@dongguk.edu

<sup>†</sup> Presented at the 3rd International Electronic Conference on Foods: Food, Microbiome, and Health—A Celebration of the 10th Anniversary of Foods' Impact on Our Wellbeing, 1–15 October 2022; Available online: <https://sciforum.net/event/Foods2022>.

**Abstract:** Many antibacterial agents have been continuously used by various industries in order to extend shelf life by controlling spoilage bacteria and reducing the risk of pathogenic bacteria. However, there are concerns related to safety and various health-related issues. The sericin in silk cocoons is considered as a waste product in the silk industry and is usually thrown away. Sericin is known to possess a number of important biochemical properties. Considering this, in the present study, sericin protein was extracted from silk cocoons via a degumming process, and its antibacterial activity was investigated against a number of foodborne pathogenic bacteria using standard procedures. Its synergistic antibacterial activity was also investigated using both sericin protein and standard antibiotics such as ampicillin, azithromycin, cephalexin, erythromycin, gentamycin, kanamycin, and streptomycin. The results showed that sericin extract displayed a prominent antibacterial effect against all the tested foodborne pathogenic bacteria, with the diameter of inhibition zones ranging from  $9.44 \pm 0.04$  mm to  $12.09 \pm 0.58$  mm, and the results were comparable with those of the standard antibiotics. The sericin extract at 500 µg/disc displayed the highest inhibition zones against both the tested *E. coli* ( $12.09 \pm 0.58$  mm) and the *L. monocytogenes* ( $11.51 \pm 0.35$  mm). Furthermore, sericin along with the standard antibiotics at (25 µg + 5 µg respectively)/disc displayed significant antibacterial potential against all the tested foodborne pathogenic bacteria, with the highest inhibition zone against *Salmonella* Typhimurium ( $26.59 \pm 0.74$  mm). The minimum inhibitory concentration and the minimum bactericidal concentration values of the sericin extract ranged from 0.0625 to 1.0 mg/mL. These data suggested that sericin extract has promising antibacterial potential that can be utilized in various industries as an effective antibacterial agent.

**Keywords:** sericin protein; antibacterial; *Escherichia coli*; *Listeria monocytogenes*; *Salmonella* Typhimurium



**Citation:** Seo, S.-J.; Shin, H.-S.; Das, G.; Patra, J.K. Investigation of Antibacterial Activity and Synergistic Antibacterial Potential of Sericin Protein Extracts. *Biol. Life Sci. Forum* **2022**, *18*, 1. <https://doi.org/>

Academic Editor: Antonio Cilla

Published: 30 September 2022

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

**Supplementary Materials:** The following are available online at <https://www.mdpi.com/article/10.3390/Foods2022-13018/s1>.

**Author Contributions:** Conceptualization, J.K.P. and G.D.; validation, G.D. and J.K.P.; formal analysis, S.-J.S. and J.K.P.; writing—original draft preparation, S.-J.S., G.D. and J.K.P.; writing—review and editing, J.K.P., G.D. and H.-S.S.; supervision, G.D., H.-S.S. and J.K.P.; project administration, J.K.P.; funding acquisition, J.K.P. All authors have read and agreed to the published version of the manuscript.

**Funding:** This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No. 2020R1G1A1004667), the Republic of Korea.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Acknowledgments:** Authors are grateful to Dongguk University, the Republic of Korea for support. This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No. 2020R1G1A1004667), the Republic of Korea.

**Conflicts of Interest:** The authors declare no conflict of interest.