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Article

Enhancement of Solubility and Bioavailability of Quercetin by Inclusion Complexation with the Cavity of MonoÃƒÂ¢Ã‚Â€Ã‚Â•6Ã‚ÃƒÂ¢Ã‚Â€Ã‚Â•deoxyÃƒÂ¢Ã‚Â€Ã‚Â•6Ã‚ÃƒÂ¢Ã‚Â€Ã‚Â•aminoethylaminoÃƒÂ¢Ã‚Â€Ã‚Â•Ã‚ÃƒÂŽÃ‚Â²ÃƒÂ¢Ã‚Â€Ã‚Â•cyclodextrin

Kyeong Hui Park

Department of Systems Biotechnology, Microbial Carbohydrate Resource Bank (MCRB), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

These authors contributed equally to this work.Search for more papers by this author

Jae Min Choi

Institute for Ubiquitous Information Technology and Applications (UBITA), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

These authors contributed equally to this work.Search for more papers by this author

Eunae Cho

Institute for Ubiquitous Information Technology and Applications (UBITA), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

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Daham Jeong

Department of Systems Biotechnology, Microbial Carbohydrate Resource Bank (MCRB), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

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Vijay Vilas Shinde

Institute for Ubiquitous Information Technology and Applications (UBITA), Center for Biotechnology

Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

Search for more papers by this author

Hyungsup Kim

Department of Organic and Nano System Engineering, Konkuk University, Seoul 05029, Republic of Korea

Search for more papers by this author

Youngjin Choi

Department of Food Science and Technology, BioChip Research Center, Hoseo University, Asan 31499, Republic of Korea

Search for more papers by this author

Seunho Jung

Corresponding Author

E-mail address:shjung@konkuk.ac.kr

Department of Systems Biotechnology, Microbial Carbohydrate Resource Bank (MCRB), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

Institute for Ubiquitous Information Technology and Applications (UBITA), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

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Kyeong Hui Park

Department of Systems Biotechnology, Microbial Carbohydrate Resource Bank (MCRB), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

These authors contributed equally to this work.Search for more papers by this author

Jae Min Choi

Institute for Ubiquitous Information Technology and Applications (UBITA), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

These authors contributed equally to this work.Search for more papers by this author

Eunae Cho

Institute for Ubiquitous Information Technology and Applications (UBITA), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

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Daham Jeong

Department of Systems Biotechnology, Microbial Carbohydrate Resource Bank (MCRB), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

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Vijay Vilas Shinde

Institute for Ubiquitous Information Technology and Applications (UBITA), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

Search for more papers by this author

Hyungsup Kim

Department of Organic and Nano System Engineering, Konkuk University, Seoul 05029, Republic of Korea

Youngjin Choi

Department of Food Science and Technology, BioChip Research Center, Hoseo University, Asan 31499, Republic of Korea

Seunho Jung

Corresponding Author

E-mail address:shjung@konkuk.ac.kr

Department of Systems Biotechnology, Microbial Carbohydrate Resource Bank (MCRB), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

Institute for Ubiquitous Information Technology and Applications (UBITA), Center for Biotechnology Research in UBITA (CBRU), Konkuk University, Seoul 05029, Republic of Korea

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Abstract

Quercetin (QUE) has a wide range of health benefits; however, its application is limited due to its low solubility. We synthesized monoÃƒÂ¢Ã‚Â€Ã‚Â•6ÃƒÂ¢Ã‚Â€Ã‚Â•deoxyÃƒÂ¢Ã‚Â€Ã‚Â•6ÃƒÂ¢Ã‚Â€Ã‚Â•aminoethylaminoÃƒÂ¢Ã‚Â€Ã‚Â•ÃƒÂŽÃ‚²ÃƒÂ¢Ã‚Â€Ã‚Â•cyclodextrin (EtÃƒÂ¢Ã‚Â€Ã‚Â•ÃƒÂŽÃ‚²ÃƒÂ¢Ã‚Â€Ã‚Â•CD) to overcome this limitation. The solubility of QUE was increased 35.1ÃƒÂ¢Ã‚Â€Ã‚Â•fold compared with QUE, by its complexation with EtÃƒÂ¢Ã‚Â€Ã‚Â•ÃƒÂŽÃ‚²ÃƒÂ¢Ã‚Â€Ã‚Â•CD. Changes in physicochemical properties following successful complexation were investigated using field emission scanning electron microscope, differential scanning calorimetry, and Fourier transform infrared spectroscopy. The complexation behavior of QUE and EtÃƒÂ¢Ã‚Â€Ã‚Â•ÃƒÂŽÃ‚²ÃƒÂ¢Ã‚Â€Ã‚Â•CD in aqueous solution was monitored by ^{1}H nuclear magnetic resonance (NMR), 2D rotating frame nuclear overhauser, and diffusionÃƒÂ¢Ã‚Â€Ã‚Â•ordered spectroscopy. The molecular docking simulation showed that the oblong shaped QUE is suitable for the formation of a stable complex with a characteristic cavity of EtÃƒÂ¢Ã‚Â€Ã‚Â•ÃƒÂŽÃ‚²ÃƒÂ¢Ã‚Â€Ã‚Â•CD. Furthermore, the antioxidant activity and photostability of QUE was also improved after its complexation with EtÃƒÂ¢Ã‚Â€Ã‚Â•ÃƒÂŽÃ‚²ÃƒÂ¢Ã‚Â€Ã‚Â•CD. From these results, we suggest that the characteristic elliptical cavity of EtÃƒÂ¢Ã‚Â€Ã‚Â•ÃƒÂŽÃ‚²ÃƒÂ¢Ã‚Â€Ã‚Â•CD can be utilized for other hardly soluble drug molecules, which can expand the development of drug delivery systems.

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