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CHARACTERIZATION AND PRIMARY RECOVERY OF FUNCTIONAL BIOACTIVE COMPOUNDS FROM EDIBLE BIRD’S NEST

LIM HONG KWONG

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CHARACTERIZATION AND PRIMARY RECOVERY OF FUNCTIONAL BIOACTIVE COMPOUNDS FROM EDIBLE BIRD'S NEST

By

LIM HONG KWONG

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The edible bird’s nest (EBN) is a saliva-cemented nest built by swiftlets (Collocalia spp. /Aerodramus spp.) during the breeding season, and it is found predominantly in Southeast Asia. However, little is known or is published about EBN and no scientific and technological findings on recovering bioactive compounds from EBN. Therefore, this study was conducted to characterize the physico-chemical, rheological behavior properties and recover the functional bio-compounds derived from EBN. The application of an aqueous two-phase system (ATPS) strategy to the potential recovery of bio-compounds (sialoglycoproteins) from the EBN was evaluated. This study revealed that the amino acid composition of EBN-extract was significantly higher ($P < 0.05$) than that of intact EBN, with the exception of the methionine content. Overall, the most abundant amino acids in the chemical structure of EBN-extract were aspartic acid (9.80 %), serine (9.50 %), and proline (8.81 %). The hydrophilic glycoprotein in EBN-extract was a heavily glycosylated protein, and this result was further supported by the presence of two glycoprotein bands at 110 and 130 kDa, as observed by SDS-PAGE analysis. The non-Newtonian flow behavior of Collocalia mucoid (EBN-extract) dispersions indicated that all concentrations (5 – 100 mg/mL) of the mucoid dispersions exhibited shear-thinning behaviors, which could best be described using the Herschel-Bulkley model. As the concentration of Collocalia mucoid dispersions increased, the appearance of a plateau shear modulus indicated the dispersion was exhibiting more gel-like behaviors. The Collocalia mucoid dispersions were thought to involve the physical entanglement of network
formations, which were able to form weak gels at high concentrations. The effects of hydrophilic solvent in the ATPS and the system parameters on partition behavior were evaluated. The partitioning of the EBN sialoglycoprotein was pH-dependent. Slightly more than 97% of the total EBN sialoglycoproteins were recovered in the top phase of ATPS under selected conditions. According to this study, the ATPS technique provides a simple, efficient, and economic recovery process for sialoglycoproteins derived from EBN and EBN by-products for the food, nutraceutical, pharmaceutical, cosmetic, and other related industries. This ATPS separation technique has great potential to be carried over to an industrial scale.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

PENCIRIAN DAN PEMULIHAN AWAL SEBATIAN BIO-AKTIF FUNGSIONAL DARIPADA SARANG BURUNG WALIT

Oleh

LIM HONG KWONG

Jun 2014

Pengerusi : Profesor Tan Chin Ping, PhD.
Fakulti : Sains dan Teknologi Makanan

Sarang burung walit (EBN) merupakan sarang burung yang dihasilkan daripada air liur burung walit (Collocalia spp. /Aerodramus spp.) semasa musim bertelur dan biasanya ditemui di Asia Tenggara. Walau bagaimanapun, hanya sedikit maklumat mengenai EBN telah diketahui atau diterbitkan dan tiada penemuan saintifik dan teknologi mengenai pemulihan sebatian bio-aktif daripada EBN. Justeru itu, kajian ini telah dijalankan untuk mencirikan sifat fiziko-kimia, kelakuan reologi dan pemulihan bio-sebatian fungsian yang diperolehi daripada EBN. Potensi penggunaan sistem akueus dua fasa (ATPS) strategi untuk pemulihan bio-sebatian (sialoglikoprotein) daripada EBN telah dinilai. Keputusan kajian ini menunjukkan bahawa komposisi asid amino daripada ekstrak EBN adalah lebih tinggi (P < 0.05) berbanding dengan EBN mentah, kecuali kandungan asid amino metionina. Secara keseluruhannya, kandungan asid amino dalam struktur kimia ekstrak EBN yang utama terdiri daripada asid aspartik (9.80 %), serin (9.50 %), dan prolin (8.81 %). Glikoprotein hidrofilik yang terdapat dalam ekstrak EBN adalah protein terglikosilat, dan keputusan ini turut disokong dengan kehadiran dua jalur glikoprotein pada 110 dan 130 kDa, seperti yang diperhatikan dalam analisis SDS-PAGE. Larutan lendir Collocalia (ekstrak EBN) yang berkelakuan aliran bukan “Newtonian” dan menunjukkan bahawa semua kepekatan (5 – 100 mg/mL) daripada larutan lendir mempamerkan tingkah laku yang ricuh penipisan yang dipadankan dengan model “Herschel-Bulkley”. Dengan peningkatan kepekatan larutan lendir Collocalia, kemunculan dataran modulus ricuh telah menunjukkan larutan tersebut lebih bersifat seperti gel. Keputusan ini
mencadangkan bahawa lendir *Collocalia* yang terlibat dalam pembentukan rangkaian secara fizikal yang akan menyebabkan larutannya bersifat gel yang lemah pada kepekatan yang tinggi. Kesan-kesan pelarut hidrofilik dalam sistem akueus dua fasa (ATP) dan beberapa parameter sistem terhadap tingkah laku pemisahan telah dinilai. Pemisahan sialoglikoprotein EBN adalah bergantung kepada pH. Lebih kurang 97 % daripada jumlah sialoglikoprotein EBN telah didapati dalam fasa atas ATPS di bawah keadaan yang terpilih. Kajian ini menunjukkan bahawa teknik ATPS merupakan satu proses pemulihan sialoglikoprotein daripada EBN dan hasil sampingan EBN yang mudah, berkesan, dan ekonomik untuk penggunaan dalam industri makanan, nutraceutikal, farmaceutikal, kosmetik, dan industri lain yang berkenaan. Teknik pemisahan ATPS ini amat berpotensi untuk dibawa ke skala industri.
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I certify that a Thesis Examination Committee has met on 18 Jun 2014 to conduct the final examination of Lim Hong Kwong on his thesis entitled “Characterization and Primary Recovery of Functional Bioactive Compounds from Edible Bird’s Nest” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

Members of the Thesis Examination Committee were as follows:

**Badlishah Sham Baharin, MSc**  
Associate Professor  
Faculty of Food Science and Technology  
Universiti Putra Malaysia  
(Chairman)

**Russly Abdul Rahman, PhD**  
Professor  
Faculty of Food Science and Technology  
Universiti Putra Malaysia  
(Internal Examiner)

**Mohd Shamsul Anuar, PhD**  
Senior Lecturer  
Faculty of Engineering  
Universiti Putra Malaysia  
(Internal Examiner)

**Chang Jo-Shu, PhD**  
Distinguished Professor  
Department of Chemical Engineering  
National Cheng Kung University  
Taiwan  
(External Examiner)

___________________________  
**NORITAH OMAR, PhD**  
Associate Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 21 July 2014
This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirements for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

**Tan Chin Ping, PhD**
Professor
Faculty of Food Science and Technology
Universiti Putra Malaysia
(Chairman)

**Faridah Abas, PhD**
Associate Professor
Faculty of Food Science and Technology
Universiti Putra Malaysia
(Member)

**Ling Tau Chuan, PhD**
Professor
Faculty of Science
University of Malaya
(Member)

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**BUJANG BIN KIM HUAT, PhD**
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School of Graduate Studies
Universiti Putra Malaysia

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