

Extraction of keratin from waste chicken feathers using sodium sulfide and L-cysteine

Firoozeh Pourjavaheri^a, Saeideh Ostovar Pour^a, Oliver A. H. Jones^b, Peter M. Smooker^a, Robert Brkljača^a, Frank Sherkat^a, Ewan W. Blanch^a, Arun Gupta^c, Robert A. Shanks^a

^a School of Science, RMIT University, Melbourne, Victoria, 3001, Australia

^b Australian Centre for Research on Separation Science (ACROSS), School of Science, RMIT University, Melbourne, Victoria 3001, Australia

^c Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, 25100, Kuantan, Pahang, Malaysia

ABSTRACT

Keratin was extracted from different segments of disposable waste chicken feathers (CF) including the whole feathers, calamus/rachis (β -sheet) and barbs/barbules (α -helix), using sodium sulfide and L-cysteine. The yield of extracted keratin from sodium sulfide and L-cysteine was ~88% and ~66% respectively. The mass ratio of feathers to reducing agent was 1:20 and the reaction temperature was 40 °C for 6 h. Concentration of keratin extracted by each method was measured using the Bradford assay. The protein extracted from each feather section was characterised using sodium dodecyl sulfate-polyacrylamide gel electrophoresis, vibrational spectroscopy including FTIR and Raman, nuclear magnetic resonance, and thermogravimetry. These results confirmed the keratin structures after each extraction methods. The study showed that α -helix and β -sheet based keratin could be extracted from CF using sodium sulfide and L-cysteine with high yields. This is the first report of CF keratin extraction using L-cysteine.

KEYWORDS

Feathers; Green chemistry; Protein; Polymers

ACKNOWLEDGEMENTS

The authors acknowledge Ms. Ibukun Aibinu, Ms. Wanlapa Chaibangyang and Mr. Andrew Sujecki for their contribution in helping with the SDS-PAGE study, Baiada Poultry Pty Ltd for supplying the chicken feathers and Dr. Michael Czajka for helpful comments on the manuscript. The first author (FP) is grateful for a Research Training Program (RTP) scholarship administered by RMIT University.