Faculty of Applied Sciences
Sabaragamuwa University of Sri Lanka

Out of the Press

Our publications - January

Volume 6 Issue 1

06th February 2026

Peer-reviewed Journal Articles

DFST

From Protein Folding to Misfolding: Pathways to Disease and Therapeutic Directions

Rinokshan R. & Kananke T.C.

Abstract

Proteins are complex macromolecules that perform a variety of biological functions in the living cell only when they are in their native state. Anfinsen's experiment shows that the native structure of a protein depends on the primary structure of the protein. The native state of protein is attained by protein folding, and this process is initiated by different intra- and intermolecular forces. Thermodynamic stability plays a key role in guiding protein folding, as proteins continuously shift and adjust their structure until they reach their most stable form. Molecular chaperones, cellular enzymes, and other cellular mechanisms drive protein folding. Despite all the guiding factors, proteins may misfold and form toxic aggregates of amyloid fibrils, and it can develop neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease, Huntington's disease, and prion diseases. Recent studies show that the incidence of neurodegenerative diseases associated with protein folding is becoming a threat to global health. Unfortunately, these diseases are incurable, and therapeutic approaches are currently being researched by scientists to mitigate this issue. Thus, study of protein folding and misfolding remains a key area of research in the bio-medical field.

About the Journal

Sri Lankan Journal of Biology

DOI: 10.4038/sljb.v11i1.185

Our Scholar

Dr. TC Kananke

Senior Lecturer

thilini@appsc.sab.ac.lk

DPST

Development and comprehensive characterization of a novel biodegradable sodium alginate–PVA blend solid polymer electrolyte for Mg-ion conduction

H. P. U. Kalhara, H. N. M. Sarangika, Kaveenga R. Koswattage, Niroshan Gunawardana, Nanditha Rajapaksha & Nadeesha P. W. Rathuwadu

Abstract

In this work, biodegradable solid polymer electrolytes (BSPEs) were developed using a blend of sodium alginate (SA) and polyvinyl alcohol (PVA), integrated with magnesium acetate tetrahydrate ($Mg(CH_3COO)_2.4H_2O$) and glycerol. The formulations were systematically optimized for ionic conductivity and mechanical flexibility by stirring the mixture for 8 h, followed by solution casting at 60 °C and vacuum drying. Different quantities of PVA, Mg $(CH_3COO)_2.4H_2O$, and glycerol were tested across five levels each. The optimal composition 0.25 g $Mg(CH_3COO)_2.4H_2O$, 0.15 g PVA, 0.06 g SA, and 0.05 g glycerol exhibited the highest ionic conductivity and flexibility. Electrochemical Impedance Spectroscopy (EIS) measurements showed an ionic conductivity of 9.82 × 10⁻4 S cm⁻1, while Linear Sweep Voltammetry (LSV) revealed an electrochemical stability window of 2.47 V. DC polarization studies indicated a total ionic transference number (t_{ion}) of 0.98, with a cationic contribution (t^+) of 0.32. Fourier Transform Infrared Spectroscopy (FTIR) analysis confirmed effective interactions among PVA, SA, and Mg $(CH_3COO)_2.4H_2O$, and X-ray Diffraction (XRD) patterns suggested an increased amorphous character in the polymer matrix. Thermal behavior, evaluated by Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA), showed a glass transition temperature (T_g) of 32 °C and moderate thermal stability. Scanning Electron Microscope (SEM) imaging demonstrated uniform distribution of granules, consistent with enhanced Mg^{2+} ion density. Overall, the SA-PVA-Mg $(CH_3COO)_2.4H_2O$-glycerol system represents a promising magnesium-ion-conducting BSPE with excellent electrochemical properties.

About the Journal

Journal of Solid State Electrochemistry

Impact Factor – 2.6

https://doi.org/10.1007/s10008-025-06508-6

Our Scholar

Dr. HNM Sarangika

Senior Lecturer

sarangikah@appsc.sab.ac.lk

Conference Proceedings

Development and Evaluation of Functional, Physicochemical, Microbial and Sensory Properties of Cookies Incorporated with Avocado (*Persea americana*) Flesh Powder

R.M.D.S.B. Rathnayake and T.C. Kananke

Abstract

Cookies are high in fat, prompting a search for natural fat replacers that preserve taste and texture. Avocado (*Persea americana*) flesh powder, rich in healthy unsaturated fats, fibre, and antioxidants, was investigated as a novel ingredient to enhance the nutritional and antioxidant properties of cookies without compromising acceptability. Three avocado varieties; Simmonds, Fuerte, and Pinkerton were processed into powders by tray drying and milling the flesh. Powders were evaluated for physicochemical, functional and nutritional properties. The Pinkerton variety exhibited a superior profile, with desirable moisture (6.82 ± 0.02%), bright color (L* = 58.37 ± 1.01, a* = 2.79 ± 0.49, b* = 39.82 ± 0.25), and a high-water absorption capacity (4.26 ± 0.05 g/g). Nutritionally, it contained 5.08 ± 0.34% crude protein, 6.45 ± 0.46% crude fibre, 2.23 ± 0.21% ash, and 15.10 ± 0.22% crude fat, showing significant varietal differences ($p < 0.05$). Pinkerton also showed high phenolic content (210.13 ± 1.74 mg GAE/g DW) and antioxidant activity (70.23 ± 0.97%). Cookies were prepared by substituting wheat flour with Pinkerton powder at 10%, 20%, 30%, and 50% levels. Sensory evaluation with 30 untrained panelists revealed that the 20% formulation was most acceptable, showing the highest ($p<0.05$) overall acceptability (4.57 ± 0.50) and pleasant aftertaste (4.42 ± 0.38). The optimized cookie retained phenolic content (2.92 ± 0.04 mg GAE/g DW), DPPH activity (39.27 ± 0.86%), and desirable texture (hardness = 1389.43 ± 22.08 g; adhesiveness = 0.33 ± 0.03 mJ). The proximate composition of the sample was as follows: fat (16.05 ± 0.16%), protein (7.29 ± 0.40%), fibre (2.97 ± 0.08%), and carbohydrates (67.49 ± 0.40%). The microbiological quality remained safe ($<4.6 \times 10^4$ CFU/g) after 72 hours, with minimal yeast and mold growth ($2.1 \times 10^3 \pm 1.7 \times 10^3$ CFU/g). The 20% incorporation of Pinkerton avocado powder significantly enhances nutritional and antioxidant properties while preserving the sensory quality of cookies, establishing its strong potential for functional bakery applications.

About the Conference

Proceedings of the Annual Scientific Sessions

24 & 25 Jan 2026

The Nutrition Society of Sri Lanka

Our Scholar

Dr. TC Kananke

Senior Lecturer

thilini@appsc.sab.ac.lk

DFST

Formulation and quality evaluation of functional bael jelly crystals incorporated with citrus peel pectin

Deshan R.G.S.D. and Kananke T.C.

Abstract

Modern jelly manufacturing predominantly utilizes artificial additives but faces growing criticism due to health concerns and clean-label demand. This study shifted artificial additives in jelly by incorporating bael pulp powder prepared from ripe bael fruits (*Aegle marmelos*) with citrus peel pectin isolated using an acid extraction method, creating a sustainable, antioxidant-rich functional jelly crystal. Following the preparation of the jelly by rehydrating anhydrous bael jelly crystals with hot water and subsequent cooling, physicochemical, textural, sensory, and nutritional properties were evaluated. Pectin was extracted from *Citrus sinensis*, *C. aurantifolia,* and *C. aurantium*. *C. sinensis* pectin exhibited significantly higher yield (36.24 ± 0.81%), methoxyl content (9.05 ± 0.11%), and degree of esterification (68.49 ± 0.49%) ($p < 0.05$), enabling superior gelation. Sample 751 (*C. sinensis* pectin) was selected as the best formulation, outperforming other samples (509: commercial, 343: *C. aurantium*, 822: *C. aurantifolia*). Hedonic ranking by 30 untrained panelists confirmed its superiority, with higher sensory scores (ANOVA, $p < 0.001$) for overall acceptability (4.27 ± 0.72), firmness (4.65 ± 0.49), and taste (4.65 ± 0.78). Texture Profile Analysis approved desirable hardness (452.60 ± 75.10 g), cohesiveness (0.65 ± 0.01), and chewiness (14.05 ± 2.50 mJ), comparable to commercial jelly. Physicochemical evaluation indicated stable rehydrated properties (moisture 71.4 ± 0.4%, soluble solids 32.37 ± 0.40 °Brix, titratable acidity 0.85 ± 0.03%). The jelly showed optimum nutritional attributes, with higher fiber content, strong antioxidant activity (DPPH IC_{50} = 23.03 ppm), and elevated total phenolic content (1.25 mg GAE/g). The production cost was LKR 165 per 100 g pack, supporting commercial feasibility. This study offers a sustainable, natural alternative to synthetic additives and valorizes citrus waste, producing antioxidant-rich, shelf-stable jelly with Ayurvedic benefits.

About the Conference

13th Ruhuna International Science and Technology Conference (RITSCON)
21 Jan 2026
University of Ruhuna, Sri Lanka

Our Scholar

Dr. TC Kananke
Senior Lecturer
thilini@appsc.sab.ac.lk