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Notice for the PhD Viva Voce Examination

Mr Sreehari Suresh (Registration Number: 2071602), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Monday, 28 October 2024 at 11.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Extraction and Characterization of Chitosan from Fish Scales of *Labeo Rohita* (Rohu) and *Oreochromis Niloticus* (Tilapia) and its Application Studies**
Discipline	:	**Biotechnology**
External Examiner (Outside Karnataka)	:	**Dr Reya Issac** Associate Professor Department of Biotechnology Karunya Institute of Technology and Sciences Karunya Nagar Coimbatore - 641114 Tamil Nadu
External Examiner (Within Karnataka)	:	**Dr A H Manjunatha Reddy** Associate Professor Department of Biotechnology R V College of Engineering Mysore Road, Bengaluru - 560059 Karnataka
Supervisor	:	**Dr Mridul Umesh** Assistant Professor Department of Life Sciences School of Sciences CHRIST (Deemed to be University) Bengaluru 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru
Date: 21 October 2024

ABSTRACT

Chitosan is a biopolymer with various properties, which makes it a suitable applicant in many industries. In this study, chitosan was successfully extracted from the scales of *Labeo rohita* (rohu) and *Oreochromis niloticus* (tilapia). Three different methods of chemical extraction were explored, of which the highest yield (10% per 100g of fish scales) providing method was selected. Biological extraction of chitosan was successfully completed using a one-step fermentation process, where a potential proteolytic strain - *Stenotrophomonas koreensis* (OL589567) was isolated and used for the demineralization and deproteinization of fish scales. A Central Composite Design (CCD) based two level, two-factor interaction (2FI), factorial model was used to optimize the chemical extraction of chitosan. In optimization of the chemical extraction of chitosan, the yield increased from 10% per 100g of fish scales to 20% per 100g of fish scales. During biological extraction, the yield acquired was 2.8g (28% w/w) of chitin per 100g of fish scale, which after the optimization was able to increase protease activity by 5.7 times.

The resulting chitosan samples were extensively characterized using advanced analytical techniques such as Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), differential scanning calorimetry (DSC), and thermogravimetric analysis (TGA). The antioxidant property of the extracted chitosan benefits in application of chitosan in aquaculture and food industry. The IC50 (50% inhibition of DPPH) value of chitosan extracted was 0.17mg/mL. In the application studies of chitosan as a feed additive in aquaculture, best growth performance of *Cyprinus carpio* fed formulated diets for 50 days was shown by Test (1.5%) Survival rate (%) = 90.0, Length gain ($cmKg^{-1}$) = 3.97, Weight gain (gKg^{-1}) = 4.84, Daily weight gain (g/day) = 0.48, Relative growth rate (%) =39.42. Specific growth rate = 0.39. The biodegradability of chitosan films is a key characteristic that distinguishes them from typical non-biodegradable materials. The promising potential of this environmentally friendly replacement for single-use plastic sheets is brought into focus by the degradation of chitosan films by 21.49±0.62% over the course of 50 days.

Keywords: Aquaculture, Biological extraction, Chemical extraction, Chitosan, Optimization.

Publications:

1. **Sreehari Suresh.**, Umesh, M., & Santosh, A. S. (2023). Biological extraction of chitin from fish scale waste using proteolytic bacteria *Stenotrophomonas koreensis* and its possible application as an active packaging material. Biomass Conversion and Biorefinery, 1-11.
2. **Sreehari Suresh.**, Umesh, M., & Sarojini, S. (2022). Valorization of fish waste for chitosan production: a sustainable approach. ECS Transactions, 107(1), 16259.
3. **Sreehari Suresh.**, Umesh, M., & Santhosh, A. S. (2022). Wastewater treatment using chitosan and its derivatives: A mini review on latest developments. Notulae Scientia Biologicae, 14(4), 11369-11369.
4. **Sreehari Suresh.**, Umesh, M., & Sarojini, S. (2022). A Short Review on Recent Applications of Chitosan Biopolymer in Gene and Drug Delivery. Asian Journal of Chemistry, 34(4), 787–792.