



Dear Readers,

Greetings from the Mapana Journal of Sciences,

On behalf of our editorial team, I am pleased to present you with the second issue of the Mapana Journal of Sciences for 2023. Mapana Journal of Sciences (MJS) has always been committed to publishing pioneering research and review articles in the vast domain of science. We take immense pride in upholding this tradition with our latest release. In this issue, we are delighted to showcase nine remarkable research articles and one review article exploring the captivating domains of science, including Mathematics, Astrophysics, Material Sciences, Life Sciences, and Chemical Sciences.

In the field of mathematics, Rehman et al., introduces the concept of coupling distance for simple connected graphs. To characterize this distance, the authors define parameters such as coupling eccentricity, coupling radius, coupling diameter, coupling center, and coupling periphery. They provide the coupling parameters for different standard graphs, offering valuable insights into graph theory and its applications. Ramanathan et al., present a study on the Maize Streak Virus disease model, focusing on the interaction between the Maize and Homopteran populations. The system of differential equations is solved analytically using the Adomian Decomposition Method. The analytical results are compared with numerical simulations, considering specific parameter values. The study also examines the demolishing and contamination rates of contagious and receptive homopteran on receptive and contagious Maize plants, aiming to reduce the contamination rate. Additionally, the death rates of contagious maize, receptive homopteran, and contagious homopteran are also discussed as potential means to eliminate the contagious population and prevent the spread of the Maize Streak Virus.

Priyadharsini et al., investigate the stability of fractional-order visco-elastically damped linear systems using the Bagley-Torvik equation. By applying the Caputo derivative and employing spectral conditions, the authors establish sufficient conditions for stability. The utilization of the Laplace Transform and Mittag-Leffler functions further

enhance the analytical results, and numerical examples demonstrate the effectiveness of the proposed method. Dhanalakshmi et al., explore spherical fuzzy sets, which offer greater flexibility in handling various scenarios through their membership, non-membership, and neutral membership grades. The authors introduce trapezoidal, spherical fuzzy numbers and discuss their properties, arithmetic operations, and membership functions. Additionally, a ranking function is proposed to order these numbers, enabling their application in solving fuzzy risk analysis problems.

In the field of Physics, Thomas et al., discusses a hybrid inflationary model with a cubic potential. This model introduces an auxiliary scalar field ψ , which dominates the energy density during the final stages of inflation. By undergoing a sudden small change, the inflaton potential affects the spectral indices related to density perturbations, leading to a nearly flat power spectrum with a step. Kagali et al., explore the fascinating realm of quantum mechanics by focusing on interference and diffraction phenomena exhibited by matter waves. By employing the path integral formulation of quantum mechanics, the authors derive interference and diffraction patterns of quantum particles and compare them with traditional methods. The agreement between the results highlights the importance of matter waves in understanding quantum phenomena.

In the field of Astrophysics, Kenath et al., explore the possibility of primordial planets composed entirely of dark matter (DM) and report their potential connection to short-duration gamma-ray bursts. This intriguing model presents an alternative explanation for the absence of detected DM particles in ongoing experiments and offers a novel mechanism for the formation of sub-stellar black holes.

In the field of Material Sciences, Yuvanthi et al., investigate the potential of *Halimeda macroloba*, a seaweed, for biosorbing Corafix Yellow GD3R dye from aqueous solutions. The research explores various factors such as dye concentration, biosorbent dose, pH, temperature, and incubation period to determine the efficiency of the seaweed in removing the dye. The results indicate that the maximum removal of Corafix Yellow GD3R (84%) was achieved at a pH of 8, with 200 mg/L of dye, 300 mg/L of biosorbent, and a temperature of 25°C. Additionally, desorption experiments using 0.1N NaOH

demonstrated a recovery rate of 60% on the first day. UV-Vis and FT-IR analyses investigated the interaction between the dye and the bioadsorbent. Furthermore, the study confirms the non-toxic nature of the treated dye solution by observing substantial growth in *Macrotyloma uniflorum* (Horse gram). Overall, this research suggests that *H. macroloba*, under optimal conditions, can effectively remove dyes and potentially serve as a sustainable solution for pollution controlling in the textile industry, promoting a clean and environmentally friendly approach to society. Sundareswari et al., successfully synthesized green nanoparticles using plant extract and environmentally friendly reducing agents. The objective was to assess the larvicidal activity of silver and copper nanoparticles, synthesized using aqueous leaf extract from *Ocimum basilicum* (OB), against larvae and adult *Epilachna vigintioctopunctata*. Larvae and adults were exposed to various concentrations of silver and copper nanoparticles produced using the aqueous extract of *O. basilicum* for 24 hours. The synthesis of Ag and Cu nanoparticles from *O. basilicum* leaf extract was confirmed within 6 hours using FTIR, particle size analysis, and UV-vis spectrophotometry. The phytochemicals present in the leaf extract were investigated through GC-MS analysis. The larvicidal activity of the Cu and Ag nanoparticles produced from aqueous leaf extract was compared, revealing that the Cu nanoparticles showed slightly lower larvicidal efficacy than Ag nanoparticles obtained from leaf extract.

In the field of Chemical and Life Sciences, a review by Saralaya et al., focused on Buparvaquone, an important anti-protozoal drug belonging to the hydroxy-naphthoquinone class. While numerous publications have highlighted the broad therapeutic applications of Buparvaquone, the synthesis approaches reported in the literature have been relatively limited. The author discusses the therapeutic applications of Buparvaquone, along with its synthesis approaches, including synthesis from materials with varying ranges of expense and yield.

As we commence another issue of MJS, I extend our heartfelt appreciation to all the authors, reviewers, and editorial board members whose contributions have made this publication possible. The wide array of topics explored in this issue exemplifies the interdisciplinary nature of contemporary scientific research. Mapana

takes pride in serving as a platform for such significant scientific advancement. We eagerly anticipate embarking on future endeavors of knowledge and discovery. We believe that the MJS will continue to benefit its readers by showcasing the latest research in diverse fields of science and providing a forum to exchange ideas and perspectives.

Manoj Balachandran

Editor