Review of: "Analysis of the Spread of Covid-19 via Atangana-Baleanu Fractional Derivatives"

Naveen Malagi

Potential competing interests: No potential competing interests to declare.

In this paper, authors have studied the spread of the epidemic via Atangana-Baleanu Fractional Derivatives, presented the mathematical analysis and formulation of a fractional model for the epidemic. The existence and uniqueness of the solution for the proposed model are proved. The study also investigates the existence of a disease-free equilibrium and analyzes its stability properties. To validate the theoretical results, they provided a numerical scheme for the fractional model and presented various simulation results. However, to improve the quality of the manuscript, the following points should be addressed carefully.

1. Enhance the introductory section by providing a comprehensive overview of the historical background of fractional calculus.
2. Numerous grammatical and typographical errors are present throughout the manuscript.
3. The order of the Atangana-Baleanu fractional integral as stated in definition 3 is incorrect.
4. The equation on the left-hand side representing the matrix form of the given problem in section 3.1 is incorrect.
5. Remark 2 in section 3.1 lacks information on the range of the parameter for the fractional order.
6. Verify the equation in Lemma 1, section 3.1 to ensure accurate representation of the Atangana-Baleanu Derivative.
7. Clarify the significance of 'k' in Lemma 2.
8. Elaborate on the physical interpretations associated with all figures.
9. Define the physical implications of reducing the fractional order in the figures.
10. Include future research directions within the conclusion section of the manuscript.
11. Discuss the novelty of the presented work in the introductory segment of the manuscript.
12. Review all mathematical equations for accuracy, ensuring each is properly numbered.
13. The following references are crucial for enhancing the quality of the manuscript. New dynamical behaviour of the coronavirus (COVID-19) infection system with nonlocal operator from reservoirs to people." (2020), doi.org/10.21203/rs.3.rs-19500/v1. New approach for fractional Schrödinger-Boussinesq equations with Mittag-Leffler kernel. *Mathematical Methods in the Applied Sciences*, *43*(17), 9654-9670, https://doi.org/10.1002/mma.6635. An efficient computational technique for time-fractional Kaup-Kupershmidt equation. *Numerical Methods for Partial Differential Equations*, *37*(2), 1299-1316, https://doi.org/10.1002/num.22580. An efficient technique to analyze the fractional model of vector-borne diseases. *Physica Scripta*, *97*(5), 054004, 10.1088/1402-4896/ac607b. A new computational technique for the analytic treatment of time-fractional Emden–Fowler equations. *Mathematics and Computers in Simulation*, *190*, 362-376, https://doi.org/10.1016/j.matcom.2021.05.030. Novel approach for nonlinear time-fractional Sharma-Tasso-Olever

equation using Elzaki transform. *An International Journal of Optimization and Control: Theories & Applications (IJOCTA) 13*(1), 46-58, https://doi.org/10.11121/ijocta.2023.1265. Fractional Reaction–Diffusion Model: An Efficient Computational Technique for Nonlinear Time-Fractional Schnakenberg Model. In *Advances in Mathematical Modelling, Applied Analysis and Computation: Proceedings of ICMMAAC 2021* (pp. 427-454). Singapore: Springer Nature Singapore, https://doi.org/10.1007/978-981-19-0179-9_26.

After implementing the suggested modifications outlined above, the presented work could be considered for acceptance.