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A Priori Predictions for a Weak Solution to Time-Fractional Nonlinear Reaction-Diffusion Equations Incorporating an Integral Condition

Abdelouahab Benbrahim [1], Iqbal M. Batiha [2,3,*], Iqbal H Jebril [2], Ahmed Bourobta [1], Taki-Eddine Oussaeif [1] and Shawkat Alkhazaleh [4]

[1] *Department of Mathematics and Informatics, Larbi Ben M'hidi University, Oum El Bouaghi, Algeria.*
[2] *Department of Mathematics, Al Zaytoonah University of Jordan, Amman 11733, Jordan.*
[3] *Nonlinear Dynamics Research Center (NDRC), Ajman University, Ajman 346, UAE.*
[4] *Department of Mathematics, Faculty of Science and Information Technology, Jadara University, Irbid, Jordan.*

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Abstract: Within this paper, we lay out the necessary criteria that ensure a solution's presence and distinctiveness within a functionally weighted Sobolev space. This pertains to a specific group of initial-boundary value problems accompanied by an integral condition, all related to nonlinear partial fractional reaction-diffusion (RD) equations. Our findings are derived through the utilization of a priori estimates in Bouziani fractional spaces. By employing an iterative approach built upon outcomes from the linear counterpart, we successfully validate the existence and uniqueness of a weak generalized solution for the nonlinear conundrum.

Keywords: *fractional partial differential equation; existence; uniqueness; energy inequality.*

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* Corresponding author: mailto:i.batiha@zuj.edu.jo