



# Self-Similar Solutions to a Density-Dependent Reaction-Diffusion Model

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In this paper, we investigated a density-dependent reaction-diffusion equation,  $u_t = (u^m)_{xx} + u - u^m$ . This equation is known as the extension of the Fisher or Kolmogoroff-Petrovsky-Piscounoff equation which is widely used in the population dynamics, combustion theory and plasma physics. By employing the suitable transformation, this equation was mapped to the anomalous diffusion equation where the nonlinear reaction term was eliminated. Due to its simpler form, some exact self-similar solutions with the compact support have been obtained. The solutions, evolving from an initial state, converge to the usual traveling wave at a certain transition time. Hence, it is quite clear the connection between the self-similar solution and the traveling wave solution from these results. Moreover, the solutions were found in the manner that either propagates to the right or propagates to the left. Furthermore, the two solutions form a symmetric solution, expanding in both directions. The application on the spatiotemporal pattern formation in biological population has been mainly focused.

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