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Radiation effects on natural bioconvection flow of a nanofluid containing gyrotactic microorganisms past a vertical plate with streamwise temperature variation

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Abstract
In this study, the mathematical modeling for steady, laminar, natural bioconvection boundary-layer flow of a nanofluid containing gyrotactic microorganisms along a vertical flat plate with the streamwise sinusoidal variation of surface temperature is examined in the presence of thermal radiation effect. The passively controlled nanofluid model is applied to approximate this nanobioconvection flows problem, which is believed to be physically more realistic than previously commonly used actively controlled nanofluid models. A suitable set of dimensionless variables is used to transform the governing equations of the problem into a non-similar form. The obtained non-similar equations have the property that they reduce to various special cases previously considered in the literature. An adequate and efficient implicit, tri-diagonal finite difference scheme is employed for the numerical solution of the obtained equations. Various comparisons with previously published works are performed and the results are found to be in excellent agreement. A representative set of numerical results for the velocity, temperature and concentration profiles as well as the skin friction coefficient, local Nusselt number, and the local density of the motile microorganisms is presented graphically for various parametric conditions and is discussed. © 2017 by American Scientific Publishers All rights reserved.

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