EFFECT OF NEWTONIAN HEATING ON BIOCONVECTION OF NANOFLUID OVER STRETCHING SHEET WITH GYROTACTIC MICROORGANISMS

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Transport processes in nanofluids and their importance in biomedical applications and process industries has gained considerable attention in recent decades [1, 2]. Bioconvection in a horizontal layer with heat and mass transfer of nanofluid containing gyrotactic microorganisms along a stretching sheet taking into account the Newtonian heating boundary condition is investigated numerically. In the modelling of nanofluid, both Brownian motion and thermophoresis effects are incorporated into the nonlinear differential equations. The governing equations are reduced to a system of couple non-linear ordinary differential equations for momentum, energy, nanoparticle concentration and dimensionless motile microorganism density, with using appropriate similarity transformations and then tackled numerically using the fifth order Rung-Kutta-Fehlberg scheme with shooting technique. Results are presented in graphical forms for dimensionless velocity, temperature, nanoparticle volume fraction and motile microorganisms in the presence of magnetic field. The solution depends on a Prandtl number, Newtonian heating parameter, Brownian motion number, Lewis number, buoyancy ratio parameter, thermophoresis number and bioconvection Lewis number. The results show dimensionless velocity and temperature distributions on the stretching sheet increase with the increase of Newtonian heating parameter, whereas nanoparticle volume fraction and motile microorganism density profile decrease with increasing it.

References

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