Mathematical Modeling of Breast Cancer Cell MCF-7 Growths due to Curcumin Treatments

Hildana Assefa, Kana Kansa, and Widodo Samyono

Abstract

The recent study from one of our collaborator students showed the effect of curcumin on the MCF-7 breast cancer cell and its ability to inhibit the growth-inducing caspase-mediated apoptosis of cell via the MAPK pathway. Based on this study we compared two mathematical models (Bertalanffy and Gompertz) that would be best fits to the data from the experiments of the MCF-7 breast cancer cell study. To find the best model, in the outside we used Powel method to solve the ordinary differential equation (ODE)-based optimization, where the objective is to minimize the sum of square errors (SSE) which are the differences between the data points and the models. In the inside we used Runge Katta method to solve the ODEs. We also used other statistics measurements, which are Akaike information criterion (AIC) and Bayesian information criterion (BIC). Based on the three measurements we found that the best fit model is the Gompertz. Additionally, we could see the best model from the graphs of the models and the data points. Our results also had good agreements with the previous studies on the modeling of the MCF-7 breast cancer cell that the Gompertz is the best fit model for the breast cancer.