Stability Analysis of a Fractional-Order SEIR Epidemic Model with General Incidence Rate and Time Delay

mahiéddine kouche[1], Ilhem Gacem[2], and Bedr' Eddine Ainseba[3]

[1]University of Badji Mokhtar Annaba
[2]Universite Badji Mokhtar Annaba
[3]Universite Victor Segalen

May 19, 2022

Abstract

In the present paper we investigate the qualitative behaviour of a fractional SEIR model with general incidence rate function and time delay where the fractional derivative is defined in the Caputo sense. The basic reproduction number $\mathcal{R}_{0}$ is derived using the method of next generation matrix and we give a complete study of local stability of both free and endemic equilibrium. Using Liapunov method we prove the global stability of free and endemic equilibrium under some hypotheses on the parameters of the system. Finally to illustrate our results, we use the model to predict the first peak of the COVID-19 epidemic in Algeria.

Hosted file

`wileyNJD-AMA.pdf` available at https://authorea.com/users/483667/articles/569709-stability-analysis-of-a-fractional-order-seir-epidemic-model-with-general-incidence-rate-and-time-delay

Hosted file

`wileyNJD-AMA.tex` available at https://authorea.com/users/483667/articles/569709-stability-analysis-of-a-fractional-order-seir-epidemic-model-with-general-incidence-rate-and-time-delay

figures/figure1/figure1-eps-converted-to.pdf

figures/figure2/figure2-eps-converted-to.pdf

figures/figure3/figure3-eps-converted-to.pdf

figures/figure4/figure4-eps-converted-to.pdf