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FRACTIONAL-ORDER VECTOR-HOST DISEASE MODEL

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Abstract. In this paper, we introduce a fractional order model of vector-host disease. The stability of disease free and endemic equilibria are also studied. We provide a general procedure for implementing the Adam-Bashforth predictor corrector method on biological system and it is utilized for solving the proposed model. Numerical simulations are presented to show the advantage of introducing a fractional vector-host disease model.

Keywords. Fractional model; Adam-Bashforth method; Stability.

1 Introduction

Vector-borne diseases, in particular, mosquito-borne diseases, are transmitted to humans by blood-sucker mosquitoes, which is a big problem for the public health in the world. The literature dealing with the mathematical theory on vector-borne diseases is quite extensive. Many mathematical models of the vector-host infectious diseases have been analyzed in the literature. Zhilan et. al [1] proposed vector-host model for the dengue fever. Zhipeng Qiu [2] discussed a model for the dynamics of many diseases spread by vectors, such as malaria, dengue, or West Nile virus. The use of mathematical modeling has proven to play an important role in gaining some insights into the transmission dynamics of infectious diseases and suggest control strategies. They provide comprehensive examinations that help us to make decisions but human reasoning and debate may not provide us useful decisions. Appropriate mathematical models can provide a qualitative assessment for the problem. Some mathematical models [3, 4] provide best understanding about the dynamics and control of infectious diseases. In [3], the authors discussed the oscillatory behavior of a SVEIRS propagation disease model which potentially involves a regular constant vaccination. The authors explained SEIR epidemic model by considering two continuous-time vaccination control strategies in [4]. One of them takes directly the susceptible population