Pathogens Population and Riccati  equation

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***Abstract*—Pathogens are microbial agents that cause disease in animal and plant hosts and in other microbes. In the context of invertebrate animal hosts, the pathogens include viruses, entomopathogenic nematodes (EPNs), bacteria, fungi, microsporidia. Invasion of a potential host is necessary for infection but does not necessarily mean that an infection will occur.A pathogen is an organism that causes disease. Your body is naturally full of microbes. However, these microbes only cause a problem if your immune system is weakened or if they manage to enter a normally sterile part of your body. Pathogens are different and can cause disease upon entering the body. Recently in [5], authors highlight the current trends in mathematical modeling approaches and related methods used for understanding host–pathogen interactions. Since these interactions can be described on vastly different temporal and spatial scales as well as abstraction levels, a variety of computational and mathematical approaches are presented. Particular emphasis is placed on dynamic optimization, game theory, and spatial modeling, as they are attracting more and more interest in systems biology.**

**For further reading in this regard, dear readers, refer to the references [1], [2], [3] and [4]. In [6],** **The issue of population growth of pathogens has been studied. In this process we will come across differential equations. The important point is that in this process, the issue of the effectiveness of antibiotics is also important. In fact, antibiotics act as a barrier and are effective in inhibiting the growth rate of the pathogen population.**

**Using mathematical modeling, it can be seen that to determine the population of pathogens ends in the following differential equation. when are constants. In fact, is the replication rate and  is the carrying capacity term.  Notice that is the antibiotic concentration. Also, we have when antibiotic decay rate. Therefore, our goal is to solve this system of differential equations so that we can reach the population equation of pathogens. Solving the second equation is not difficult. Because it is a simple linear equation is first order. By solving the second equation whose answer is an exponential function, we can solve the first equation.**

**In fact, the main model of the pathogen population is a differential Riccati  equation. To solve the Riccati equation, we need to be able to obtain a private solution to the equation. Using the variable separation method, note that the function is an exponential function in terms of , we have . Thus, Consequently,**

***Keywords—* Pathogens population*,* mathematical modeling, Riccati equation, ODE,** **antibiotic.**

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