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Spread of a disease and its effect on population dynamics in an eco-epidemiological system.
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Summary: In this paper, an eco-epidemiological model with simple law of mass action and modified Holling type II functional response has been proposed and analyzed to understand how a disease may spread among natural populations. The proposed model is a modification of the model presented by *R. K. Upadhyay* et al. [Appl. Math. Comput. 196, No. 1, 392–401 (2008; Zbl 1131.92070)]. Existence of the equilibria and their stability analysis (linear and nonlinear) has been studied. The dynamical transitions in the model have been studied by identifying the existence of backward Hopf-bifurcations and demonstrated the period-doubling route to chaos when the death rate of predator (μ_1) and the growth rate of susceptible prey population (r) are treated as bifurcation parameters. Our studies show that the system exhibits deterministic chaos when some control parameters attain their critical values. Chaotic dynamics is depicted using the 2D parameter scans and bifurcation analysis. Possible implications of the results for disease eradication or its control are discussed.

MSC:

92 Biology and other natural sciences
34 Ordinary differential equations

Keywords:

eco-epidemiological model; susceptible prey; deterministic chaos; Hopf-bifurcation

Software:

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