

## Dynamics of a Reaction-Diffusion Problems Modeling Two Predators Competing for a Prey

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**Abstract :** In this work, we investigate both the analytical and numerical studies of the dynamical model comprising of three species system. We analyze the linear stability of stationary solutions in the one-dimensional multi-system modeling the interactions of two predators and one prey species. The stability analysis has a lot of implications for understanding the various spatiotemporal and chaotic behaviors of the species in the spatial domain. The analysis results presented have established the possibility of the three interacting species to coexist harmoniously, this feat is achieved by combining the local and global analyzes to determine the global dynamics of the system. In the presence of diffusion, a viable exponential time differencing method is applied to multi-species nonlinear time-dependent partial differential equation to address the points and queries that may naturally arise. The scheme is described in detail, and justified by a number of computational experiments.

**Keywords :** asymptotically stable, coexistence, exponential time differencing method, global and local stability, predator-prey model, nonlinear, reaction-diffusion system

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