
ABSTRACT

This work includes an amalgamation of multiple studies in applications of mathematics to biological and ecological subjects, in particular, disease control and infestation control. The main mathematical framework of all these applications is the theory of dynamical systems, mostly considering systems of ordinary differential equations, and an application with partial differential equations. In two of these subjects, we consider applications of *generalized monotonicity*, and in another two, we consider applications of *optimal control*. In this thesis, our objectives were to generate new results on these subjects and to further develop these mathematical fields for further applications in these areas.

Keywords. Optimal Control, Generalized Monotonicity, Biomathematics, Viability Theory, Analysis, Dynamical Systems