
Summary: Based on the theory of impulsive differential equation, due to the effect of pesticide spraying on natural enemies, considering two different kinds of impulse processes, and using Hassell-Varley functional response, a predator-prey system was established in this paper. We employ the comparison theorem to get the boundedness and the sufficient condition for the permanence of predator-prey system. Finally, this paper explains the conclusion and gives the corresponding biological significance. This work provides reliable technical support for pest control in the real environment. Moreover, the method of this paper has a wide range of applicability, and similar methods can be used to extend Hassell-Varley functional responses to other specific functional responses, such as Beddington-DeAngelies, Watt-type, Square-Root functional response and so on. The system can be used to control pests and rodents in farmland. It can also be used to protect endangered species so that predators and prey can live together to maintain ecological balance.

MSC:
34A37 Ordinary differential equations with impulses
34D20 Stability of solutions to ordinary differential equations
92D25 Population dynamics (general)

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Hassell-Varley functional response; competition; permanence; predator-prey system; impulsive