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A CONTROLLED MATHEMATICAL MODEL FOR POPULATION DYNAMICS IN AN INFESTED HONEYBEES COLONIES

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In this paper a mathematical model of infested honey bees colonies is formulated in order to investigate Colony Collapse Disorder (CCD) in a honeybee colony based on [1]. CCD, as it is known, is a major problem on honeybee farms because of the massive decline in colony numbers. We introduce to the model a control variable which represents forager protection. We study the controlled model to derive conditions under which the bee colony can fight off epidemic. Secondly we study the problem of minimizing prevention cost under model's dynamics constraints using Pontryagin's results [2].

References

- [1] Vardayani Ratti, Peter g. Kevan and Hermann j. Eberl. (2013). *A Mathematical Model For Population Dynamics In Honeybee Colonies Infested With Varroa Destructor And The Acute Bee Paralysis Virus*, Canadian Applied Mathematics Quarterly, 21 (1), 63–93.
- [2] Pontryagin L., Boltyanski V., Gamkrelidze R. and Michtchenko E. (1974). *Théorie Mathématique de Processus optimaux*, Edition Mir, Moscou.