Weights Optimization Using Firefly Algorithm for Dengue Fever Optimal Control Model by Vaccination, Treatment, and Abateseae

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Abstract: Indonesia is one of tropical countries where dengue fever disease can spread through *Aedes aegypti* mosquitoes and sometimes cause deaths. There are many control strategies to bound the spread of dengue fever: vaccination for controlling susceptible humans, treatment for controlling infected humans, and abateseae (larvacides for killing the mosquito larvae). Optimal control is used for minimizing the number of infected humans, larvae, infected mosquitoes, the cost of vaccination, the cost of treatment, and the cost of abateseae. Due to the cost of the objective function depending on weights, in this research, we will apply the Firefly Algorithm (FA) to optimize the weights minimizing the cost of the objective function. The FA is based on the behavior of flashing characteristics of fireflies. Simulations have been applied and we can obtain the comparison of the number of humans and mosquitoes with and without control. In addition, we also obtain the optimal weight related to the number of infected humans, the number of larvae, the number of infected mosquitoes, the cost of vaccination, the cost of treatment, and the cost of abateseae, respectively.

Keywords: *dengue fever; optimal control; firefly algorithm; vaccination; treatment; abateseae.*

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