UNIVERSITI TEKNOLOGI MARA

EFFECTS OF RAINFALL ON THE POPULATION DYNAMICS OF *AEDES AEGYPTI* AND THE NUMBER OF DENGUE CASES

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Dengue is a dangerous virus which can cause Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF). This virus is transmitted by female *Aedes aegypti* mosquitoes. In this research, a mathematical model was developed for the city of Shah Alam to predict the mosquito population by considering the mosquito life cycle which consists of egg, pupa, larva, and adult. Rainfall is considered as a primary factor since it has an obvious fluctuation as compared to temperature. The Lefkovitch model is extended to integrate the factor of rainfall and the life cycle of the mosquito. By using this model, the amount of rainfall sufficient for the development of mosquito breeding sites was determined as well as the effect of rainfall duration on the mosquito population. The relationship between the abundance of *Aedes aegypti* population and the number of dengue cases was obtained by curve fitting. This relationship was strengthened by considering the lag period between rainfall and the emergence of dengue symptoms in an infected person. It is ascertained that 28 days is the most appropriate lag period to predict the number of dengue cases after the rainfall period. The severity of the disease is determined by computing the transmission rate and the recovery rate of dengue using a standard SIR model. Solution of the SIR model was obtained using the Euler's Method. A warning system was developed to forecast the number of dengue cases based on the amount of rainfall. A significant relationship was shown to exist between the amount of rainfall, the *Aedes aegypti* population and the number of dengue cases. It is also identified that medium amount of rainfall is most favourable in contributing to productive breeding sites of *Aedes aegypti*. It is recommended to consider the combination factors of rainfall, temperature and relative humidity in predicting the incidence of dengue cases in future research.

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