UNIVERSITI TEKNOLOGI MARA

SIMULATION OF AEDES AEGYPTI POPULATION DYNAMICS BY USING STAGE-STRUCTURED MATRIX MODEL RELATED TO RAINFALL DISTRIBUTION

NUR SITISARA BINTI MOHD SUHAIMI, HANI MASTURA AMIRA SUHAIMI & NURUL AIN BINTI ABD RAHMAN

Report submitted in partial fullfillment
of the requirements for the degree of
Bachelor of Science (Hons)
(Mathematics)

College of Computing, Informatics & Mathematics

FEBRUARY 2024

ABSTRACT

Introduction : *Aedes aegypti* is one type of mosquito that spreads dengue disease. This dengue disease can be seen as a threat because it can threaten human life, and it is one of the causes of death in Malaysia. The number of dengue fever remains high in Malaysia, particularly in Shah Alam, where it has resulted in deaths. Years have passed, and there is still no effective medicine or vaccine to treat it. **Research Objectives :** In light of this, this study aims to simulate the growth of *Aedes aegypti* mosquito populations related to rainfall distribution. Before the simulation, the pattern of egg hatching rate will be identified by using rainfall distribution. The simulation reveals a clear correlation between the population of *Aedes aegypti* and the occurrence of dengue cases. **Methodology :**The Lefkovitch matrix model, one of the stage-structured matrix models was used to simulate the population of *Aedes aegypti* changes based on rainfall distribution. Mosquitoes go through five stages in their life cycle which is egg, larva, pupa, adult 1, and adult 2. Rainfall distribution was picked as the dependent variable in this research. **Result and Discussion :** Based on the results of this research, the population of *Aedes aegypti* decreases during periods of heavy precipitation and increases during periods of light precipitation. The increment and decrement of the *Aedes aegypti* population depend on the precipitation because, during periods of heavy precipitation, the water level in the container containing mosquito eggs will exceed capacity, resulting in the death of the eggs and a decrease in the population of *Aedes aegypti*. Additionally, the correlation between dengue cases and the population size of *Aedes aegypti* was validated to verify this research. **Conclusion and Recommendations :** In conclusion, the research outcomes have the potential to provide significant contributions in terms of understanding dengue cases in Malaysia and reducing their growth. This research contributes more specifically to the authorities because the authorities can formulate strategies to prevent the increase in dengue in Malaysia. The next researcher should have included additional variables, such as humidity and regions (urban and rural), in order to obtain more precise and reliable results.

ACKNOWLEDGEMENT

IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

Our first and foremost debt is to God, who has always showered us with blessings and given us the strength to complete this project successfully just in time. After God who has always benefited us, we thank our parents. Without their precious and purest support, we will not be able to arrive at this stage. The trust and prayers they had for us are what motivate us to do our best.

We would like to express our gratitude and big thanks to our supervisor, Mr Mohd Najir Tokachil for guiding us with patience and giving us advice along with encouragement throughout the process of completing this project. Also not forgotten, our MSP660 lecturer, Mr Mohd Azdi Maasar who constantly reminds us and monitors our work.

Finally, we would like to thank our friends for their indirect contributions that helped to raise our spirits to continue completing this final year project. May Allah bless all of you.

TABLE OF CONTENTS