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DYNAMICAL ANALYSIS AND CONTROL MANAGEMENT MODEL OF MOSQUITO RESISTANCE TO INSECTICIDES

Edy Soewono

Department of Mathematics, Institut Teknologi Bandung, Indonesia

esoewono@lppm.itb.ac.id

Vector control management has been widely known as the critical factor in most malaria control strategies. For several decades, massive use of the same insecticide have been identified in many malaria endemic countries as part of mosquito control. It is known that long term use of insecticide with high doses and with no adequate control management, could generate mutant strains which are resistant to insecticide. Recent studies in ten provinces in Indonesia indicated that significant percentage of mosquitoes carried Rdl mutant alleles. It is also concluded that mutant Rdl alleles remain stable even in the absence of insecticide. Two objectives are discussed here. Firstly, knowing that mosquitoes rely on human blood for fertilizing their eggs, then reducing the contacts between mosquitoes and humans will give effect to the reduction of the mosquito population. A simple model for spatial repellent strategy is constructed and critical ratio of human-mosquito is used to analyze the dynamical behavior of mosquitoes. Secondly, for analyzing the effect of insecticide in mosquito control, a dynamical model for genetic resistance of mosquitoes to insecticides is constructed. The model is represented as three-dimensional non-linear system describing the growth and interaction of wild-type mosquitoes (WW), heterozygous (WR) and mutant mosquitoes (RR). Conditions of existence and stability of the equilibria are shown here. In addition, basic offspring number (Q) which represents the threshold of co-existence of mutant Anopheles mosquito population in the wild-type conditions are obtained. Relation between the rate of insecticide and the three types of mosquitoes is obtained.

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