Rifkia Aunur Rochmah, 2019, **Analisis Kestabilan dan Kontrol Optimal Model Matematika Penyebaran Aflatoksin pada Hewan dan Manusia.** Skripsi ini di bawah bimbingan Dr. Miswanto, M. Si. dan Cicik Alfiniyah, M. Si, Ph. D. Departemen Matematika, Fakultas Sains dan Teknologi, Universitas Airlangga, Surabaya.

ABSTRAK

Dalam skripsi ini dilakukan analisis kestabilan model matematika penyebaran aflatoksin pada hewan dan manusia. Selanjutnya pada model tersebut diaplikasikan kontrol berupa pengobatan. Berdasarkan analisis model tanpa kontrol diperoleh empat titik setimbang, yaitu titik setimbang *animal and human absence* (E_0), titik setimbang *animal absence* (E_1), titik setimbang *human absence* (E_2) dan titik setimbang *co-existence* (E_3). Selain itu diperoleh besaran *basic reproduction rasio* (R_0) yang menentukan kestabilan titik setimbang. Titik setimbang *animal and human absence* (E_0) stabil asimtotis jika $R_{01} < 1$ dan $R_{02} < 1$, titik setimbang *animal absence* (E_1) stabil asimtotis jika $R_{01} < R_{02}$ dan $R_{02} > 1$, titik setimbang *human absence* (E_2) stabil asimtotis jika $R_{02} < R_{01}$ dan $R_{01} > 1$. Sedangkan, titik setimbang *co-existence* (E_3) stabil asimtotis jika $R_{01} = R_{02}$. Selanjutnya, eksistensi kontrol optimal pada model penyebaran aflatoksin pada hewan dan manusia ditentukan dengan menggunakan Prinsip Maksimum Pontryagin. Dari hasil simulasi numerik sebelum dan sesudah diberikan kontrol, menunjukkan bahwa pemberian kontrol cukup efektif untuk meminimalkan jumlah penyebaran aflatoksin pada manusia.

Kata Kunci: Model Matematika, Aflatoksin, Pengobatan, Kestabilan, Kontrol Optimal.

Rifkia Aunur Rochmah, 2019, **Stability Analysis and Optimal Control of Mathematic Model of the Spread of Aflatoxins in Animals and Humans.** This thesis is supervised by Dr. Miswanto, M. Si. And Cicik Alfiniyah, M. Si, Ph. D. Mathematics Department, Faculty of Science and Technology, Airlangga University, Surabaya.

ABSTRACT

This thesis stability analyses mathematical model aflatoxins spread in animals and humans. Furthermore, the control was applied in the form of treatment. Based on the analysis model without control, we obtain four equilibriums, namely the animal and human absence equilibrium (E_0), the animal absence equilibrium (E_1), the human absence equilibrium (E_2), and the co-existence equilibrium (E_3). In addition, basic reproduction ratio (R_0) is obtained which determines the stability of the equilibrium point. Animal and human absence equilibrium (E_0) is asymptotic stable if $R_{01} < 1$ and $R_{02} < 1$, the animal absence equilibrium (E_1) is asymptotic stable if $R_{01} < R_{02}$ and $R_{02} > 1$, the human absence equilibrium (E_2) is asymptotic stable if $R_{02} < R_{01}$ and $R_{01} > 1$, while the co-existence equilibrium (E_3) is asymptotic stable if $R_{01} = R_{02}$. Furthermore, the existence of optimal control in the aflatoxin distribution model was determined using the Pontryagin Maximum Principle. Based on the numerical simulation results, it shows that treatment is effectiveto minimize the number of aflatoxin concentration in humans.

Keyword: Mathematical Model, Aflatoxin, Treatment, Stability, Optimal Control.