

ABSTRACT

Qualitative Analysis of Different Attack Pattern of

Whitefly on Jatropha Curcas Plant Growth and Control of Mosaic Disease

Index No-218/16/Maths/25

As the human civilisation is upgrading day by day the natural resources of energy face a crisis. To solve this problem we are searching for the elective vitality sources in a situation inviting way. To provide an affordable solution of shrinkage of fossil fuel we pay our attention to a very essential as well as wonder plant Jatropha curcas. Jatropha curcas is such a significant plant the seeds of which plant contains 37% oil that can be utilized to obtain a superior nature of biodiesel. So the plant is economically very important. This plant is also used for medicinal purpose.

In Mathematical Biology we also study the non-linear mathematical models which are based on various realistic phenomenon. The results of these study is very significant for understanding the actual dynamical behavior regarding effect of attack pattern of herbivore to the plant, renewable resource management, effect of growth pattern of the plant, pest control, permanent coexistence of all the species etc.. Mathematical ecology deals with the interaction between the living organisms with each other and their natural environment.

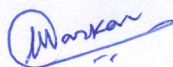
In my research work our concern goes to Jatropha curcas plant. This plant is easily effected by the mosaic virus through the vector whitefly. This attack affects the plant very badly. To protect the plant from the virus attack applying insecticide is very helpful. Mathematically it is done by applying control theory.

Mathematically exponential growth of plants gives the unstability where as logistic growth gives stable steady state of the system. Theoretical results shows that applying control theory for spraying insecticide the system can be stabilised. Likewise the growth pattern the attack pattern of whitefly also plays an important role for the disease dynamics. Different probability distribution like Binomial, Poisson and Negative-binomial distribution which biologically express the regular, random and aggregated attack pattern of whitefly are also used in my research work to determine the effect of different attack pattern. It gives us interesting results like stable coexistence, periodic oscillation, Hopf bifurcation etc. depending upon the different parameter values. Persistence and permanence are also performed to ensure the permanent coexistence of all the species.

Besides the continuous-time model we also chosen discrete time model by introducing Mickens non-standard finite difference scheme (NSFD) as well as Euler's discrete time system. Comparing all of them we observed that discrete time system gives better approximation of the solution as well as the disease dynamics than the continuous counter part.

All the results so obtained are verified by numerical simulations.

Keywords : Jatropha Curcas, whitefly, Mosaic disease, Random attack pattern, Regular attack pattern, Aggregated attack pattern, control theory, discrete time system.


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