

The spatially inhomogeneous structures in the solution of Fisher–Kolmogorov equation with delay

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We considered the problem of density wave propagation in a logistic equation with delay and diffusion (Fisher-Kolmogorov equation with delay). It was constructed a Ginzburg-Landau equation in order to study the qualitative behavior of the solution near the equilibrium state. The numerical analysis of wave propagation shows that for a sufficiently small delay this equation has a solution similar to the solution of a classical Fisher-Kolmogorov equation. The delay increasing leads to existence of the oscillatory component in spatial distribution of solutions. A further increase of delay leads to the destruction of the traveling wave. That is expressed in the fact that undamped spatio-temporal fluctuations exist in a neighborhood of the initial perturbation. These fluctuations are close to the solution of the corresponding boundary value problem with periodic boundary conditions. Finally, when the delay is sufficiently large we observe intensive spatio-temporal fluctuations in the whole area of wave propagation.