THE FKPP PROBLEM. FROM THE LINEAR TO THE DOUBLY NONLINEAR DIFFUSION.

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ABSTRACT. The famous Fisher-KPP reaction-diffusion model combines linear diffusion with the typical KPP reaction term, and appears in a number of relevant applications in biology and chemistry. It is remarkable as a mathematical model since is possesses a family of travelling waves that describe the asymptotic behaviour of a wide class solutions $0 \leq u(x, t) \leq 1$ of the problem posed in the real line. The existence of propagation waves with finite speed has been confirmed in some related models and disproved in others. We investigate here the corresponding theory when the linear diffusion is replaced by the "slow" doubly nonlinear diffusion and we find travelling waves that represent the wave propagation of more general solutions even when we extend the study to several space dimensions. A similar study is performed in the critical case that we call "pseudo-linear", i.e., when the operator is still nonlinear but has homogeneity one. With respect to the classical model and the "pseudo-linear" case, the "slow" travelling waves exhibit free boundaries.

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