

COMPETITIVE GOMPERTZ MODEL OF TWO SPECIES

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Abstract. In this paper, a competitive Gompertz model of two species is proposed. Furthermore, under a certain condition, the existence of monotone traveling wave solutions of this model is shown by the method of super- and subsolutions, which is developed in [6, 15, 16].

Mathematics subject classification (2010): 34C12, 35C07, 35K57, 92D25.

Keywords and phrases: competitive Gompertz model, Lotka-Volterra system, monotone traveling wave solutions, method of super- and subsolutions.

REFERENCES

- [1] D. G. ARONSON, H. F. WEINBERGER, *Multidimensional nonlinear diffusion arising in population genetics*, Adv. in Math., **30** (1978), 33–76.
- [2] R. D. BENGURIA, M. C. DEPASSIER, *Variational characterization of the speed of propagation of fronts for the nonlinear diffusion equation*, Comm. Math. Phys., **175** (1996), 221–227.
- [3] J. CANOSA, *On a nonlinear diffusion equation describing population growth*, IBM J. Res. Develop., **17** (1973), 307–313.
- [4] N. FEI, J. CARR, *Existence of travelling waves with their minimal speed for a diffusing Lotka-Volterra system*, Nonlinear Anal. Real World Appl., **4** (2003), 503–524.
- [5] K. P. HAEDLER, F. ROTHE, *Travelling fronts in nonlinear diffusion equations*, J. Math. Biol., **2** (1975), 251–263.
- [6] X. HOU, A. W. LEUNG, *Traveling wave solutions for a competitive reaction-diffusion system and their asymptotics*, Nonlinear Anal. Real World Appl., **9** (2008), 2196–2213.
- [7] L.-C. HUNG, *Exact traveling wave solutions for diffusive Lotka-Volterra systems of two competing species*, Jpn. J. Ind. Appl. Math., **29** (2012), 237–251.
- [8] Y. KAN-ON, *Parameter dependence of propagation speed of travelling waves for competition-diffusion equations*, SIAM J. Math. Anal., **26** (1995), 340–363.
- [9] ———, *Existence of standing waves for competition-diffusion equations*, Japan J. Indust. Appl. Math., **13** (1996), 117–133.
- [10] ———, *Fisher wave fronts for the Lotka-Volterra competition model with diffusion*, Nonlinear Anal., **28** (1997), 145–164.
- [11] ———, *Travelling waves for a Lotka-Volterra competition model with diffusion [translation of Sugaku 49 (1997), no. 4, 379–392; MR1614330 (2000b:92020)]*, Sugaku Expositions, **13** (2000), 39–53.
- [12] J. I. KANEL, *On the wave front solution of a competition-diffusion system in population dynamics*, Nonlinear Anal., **65** (2006), 301–320.
- [13] J. I. KANEL, L. ZHOU, *Existence of wave front solutions and estimates of wave speed for a competition-diffusion system*, Nonlinear Anal., **27** (1996), 579–587.
- [14] A. KOLMOGOROV, I. PETROVSKY, N. PISKUNOV, *Etude de l'é de la diffusion avec croissance de la quantite de matiere et son application a un probleme biologique*, Moscow Univ. Math. Bull., **1** (1937), 1–25.
- [15] A. W. LEUNG, X. HOU, W. FENG, *Traveling wave solutions for Lotka-Volterra system re-visited*, Discrete Contin. Dyn. Syst. Ser. B, **15** (2011), 171–196.
- [16] A. W. LEUNG, X. HOU, Y. LI, *Exclusive traveling waves for competitive reaction-diffusion systems and their stabilities*, J. Math. Anal. Appl., **338** (2008), 902–924.

- [17] M. LUCIA, C. B. MURATOV, M. NOVAGA, *Linear vs. nonlinear selection for the propagation speed of the solutions of scalar reaction-diffusion equations invading an unstable equilibrium*, Comm. Pure Appl. Math., **57** (2004), 616–636.
- [18] M. RODRIGO, M. MIMURA, *Exact solutions of a competition-diffusion system*, Hiroshima Math. J., **30** (2000), 257–270.
- [19] M. RODRIGO, M. MIMURA, *Exact solutions of reaction-diffusion systems and nonlinear wave equations*, Japan J. Indust. Appl. Math., **18** (2001), 657–696.
- [20] M. TANG, P. FIFE, *Propagating fronts for competing species equations with diffusion*, Archive for Rational Mechanics and Analysis, **73** (1980), 69–77.
- [21] A. I. VOLPERT, V. A. VOLPERT, V. A. VOLPERT, *Traveling wave solutions of parabolic systems*, vol. 140 of Translations of Mathematical Monographs, American Mathematical Society, Providence, RI, 1994. Translated from the Russian manuscript by James F. Heyda.
- [22] Y. YU, W. WANG, Z. LU, *Global stability of Gompertz model of three competing populations*, J. Math. Anal. Appl., **334** (2007), 333–348.