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MODELING AND ANALYSIS OF A DELAYED COMPETITIVE SYSTEM WITH IMPULSIVE PERTURBATIONS

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ABSTRACT. In this paper, a periodic delayed competitive system with impulsive perturbations is proposed. By using the property of globally asymptotic stability of a periodic single-species growth population model with impulse, sufficient conditions for the permanence of the above impulsive system without delays are derived. Later, the existence of positive periodic solutions of the above impulsive system with delays is discussed. As an application, an example and its numerical simulations are presented to illustrate the feasibility of the main results. Biological interpretations on our main results are also given.

1. Introduction. In [**6**], Golpasamy introduced the following autonomous two-species competitive system with a single constant delay

$$\begin{aligned} y_1'(t) &= y_1(t)\left[r_1 - a_1 y_1(t-\tau) - \frac{c_2 y_2(t-\tau)}{1+y_2(t-\tau)}\right], \\ y_2'(t) &= y_2(t)\left[r_2 - a_2 y_1(t-\tau) - \frac{c_1 y_1(t-\tau)}{1+y_1(t-\tau)}\right], \end{aligned} \tag{1.1}$$

where r_i, a_i and c_i, $i = 1, 2$, are all positive constants, and τ is a nonnegative constant. From system (1.1), it is easy to see that one species is governed by the following well-known Wright equation, see [**7**], when the other is absent

$$y'(t) = y(t)[r - ay(t-\tau)]. \tag{1.2}$$

Keywords and phrases. Delay, impulse, competitive system, permanence, periodic solution.

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