

1135-34-1815

Marisabel Rodriguez Rodriguez* (marisabel@asu.edu), **Yun Kang** and **Robert E. Page Jr.**. *Population and vitellogenin dynamics of a honeybee colony influencing division of labor.*

The complexity of honeybees has provided an ample study of different mechanisms affecting their population dynamics. Our goal is to provide further understanding of honeybees and underlying mechanisms of nutritional regulation influencing their age-based division of labor and sudden or gradual changes in the populations within a colony. These mechanisms are affected not only by intracolony processes but also outside factors such as weather or change of season. In this study, we present a non-linear differential equation system that models the population dynamics of brood, nurse bees, and foragers within a colony. The dynamics of these populations are influenced by the available stored pollen in cells and the current levels of vitellogenin (Vg) in the fat body of nurse bees. Analytical analysis and numerical simulations provide: (1) a honeybee colony can survive if the brood's feeding rate is less than the efficiency of pollen collection rate by foragers for Vg production; (2) decreasing the queen's feeding rate decreases population size of brood, nurse bees, and foragers; (3) synthesis of Vg and low mortality rate of nurses are critical for colony survival; (5) high transition rate from nurse to forager is not colony sustainable in the long term. (Received September 25, 2017)