SHIFTS IN ECOLOGICAL DOMINANCE BETWEEN TWO LEPIDOPTERAN SPECIES IN REFUGE AREAS OF BT COTTON WITH INSECTICIDE SPRAY

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RESUMO

Understanding the reasons that substantiate competitive strategies as a result of selective pressure and their consequences for the dynamics of competitors under specific conditions is one of the key issues in Game Theory. Taking into account the possibility of non-cooperative behaviour involving *Spodoptera frugiperda* and *Helicoverpa armigera* in cotton plants that are used as refuge areas for Bt crops, a game theory-based approach may be useful to describe the decision-making dilemma of a competitor with impacts to guarantee its superiority in terms of ecological dominance or sharing of the food resource with its competitor. We show also how the adoption of chemical control in refuge areas and the occurrence *S. frugiperda* and *H. armigera* resistance to insecticides could impact the large-scale production of individuals in refuge areas of Bt cotton in a context of competition dynamics. In an attempt to elucidate the consequences of competitive dynamics for the ecological dominance of these species in refuge areas, we conducted a study that was divided into two parts. The first study consisted of an evaluation of interactions involving *H. armigera* and *S. frugiperda* on non-Bt cotton plants in a field trial. In the second study, we explored the data matrix collected in the field to parameterize a model of Cellular Automata (CA) with update rules inspired by Game Theory. Simulations were analyzed in hypothetical scenarios involving the application and non-application of insecticides in the refuge areas in combination with the resistance factor of one or both pest species to the insecticides used in the refuge areas. *H. armigera* had superior competitive performance in relation to *S. frugiperda* only at high densities. According to the density-mediated shift in dominance of the species, the resistance of *S. frugiperda* to insecticides is seen as a risk factor for the production of susceptible individuals of *H. armigera* on a large-scale in the refuge areas, and additionally may, potentially, impact the resistance evolution of the *H. armigera* population to Bt cotton. In view of our results, we emphasize the urgent necessity to design sustainable management with minimum use of insecticide spray to control *S. frugiperda* and *H. armigera* in refuge areas of agroecosystems that have both these species.

PALAVRAS-CHAVE: larval, competition, game theory.

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