

Study of methodologies for evaluating effectiveness of the grooming behavior as mechanisms of resistance against *Varroa destructor*

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The Africanized honey bee is well known for its resistance against pathogens and parasites. The grooming behavior has been pointed as one of the mechanisms of resistance displayed by *Apis* bees against *Varroa destructor*. This study aimed to identify suitable methods for evaluate efficient grooming performance by correlating some behavioral data with the infestation rates (IR) of the studied colonies. The method developed by Aumeier (2000) as well as the technique of the bottom-board trap was evaluated. None of the parameters analyzed through the bottom-board trap (Idiossoma damaged mites, appendix damaged mites and total number of trapped mites) showed significant statistical correlation to IR (figure 1). Some behavioral parameters evaluated by the Aumeier technique presented high linear correlation to IR as well as statistical relevance (figure 2). The time takes by the worker bee to notice the presence of *Varroa* on its body and starts grooming behavior was the parameter that presented the highest linear correlation (0.832) to IR. The time spent displaying intense grooming behavior has shown as well a significant linear correlation to the IR (-0.816). Behavioral experiments have also shown that the dorsal surface of the thorax is the area that most exposes the mite to be touched or removed through legs grooming movements. This research showed that the efficiency of the grooming behavior is correlated to quick starting and long lasting grooming behavior. The former concept that the ability to chew mite as a main promoter to control mite's population has been proved not be completely correct. This study also describes a significant influence of the mite's behavior on the success of grooming as promoter of mite's population controller. The methodology developed by Aumeier (2000) is highly recommended as diagnostic method to evaluate the grooming behavior efficiency.

Figure 1. Percentage of damaged mites found in bottom board debris and the respective adult bee mite infestation rates (IR) of eight African-derived honey bee colonies selected for high and low infestation rates (Confidence limits = 95%). C9, etc. are colony identification numbers.

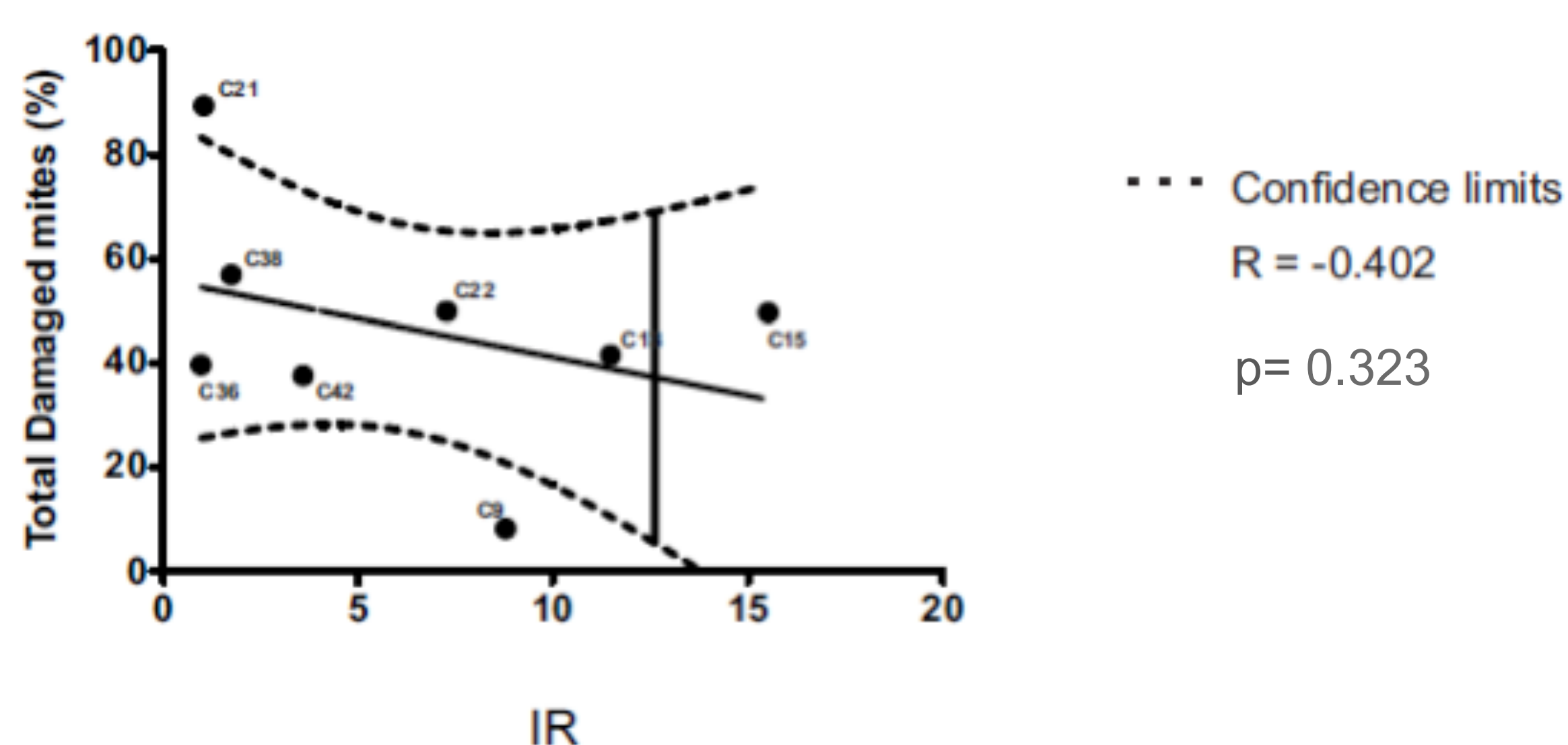
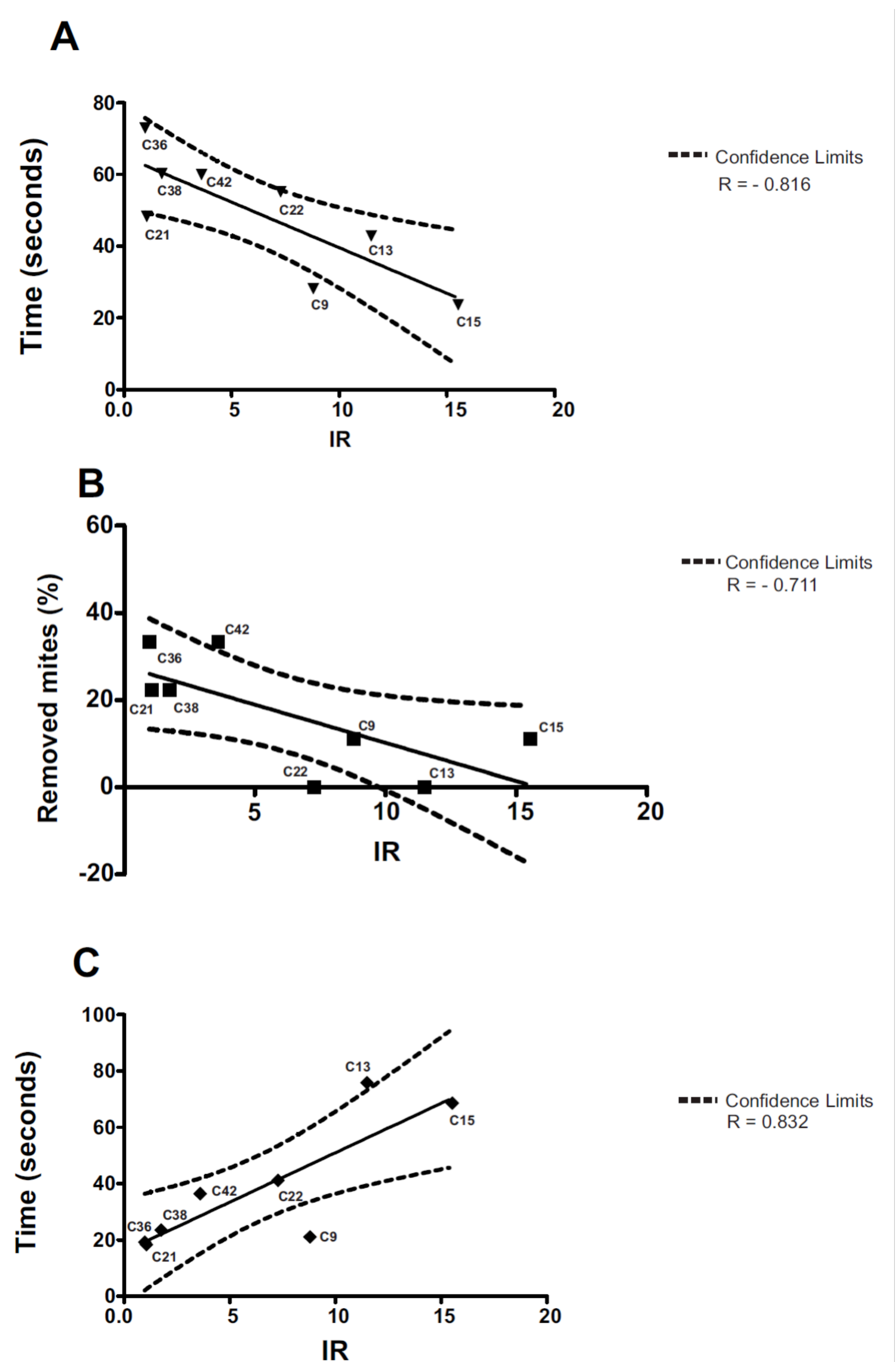


Figure 2. A. Time spent displaying (in seconds) intensive grooming behavior as a function of the infestation rate (IR) of the colonies the bees were sampled from. **B.** Percentage of mites removed during the grooming behavior bioassay as a function of the infestation rate). **C.** The time for worker bees to react to the presence of the mite placed on its body (in seconds) as a function of the infestation rate of the colonies (Confidence limits = 95%).



A. $p = 0.013^*$; **B.** $p = 0.048^*$; **C.** $p = 0.010^*$.
*Significant difference

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