

SUSTAINABILITY, APPLICATION AND DELIVERY MECHANISM OF BIOLOGICAL CONTROL AGENTS

Enrique Quesada-Moraga¹, Josep A Jaques-Miret²

¹ Department of Agricultural and Forestry Sciences, ETSIAM, University of Cordoba. Campus de Rabanales. Edificio C4 Celestino Mutis. 14071 Cordoba, Spain. E-mail: equesda@uco.es;

² Universitat Jaume I (UJI). Unitat Associada d'Entomologia Agrícola UJI-IVIA (Institut Valencià d'Investigacions Agràries), Departament de Ciències Agràries i del Medi Natural, Campus del Riu Sec. 12071. Castelló de la Plana (Spain)

This contribution focuses on the natural enemies of *Rhynchophorus ferrugineus*, both entomophagous agents and entomopathogenic microorganisms, and on their potential to control this pest. Although there are many references to *R. ferrugineus* natural enemies, very few of them fulfil the requirements for further development to effectively control the red palm weevil (RPW), either by conservation or by augmentative (inoculative and inundative) biological control. Pros and cons of all the biological control agents are discussed, and special attention is given to entomopathogenic fungi (EPF), which are noteworthy the most relevant agents for the natural regulation of *R. ferrugineus* populations and are the most promising for inclusion in RPW IPM programs.

Several strains of EPF have been isolated from diverse naturally infected specimens of RPW in different countries through the Mediterranean Basin and elsewhere. Molecular studies conducted to study the diversity and relationship between some of these strains, with emphasis on *Beauveria* sp., have revealed a host mediated spread of this EPF in the Mediterranean Basin. Most of these fungal strains have environmental competence as revealed by their temperature, humidity and UV-B radiation requirements. Several tactics may be adopted to develop EPF for RPW control, including mycoinsecticide sprays targeting the base of the fronds and EPF-based lure and infect devices, which have shown full potential for effective control in laboratory, semi-field and field trials.

Finally, the potential of insecticidal compounds secreted by EPF for RPW (targeting both adults and larvae) control is highlighted.