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# The RPW infestation elicit a control-factor repressive environment

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Bacteria-insect business...

Secondary symbionts (cultivable and also horizontally transmitted)

## Strong influence on hosts' fitness

# Bacteria and aphids, psyllids, scale insects, whiteflies, weevils and so on...

## Bacteria and R. ferrugineus ????

## **Insect external compartments**

Oliver K.M. et al (2003) Facultative bacterial symbionts in aphids confer resistance to parasitic wasp; PNAS; Lukasik P. et al (2015) Horizontal transfer of facultative endosymbionts is limited by host relatedness; Evolution; Montagna M. et al (2015) Effects of the diet on the microbiota of the red palm weevil (Coleoptera: Dryophthoridae); PlosOne Tagliavia M. et al (2014) The gut microbiota of larvae of *Rhynchophorus ferrugineus* Oliver (Coleoptera: Curculionidae); BMC Microbiology Butera G. et al (2012) The culturable bacterial community of frass produced by larvae of Rhynchophorus ferrugineus Olivier (Coleoptera: Curculionidae) in the Canary island date palm; Lett Appl Microbiol Raio A. et al (2016) Bacteria associated to *Rhynchophorus ferrugienus* (Olivier) (Coleoptera Dryophthoridae) in Italy; Redia





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**Red Pigment-Producing Bacteria (RPPB)** 







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## **Regions from which insects were collected**



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## Sampling





### Infested Palm tissue and pupal cases



Controls: un-infested apple peel and pulp from apples; insect surface before dissection



egg-chambers in apple







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## **Presence of RPPB**









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## **RPPB** *vs.* the three red pigment producing Serratia species







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### **RPPB** *vs.* the three red pigment producing Serratia species







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## Antimicrobial activity assay



Open Access

## MicrobiologyOpen

ORIGINAL RESEARCH

Identification of pigmented Serratia marcescens symbiotically associated with Rhynchophorus ferrugineus Olivier (Coleoptera: **Curculionidae**)

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Bacillus megaterium	ATCC 14581
Bacillus pumilus	ATCC 7061
Staphilococcus aureus	ATCC 25923
Lysinibacillus spp.	l environmental strain
Paenibacillus spp.	l environmental strain

### **Gram negative**

Acinetobacter baumannii	l clinical strains
Salmonella typhimurium	2 clinical strains
Klebsiella pneumoniae	2 clinical strains
Vibrio cholerae	El Tor 787
Escherichia coli	LE392; ATCC 25922



**Attribuzione** -Yes! Yes! of commerciale -Yes! Yes! Yes! Non opere deriva NO Yes! Yes! 6 Yes! **BY-NC-ND** NO





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Ethanol

## Conclusions



Red pigment producing S. marcescens/nematodiphila as secondary symbiont of RPW

Metabolic features of S. marcescens/nematodiphila are consistent with the higher temperature, levels of Ethanol and other organic compounds detected in infested palms

The combinatory effect of these factors and the antimicrobial activity exhibited by the symbiont, suggest that RPW infestation induces a repressive environment for biological control-factors





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**Open perspectives** 

Potential protective role played by S. marcescens/nematodiphila against microbial species suggested for biocontrol

The contribution to palm death due to Serratia marcescens/nematodiphila metabolism and the bacterial ability to spread within palm tissue

Could distruption of Serratia/RPW association be a target for the weevil control?



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Food and Agriculture Organization of the United Nations

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Volatile Compounds in Biological System

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