Fitness improvement mass reared sterile males of *Ceratitis capitata* (*Vienna 8* strain) after gut enrichment with probiotics

Hamden Heithem, Meriem M'saad Guerfali, Salma Fadhel, Mouldi Saidi and Claude Chevrier

Unité de production des mâles stériles de la Cératite

Centre National des Sciences et Technologies Nucléaires.

SIT success conditions

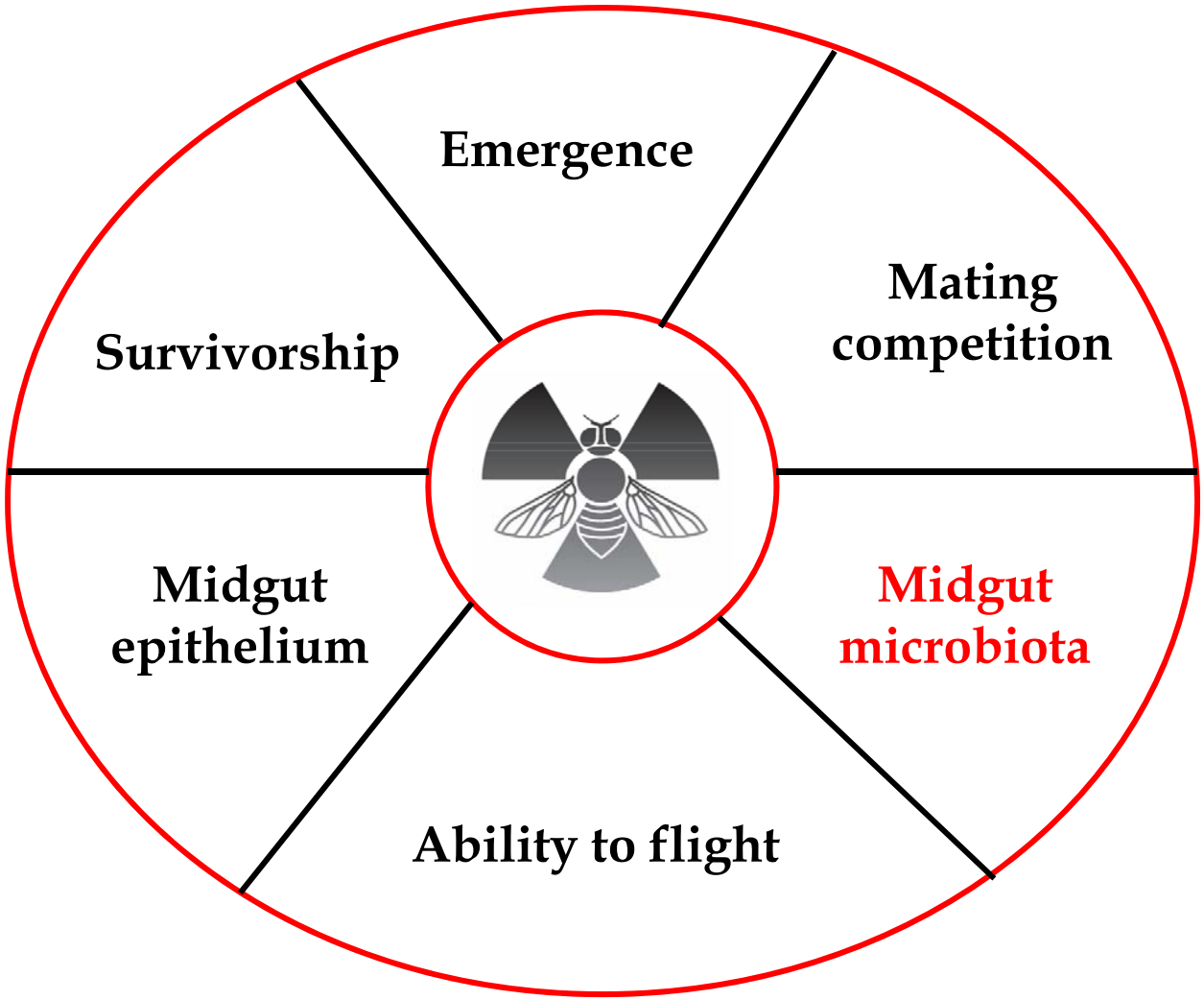
Our mission is to:

Disperse in the fields/Survivorship

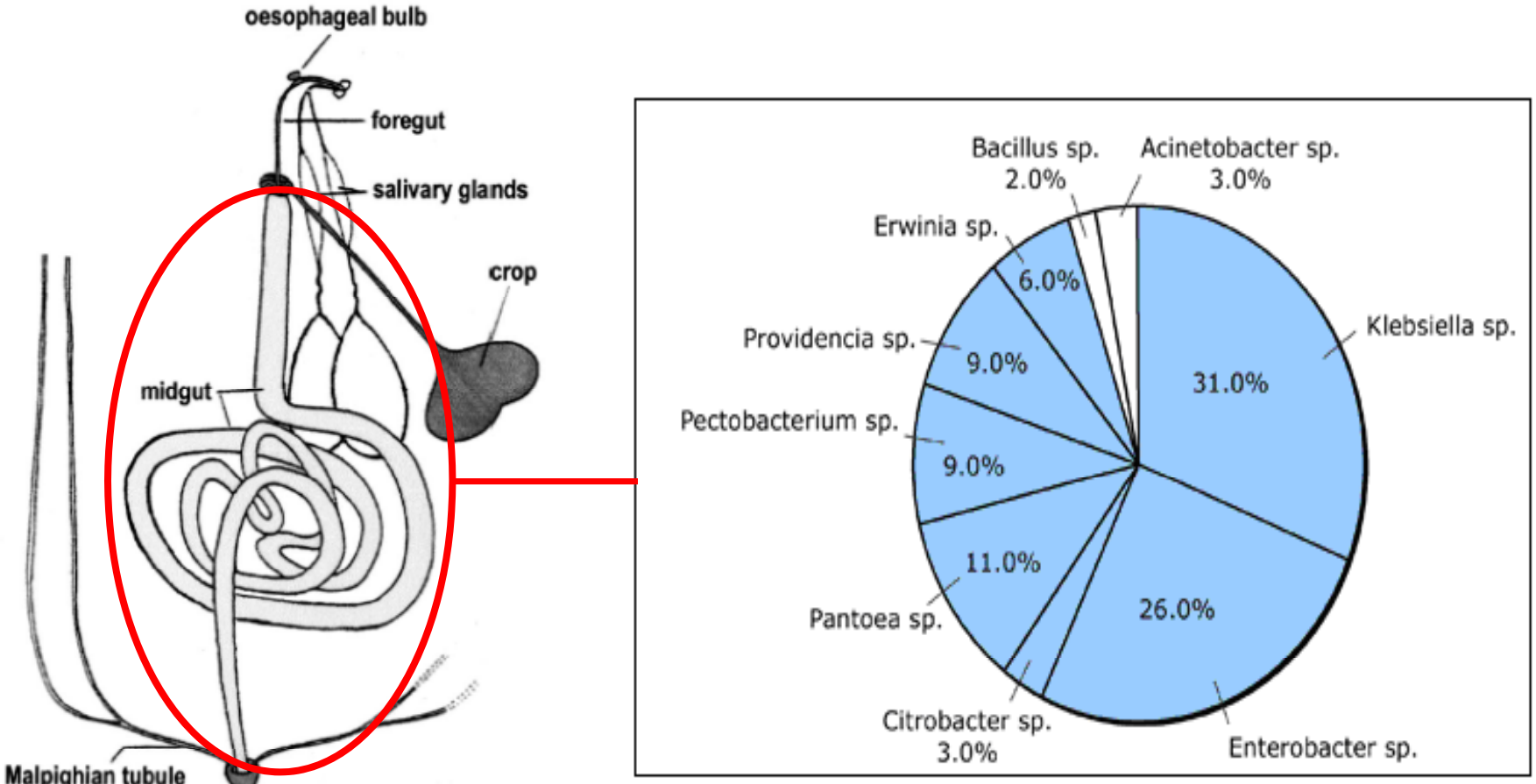
Compete with the wild males.

Mating success.

Effects of irradiation



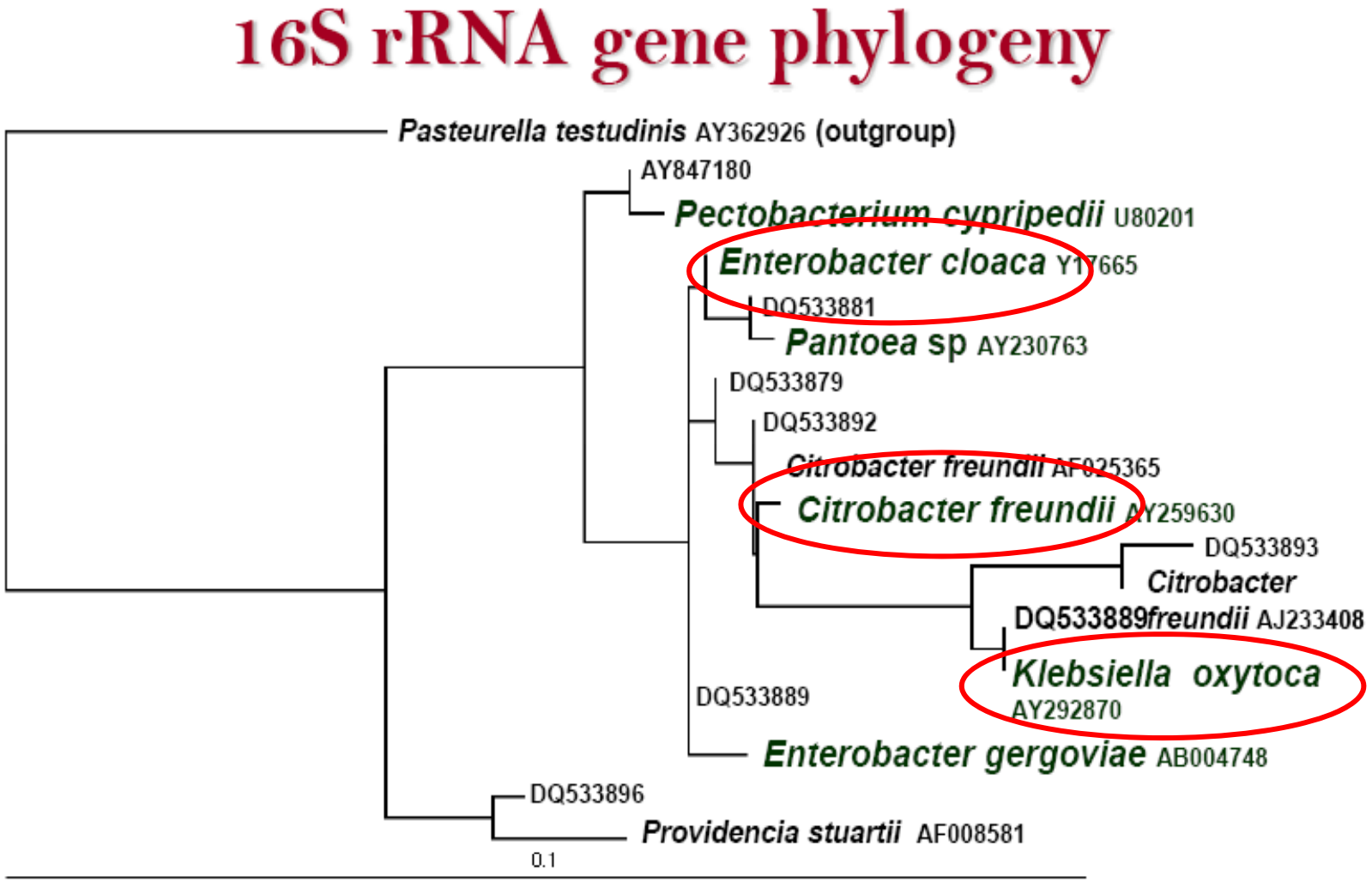
In wild strain



Enterobacteriacea 95%

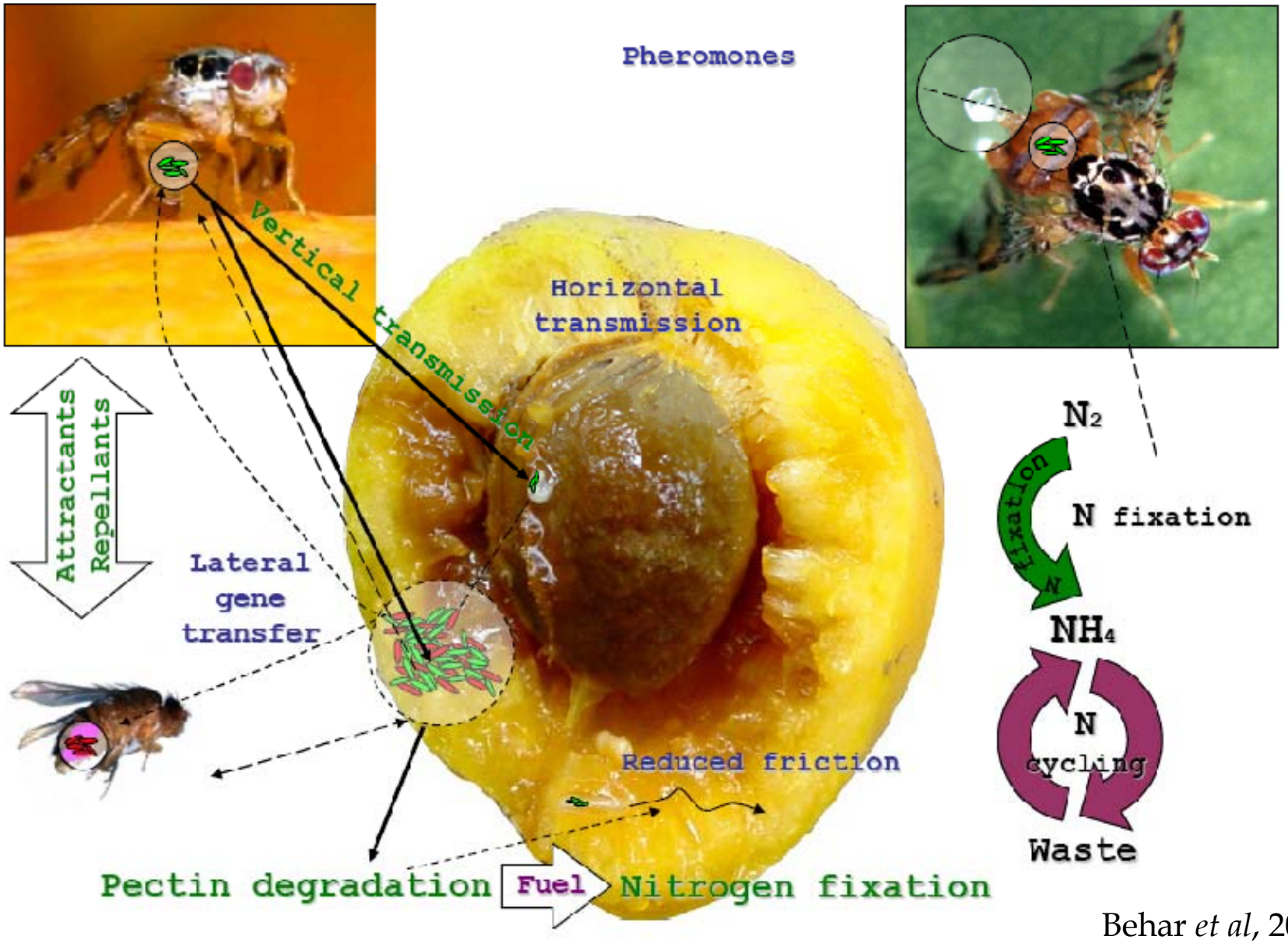
Ben Ami *et al*, 2009

In wild strain



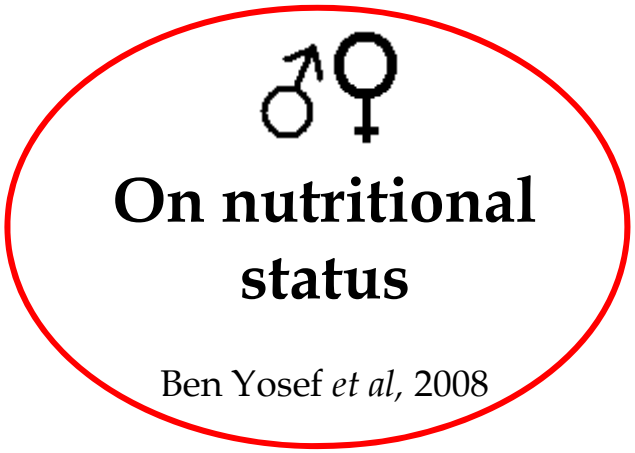
Behar *et al*, 2008c

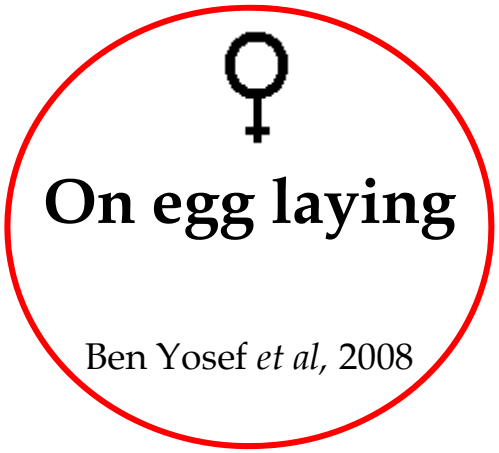
In wild strain

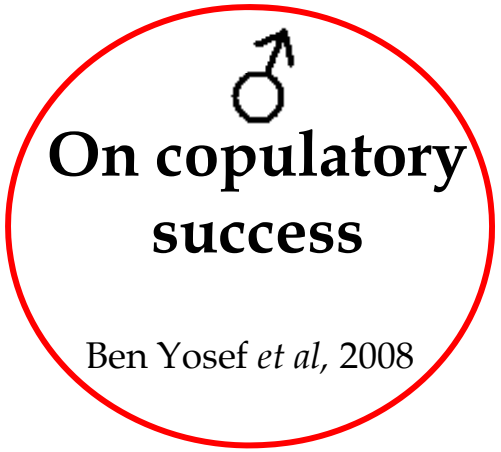


Behar *et al*, 2008c

Gut bacteria contribution on the fly's fitness

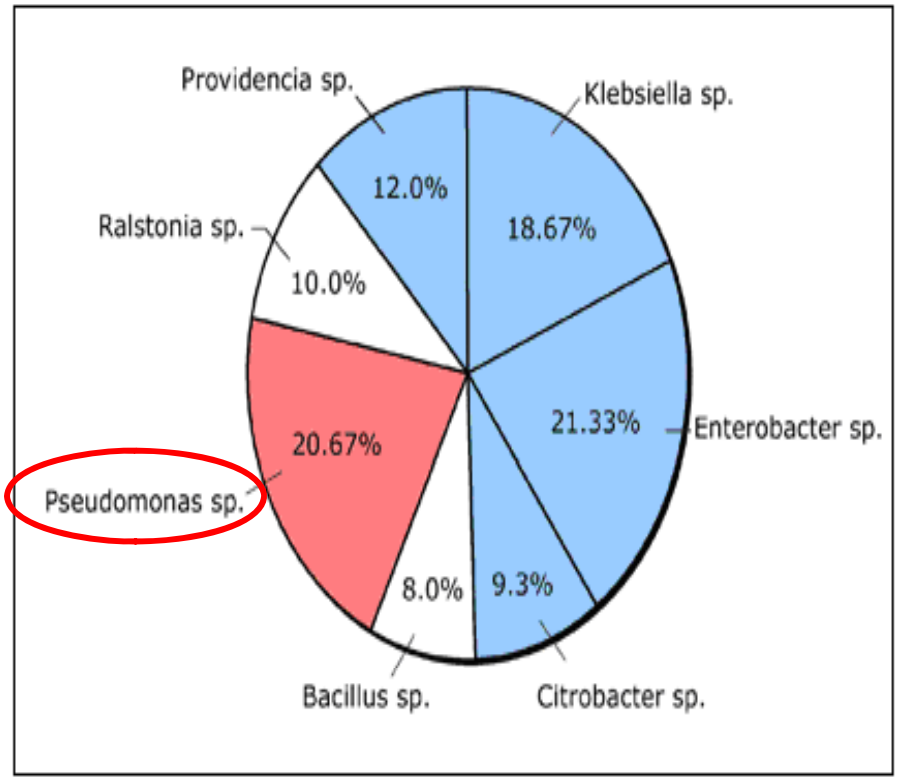






Mass reared strain, microbial community

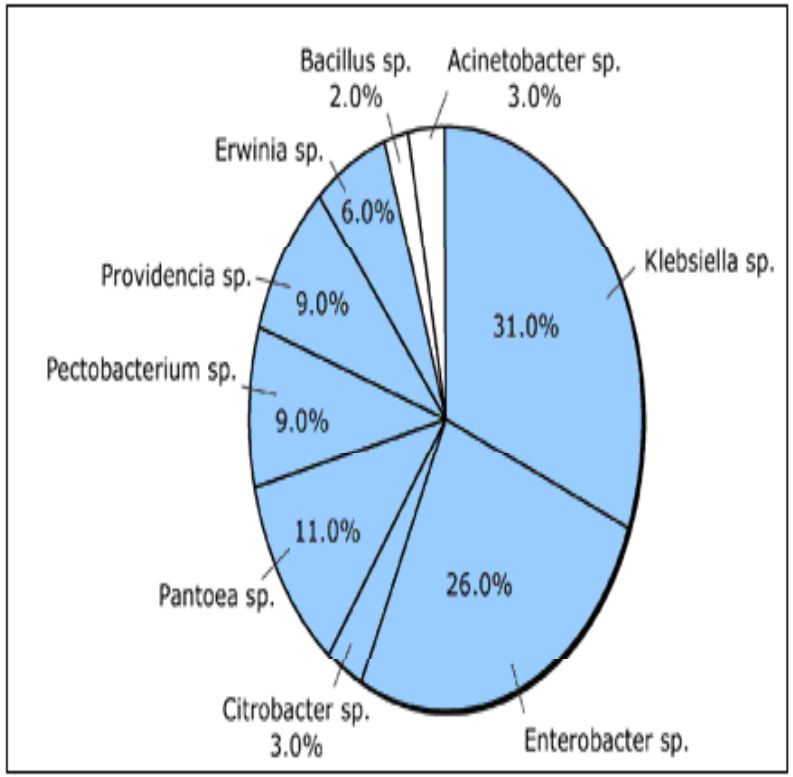
Mass reared strain



***Enterobacteriacea* = 61.3%**

***Pseudomonas* = 20.67%**

Wild strain



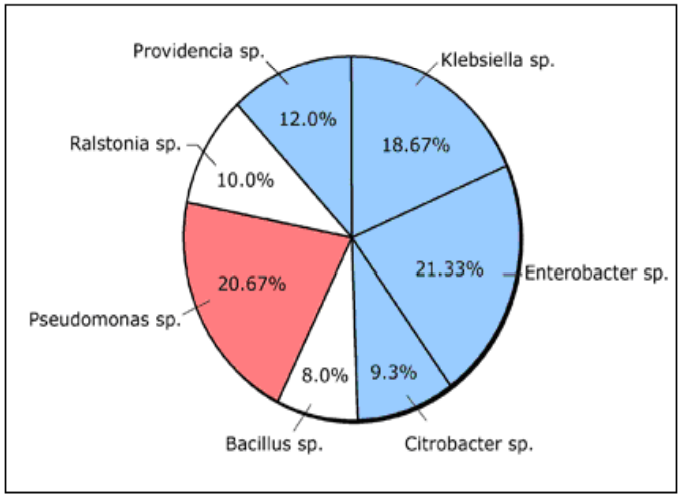
***Enterobacteriacea* = 95%**

***Pseudomonas* = 0%**

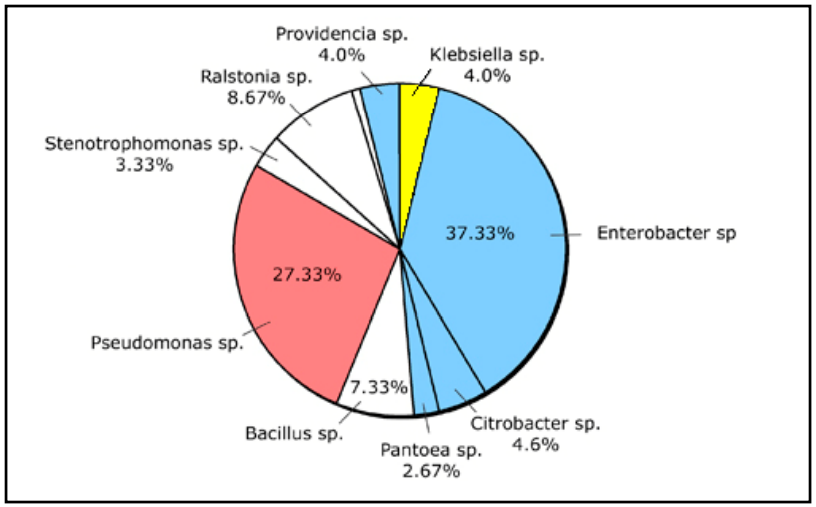
Ben Ami *et al*, 2009

The SIT's sterilizing irradiation process affects the microbial community structure in the medfly's gut

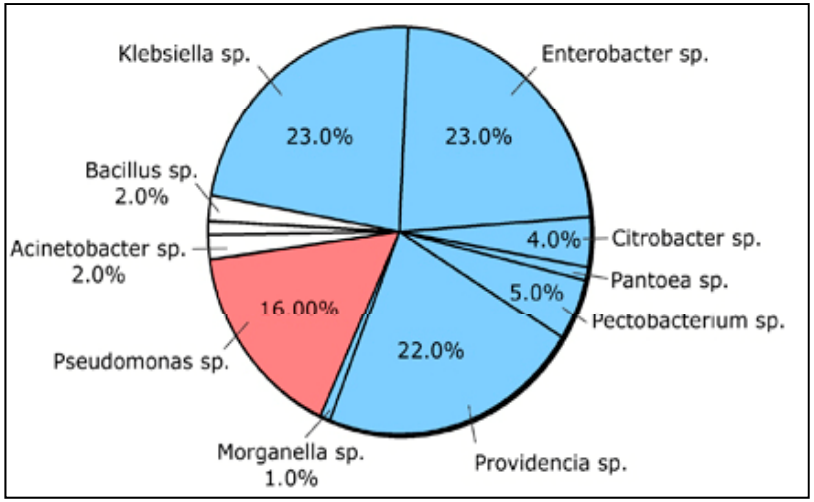
Non sterile (Eclosion day)



Sterile (Eclosion day)



Sterile (Release day)



Manipulations improves sexual performances

Inoculation with

Klebsiella oxytoca

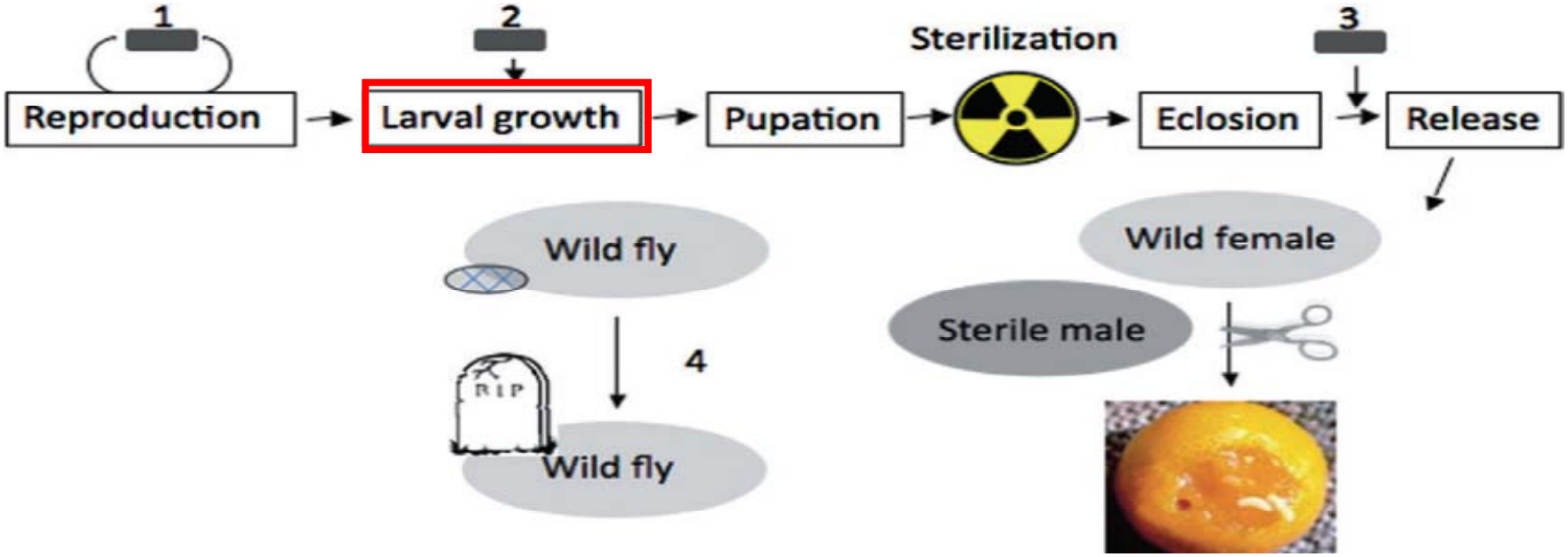
Improvement in the sexual competiveness both in the laboratory and in field cages

Significantly inhibited females receptivity to further copulations

(Gavriel *et al*, 2011)

Improvement of the mating latency
(Ben Ami *et al*, 2009)

Can probiotics be used in the SIT male production ?



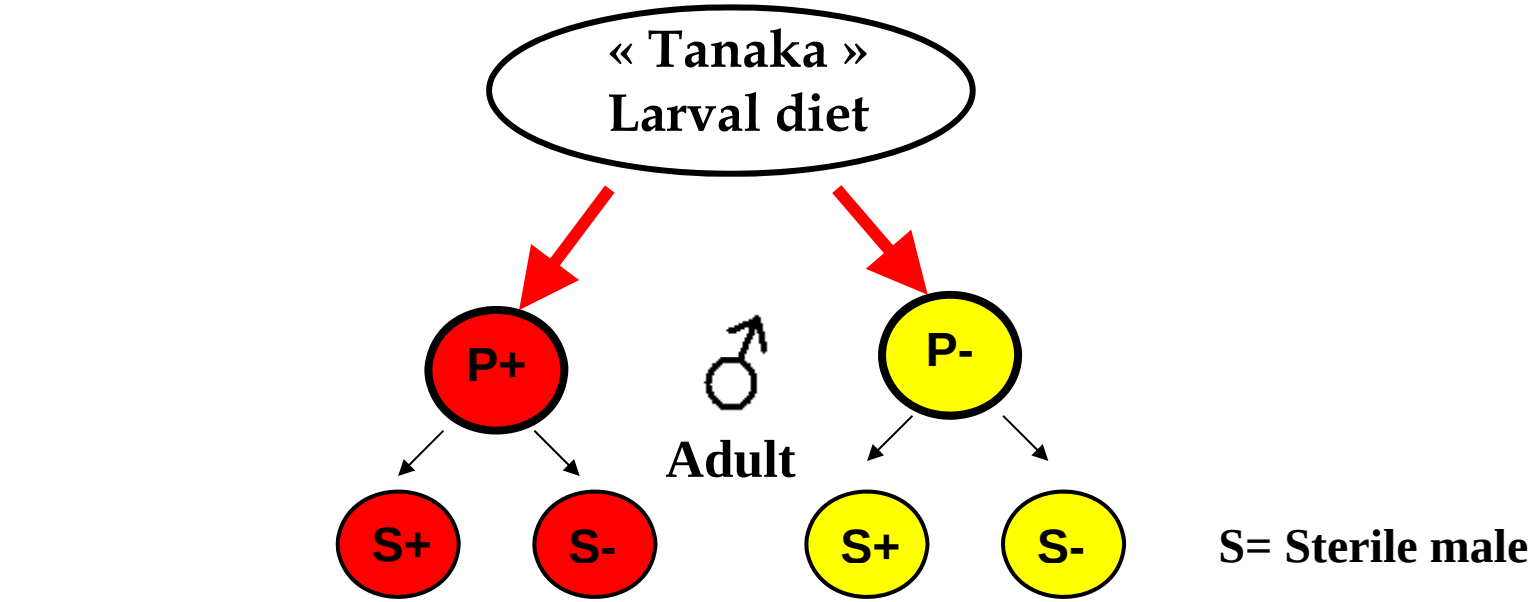
Jurkevitch *et al*, 2011

Our aim:

Improve the sterile males performances by

microbiota manipulation during SIT larval growth.

Effect of probiotics on quality control parameters: Methods



P= Mix of probiotics (*Enterobacter sp* + *Klebsiella sp* + *Citrobacter sp*)

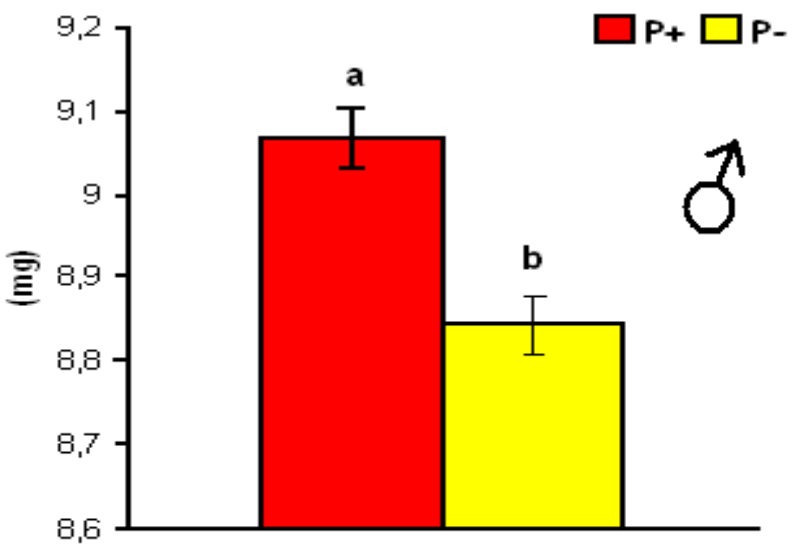
1. Weight

2. Adult emergence and flight ability

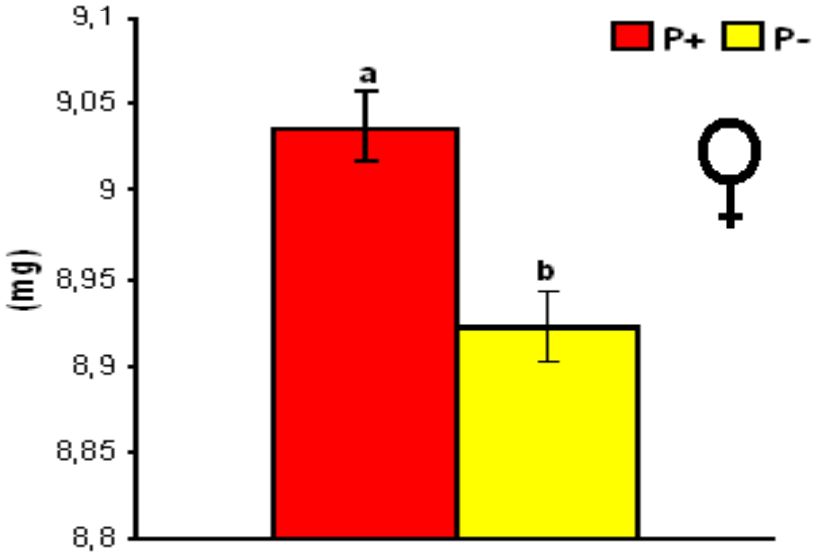
3. Longevity

4. Morphometric traits

1. Effect on pupae weight

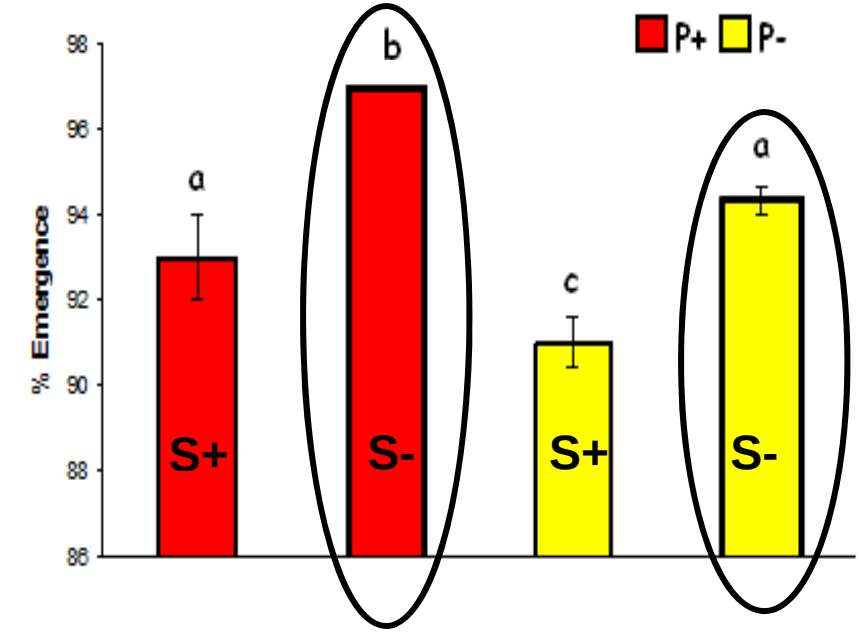


One way anova: F= 32.06, df1=1, df2=4, p<0.05

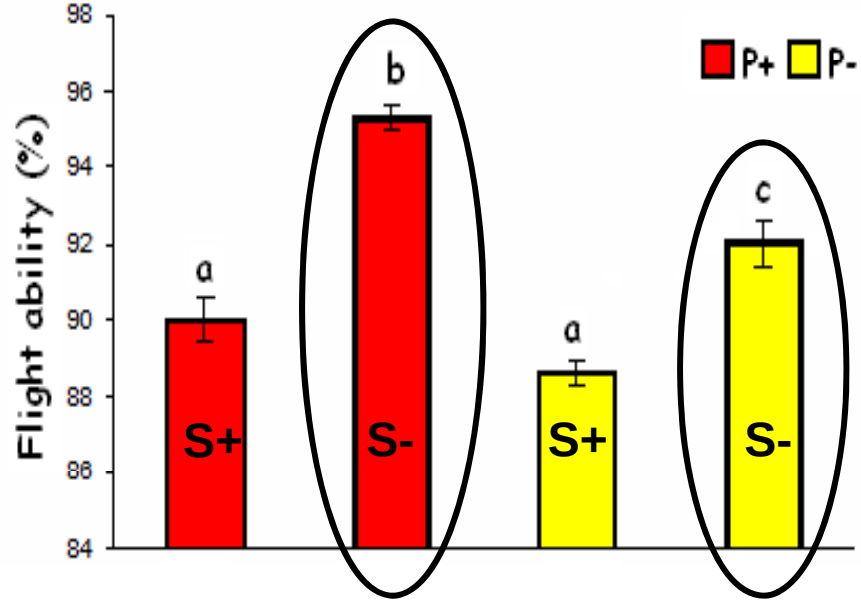


One way anova: F= 9.97, df1=1, df2=4 p<0.05

2. Effect on adult emergence/ Flight ability

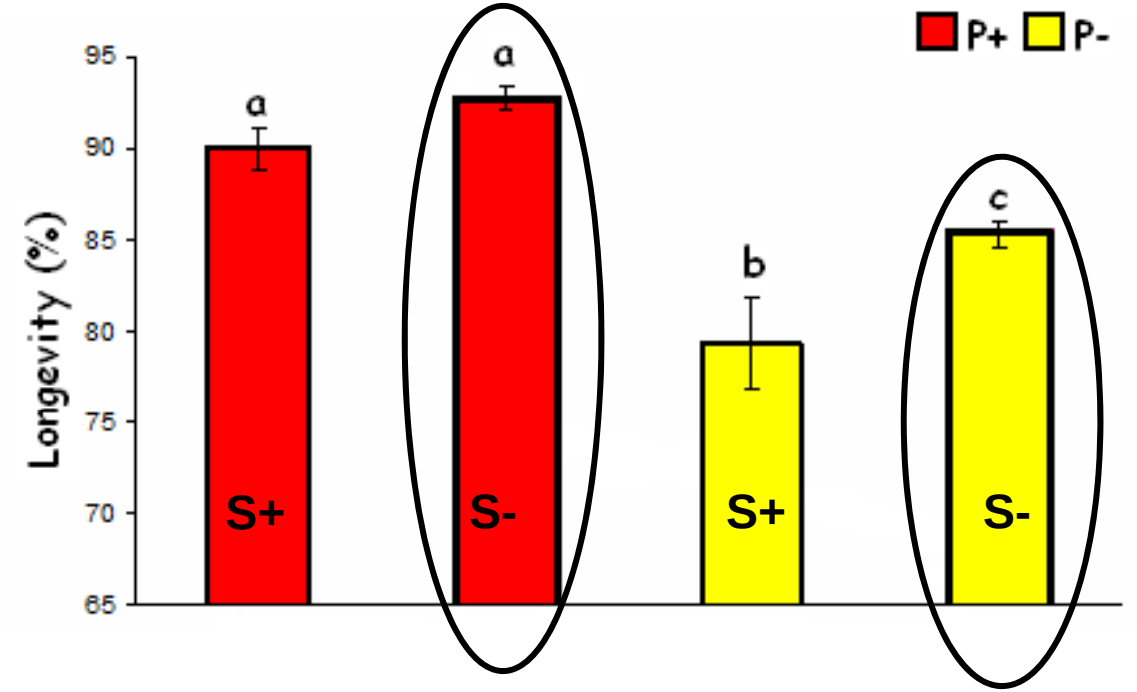


One way anova: F= 17.54, df1=3, df2=8 p<0.05



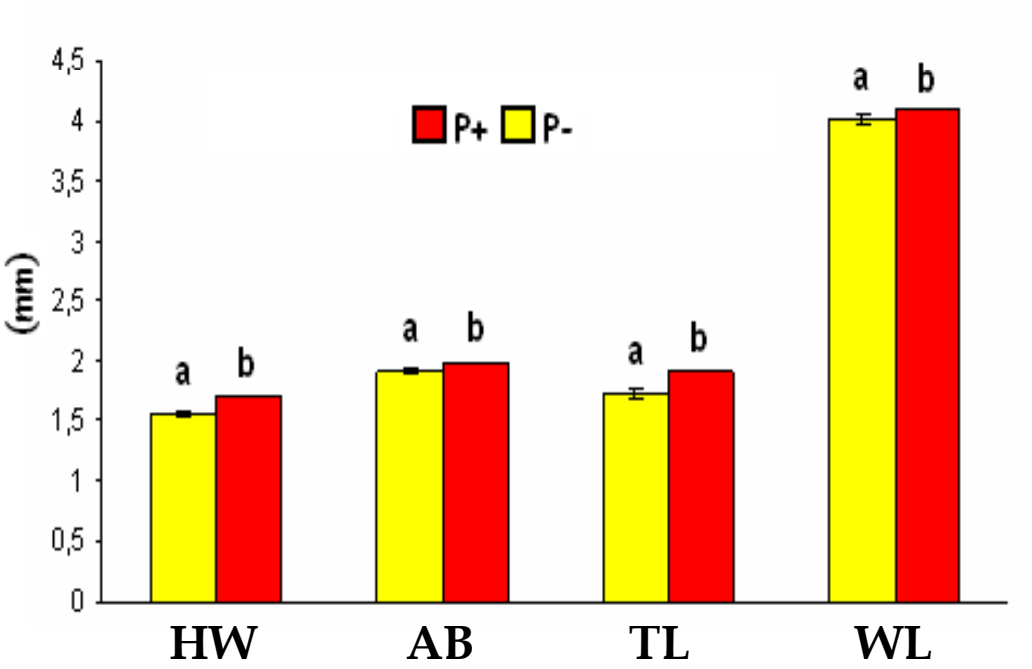
One way anova: F= 37.83, df1=3, df2=8 p<0.05

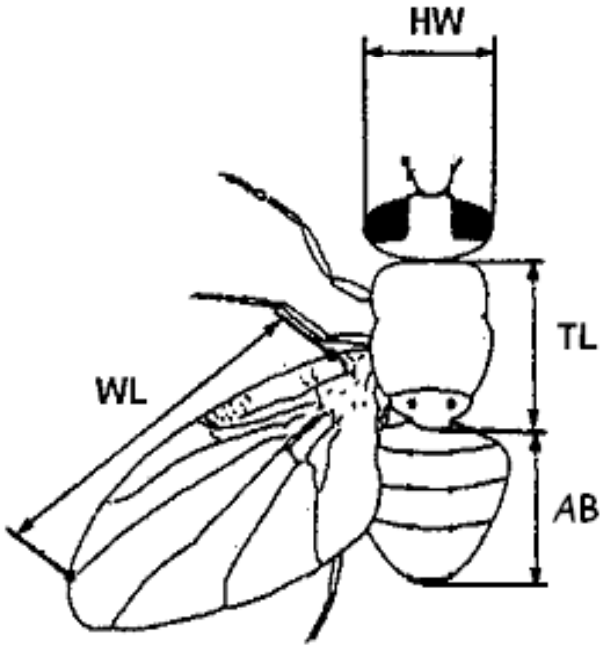
3. Effects on longevity



One way anova: F= 17.09, df1=3, df2=8 p<0.05

4. Effect on morphometric traits





HW: head width

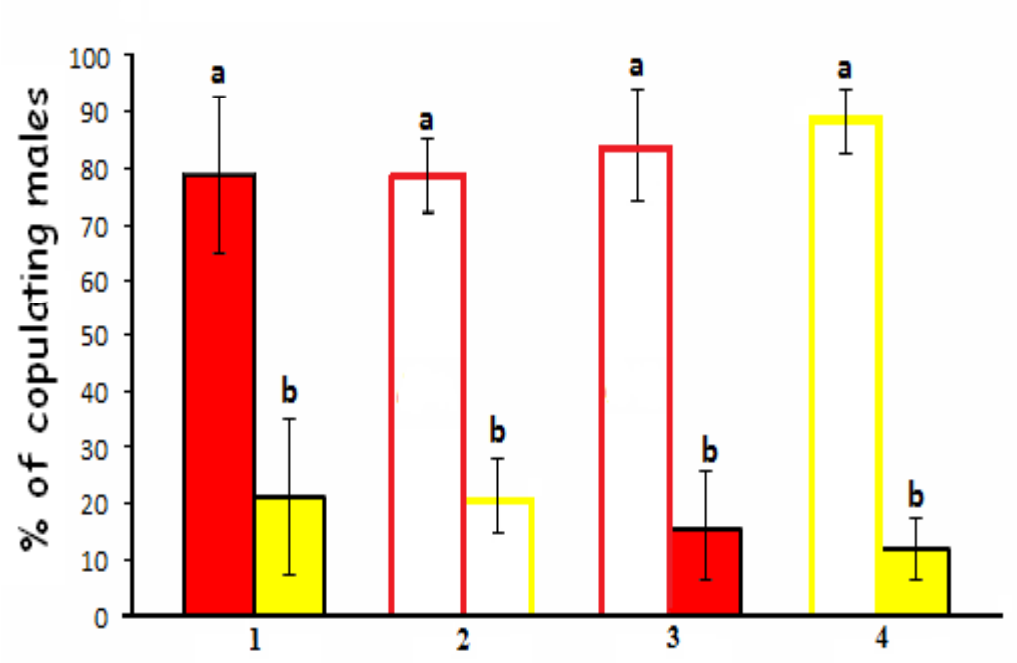
TL: thorax length

AB: abdomen length

WL: wing length

Effect of probiotics on mating success

	Mating combinaison
1	*15* ♂ **vs** *15* ♂ **vs** *15* ♀
2	*15* ♂ **vs** *15* ♂ **vs** *15* ♀
3	*15* ♂ **vs** *15* ♂ **vs** *15* ♀
4	*15* ♂ **vs** *15* ♂ **vs** *15* ♀



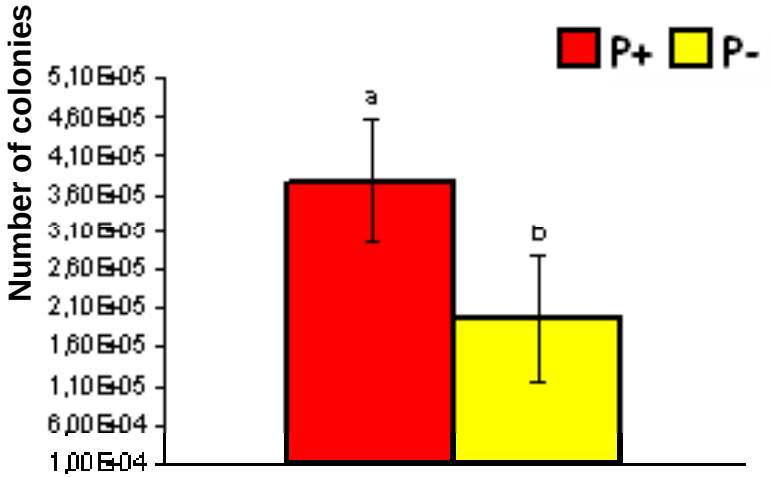
♂ **Probiotic sterile male** ♂ **No Probiotic sterile male**

♂ **Probiotic male** ♂ **No Probiotic male** ♀ **Virgin female**

Gut community structure after larval growth microbiota manipulation

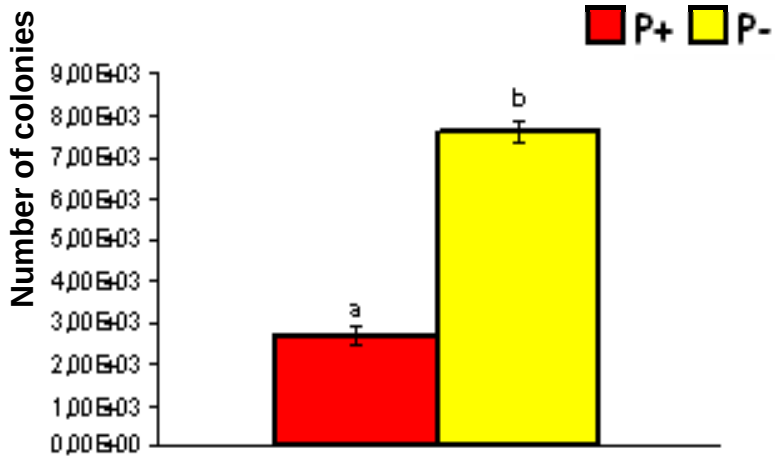
Larval stage

Enterobacteriacea



One way anova: F= 4.73, df1=1, df2=31, p<0.05

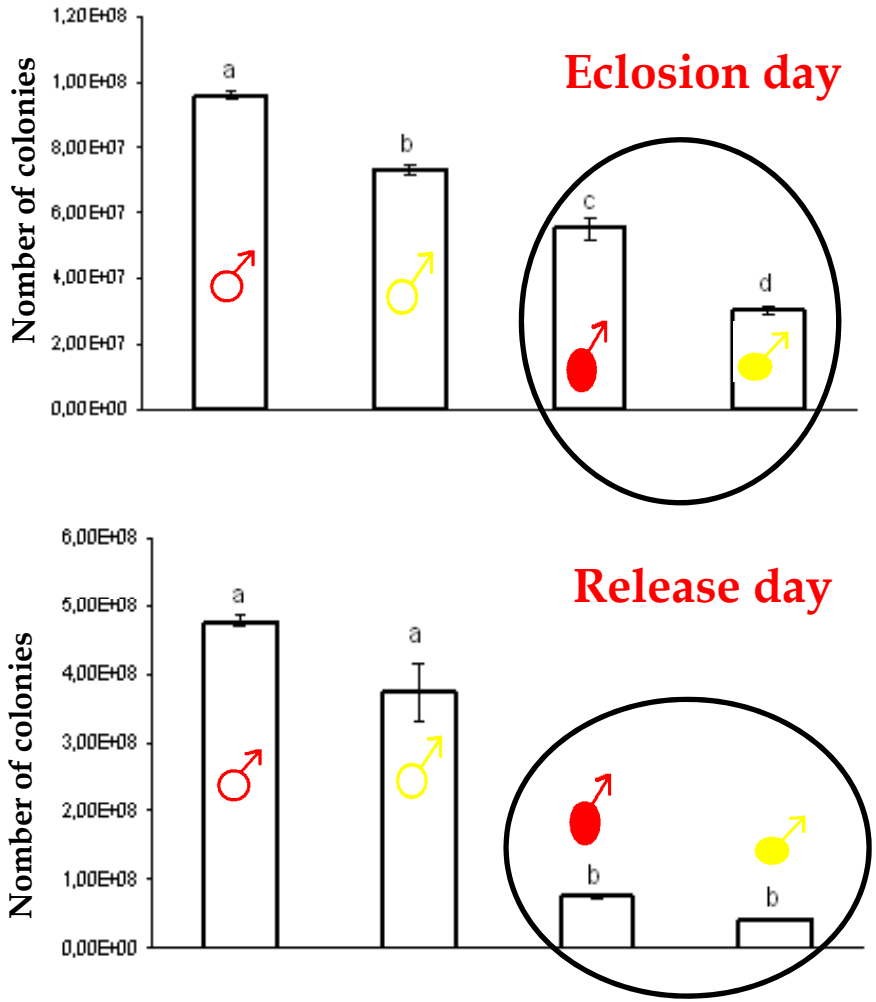
Pseudomonas



One way anova: F= 153.4, df1=1, df2=16, p<0.05

Gut community structure after larval growth microbiota manipulation

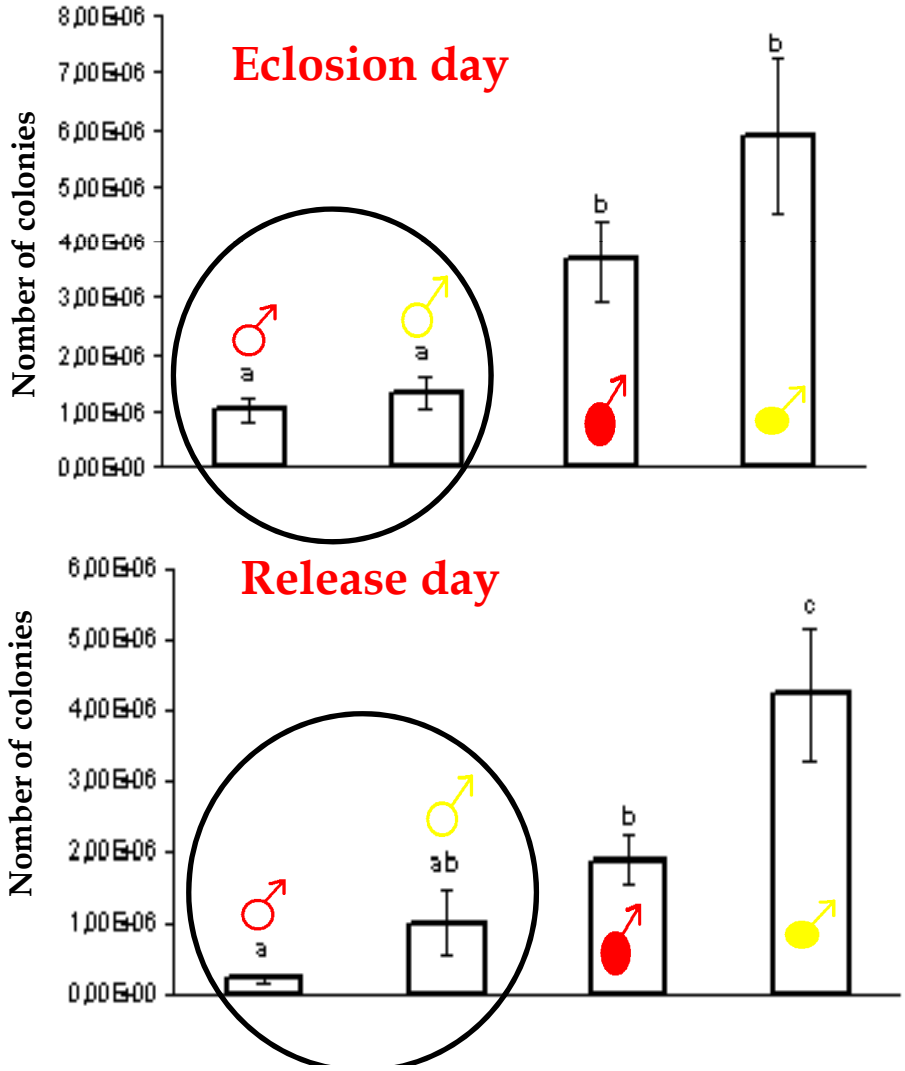
Enterobacteriacea



- Probiotic sterile male
- Probiotic male
- No Probiotic sterile male
- No Probiotic male

Gut community structure after larval growth microbiota manipulation

Pseudomonas

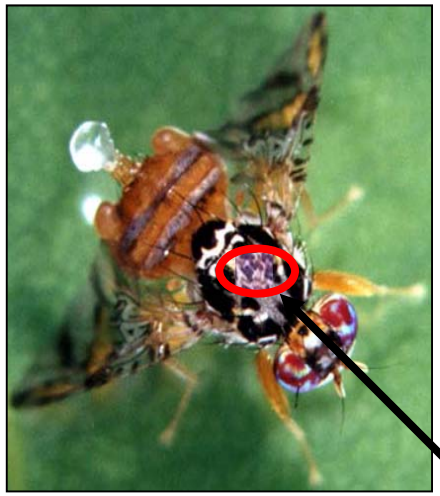


Probiotic sterile male

Probiotic male

No Probiotic sterile male

No Probiotic male

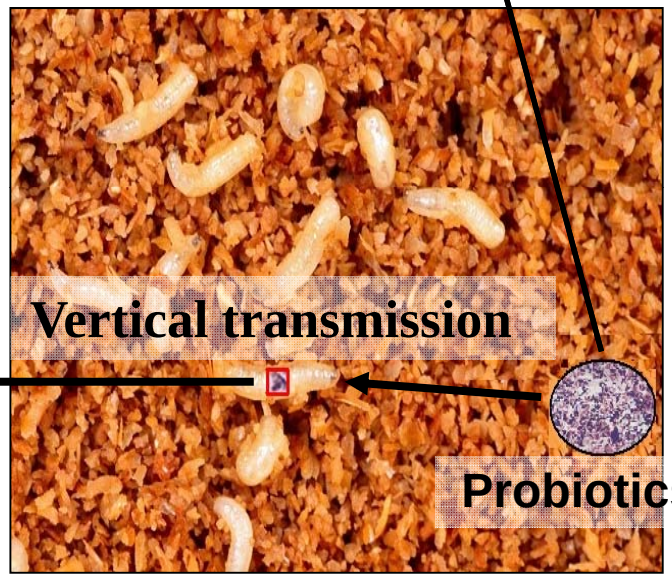


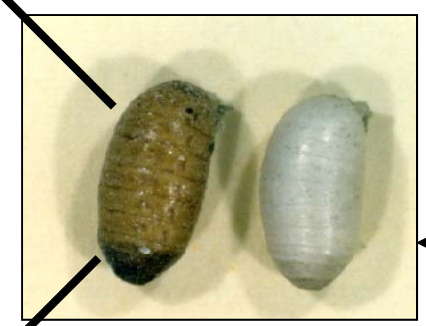
- Morphometric traits
- Longevity
- Emergence
- Flight ability

Pectin degradation

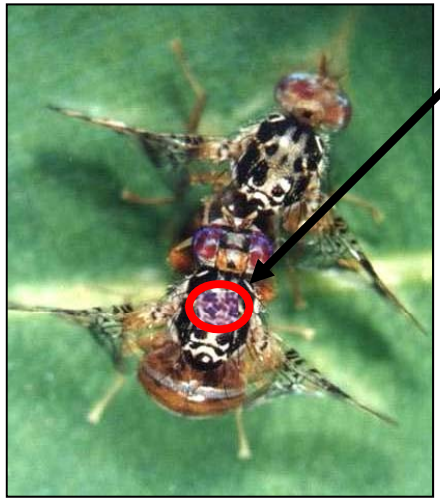
Fuel

Nitrogen fixation





Pupae weight



- Copulatory success

Thank you for your attention